Notice of Alteration Form



File No. : 5556.00	Environmer	Environment Act Licence No.: 3081 R							
Legal name of the Licensee: City of Winnipeg, Water and Waste Department									
Name of the development: Brady Road Resource Management Facility									
Category and Type of development per Classes of Development Regulation:									
Waste Treatment and Storage	20	Class 1 Waste Disposal Grounds							
Licensee Contact Person: Chris R Mailing address of the Licensee: 1 City: Winnipeg Phone Number: (204) 232-9486	120 Waverley Street Province: N								
Name of proponent contact person WSP Canada Inc Fiona Scurra		nvironmental assessment (e.g. consultant): R.P. Bio., EP(CEA)							
Phone: (204) 918-3277 Fax:	Mailing addr	ress: 6 High Level Road, Oak Bluff, MB R2G 0E4							
Email address: fiona.scurrah@ws	p.com								
	5411 436	for the Brady humanitarian search							
Alteration fee attached: Yes:	No: 🗸								
Date: 2025-09-05	Signature:								
N	Printedname: Chris	s Kozak							
A complete Notice of Alteration (N consists of the following components Cover letter Notice of Alteration Form 1 electronic copy of the NoA (see "Information Bulletin - Developments with Environment Act Licence \$500 Application fee, if appropayable to the Minister of Fi	nts: A detailed report Alteration to ces") plicable (Cheque,	Submit the complete NoA to: Director, Environmental Approvals Branch Environment and Climate Change Box 35, 14 Fultz Blvd Winnipeg MB R3Y 0L6 EABDirector@gov.mb.ca For more information: Toll-Free: 1-800-282-8069 Phone: 204-945-8321 Fax: 204-945-5229 https://www.gov.mb.ca/sd/ permits_licenses_approvals/eal/ licence/ index.html							

Note: Per Section 14(3) of the Environment Act, Major Notices of Alteration must be filed through submission of an Environment Act Proposal Form (see "Information Bulletin – Environment Act Proposal Report Guidelines")



4 September 2025

Ms. Agnes Wittmann, Director – Environmental Approvals Branch Environmental Approvals Branch Manitoba Environment and Climate Change 14 Fultz Blvd Winnipeg MB R3Y 0L6

Subject: File No. 5556.0: Notice of Alteration for Licence No. 3081 R – Construction and Operation of a Search Facility and Excavation of Cell 32 at the Brady Road Resource Management Facility

Dear Ms. Wittmann:

WSP Canada Inc. (WSP) was retained by the City of Winnipeg, Waste and Water Department (COW) to compile a Notice of Alteration (NoA) related to its *Environment Act* Licence 3081 R (the Licence), for the Brady Road Resource Management Facility (BRRMF) located at 1901 Brady Road, Winnipeg, Manitoba. This NoA has been developed to accommodate the construction and operation of a Search Facility to support the Humanitarian Search Project for the remains of Ashlee Shingoose, previously known as Buffalo Woman. A Humanitarian Search Project is proposed to be completed at the BRRMF that will involve excavation of existing material from and around Cell 32, which has identified as the cell of interest. The particular steps of the project will include:

- Excavating daily cover over the existing waste and setting it aside for future use;
- Excavating the overburden waste material above the targeted zone and hauling it to Area D for possible searching;
- Excavating waste and cover soil material within the targeted zone and sending it to a Search Facility for detailed examination;
- Once searched and cleared for disposal, taking the targeted zone waste and cover soil material from the Search Facility to Area D; and
- At the conclusion of the search, backfilling the excavated area.

The Search Facility is to be constructed within an existing licensed wood waste storage area of the BRRMF. Excavated waste will be hauled to the Search Facility and spread out to allow for detailed search of the material for human remains.

After searching the waste, the cleared material will be hauled to Area D (Appendix A – Drawing C100) for disposal.

As per Clause 13 of the licence, COW is required to obtain approval in writing from the Director for any proposed alteration to the Landfill.

This letter report provides an environmental assessment associated with the proposed construction and operation of the Search Facility and associated infrastructure and the excavation of Cell 32, and forms part of the NoA submission along with the NoA application form to Manitoba Environment and Climate Change.

The construction and operation of the Search Facility and associated infrastructure and the excavation of waste would be considered a minor alteration to the Licence, given that the environmental impacts would not be significant, as the waste material being excavated, relocated within the landfill to Area D, and/or searched is coming from the landfill and will be returned to the landfill post search. The BRRMF previously received approval from the Government of Manitoba Environmental Approvals Branch (EAB) on February 6, 2024, for the construction of Area D, a 1 m clay-lined emergency cell, proposed for the disposal of waste that cannot be accommodated in the active cells. Per correspondence from EAB on August 29, 2025, Phase I of the Area D construction has been approved. It is anticipated that the use of Area D will be approved following a construction inspection in accordance with Clause 31 of the Licence.

Additionally, mitigation measures and strategies already in place at the landfill to minimize environmental effects such as ambient air, gas, and odour monitoring will be in place during the duration of the Project.

As per guidance by Manitoba Environment and Climate Change, there is a requirement for payment of five hundred dollars (\$500.00) for the NoA fee which will be paid by the City of Winnipeg at time of submission.

1 INTRODUCTION

The City of Winnipeg owns and operates the Brady Road Resource Management Facility (BRRMF), located at 1901 Brady Road, Winnipeg, Manitoba. BRRMF is bordered by the Perimeter Highway on the north, Waverley Street on the east, Brady Road and the RM of MacDonald on the west and Rue de Trappistes on the south.

BRRMF has been in operation since 1973 and is licensed under the revised *Environment Act* License (Licence) No. 3081 R as a Class 1 Waste Disposal Ground and Resource Management Facility (WDG). As a Class I WDG, waste materials that can be disposed of at the BRRMF include solid residential, commercial, and institutional material as well as a recycling facility, materials recovery facility, and a composting facility. As part of the infrastructure at BBRMF, there is a leachate system, a gas collection system, a stormwater runoff system and a leachate treatment tank for the treatment of leachate. The BRRMF site (the "Site") is 790-hectares and holds approximately 12 million metric tonnes of waste, with over 300,000 metric tonnes of waste materials landfilled on an annual basis. BRRMF has capacity for over 100 additional years of waste disposal, assuming current waste diversion practices are continued.

A Humanitarian Search Project is proposed to be completed at the BRRMF that will involve: excavation of existing material from the cell of interest (Cell 32); hauling excavated overburden material (i.e., material above the zone of interest) to a location within BRRMF, identified as Area D, for landfilling; hauling excavated material from the targeted zone to a proposed Search Facility Area, to be located within the existing licenced wood waste storage area; and searching the material for human remains at the Search Facility Area. After searching through the waste, the cleared material will be hauled to Area D (Appendix A – Drawing C100) for landfilling. BRRMF previously received approval from the Government of Manitoba EAB on February 6, 2024, for the construction of Area D, a 1 m clay-lined emergency cell, proposed for the disposal of waste that cannot be accommodated in the active cells. Per correspondence from EAB on August 29, 2025, Phase I of the Area D construction has been approved. It is anticipated that the use of Area D will be approved following a construction inspection in accordance with Clause 31 of the Licence.

To support the development of an applicable search procedure for the humanitarian search, WSP is submitting this Notice of Alteration (NoA) to EAB on behalf of the City of Winnipeg, for approval to construct the Search Facility Area, including a temporary Search Facility Building, search pad, trailer compound and other ancillary infrastructure, conduct excavation and hauling activities from Cell 32, conduct search operations within the Search Facility Area, and conduct landfilling activities in Area D. The details relating to the NoA are further outlined below.

2 EXISTING SITE CONDITIONS

BBRMF is proposing to use the wood waste storage area located in the southeast area with the larger landfill property as the location for the temporary search pad, the Search Facility Building, including a holding tank, the trailer compound and other ancillary infrastructure, such as electrical (Appendix A – Drawing C101). The wood waste storage area has previously been approved for the storage of wood waste by the EAB under the current Licence and upon completion of the search activities and decommissioning of the Search Facility Area, this area will revert to its original use as the wood waste storage area.

The wood waste storage area is comprised of native material, with the exception of a small 60 m by 90 m pad of compacted granular material and a geogrid overlying clay. Surface water runoff in this location, which may become impacted from the surrounding environment, goes into the surrounding ditching which carries impacted waters to the BRRMF south retention pond (Appendix B – Leachate Collection System Memo). WSP undertook a geotechnical investigation of the area on 19 and 20 of June 2025. The objective of the geotechnical investigation was to confirm the nature of the compacted granular, geogrid and subgrade to assess what additional materials may be required to support the installation of an asphalt pad and the structural loads of a temporary prefabricated fabric covered Search Facility Building, including a concrete block foundation.

Consistent with regional soil deposits, the stratigraphy observed at the test holes consisted of the following, in descending order from grade level:

- Fill (Gravel, Sand, and Clay)
- Organic Clay
- Fat Clay
- Silt

The full geotechnical report is found in Appendix C and provides greater details related to design considerations and recommendations for upgrading the area to accommodate the Quonset structure and its foundation; the trailer compound; traffic flow into and out of the Site; the asphalt pad; and information related to the clay liner. Detailed test hole logs are located in Appendix A of the geotechnical report (Appendix C).

3 PROPOSED ALTERATION

The Search Facility Area, which includes a temporary Search Facility Building, temporary support facilities (including parking lot, laydown areas and trailer compound), and access roads is proposed to be constructed and operated to support the search activities. The proposed search facility area is located in the wood waste storage area, in the southeast area of BRRMF (Appendix A – Drawing C100).

Liquid management within the Search Facility Building will be undertaken through the installation of a 2,000-gallon underground holding tank in the middle of the structure. It is noted that water or any other liquids generated within the Search Facility Building will be assumed impacted and considered as leachate. The asphalt pad to be

constructed inside the building will be sloped toward the center, directing leachate to drain and collect in the holding tank. Outside the building, the Search Facility Area will also be graded and sloped so that surface water, which may become impacted from the surrounding environment, will run to the adjacent ditching. This ditching is designed to capture and move impacted water from the wood waste storage area into the BRRMF's collection pond (Appendix B). The collection pond is not connected to other drainage ditches or ponds at the BRRMF, therefore containing impacted surface runoff to this area (Appendix A – Drawing C101; Drawing C102).

The excavated overburden material (i.e., waste and cover materials located below the top layer of daily cover and above the targeted zone) will be hauled from the Excavation Area within Cell 32 to Area D using the existing access road from the cell to the Area D, and bypassing the Search Facility (Appendix A – C801). The excavated material from the targeted zone will be hauled from the Excavation Area within Cell 32 to the Search Facility Area, using the existing access road from the cell to the Search Facility Area (Appendix A – Drawing C100). A parking lot and temporary support buildings (i.e., trailer compound) will be used by workers during the operational period will be located on the south side of the proposed Search Facility Building (Appendix A – Drawing C101).

3.1 EXCAVATION

Based on information from the COW and the Winnipeg Police Service (WPS) regarding when Ashlee Shingoose may have been deposited at BRRMF, it was determined that the area where Cell 32 is located, along with the tipping area to the northeast, adjacent to Cell 32, are the primary areas of interest. Several surveys were conducted in the area of interest, including in November 2021, March 2022, May 2022 and July 2022. Based on a comparison of the 2021 survey data to the current (2025) survey, it is estimated that there was an approximate volume of 22,466 m³ of waste material deposited in the area of interest polygon between March 15 to May 15, 2022. This approximate volume is subject to change and will be confirmed by the Targeted Zone Assessment currently being prepared by WSP and will be provided to EAB upon completion.

It is anticipated that a volume of daily cover and overburden material will need to be removed first. The daily cover will be set aside and stockpiled within Cell 32 and outside the area of interest for reuse, and the overburden material will be hauled and placed in Area D. The construction of this area was approved by EAB for the emergency disposal of waste and the BRRMF is currently finalizing the detailed design for construction activities for Area D. Through discussions, the EAB has been advised of the intent to store overburden material in Area D.

Excavation of the material to be searched will start once the identified overburden is removed. This phase is expected to proceed at a much slower pace compared to the overburden excavation.

3.1.1 EXCAVATION APPROACH

The excavation is planned to be completed in a staged approach while maintaining stable side slopes and mitigating environmental impacts. The general sequence of activities required for waste excavation in Cell 32 is noted in the table below. A systematic sequence of activities will be required during excavation, including the installation of infiltration pits, grading of excavation at a minimum slope of 2% to direct leachate toward the pits, and construction of temporary stormwater control berms around the excavation perimeter as needed. Daily cover material will be placed on exposed waste material at the end of each operating day. Excavation depth is anticipated to be undertaken in 1 m increments.

General Sequence of Activities Required for Waste Excavation								
Stage Item	Description of Activities							
1	Construct temporary stormwater control berm prior to removal of existing cover							
2	Remove existing cover prior to waste material excavation							
3	Excavate waste material to form an infiltration pit or infiltration trench at low points							
4	Excavate waste material with bottom graded at minimum 2% to the infiltration pit or trench							
5	Excavate waste material to form an infiltration pit or infiltration trench at low points							
6	Excavate waste material with bottom graded at minimum 2% to the infiltration pit or trench							
7	Remove existing cover prior to waste material excavation							

The 2(H):1(V) design slopes proposed for waste material excavation are considered stable. This design is based on WSP experience with previous landfill material excavation projects, supported by Case Study: Deformations of a Steep Slope Excavated in a Municipal Solid Waste Landfill conference paper (Appendix D), where WSP (previously Golder Associates Limited) designed and monitored 2(H):1(V) and 1(H):1(V) slopes successfully excavated for the Barrie Landfill mining project in Ontario. The Barrie Landfill mining project had slopes up to 30 m high at 2(H):1(V), which is 3 times higher than the approximately 10 m maximum height for the proposed project slopes. This design assumes the waste is not saturated and will be monitored by an experienced geotechnical engineer during excavation.

Additionally, the following basic slope stability monitoring program is proposed to be implemented during excavation:

- Visual Monitoring Daily visual inspections of all work area slopes by a qualified person to identify slope stability concerns (i.e., tension cracks, bulging, leachate seeps, etc.); and
- Survey Slope Stability Monitoring Installation of survey stakes along the crest of the excavation slopes to monitor potential horizontal and vertical slope movement during excavation.

3.1.2 LANDFILL LINER AND LEACHATE COLLECTION SYSTEM PROTECTION

Excavation will be maintained above the top of the leachate collection system at all times, as it will remain above the 2021 survey level of Cell 32. A cross-section showing the depth to the liner and leachate collection system compared to the 2021 survey level, the current 2025 survey level, and the excavation limits will be generated as part of the Targeted Zone Assessment and will be provided to EAB upon completion. Survey control measures will be implemented and monitored to confirm that the excavation aligns with the proposed plan and does not extend below the target elevations. The survey control measures will be sufficient to maintain a safe separation from the

excavation limit to the existing leachate collection system and bottom liner. In addition, a gas collection system has not been installed in Cell 32 and, as such, does not impact the proposed excavation limit.

3.2 SEARCH FACILITY AREA

The Search Facility Area is the area designated for the humanitarian search, with an engineered base (Search Facility Area Pad) and perimeter compacted clay berms. This area includes the Search Facility (Drawing C101). The preliminary design of the Seach Facility Area is outlined below.

3.2.1 BASE DESIGN

The Search Facility Area Pad will be constructed with the highest point of the Search Facility Area with the drainage primarily in the north-south direction designed. The Search Facility Building serves as the stormwater drainage divide. The Search Facility Area Pad will be graded from 0.5% to 1.0% from the Search Facility Building, with an existing drainage channel to the northwest and a proposed swale on the southwest and southeast sides of the Search Facility Area Pad.

The base of the Search Facility Area Pad will consist, from bottom to top, of underlying low permeability native clay, a compacted clay subgrade leveling layer, a minimum of 300 mm thick layer of compacted 50 mm limestone subbase material and a minimum of 150 mm thick layer of compacted 19 mm limestone base material. As previously submitted by the geotechnical team, the existing in-situ material provides an adequate liner, and the outlined granular structure provides a working surface for operations and water drainage (Appendix A – Drawing C501; Drawing C502).

An asphalt floor will be placed on top of the granular layer inside the Search Facility that slopes to the middle of the Search Facility Building where a 2,000-gallon holding tank will be installed to collect any leachate from the operations.

Where necessary for workers' health and safety, rubber mats or an equivalent, will be placed at working areas on top of the asphalt floor. These rubber mats will provide a working surface for workers standing on the Search Facility Area and may be relocated as needed.

3.3 SEARCH FACILITY

The approximate location of the Search Facility Building is shown in Drawing C100, Drawing C101, and Drawing C102 in Appendix A.

The Search Facility Building is a temporary prefabricated fabric covered building within the Search Facility Area Pad. The details of the pad are described above and will include the addition of an asphalt floor to be placed on top of the granular layer inside the Search Facility Building for enhanced drainage and seepage control. The foundation of the prefabricated fabric covered building will be designed to not compromise the integrity of the compacted granular and geogrid currently in place.

The building will have a designated area for receiving search material at one end, a sorting operation in the core, and a post-search material shipping area at the opposite end. A designated area for hazardous waste and materials storage will be located in the northwest corner of the Search Facility Building. Additionally, there will be a staging area for forensic screening within the Search Facility Building.

The Search Facility Building will be serviced with the required electrical and mechanical services to allow for a safe working environment.

Emergency showers and eyewash stations will be located in the Search Facility Building and may discharge water directly to the asphalt surface inside the building and be directed to the underground holding tank at the center of the facility.

Washing and decontamination of equipment can also be undertaken inside the building, and water will also be directed to the underground holding tank. Additional details regarding the decontamination of equipment are provided in Appendix E.

3.4 TEMPORARY SUPPORT BUILDINGS (TRAILER COMPOUND)

Temporary support buildings, similar to construction trailers, will be established adjacent to the Search Facility Building. The temporary support buildings will be located within the area identified in Drawing C101 and Drawing C102, Appendix A. These buildings will provide the following:

- Operations Office Space;
- Forensic Anthropologist Space, i.e., a secure and restricted space to complete material specific identification;
- Washroom Facilities with a built-in holding tank;
- Decontamination facilities (i.e., secure shower rooms), lockers, and change rooms;
- Therapy Trailer;
- Family Trailer;
- Personal Protective Equipment (PPE) storage area;
- Health, Safety and First Aid space;
- Lunch/ break room space; and
- Equipment/ Cold Storage/ Maintenance space.

4 OPERATIONS

The operating hours for the search facility area will coincide with or will be within the hours of the operations of the BRRMF, which are from 8:00 AM to 8:00 PM, Monday to Friday, and from 9:00 AM to 5:00 PM on Saturdays and Sundays, with the exception of New Year's Day, Remembrance Day, and Christmas Day.

4.1 ACCESS AND SECURITY

Access to the excavation area and Search Facility Area will be via the BRRMF's commercial entrance and BRRMF's roadways. Traffic in the vicinity of the excavation area and Search Facility Area will be limited to the trucks and equipment related to its operation. Humanitarian search operations are anticipated to occur on a year-round basis. As such, all-weather access roads will be provided to the Search Facility Area.

The existing access roadways accommodate passenger cars, commercial material hauling vehicles and walking floor trailers, and therefore are suitable for the traffic related to humanitarian search operations. The access road

to the excavation area will be upgraded to accommodate the increase in heavy equipment traffic going to and from Cell 32.

The BRRMF is operated and maintained in a secure manner. The BRRMF is secured to prevent unauthorized access. The main commercial entrance gate is locked when not attended and/or in use.

All visitors to the Search Facility Area will be required to be signed in by security and attend the administrative trailer to check into the Site. There will be one two-lane access to the Search Facility Area to allow efficient inbound and outbound traffic flow. A traffic plan illustrating the management of traffic flow and access to the Search Facility is provided in Drawing C101, Appendix A.

4.2 WASTE MATERIAL EXCAVATION

Prior to excavation, a temporary stormwater control berm will be constructed with compacted clay on the crest of the existing side slopes, to contain stormwater and leachate runoff (Stage 1). Subsequently, the existing daily cover will be progressively removed and stockpiled within Cell 32 for reuse (Stage 2), and the excavation of material will be initiated and proceed until an infiltration trench or pit is established at low points (Stage 3). Following progressive removal of existing cover, the excavation of the Stage 4 area will then proceed to form a minimum 2% slope at the bottom toward the existing infiltration trench or pit. After that, Stage 5 will be completed to form a new infiltration trench or pit before starting the excavation of the next stage. Stage 6 will proceed to form a minimum 2% slope at the bottom toward the existing infiltration trench or pit. The existing temporary stormwater control berm (completed under Stage 1) and material underneath it will not be removed until the west slope of the Stage 6 area is completed to act as a new temporary berm. This process of forming a new infiltration trench pit on the low end and a temporary berm on the upper end of each excavation phase will contain stormwater and leachate runoff. Additional existing cover will be removed (Stage 7) prior to material excavation (Stage 8). This sequence of activities will repeat until the excavation reaches the bottom of the area of interest or the humanitarian search objectives are achieved.

4.2.1 LARGE MATERIALS SEPARATION

Large materials such as carpet rolls, mattresses and pieces of furniture may be separated at the active Excavation Area, searched and given clearance as necessary, and hauled to Area D, i.e., large materials may be separated, properly searched and bypass the Search Facility Area.

4.2.2 SPECIAL WASTES MANAGEMENT

The BRRMF accepts "special wastes", as defined in the Licence, to include "bagged asbestos containing materials, dead animals including specified risk material (SRM), slaughterhouse waste and food products deemed to be unacceptable by the Canadian Food Inspection Agency (CFIA), biosolids, and any other waste identified by the Director". Special wastes are accepted by BRRMF in approved containers and following regulatory requirements for the specific type of waste. As per the License, records are kept by Global Positioning System (GPS) of the locations of buried special wastes. During excavation and search activities, if special wastes are discovered, the location will be recorded by GPS coordinates. In addition, precautions will be taken to keep work zones safe by implementing procedures to avoid exposure worker exposure to contaminants and manage dust to prevent the spread of contamination offsite. Workers will wear protective clothing and wash or dispose of their rubber boots and other PPE before leaving the site to avoid carrying contaminants away from the work area.

Trucks and earth-moving equipment involved in excavation and/or relocating special wastes will be washed in the work area before leaving the site and/or performing further operations to avoid tracking waste and potential contamination from the work area. The decontamination of heavy equipment and vehicles must be done in the designated area within the BRRMF and the wetted area is to be covered in accordance with the Licence.

Additional information on the management of special wastes, including ACM, SRM and other hazardous materials, relevant decontamination procedures for PPE, equipment, and personnel, and the locations of decontamination facilities during the Humanitarian Search Project is outlined in detail in the Asbestos and Hazardous Materials Management Plan (AHMMP) provided in Appendix E.

4.2.2.1 ASBESTOS MANAGEMENT

The BRRMF accepts disposed asbestos-containing materials (ACM) generated from site remediation projects. In accordance with Clause 49 of the Licence, the Site does not accept unbagged asbestos waste, and all ACM must be contained and transported in accordance with all applicable Provincial rules and regulations. The Excavation Area will include ACM that had been contained in designated yellow bags to prevent the release of asbestos fibers and asbestos containing dust. The Site-specific procedure established for ACM handling in the BRRMF (Appendix E) needs to be followed for asbestos management during the excavation.

Only trained and properly equipped personnel will handle ACM, and all non-essential personnel will be required to evacuate the area until the ACM has been safely removed. The operators of the material handling machines will ensure that the equipment is upwind from the ACM at all times.

The BRRMF does not accept ACM without applicable containment, but general construction and demolition debris containing trace elements of asbestos may be potentially present in the waste stream. Therefore, extra precautions will be taken, and construction and demolition debris identified during excavation will be managed as having the potential to contain ACM. These materials will be segregated and wetted down by a water truck available at the Excavation Area to prevent dust particles becoming airborne.

No ACM bags found in the Excavation Area will be transported to the Search Facility Area. If ACM bags are found or identified by equipment operators in the Excavation Area, all operations will immediately stop. Non-essential personnel and equipment will be required to evacuate to a pre-determined upwind location. Once the Excavation Area has been safely set up (i.e., water truck in-place, equipment staged upwind, etc.), the ACM will be directly loaded and hauled to a designated asbestos area of the active cell for landfilling in accordance with the Licence.

If any ACM bags are punctured during excavation, a water truck will be available to the Excavation Area to wet down the ACM and prevent dust particles from becoming airborne. Additionally, provisions will be made for personnel to decontaminate in case of spills or other circumstances resulting in contamination of their work clothing or person. A portable vacuum that contains a HEPA filter will be kept near the excavation area for operators to collect airborne asbestos particles.

Equipment in accidental contact with ACM will be thoroughly wetted to prevent ACM from becoming airborne in the vicinity of the disturbance area.

4.2.2.2 SPECIFIED RISK MATERIALS MANAGEMENT

The BRRMF accepts SRM that includes carcasses, rendering and biproducts of infected or diseased animal mortalities. Attempts will be made to not excavate in the specific areas of Cell 32 where it is known to have burial of SRM.

If SRM or other areas of landfilled animal carcasses are discovered during excavation, work will temporarily stop, and the exposed animal remains will be covered. If SRM is encountered and disturbed during the excavation activities, it will be handled and tracked in accordance with Clause 51 and 52 of the Licence.

Excavating landfilled material around or near buried SRM carries the potential for contaminants to be present at the excavation site or in the search facility and as such, workers will be required to complete robust decontamination with a suitable disinfectant and follow personal hygiene protocols each time they leave the Search Facility. In addition to completing thorough cleaning and disinfection of PPE, practicing good hand hygiene will be imperative. Alcohol-based hand sanitizer will be used after removing nitrile gloves, however washing hands with soap and water after every shift will also be mandatory.

4.3 DAILY COVER

At the end of each working day, daily cover will be applied to material exposed by the excavation activities. Daily cover material includes native soil or alternative daily cover such as Posi-Shell®. Posi-Shell® is a blend of clay, fibre, and polymers that can be mixed with water or leachate to form a sprayable mortar that dries to form stucco. Posi-Shell may be preferred to minimize excavation volumes and is the daily cover currently used during standard operations at the BRRMF. The safety data sheet for Posi-Shell®, including manufacturer specifications, is provided in Appendix F.

4.4 MATERIAL RECEIPT AND HANDLING AT THE SEARCH FACILITY

Excavated materials that are not pre-separated at the Excavation Area will be hauled to the Search Facility Area through the existing and proposed access roads. As previously described, there will be one two-lane access to the Search Facility Area to allow efficient inbound and outbound traffic flow. The search material will be transported from the Excavation Area to the Search Facility Building on roll-off bins.

The material will be temporarily stored in the Search Facility Building before and after the search process. This will minimize the amount of leachate generated from the stored material as any precipitation will be shed by the Seach Facility.

The sorting operation will be completed in the Search Facility. The roll-off bins will be emptied and deposited on the asphalt floor of the sorting operation area and will be spread by skid steers into thin lines for ease of searching. The operation may be manual, mechanical, or a combination of both methods. In general, a total of two teams of six Search Technicians will be involved with the sorting of the waste stream. Each team of six Search Technicians will be located on either side of the waste stream in a staggered format in order to view all of the material as many times as possible. The team will be divided into three areas of focus: 1) Front of line is to remove large items and open bags, 2) Middle of line is to open any remaining bags, remove plastic and search medium sized material, and 3) Back of line is to complete the searching of fine materials. The Search Technicians will use rakes and hand tools to break apart bags or clumps of material or to move the material around to allow for thorough visual inspection. At any point, should a Search Technician identify something of interest, they will alert the Team Lead and that material must be placed into a clearly labelled collection container. The container must then be placed into a restricted access refrigerated storage trailer by assigned personnel for assessment by the Forensic Anthropologist.

Once the material is searched and cleared, the skid steers will reload the material into the roll-off bins and will be hauled to Area D. Regular landfill operation procedures will then apply to the post-search material.

4.5 SOLID AND LIQUID WASTE MANAGEMENT AT THE SEARCH FACILITY AREA, AND TEMPORARY SUPPORT BUILDINGS

Domestic solid and liquid waste will be generated in the Search Facility Area, specifically in the Search Facility Building and temporary support buildings. Therefore, waste management is required for those areas.

Water will be required in the Search Facility Building for routine washing of the area and equipment designated for humanitarian search activities to control odours and vectors. A separate water storage will be available for emergency showers and eye wash stations. The wash water will be directly discharged to the underground holding tank in the center of the Search Facility from where it will be subsequently sent to BRRMF's centralized onsite leachate treatment system.

Potable water required in the temporary support buildings will be supplied from potable water storage tanks. Gray and black wastewater from these facilities will be stored in built-in holding tanks and periodically removed by a licensed liquid waste hauler for disposal off-site at a licensed facility. The holding tanks will be located in close proximity to the temporary support buildings. The exact need and location will be determined during detailed design and project implementation.

Domestic solid waste generated in the Search Facility Area and temporary support buildings will be disposed of at the working face of the BRRMF on a regular basis.

4.6 HEALTH AND SAFETY

A project-specific exposure control plan (Appendix E) has been developed and will be implemented prior to commencement of the proposed operations.

To mitigate the exposure to workers, health and safety training and appropriate PPE will be required for all search technicians and staff on Site. Training may include Hazmat, PPE, Emergency First Aid, and other applicable Health and Safety topics.

5 CONTROLS AND CONTINGENCIES

5.1 DUST

Dust from humanitarian search activities may be generated by vehicles travelling on gravel haul roads located on-Site, material handling, and wind erosion of cover material and stockpiles. Provided that Search Facility Area housekeeping and maintenance procedures are followed, the likelihood of nuisance dust generated from the search operations is anticipated to be low.

The existing dust control program for the Site will be extended to the search operations. To minimize the potential for dust, internal access roadways will be watered as required.

Site personnel will be responsible for monitoring nuisance dust and implementing measures to alleviate concerns, if identified.

5.2 NOISE

The maintenance of a buffer zone between the Search Facility Area and adjacent receptors will help to restrict any additional noise at the BRRMF resulting from additional equipment operations.

To minimize the potential for nuisance noise due to the search operations, preventative measures may include the following:

- Proper maintenance of all equipment used for humanitarian search operations;
- Staggering the use of equipment with higher noise ratings operating in other areas of the BRRMF and the use of equipment with higher noise ratings needed for humanitarian search operations; and
- Maintenance of buffering features at the BRRMF, including berms and vegetation.

5.3 ODOUR

It is anticipated that odour will be generated from humanitarian search activities. The existing odour management program implemented at the BRRMF will therefore be extended to the Excavation Area and will include but not be limited to:

- Maintaining a small waste excavation area, limited to one day's volume of search material;
- Covering the excavation area at the end of each working day with soil or other suitable and approved on-Site daily cover material; and
- Utilizing odour neutralizer products are delivered through a dry vapour (i.e., waterless) based system.

An odour mitigation system is being proposed for the Search Facility Building. The proposed mitigation system includes the installation of Bektra Odor Management equipment (i.e., a system of vapor-tec fans and air compressors). These types of systems utilize non-toxic and biodegradable odour neutralizing compounds, delivered through water-soluble or dry-vapour (i.e., waterless) systems. The Bektra system is an all-natural and non-chemical dry-vapour system using Bektra's Odor-Key VP 980 solution. The Odor-Key VP is a diffuse waterless and freeze-proof solution which will not contribute to leachate generation and allows for year-round use, including during cold winter conditions. The Bektra system specifications are attached in Appendix G.

Maintaining good housekeeping practices will further support the minimization of odour emissions from the Search Facility Area. To minimize the potential for odour emissions from the humanitarian search operations, preventative measures may include the following:

- Routine housekeeping, including the sweeping and removal of material and other debris from the Search Facility Area;
- Routine maintenance of the Search Facility Area Pad, repairing divots, and other low-lying areas that may lead to ponding water, and ensuring adequate drainage is maintained; and
- Routine wash and disinfection of the Search Facility Building and search equipment.

Site personnel will be responsible for monitoring nuisance odour and implementing measures to alleviate concerns, if identified. Days exhibiting high humidity, warm temperatures, and little or no air movement shall require careful odour observation and odour management.

5.3.1 ODOUR MONITORING

Daily odour surveys will be conducted around the Excavation Area and Seach Facility Area to detect and verify odour intensity. To detect potential off-Site odour impacts, periodic odour surveys will be undertaken daily at the

BRRMF boundary downwind of the prevailing wind. The odour surveys will be conducted daily at the external odour monitoring locations as identified in the City of Winnipeg's Odour Monitoring Program — Brady Landfill standard operating procedure (SOP) and in proximity to Cell 32. Odour surveys will also be taken at the internal monitoring points (i.e., points located within the boundaries of the BRRMF that have been identified as key odour and hydrogen sulfide generating areas) described in the SOP, including the following locations:

- Small Commercial Tipping Face;
- Large Commercial Tipping Face;
- Specified Risk Materials (SRM) dumping location (or trench);
- · Compost Pad;
- Biosolids Composting Facility; and
- 4R Depot.

If specific odours are detected due to the excavation and/or the Search Facility Area, odour mitigation measures will be implemented. This could also include the suspension of operations until odours can be mitigated, or a change in weather occurs to provide more favourable site conditions.

5.4 AMBIENT AIR AND GAS

Excavating material from a landfill poses significant airborne exposure risks due to the potential release of hazardous substances and contaminants into the air. Landfill gas (LFG) is a natural byproduct of the decomposition of organic material in landfills. LFG contains many different gases. Methane (as %LEL) and carbon dioxide (CO₂) make up 90% to 98% of LFG. The remaining 2% to 10% includes nitrogen, oxygen (O), ammonia, sulphides, carbon monoxide (CO), nonmethane organic compounds, hydrogen sulphide (H₂S) and various other gases. Landfill gases are produced when bacteria break down organic waste. The amount of these gases depends on the type of waste present in the landfill, the age of the landfill, oxygen content, the amount of moisture, and temperature. Due to the high volume of residential waste accepted by the BRRMF, there is an increased likelihood that landfill gases may be encountered throughout the duration of the project.

Some of the known airborne contaminants that workers will need to be protected against include landfill gases (e.g., H₂S, methane), volatile organic compounds (VOCs), respirable particulates, asbestos, and biological pathogens.

5.4.1 AMBIENT AIR AND GAS MONITORING

Ambient air and gas monitoring will be conducted throughout the duration of the project. Monitoring will occur in the location of various personnel exposure groups, including those working in the excavation area and in/around the Search Facility Area. Monitoring will include instantaneous (real-time) and integrated sampling of ambient air for H2S, %LEL, CO, O2, and VOCs, periodic sampling for airborne fibres, and the use of personal real-time monitor devices. Sampling will be conducted in accordance with acceptable sampling methods as outlined in the *Manitoba Workplace Safety and Health Act and Regulations*.

Additional information on the ambient air and gas monitoring procedures, locations of monitoring points, monitoring frequency and parameters, and exposure controls are outlined in detail in the AHMMP and its appendices provided in Appendix E.

5.5 LITTER

Litter resulting from the humanitarian search activities will be monitored as part of the routine general housekeeping practices. It is anticipated that litter control measures, including increased frequency of inspections and increased resources to complete collection, will be augmented due to the nature of the search activities. Existing procedures and methods employed at BRRMF for the control of windblown litter will be adhered to as part of the humanitarian search operations. A litter control program is continually in operation at BRRMF and includes daily monitoring for litter, both on-Site, on the access road to the BRRMF, and along the BRRMF perimeter and Provincial Trunk Highway 7.

To minimize the potential for blowing litter from the humanitarian search operations, preventative measures may include the following:

- Maintaining existing Search Facility Area features, including perimeter berms and prefabricated fabric covered building, to trap litter before it leaves the Search Facility Area; and
- Routine housekeeping, including the sweeping and removal of material and other debris from the Search Facility Area.

In addition, litter fencing (i.e., portable windscreens) will be placed along the Excavation Area and could also be provided along the Search Facility Area perimeter berm, if required. The location of the litter fencing will be moved as required for effective litter control.

Any collected litter will be stored within a covered container, which is removed for disposal in the landfill component of the BRRMF as necessary, or at the end of each operating day.

5.6 VECTORS AND VERMIN

Provided that Search Facility Area housekeeping and maintenance procedures are followed, the likelihood of the Search Facility Area attracting vectors and vermin is anticipated to be low.

Continued implementation of the Site's Peregrine Falcon and Birding Program will help to minimize the attraction of gulls to the Search Facility Area and the risk of potential hazard to aircraft using Winnipeg International Airport. Continued implementation of the Site's Vector and Vermin Management Program will help minimize the attraction of additional vectors and vermin to the Search Facility Area and includes:

- Ensuring the entire BRRMF Site is securely fenced;
- The application of vector control products through licensed professionals, if necessary; and
- The availability and use of bird deterrents (e.g., falconers, noisemakers)

To minimize the potential for vectors and vermin in the Search Facility Area, preventative measures may include the following:

- Ongoing housekeeping measures, such as litter pick up;
- Routine wash and disinfection of the Search Facility and search equipment; and
- Routine maintenance of the Search Facility Area to prevent ponded water.

Should vectors and/or vermin become a concern in the Search Facility Area, the same control measures developed for the Site will be employed for the Search Facility Area. Site equipment operators are trained in the use of approved deterrent devices for birds (e.g., pyrotechnics). A licensed pest control contractor can provide the necessary services to control pests should it become a concern.

5.7 COMPLAINTS RESPONSE PROGRAM

The Complaints Response Program developed for the BRRMF will apply to the Humanitarian Search Project. Complaints will be recorded separately for the Humanitarian Search Project and should include details, where available, as to the nature of the complaint, applicable environmental conditions (e.g., wind direction, etc.), the name and address of the complainant, the date and time of the compliant, investigative/ corrective actions taken, and a determination of what follow up, if any, is requested and in what form (i.e., email, phone call, etc.). Complaints will be communicated to the Community Liaison Committee in accordance with the pre-established complaints response procedures for the Site.

If at least five (5) written noise or odour complaints are received within a 90-day period from five (5) different individuals who do not live in the same household, the events will trigger a "noise or odour nuisance".

Any operation or construction that results in a "noise or odour nuisance" should be mitigated.

Whenever an odour or noise complaint is received, the assigned Environment Officer from Manitoba Environment and Climate Change should be informed within 48 hours and be provided with a summary of the incident, including details on what actions are taken to resolve the concerns.

5.8 ENVIRONMENTAL MONITORING

A comprehensive groundwater monitoring program is currently approved for the BRRMF and is completed annually, serving as an early detection system for any unacceptable discharges of contaminants from the property. Monitoring is completed annually for a comprehensive list of parameters, including organics, inorganics, nutrients, metals, and petroleum hydrocarbons, including benzene, toluene, ethylbenzene and xylene components. A detailed description of the groundwater monitoring well system at the Site is provided in the annual monitoring reports. At this point, no changes to the monitoring program as a result of the proposed Humanitarian Search Project are proposed.

5.9 EMERGENCY RESPONSE PROGRAM

In the event of an emergency incident, including personal injury, fire, spills, and inclement weather, the humanitarian search will operate in accordance with the emergency response program developed for the BRRMF, in accordance with Clause 130 of the Licence.

6 SEARCH FACILITY CLOSURE AND DECOMMISSIONING PLAN

Once the humanitarian search activities are completed, any remaining material in the Search Facility Building will be removed. The temporary buildings, Search Facility and contents associated with the Humanitarian Search Project will be removed. The Search Facility Area is proposed to be returned to use as the wood waste storage area avoiding the need to decommission this area, (i.e., granular pad will remain in place). The asphalt pavement condition will be assessed, and a determination will be made for its removal and/or recycling.

The excavated area within Cell 32 will be treated as a new landfill cell, backfilled in lifts with new waste material and daily cover per the existing BRRMF Licence. Further details on this process will be outlined and provided to EAB in a separate Decommissioning Plan once the search activities have been concluded.

7 SUMMARY OF EFFECTS

The Facility operates as per the Licence terms and conditions. The addition of the temporary Search Facility Building, Search Facility Area Pad and ancillary infrastructure does not create any new environmental impacts at the Site, nor does the excavation activities that will be undertaken in Cell 32. BRRMF will continue to comply with its Licence requirements. Thus, the environmental impacts associated with the proposed Alteration are deemed not to be significant.

8 CONCLUSION

Based on the information provided, WSP is of the opinion that the proposed Alteration, does not create additional environmental effects at the BRRMF, therefore it would be considered a minor alteration under Section 14(1) of the *Environment Act*.

This NoA Report has been prepared for the exclusive use of City of Winnipeg, and their agent(s) for specific application to the property identified in this report. The NoA was compiled in accordance with generally accepted assessment practices. No other warranty, expressed, or implied, is made. General limitations are provided in Appendix H.

We trust that this report meets your present requirements. Should you have any questions, or concerns, please do not hesitate to contact WSP.

Prepared by

Natalie Wagner, B.Env.Sc. Experienced Environmental Scientist Reviewed by

Fiona Scurrah, M.Sc., P.Biol., R.P.Bio. Senior Principal Environmental Scientist

Appendix ASite Drawings

ILITY

MANAGEMENT FACILITY

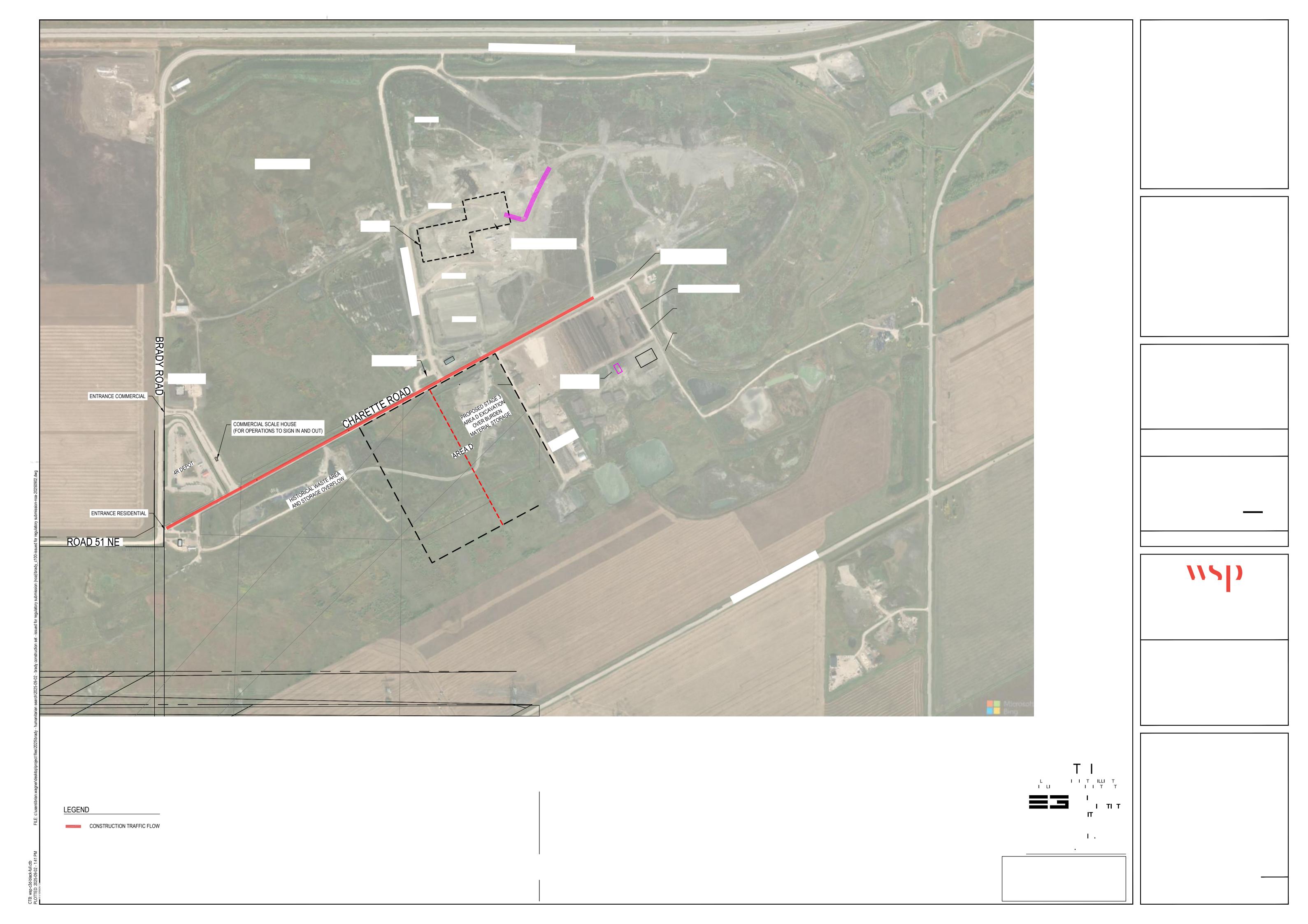
WINNIPEG, MANITOBA

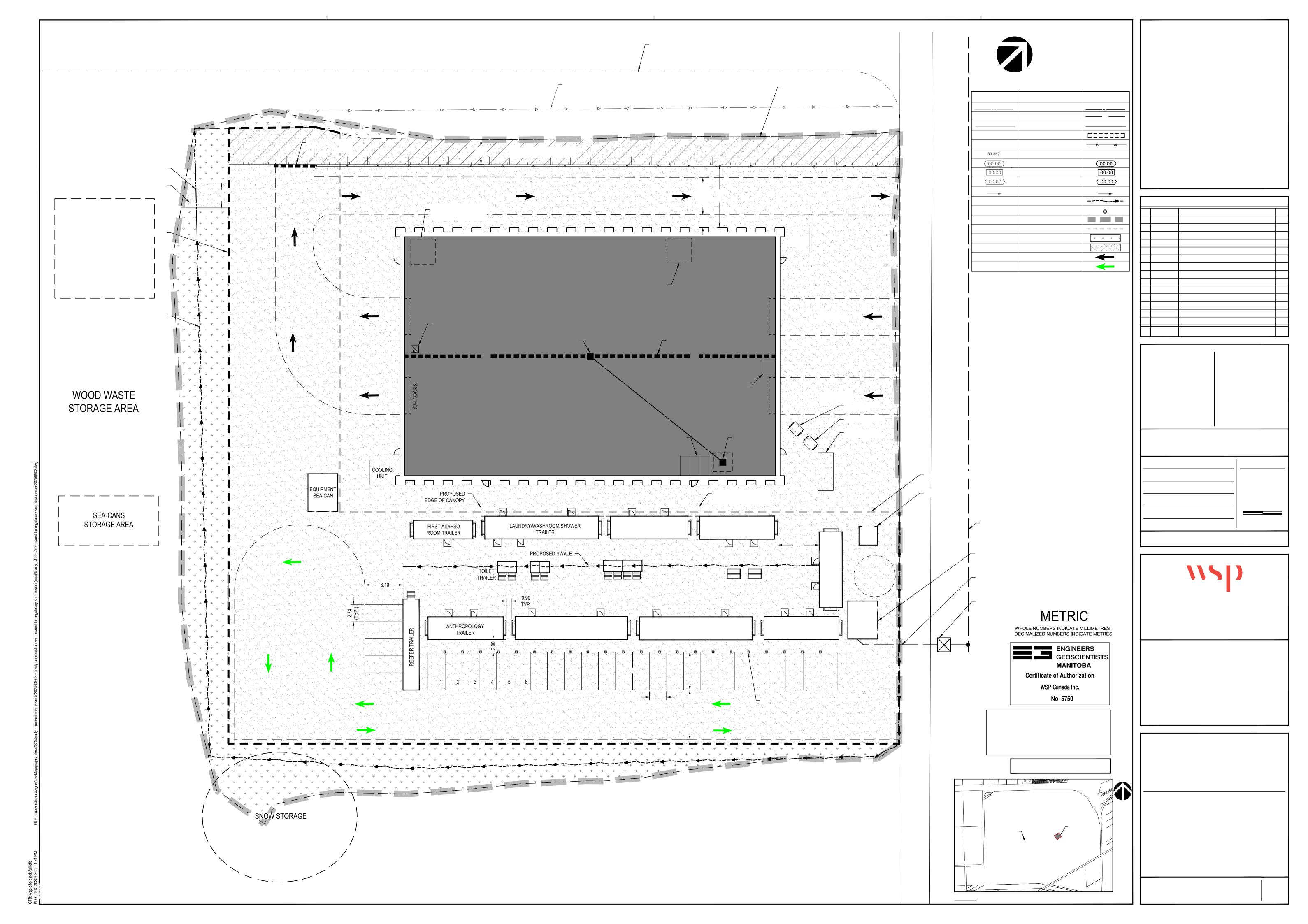
ISSUED FOR REGULATORY

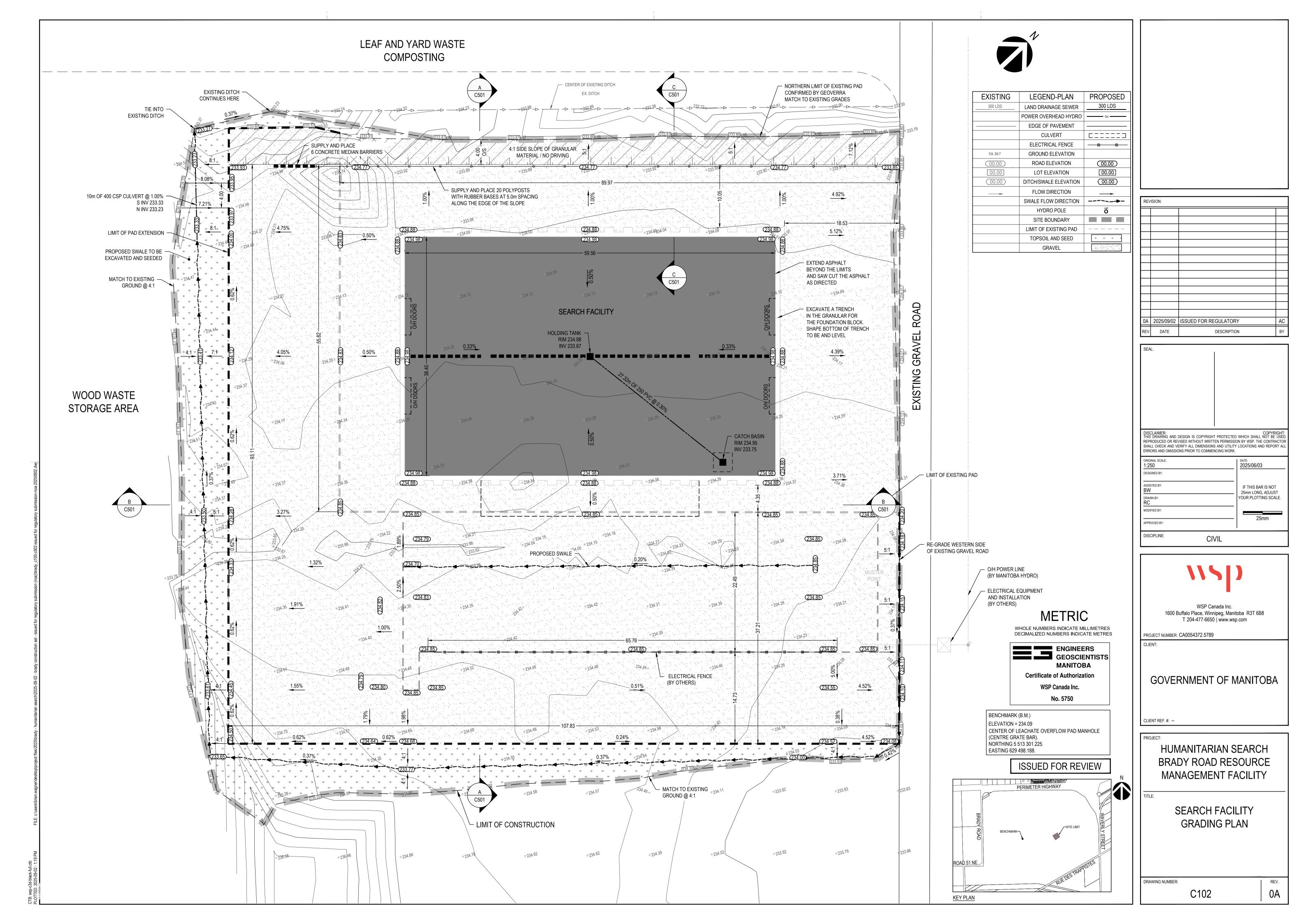
WSP Project No: CA0054372.5789

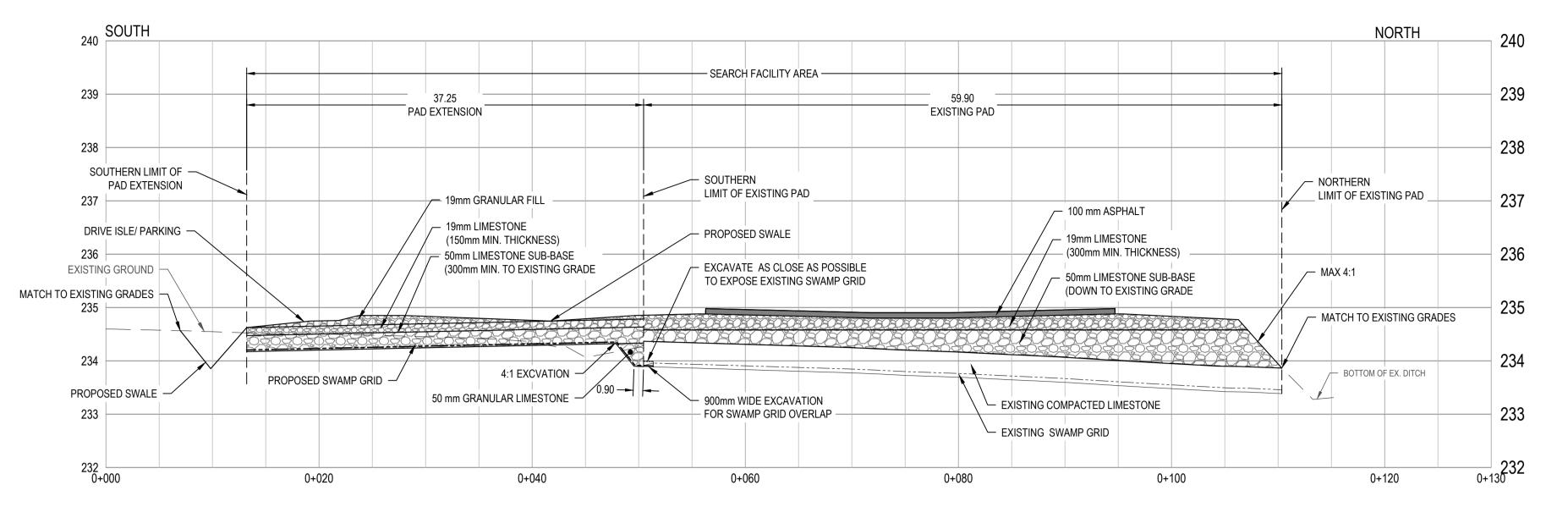
Date: 2025/09/02



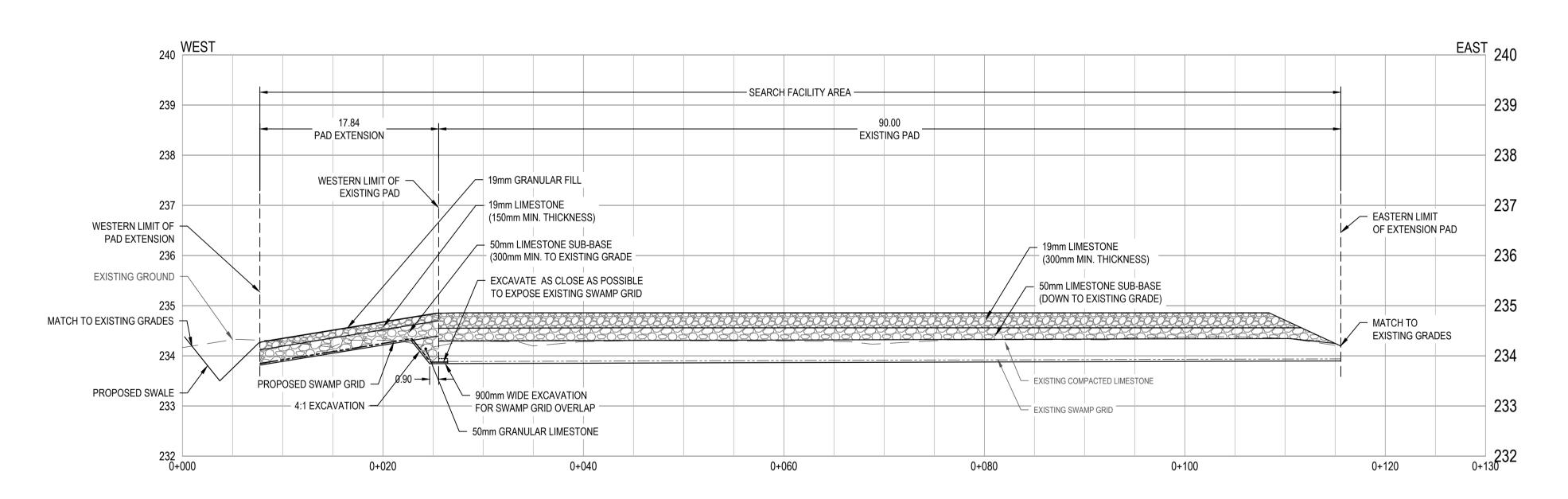




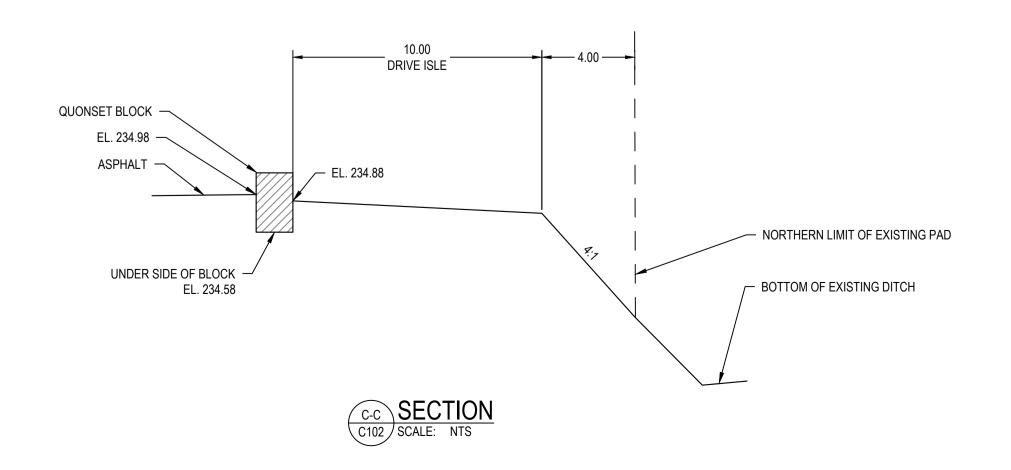


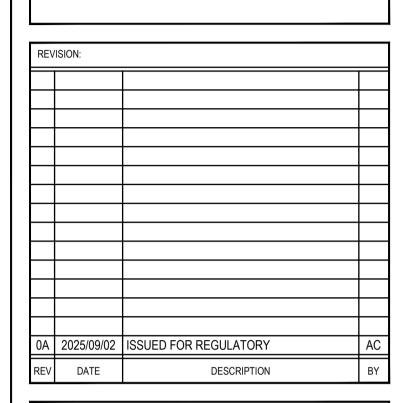


A-A SECTION A-A C102 SCALE: 1:300



B-B SECTION B-B C102 SCALE: 1:300





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ERRORS AND OMISSIONS PRIOR TO COMMENCING WORK.

ORIGINAL SCALE:
AS NOTED
DESIGNED BY:

ASSISTED BY:
BW
DRAWN BY:
RC
MODIFIED BY:

APPROVED BY:

25mm
DATE:
2025/08/19



CIVIL

GOVERNMENT OF MANITOBA

CLIENT REF. #: --

DISCIPLINE:

HUMANITARIAN SEARCH BRADY ROAD RESOURCE MANAGEMENT FACILITY

TITLE:

METRIC

MANITOBA

WHOLE NUMBERS INDICATE MILLIMETRES DECIMALIZED NUMBERS INDICATE METRES

Certificate of Authorization

WSP Canada Inc.

No. 5750

ISSUED FOR REVIEW

CROSS SECTIONS AND DETAILS

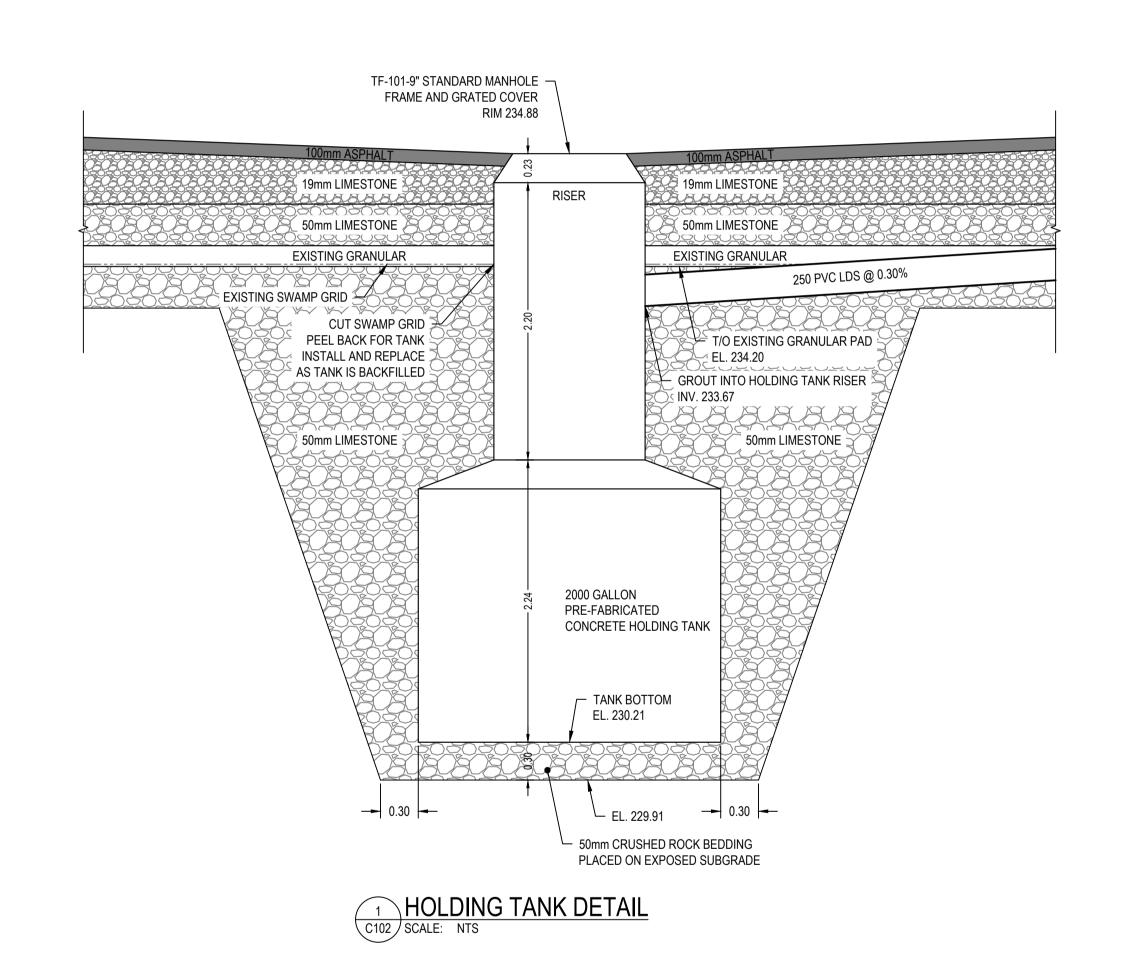
ENGINEERS
GEOSCIENTISTS

CROSS SECTIONS AND DETAILS

DRAWING NUMBER:

C501 0A

sp-c3d-black-full.ctb FD: 2025-00-02 - 1:19 PM



TRAILER COMPACTED 6 mm — LIMESTONE RAMP @4:1 SLOPE MAX

TRAILER STEP DETAIL

C102 SCALE: NTS

REVISION: 0A 2025/09/02 ISSUED FOR REGULATORY DATE DESCRIPTION

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WSP Canada Inc. 1600 Buffalo Place, Winnipeg, Manitoba R3T 6B8 T 204-477-6650 | www.wsp.com

PROJECT NUMBER: CA0054372.5789

GOVERNMENT OF MANITOBA

CLIENT REF. #: --

HUMANITARIAN SEARCH BRADY ROAD RESOURCE MANAGEMENT FACILITY

CROSS SECTIONS AND DETAILS

DRAWING NUMBER:

C502

0A

METRIC

WHOLE NUMBERS INDICATE MILLIMETRES DECIMALIZED NUMBERS INDICATE METRES ENGINEERS
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> WSP Canada Inc. No. 5750

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Appendix B

Leachate Collection System Memo



MEMO

TO: Amna Mackin, P.Eng. - Assistant Deputy Minister

FROM: Fiona Scurrah, WSP Canada Inc.

SUBJECT: Brady Road Resource Management Facility Excavated Waste Search Facility:

Review of Requirement for a Leachate Collection System

DATE: 06 June 2025

WSP has been retained to plan and develop the design for the construction of a search facility and associated infrastructure at the Brady Road Resource Management Facility (BRRMF) in relation to undertaking a humanitarian search for the remains of Ashlee Shingoose.

The BRRMF operations staff has identified an area within the BRRMF, namely the current Wood Waste Storage Area, which has already been partially developed as the location for the construction of the search pad, search facility and associated infrastructure. This area is comprised of compacted granular and a geogrid overlying clay. Surface water runoff in this location goes into the surrounding ditching which carries impacted waters to the BRRMF south retention pond.

The Government of Manitoba intends to construct the search facility at BRRMF, including an interior leachate containment system, similar to that constructed at the Prairie Green Integrated Waste Management Facility (PGIWMF). At PGIWMF, leachate generated inside the building was directed to a holding tank, from where it was subsequently collected and properly disposed of. However, the installation of a leachate system underneath the search facility pad, constructed at PGIWMF for redundancy, would not be part of the design for this site. The rationale for not requiring this to be installed is as follows:

- The waste material excavated and delivered to the search facility is expected to have a low moisture content with no free liquids, or leachate, expected to drain from it.
- Water or any other liquids are not added to the waste during the search, and thus, no leachate is
 expected to be created as the waste is spread on the floor for searching. Appropriate controls will
 be implemented to ensure that any cleaning activities involving liquids are conducted only when no
 waste is present inside the facility
- The proposed search facility area is well within the property boundaries of BRRMF which has a network of compliance monitoring wells established;
- Surface water drainage management and collection is already established in the area of the proposed search facility. The collection pond does not connect to other drainage ditches or ponds at the BRRMF and therefore should leachate enter the drainage channel, it will remain contained.



- Bins of excavated waste are filled from the search area and transported directly to the Quonset;
 material / bins are not stored outside of the Quonset on the pad and will not be exposed to precipitation that could result in the generation of leachate.
- Waste will be hauled to the search facility using sealed roll-off bins, which mitigates leachate contamination outside the facility
- The area beneath the search pad and below the BRRMF in general is comprised of low permeability clay which protects the underlying non-potable aquifer.
- A holding tank will be installed within the Quonset to collect any liquids that are generated during search activities. This collected water can be sent to BRRMF's centralized onsite leachate treatment system.
- Water collected in the holding tank will be sampled prior to pump out to ensure it meets regulatory requirements for disposal into BRRMF's centralized leachate tank.
- A leachate collection system will not be required for this area once the search facility is decommissioned. The area was proposed as a wood compost storage area and this is the longterm anticipated use once the search is completed.

Based on the information above the need for the design and installation of a leachate system at this Site may not be warranted.

Prepared by:	Reviewed by:					
Fiona Scurrah, M.Sc., P. Biol., R.P. Bio, EP(CEA) Project Manager, Senior Principal Environmental Scientist	Allyson Desgroseilliers, B.Sc., P. Eng. Vice President, Environmental Management, Prairies, and North					
Reviewed by:						
lan MacLeod, P. Eng. Senior Principal Environmental Engineer						

From: Scurrah, Fiona

Sent on: September 3, 2025 1:08:07 PM

To: <u>Wagner, Natalie</u>

Subject: FW: Brady Landfill Humanitarian Search Project- leachate memo

Urgent: High

Follow up email

From: Scurrah, Fiona

Sent: Wednesday, July 16, 2025 4:16 PM
To: Bajwa, Mehak < Mehak. Bajwa@gov.mb.ca>

Cc: Mackin, Amna (MI) <Amna.Mackin@gov.mb.ca>; Dey, Asit <asit.dey@gov.mb.ca>; shannon.kohler <shannon.kohler@gov.mb.ca>;

Payment, Brandie <brandie.payment@gov.mb.ca>; Keijzer, Emily <Emily.Keijzer@gov.mb.ca>; Alves, Alexandre

Cowan, Amanda

; Dreger, Derek

Desgroseilliers, Allyson <allyson.desgroseilliers@wsp.com>; Hachey, Tryphena <tryphena.hachey@wsp.com>; Bain, John

>; Kozak, Chris

Subject: RE: Brady Landfill Humanitarian Search Project

Importance: High

Hi Mehak ...

With respect to your review and comments please see responses below.

Here are the proposed responses to EAB's comments on the leachate memo:

1. Please specify the thickness of the clay liner and if it is in-situ clay or compacted clay? 100mm of granular; 800 mm of clay fill and natural clay. The geotechnical report (in draft) undertook a test hole from the corner of the pad and its profile is as follows:

	74	CC	MATERIAL PROFILE			SAMPLES				WATER CONTENT			Т	SHEAR STRENGTH (kPa)			ی ب	NS ER	_		
DEPTH (m)	DRILL RIG	DRILL METHOD	DESCRIPTION	nscs	STRATA	ELEV. DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	N-VALUE	((ater Co Nonp	Liquid Limit Intent (%) Iastic	5		Q U Torvane	ne Pen Su	ADDITIONAL LAB TESTING	GROUNDWATER	ADDITIONAL
- 1	Acker MP5	SSA - 125-mm Hole Dia.	FILL - (GM) Silty gravel, mostly medium to coarse angular GRAVEL, few sand; tan brown; non-cohesive, moist, compact. FILL - (CH) Fat clay, mostly high plasticity FINES, trace sand, trace gravel; dark grey; cohesive, w > PL, stiff. (CH) Fat clay, mostly high plasticity FINES; grey; cohesive, w > PL, stiff.	CH		0.00	3 2 1	cs cs cs cs				0	0 0					61.5 49.0			
2			End of hole at 1.52 m. TEST HOLE TERMINATED AT 1.52 m BELOW EXISTING GRADE -Neither sloughing nor seepage observed during drillingTest hole remained open to 1.52 m with no water accumulated prior to backfillingTest hole backfilled with auger cuttings and bentonite.															86.0			

2. My understanding the surface water from goes to retention pond and if the surface water gets contaminated, it will still remain in the retantion pond. Since no other water channels connect to this retention pond, the contaminated water will remain self contained as in a leachate pond. Correct

- 3. How will the leachate generated within the building structure feed into the holding tank. Is it via surface grading? Surface grading and pad will be designed to have interior generated water or leachate flow towards the drain in the middle of the facility where the holding tank is located.
- 4. Water or liquids used for cleaning the floor may still be contaminated, and will this liquid be retained within the building in the holding tank Correct.
- 5. Does the collection pond here refer to the retention pond? Yes.

I trust this addresses your comments.

Thanks.

Fiona

From: Bajwa, Mehak < Mehak. Bajwa@gov.mb.ca >

Sent: Thursday, June 19, 2025 3:02 PM

To: Scurrah, Fiona < fiona.scurrah@wsp.com>

Cc: Mackin, Amna (MI) < Amna. Mackin@gov.mb.ca >; Dey, Asit < asit.dey@gov.mb.ca >; shannon.kohler < shannon.kohler@gov.mb.ca >;

Payment, Brandie

 Srandie payment@gov.mb.ca>; Keijzer, Emily <Emily.Keijzer@gov.mb.ca>; Alves, Alexandre

; Cowan, Amanda < >; Dreger, Derek
Desgroseilliers, Allyson >; Hachey, Tryphena ; Bain, John

; ckozak **Subject:** RE: Brady Landfill Humanitarian Search Project

Good afternoon.

Thank you for giving us the opportunity to review the memo prepared by WSP regarding the potential need for a leachate system at the Brady Search Facility Site.

We have reviewed the document and provided comments in the attached pdf document. There are a few minor comments for clarification of the process.

Please let me know if you have any questions or require any clarification.

Thank you.

Regards,

Mehak Bajwa, P.Eng, M.Eng Senior Environmental Engineer Environmental Approvals Branch

Department of Environment and Climate Change

14 Fultz Blvd, Winnipeg, MB R3Y 0L6

Phone:431-334-3667, Email: mehak.bajwa@gov.mb.ca

From: Scurrah, Fiona

Sent: June 11, 2025 11:37 AM

To: Bajwa, Mehak < Mehak.Bajwa@gov.mb.ca >; Dey, Asit < Asit.Dey@gov.mb.ca >; Kohler, Shannon < Shannon.Kohler@gov.mb.ca >

ckozak

Cc: Mackin, Amna >; Payment, Brandie <<u>Brandie.Payment@gov.mb.ca</u>>; Keijzer, Emily

<Emily.Keijzer@gov.mb.ca>; Alves, Alexandre >; Cowan, Amanda

Derek ; Desgroseilliers, Allyson

com>; Bain, John

; Hachey, Tryphena

; Dreger,

Subject: Brady Landfill Humanitarian Search Project

Good morning,

As we discussed on our call yesterday, I have attached the memo drafted by WSP regarding the potential need for a leachate system at the Brady Search Facility Site.

Please take a moment to review the document and let me know if you have any questions or require any further clarification on the matter.

Thanks, Fiona

Appendix C Geotechnical Report



REPORT

Brady Road Landfill - Humanitarian Search

Geotechnical Investigation

Submitted to:

Amna Mackin, Assistant Deputy Minister

Government of Manitoba – Cabinet Delivery and Strategic Priorities Executive Council
450 Broadway, Winnipeg, MB

R3C 1S4

Submitted by:

WSP Canada Inc.

6 High Level Road, Oak Bluff (Winnipeg), MB R4G 0E2 Canada

(431) 482-2900

CA0054358.1564

July 28, 2025



July 28, 2025 CA0054358.1564

Distribution List

Government of Manitoba - Cabinet Delivery and Strategic Priorities Executive Council



July 28, 2025 CA0054358.1564

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Figure 1 Test Hole Location Plan

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APPENDIX A

Test Hole Logs

APPENDIX B

Laboratory Test Reports



July 28, 2025 CA0054358,1564

1 INTRODUCTION

As authorized by Amna Mackin, Assistant Deputy Minister for the Government of Manitoba, WSP Canada Inc. (WSP) conducted a geotechnical investigation for a proposed humanitarian search facility and access road to be located within the Brady Road Landfill site in Winnipeg, Manitoba.

The scope of work for the geotechnical investigation was defined in WSP's proposal dated May 13th, 2025, and authorized on May 23rd, 2025. The purpose of the geotechnical investigation was to determine subsurface soil and groundwater conditions at the site to provide geotechnical recommendations for design and construction of foundations and granular traffic structures of the proposed facility. An assessment of hydraulic characteristics of the clay fill to determine if it meets the requirements for a clay liner was not part of the scope of work of the investigation; however, it is understood that such an evaluation is now needed and has been included herein.

2 PROJECT DESCRIPTION

2.1 Site Description

The site is shown on Figure 1. The proposed facility and road will be located within the existing Wood Chip Processing and Storage area on the south side of the landfill site. The site is bordered by the Leaf and Yard Waste Composting Facility to the north, the existing access road followed by a closed portion of the landfill to the east, an undeveloped area to the south, and the Biosolids Composting Facility to the west. There is an existing gravel pad on the northeast corner of the site that is understood to have been developed with a granular structure with geogrid reinforcement. Drainage is inferred towards the low-lying undeveloped area to the south of the site. At the time of completion of the geotechnical investigation, removal of wood waste piles near the south end of the existing pad was occurring. The footprint of the wood waste pile was estimated to be around 70 m in the east-west direction by 10 m in north-south direction. The pile height was estimated to be around 2 m. Other fill piles were observed across the site that are also expected to be removed to make way for the search facility.

2.2 Project Description

Based on the information provided to WSP, it is understood that the proposed search facility will consist of an engineered prefabricated fabric Quonset with below grade 2,000 gallon holding tank, heavy duty access road, trailer compound and portable washrooms. Foundation supports for the Quonset are expected to consist of interlocked concrete blocks forming continuous strips at both sides of the Quonset. At the time of preparation of this report and at preliminary stage Traffic loads and frequencies were not available at the time of preparation of this report; however, were assumed to be similar to those for the Prairie Green Landfill (PGL) humanitarian search and in the order of 7 to 10 trucks per day.

3 GEOTECHNICAL INVESTIGATION

Prior to drilling, WSP notified public utility providers of the intent to drill in order to clear public utilities. Given that the site was undeveloped, a private utility locator was not retained to scan the site for private utilities. All field activities were completed without contacting any underground utilities.

From 19 to 20 June 2025, WSP supervised the drilling of eight test holes (TH25-01 to TH25-08) terminated to depths ranging from 4.7 m to 5.2 m below existing grade, five test holes (TH25-09 to TH25-13) terminated at 3.0 m below existing grade, and one test hole (TH25-14) terminated at 1.5 m below existing grade.

The test holes were drilled using track mounted Geoprobe 3230DT and Acker MP5 drill rigs equipped with 125 mm solid stem augers operated by Maple Leaf Drilling Ltd. of Winnipeg, Manitoba. During drilling, WSP field



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personnel visually classified the soil stratigraphy within the test holes in accordance with ASTM D2487; and recorded observed seepage and sloughing conditions. Soil descriptions are based on the Canadian Foundation Engineering Manual (CFEM, 2023, 5th Edition) generally employed in geotechnical practice. Visual classification and identification of soil involves judgement and WSP does not guarantee descriptions as exact but infers accuracy to the extent that is common in current geotechnical practice.

Soil sampling consisted of grab samples of the auger cuttings, relatively undisturbed Shelby tube samples of the clay, and a bulk sample of clay subgrade material. All samples were sealed and shipped to WSP's Oak Bluff laboratory for review and selected testing. The in-situ relative consistency of cohesive soils was evaluated during drilling using a pocket penetrometer and a handheld torvane.

Upon completion of drilling the depth to accumulated slough and groundwater level were measured in each test hole prior to backfilling. The test holes were backfilled to grade with auger cuttings and sealed with bentonite at the surface.

Following completion of the field drilling program, a laboratory testing program was conducted. The laboratory testing program consisted of moisture content determinations, unconfined compressive strength (UCS) tests, Atterberg limits, and hydrometer grainsize analysis, was well as a single standard proctor and a single California Bearing Ratio (CBR) test.

The test hole logs are presented in Appendix A and include the sampling, field testing, laboratory testing results and subsurface conditions encountered at the test hole locations. The laboratory test results are provided in Appendix B.

4 SUBSURFACE CONDITIONS

4.1 Stratigraphy

Consistent with regional soil deposits, the stratigraphy observed at the test holes consisted of the following, in descending order from grade level:

- Fill (Gravel, Sand, and Clay)
- Organic Clay
- Fat Clay
- Silt

A brief description of each of the soil layers listed above is presented in the following sub-sections. For detailed descriptions, the test hole logs in Appendix A should be consulted.

4.1.1 Fill

A 0.1 m to 0.5 m thick layer of gravel fill was present at the surface in TH25-01, TH25-13 and TH25-14, extending to the contact with the underlying clay fill layer. In TH25-01 and TH25-14, the gravel was described as silty gravel consisting of medium to coarse angular crushed limestone, few sand, tan-brown and inferred as compact. Geogrid was observed to be separating the gravel fill from the underlying clay fill. In TH25-13, the gravel fill was described as silty gravel containing few sand, dark grey, moist and inferred as compact. The moisture content of the gravel fill ranged from 3% to 8%.



A 1.2 m thick layer of sand fill was present at the ground surface in TH25-07, extending to the contact with the underlying clay fill layer. The sand fill was described as poorly graded sand with silt, mostly fine to medium grained, brown, moist, and inferred as compact. Sandbag fragments were present throughout the sand fill layer. The moisture content of the sand fill ranged from 6% to 9%.

A 0.6 m to 1.5 m thick layer of clay fill was present at the ground surface of TH25-02 to TH25-05, and TH25-12, and below the gravel and sand fill layers in TH25-01, TH25-07, TH25-13 and TH25-14. In general, the clay fill was described as fat clay containing mostly high plastic fines with trace sand and trace gravel, dark brown to mottled grey, and stiff. Occasional to frequent garbage, glass and wood fragments were present in the clay fill. The moisture content of the clay fill ranged from 24% to 36%.

4.1.2 Organic Clay

A 0.4 m to 0.6 m thick layer of organic clay was present at the ground surface in TH25-06, TH25-08, and TH25-10, and below they clay fill layer in TH25-02 to TH25-04. In general, the organic clay was described as containing mostly high plastic fines, black, and containing occasional roots. Moisture contents in the organic clay ranged from 32% to 45%.

4.1.3 Silt

A silt layer was present below the organic clay layer in TH25-04, TH25-09 and TH25-10 and within the fat clay layer in TH25-06. The top of the silt layer was between 0.5 m to 1.7 m below existing grade and was 0.6 m to 0.9 m thick and was generally described as containing mostly low plastic fines, tan-brown, and soft. Water content in the silt was generally equal to or greater than the plastic limit. Moisture contents in the silt ranged from 23% to 29%.

4.1.4 Fat Clay

Fat clay was present at the ground surface in TH25-09 and TH25-11 and below the fill and organic clay layers in all other test holes except TH25-10. At TH25-10 the fat clay was encountered below a layer of silt. The fat clay extended to the termination depths of between 3.0 and 5.2 m across all test holes. In general, the fat clay was described as containing mostly high plastic fines, grey becoming brownish grey below 1.5 m and firm to stiff. Water content in the fat clay was generally equal to or greater than the plastic limit. Moisture contents in the fat clay ranged from 27% to 57%.

Additional laboratory testing of the fat clay included UCS testing, Atterberg limits, hydrometer grainsize analysis, standard proctor and CBR tests. The results of the additional testing are shown on the logs, in Appendix B and are summarized in Table 1, Table 2 and Table 3.

Unconfined **Sample Depth** Wet Density **Dry Density Moisture Content Test Hole** Compressive (kg/m^3) (kg/m^3) (%) (m) Strength (kPa) TH25-01 4.6 - 5.21723 50 65 1147 TH25-02 3.0 - 3.787 1787 1256 42 TH25-03 33 1.5 - 2.1144 1853 1392 TH25-06 3.0 - 3.773 1751 1203 46 TH25-07 4.6 - 5.256 1739 1164 49

Table 1: Fat Clay Unconfined Compressive Strength Testing Results



Table 2: Summary of Atterberg Limits and Hydrometer Tests of Fat Clay

	Sample	Moisture	Att	erberg Limits (%)	Ну	drometer R	Results (9	%)
Test Hole	Depth (m)	Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Gravel	Sand	Silt	Clay
TH25-01	1.5	36	85	27	58	0	3	16	81
TH25-05	2.3	32	97	23	74	0	1	13	86
TH25-07	2.3	32	72	21	51	0	6	27	67

Table 3: Proctor and CBR Results on Bulk Clay Sample

	Proctor	Results			CBR Results		
Campula	1100101	rtoounto		Moisture C	Content (%)	Soaked	CBR (%)
Sample Type	Maximum Dry Density (kg/m³)	Optimum Moisture Content (%)	Initial Dry Density (kg/m³)	Initial	Top 25.4 mm after penetration	Soaked CBR at 2.5 mm	Soaked CBR at 5.1 mm
Bulk Combined	1428	28	1361 [*]	29	43	1.9	1.4

Note: * 95% of Standard Proctor Maximum Dry Density (SPMDD)

4.2 Test Hole Termination

All test holes were terminated at depths ranging from 3.0 m to 5.2 m below existing grade without reaching auger refusal.

4.3 Groundwater and Sloughing Conditions

Seepage and sloughing conditions were noted during drilling, and the depths to the accumulated slough and groundwater levels upon completion were measured prior to backfilling. Recorded observations are summarized in below.

Table 4: Summary of Short-term Sloughing and Groundwater Observations

	Depth	During	Drilling	Upor	n Completion
Test Hole ID	Advanced (m)	Sloughing Zone (m)	Seepage Zone (m)	Depth Open (m)	Depth to Groundwater (m)
TH25-01	5.2	None	None	5.2	N/A
TH25-02	4.6	None	None	4.6	N/A
TH25-03	4.6	None	None	4.6	N/A
TH25-04	4.6	1.7 to 2.6	1.7 to 2.6	3.0	None above slough
TH25-05	4.6	None	None	4.6	N/A
TH25-06	4.6	0.9 to 1.5	0.9 to 1.5	4.0	None above slough
TH25-07	5.2	0.3 to 1.2	0.3 to 1.2	4.3	2.7
TH25-08	4.6	None	None	4.6	N/A
TH25-09	3.0	None	None	3.0	N/A
TH25-10	3.0	None	None	3.0	N/A
TH25-11	3.0	None	None	3.0	N/A



	Depth	During	Drilling	Upor	n Completion
Test Hole ID	Advanced (m)	Sloughing Zone (m)	Seepage Zone (m)	Depth Open (m)	Depth to Groundwater (m)
TH25-12	3.0	None	None	3.0	N/A
TH25-13	3.0	None	None	3.0	N/A
TH25-14	1.5	None	None	1.5	N/A

It should be noted that only short-term seepage and sloughing conditions were observed during drilling and that groundwater levels can fluctuate, annually, seasonally, or as a result of construction activity.

5 FOUNDATION DESIGN AND CONSTRUCTION RECOMMENDATIONS

5.1 General Geotechnical Considerations

The soil stratigraphy encountered generally consisted of surficial gravel, clay, or sand fill layers underlain by fat clay extending to the termination depths of between 3.0 m and 5.2 m below existing grade. Organic clay was present above the fat clay in TH25-02 to TH25-04, TH25-06, TH25-08, and TH25-10, while silt layers were present in TH25-04, TH25-06 and TH25-08 to TH25-10 at shallow depths. Sloughing and seepage were observed within the silt in TH25-04 and TH25-06 below a minimum depth of 0.9 m and in the sand fill layer in TH25-07 below a minimum depth of 0.3 m.

TH25-01 and TH25-14 were drilled within the area of the existing gravel pad located at the northeast corner of the site. According to information provided by The City of Winnipeg, there is an existing pad measuring 60 m by 90 m and consisting of 250 mm and 50 mm of compacted and uncompacted granular material, respectively placed on a biaxial Swamp Geogrid[®] layer. The specifications of the Swamp Geogrid[®] were not provided as part of the City of Winnipeg information. Subsurface conditions encountered during the investigation around the pad were not consistent with the City of Winipeg information and only confirmed a 100 mm crushed limestone gravel fill over a geogrid layer. Below this composite layer, both clay fill and fat clay were identified. It is likely that the pad or parts of it may be used to support the Quonset. Site planning and building layouts were still in evaluation at the time of preparation of this report.

Within the clay fill, fragments of wood, glass and sandbags were encountered randomly across the site, introducing the potential for long-term settlements associated with the eventual degradation of organic materials. This risk is further aggravated by the uncertain compaction quality of the clay fill, and thus differential settlements may be anticipated throughout the area. It is also expected that the settlements may occur differentially across the site. Additionally, given that the site is in a relatively low-lying location where shallow, water-bearing silt was also encountered, it is recommended to raise site grades to enhance drainage; this activity, however, would likely induce further settlement beyond that previously described. WSP can provide further comments and recommendations regarding these additional settlements in the event that raising the site grades will be undertaken.

It should be noted, however, that the proposed Quonset building is expected to be a lightweight, temporary structure (anticipated duration on-site to be around a maximum of 1 year). Provided settlement risks are deemed acceptable, placement of the interlocked concrete blocks placed near the existing grade are considered suitable for this application provided that the concrete blocks are placed on a prepared granular surface.



5.2 Bearing Capacity Evaluation

WSP understands that the Quonset is an engineered prefabricated fabric structure occupying a footprint of 60 m by 40 m. The Quonset is to be supported on interlocked 760 mm wide concrete blocks forming continuous 60 m strips at both sides of the Quonset. The Quonset is to be placed directly on the existing granular pad; however, it is noted that a minimum 300 mm thickness of granular material is recommended as support for the blocks as per manufacturer recommendations. It is also noted that maximum embedment depth of 380 mm is preferable for the continuous block arrangement to improve the resistance to lateral loads.

It is understood that a new area southwest from the existing pad is also being considered to house the search facility and ancillary structures. Design details were still pending to be confirmed at the time of preparation of this report. Regardless of the uncertain location of the search facility, the vertical (i.e. compressive) and horizontal factored building loads of the structure are to be in the order of 140 and 100 kN, respectively acting at the baseplates of each of the 21 frames as indicated in the Quonset design drawings (Sheet 1 of 23, Order ID 187649, Winkler Structures) from the previous structure at the PGL humanitarian search facility. As such the following sections discuss the bearing capacity of the existing composite pad and recommendations for improvement if needed.

5.2.1 Bearing Resistance

As calculated from the above loads acting over the array of interlock concrete blocks, the factored bearing resistance required to support the Quonset is understood to be about 65 kPa per continuous strip arrangement. As presented previously, shallow water bearing silt layers were encountered as part of the investigation that may give variations in groundwater levels due to seasonal fluctuations. As such, the ultimate bearing capacities presented below (quit) were calculated assuming saturation of the foundation soils.

Table 5: Ultimate Bearing Resistance

Bearing Capacity Condition	Ultimate Bearing Stress (kPa)
100 mm granular pad above existing grade	140
100 mm granular pad reinforced with one layer of geogrid above existing grade (1)	180

⁽¹⁾ Assumes a biaxial geogrid developing an ultimate tensile strength of 20 kN/m

For the 100 mm granular pad and geogrid configuration, and provided that building loads exceed the bearing capacity of the 100 mm granular pad (i.e., 140 kPa), the geogrid should extend at least 11 m beyond both ends of the foundation to develop the geogrid tensile strength and achieve the ultimate bearing capacity. WSP can provide alternate configurations on request if building requirements change. It is also noted that the geogrid tensile strength develops if the geogrid is laid flat and tight with proper overlaps and following manufacturer recommendations to reduce the development of wrinkles and defects that may impact the gravel and geogrid configuration.

Based on the 2020 National Building Code of Canada (NBCC), a geotechnical resistance factor, Φ = 0.5 should be applied to the ultimate bearing resistance to obtain the factored geotechnical bearing resistance at the Ultimate Limit State.

5.2.2 Settlement Estimates

The bearing pressure at the Serviceability Limit State (SLS) can only be determined from settlement analyses which in turn can only be evaluated once the final foundation configuration details are known. However,



conservatively, the serviceability limit state may be assumed equivalent with traditional working stress design, and in this regard, the bearing pressure at the serviceability limit state may be taken as equal to the factored ULS footing pressure. Assuming good workmanship and clean bearing surfaces, total and differential settlements at the SLS are expected to be minimum and less than 25 mm, respectively, when designed and constructed in accordance with recommendations provided in this report.

5.2.3 Design and Construction Recommendations

Additional recommendations for construction are as follows:

- 1) Grades at the site should be maintain as high as possible to promote drainage away from the planned infrastructure.
- 2) When required, excavations should be limited to a maximum of 1m from grade to reduce the likelihood of exposing the water bearing shallow silt.
- 3) Preparation of the bearing surface should proceed with care using an excavator equipped with a smooth bucket working away from the finished grade to reduce the potential for disturbance of the bearing surface and development of total and differential settlements.
- 4) All loosened and disturbed soils should be removed from the final bearing surface by hand. Care should be taken to ensure that the bearing surface is not subject to frost, inundation, desiccation or heavy equipment, or disturbed in any way prior to construction activities.
- 5) Once the bearing surface has been prepared, it should be inspected by WSP (or by a qualified geotechnical person) to verify the suitability of the proposed bearing soils and to confirm that the soils are uniform and consistent with the conditions noted in the test hole logs presented in this report.
- 6) Where excavation below design grade elevation is required for removal of unsuitable soils, fill material used to backfill to the design footing elevation should consist of lean mix concrete or approved granular fill placed in maximum 200 mm thick uncompact lifts, and uniformly compacted to 100% of SPMDD.
- 7) Bearing surfaces should be protected from environmental effects (i.e., precipitation and freezing temperatures) during the period between completion of excavation and commencement of construction. Water should not be allowed to pond on the bearing surface to reduce the potential for disturbance. Seepage controls should be undertaken as required using trenches, sumps and pumps located outside the bearing surface areas.

6 FROST DESIGN CONSIDERATIONS

6.1 Frost Penetration Depth

The upper stratigraphy at the site is considered highly frost susceptible in the presence of a free supply of water, particularly given the presence of fat clay and wet silt layers within the seasonal frost penetration depth. As such, frost effects should be considered for foundations or surface structures sensitive to movement. Based on historical temperature data for the area, a design frost penetration of 2.4 m below final grade is recommended in areas that will not have regular snow or vegetative ground cover. It should be noted that this frost penetration depth extends both vertically and laterally behind final surfaces.



6.2 Frost Forces and Design Mitigations

Movements due to seasonal frost should be expected. At this site the potential for frost heave pressures to develop on the underside of foundation elements may be mitigated by any of the following optional measures:

- 1) Placement of rigid Insulation may be used to establish a minimum equivalent depth of soil cover.
- 2) The finished grade adjacent to all structures and foundation elements should be capped with well compacted clay and sloped away from the structure so that the surface runoff is not allowed to infiltrate and collect below the granular structure.

7 TRAFFIC AREAS

7.1 General Discussion

To aid in the humanitarian search it is understood that loaded tandem trucks will travel in and out from the landfill into the Quonset in a bi-directional way. As such, a traffic surface with Asphalt Concrete Pavement (ACP) will be required within the Quonset. The purpose of the ACP is to reduce the likelihood of water infiltration into the underlying granular structure and potential contamination of potential adjacent water sources. Outside the Quonset a granular traffic surface without ACP is sufficient.

Soil conditions encountered at the test hole locations generally consisted of a combination of surficial fill (sand, gravel, and clay), underlain by organic clay, further underlain by fat clay extending to the termination depth. Shallow silt layers were present in TH25-09 and TH25-10. Typically, where organic clay (> 6% organic content), silt or otherwise unsuitably soft subgrade conditions are encountered at or immediately below the design subgrade elevation, full-depth excavation of the layer (if practical) or sub-excavation and placement of a limestone rock bridging layer with geotextile separator may be necessary to allow placement and compaction of granular fill. Where possible, final grades should be as high as practical to provide cover over the frost susceptible clay and silt materials.

The fill in the area of the existing pad was noted to extend between 0.9 m and 1.5 m below grade. Outside the existing pad, fill was either not encountered or extended to a maximum depth of 2.5 m. The fill consisted of the granular material used to build the existing pad and clay fill. The clay fill was firm to very stiff and moist with random deleterious materials (i.e. glass, metal, wood, etc) as described previously. As also discussed before, the clay fill generally carries uncertainties of the composition and density and should be reviewed by the geotechnical engineer at the time of construction. Depending on the quality observed, partial or full removal of the clay may be required in areas away from the existing pad. It is acknowledged that within the area of the existing pad, the preference is to maintain that structure and build up from there based on the design requirements.

To confirm suitability of subgrade soils, the subgrade conditions should be reviewed by the geotechnical engineer prior to the start of construction of the pavement structure. If acceptable soil conditions are encountered, proof rolling should also be used to identify soft spots to further assess the need for removal / replacement, including areas within the existing pad. Where partial fill / organic clay removal is found to be an acceptable option for the pavement, the upper 300 mm of the remaining soil that is considered suitable for subgrade support should be scarified, moisture conditioned and recompacted to 95% of Standard Proctor Maximum Dry Density (SPMDD) prior to placement of additional fill or pavement materials. Nevertheless, a separation layer of geofabric is recommended to be placed beneath any new granular structure.



To maintain uniformity in the design, a layer of reinforced geogrid is recommended in areas outside the Quonset. The geogrid will serve the function of providing added subgrade resistance while reducing the thickness of the Granular Base Course.

7.2 Pavement Section

It is understood that heavy duty gravel pavement is planned for this project. The following gravel pavement sections are intended as minimums for the design of the pavement structures. There is limited traffic information; however, it is understood that a vehicle frequency of 7 to 10 fully loaded tandem trucks per day may be possible based on the previous experience at the PGL humanitarian search. Based on this limited information, an Equivalent Single Axle Loadings (ESAL) of 10,950 was assumed for the heavy-duty structure in the pavement design. The assumed ESALs should be confirmed prior to construction. It is also understood that the facility will have a short design life of a maximum of 1 year. The pavement sections should be reviewed during detailed design for actual design traffic loading. If actual traffic patterns will either exceed or are significantly less than the assumed ESAL values, the recommended structures should be modified as necessary. WSP can complete a more comprehensive assessment of the required pavement structure once the design loads are better understood as an additional scope.

Pavement sections have been established based on an effective subgrade resilient modulus (Mr) of 20 MPa, or an approximately equivalent California Bearing Rations of 2.0 selected based on the testing data. If softened areas are present in the subgrade during construction, it may be necessary to incorporate additional gravel to establish a stable subgrade. Recommendations for additional gravel thickness should be made in the field based on observations made during site grading.

Where pavement distress such as cracking occurs, maintenance and/or prompt repair of affected areas will be important to mitigating infiltration of water into the pavement structure and subgrade, which could exacerbate pavement deterioration. Subgrade conditions should be inspected and the need for subgrade improvement should be reviewed by WSP at the time of construction once the subgrade is exposed.

For areas within the existing pad, a recommended section for heavy-duty gravel pavement is provided in Table 6 on the assumption that the New Granular Base is constructed above the existing pad and provided that is acceptable to raise the top of the pavement. A granular structure is also recommended for areas outside of the Quonset that do not require an asphalt surface. Construction recommendations are outlined in Section 7.3.

Thickness (mm) **Material** Within Quonset (Existing Pad) **Outside of Quonset** 100 Dense Hot Mix Asphalt New Granular Base Course 200 450 100 **Existing Granular Base Course** Bi-Axial Geogrid (Titan Swamp Grid 20 or similar) As per specification As per specification **Total Thickness** 400 450

Table 6: Recommended Heavy-Duty Pavement Design Sections

A program of regularly scheduled maintenance should be undertaken to preserve the integrity of the pavement structure. During pavement service life, heavy vehicle traffic should be limited to heavy duty pavement areas.



Drainage paths should be maintained to allow the free flow of surface water away from the structure and pavements, such as by maintaining clear paths to nearby drainage ditches.

7.3 Subgrade Preparation

Recommendations for subgrade preparations and pavement construction are as follows:

Prior to placement of additional material above the existing granular pad, the pad should be inspected and proof rolled. Provided ruts are less than 5 mm and deflections are less than 10 mm under full loaded tandem loads, the existing granular structure should suffice. WSP should be consulted if the ruts greater than 5 mm are observed so that we can provide additional recommendations if required.

In areas outside the existing pad the following is recommended:

- 1) , excavate to design subgrade elevation, which should be taken as the top of the pavement elevation minus the granular structure thickness provided in Section 7.2. Further remove any unsuitable and/or deleterious materials if discovered at the design subgrade elevations during construction including soft ground, poor quality fill, silt, organic soils, etc. Once the subgrade area is exposed, the subgrade should be reassessed by the geotechnical engineer to evaluate the quality and uniformity of the clay fill and / or organic soil at this level and to determine whether removal and replacement is required or not. In this regard, it is recommended that additional organic content testing may be required at that time to confirm the thickness of the organic clay that should be removed, where encountered.
- Once final subgrade is achieved, the subgrade should be evaluated by qualified personnel to detect soft or weak areas, and to verify that soils are as expected and that no unsuitable materials remain.
- 3) Provided the subgrade can support heavy equipment without excessive disturbance (ruts less than 25 mm), and where practical, the subgrade should be proof rolled using a fully loaded tandem dump truck to identify soft, weak or compressible areas. The suitability of the subgrade for proof rolling should be assessed by the geotechnical engineer at the time of construction.

The following is also recommended and applicable for both areas within and outside the existing pad:

- The subgrade should be protected from frost, desiccation, inundation and excessive wheel loads at all times. Subgrade preparation and fill placement under freezing conditions should be avoided. The use of frozen soils for fill, placement/compaction of frozen soils, and placement/compaction of soils over frozen subgrade, should also be avoided. These practices carry a risk of differential movements upon thawing, and could cause cracking. Before the pavement materials are placed, and depending on the season of construction, the subgrade should be checked for the absence of freezing conditions such as with frost probes. If the subgrade is frozen, it must be thawed and potentially repaired before placing fill, allowing time for thawsettlements to occur. Rolling the subgrade after thawing is complete may be suitable to mitigate thaw-related settlement potential; however, may not mitigate the full depth of disturbed soil.
- 2) Unless stipulated in this report, the base course should meet the requirements for Granular A per City of Winnipeg Specification CW3110-R22 (Sub-grade, Sub-base and Base Course Construction). The granular base should be placed in maximum 150 mm thick lifts (or reduced lift thicknesses as governed by the compactive abilities of the compaction equipment) and uniformly compacted respectively to a minimum of 100% of SPMDD, respectively.



Qualified and knowledgeable geotechnical personnel should monitor the quality and placement of gravel, and the compaction of the gravel should be monitored by field density testing at regular frequencies. The density of each lift should be tested to confirm that adequate compaction has been achieved before placing the next lift.

- 4) Additional measures recommended to improve long term pavement performance are as follows:
- Maximize drainage slopes;
- Minimize drainage path lengths;
- Maintain finished grades as high as possible;
- Provide regular maintenance of the gravel surface to prevent water ponding and infiltration and subsequent softening of the subgrade.
- Provide adequate discharge into ditches from sub-base and base course materials such that those layers act in a drained manner. In this regard, the bottom of the ditch should be at least 1.0 m below the design subgrade elevation.

8 HYDRAULIC ASSESSMENT OF SOIL PROPERTIES

Environmental regulations for the landfill require that the soils beneath the search facility function as a clay liner. Typically, clay liners are placed above permeable layers to prevent the infiltration and potential contamination of water bodies or underlying aquifers. For that purpose, the clay liner must be at least 1 m thick with a hydraulic conductivity no greater than $1x10^{-7}$ cm/s.

Feasibility for the utilization of fill materials as a low permeable liner meeting the requirements of Manitoba Conservation¹ for storage lagoons will largely depend on the quality and amount of suitable clay available. Typical engineering practice is to specify materials that comply with the following minimum parameters:

- Liquid Limit of 30% or greater.
- Plastic Index of 20% or greater.
- 50% or more passing a number 200 mesh sieve.
- 20% or more of clay particles (2-µm particle size).
- 45% or less of sand particles.

As stated in the Manitoba Conservation technical reference, "if the distribution of the particle size classes and the Atterberg limits fall within the ranges given in Section 5.3.2.1 and 5.3.2.2"; that is, the ranges above presented, "the material is considered acceptable for compacted clay liner construction without the need for additional laboratory testing". Materials meeting the combination of characteristics noted above would typically provide a recompacted liner having a hydraulic conductivity not exceeding the maximum allowable value of 1x10-7 cm/sec.

¹ Technical Reference Document for Liquid Manure Storage Structures – Compacted Clay Liners, Government of Manitoba – Sustainable Development – Environmental Projects and Strategies



As noted before, the clay fill around and inside the existing pad ranged from 0.8 to 1.5 m thick beneath the granular structure. Native high plastic clay was found below the fill, extending to the termination depths of 1.5 to 5 m. No silt or organic soils were detected, suggesting they had likely been removed from the pad area prior to placement of the granular structure. Based on historical records² the thickness of the native clay is expected to be in the order of 12 to 15 m before reaching the more permeable underlying silt till.

Laboratory testing results of the native clay presented in Table 2 suggest the index parameters of the native clay exceeds the minimum requirements of a clay liner. That is:

- Liquid Limit greater than 72%.
- Plastic Index greater than 67%.
- 93% or more passing a number 200 mesh sieve.
- 51% or more of clay particles (2-µm particle size).
- 6% or less of sand particles.

A particular assessment of the clay fill was not completed as it was outside of the scope of services at the time of the geotechnical investigation; however, it is expected that the clay fill used to replace unsuitable soils may have been obtained from borrow areas within the landfill facility and as such the index parameters of the clay fill may be somewhat similar to those of the native clay. This assumption is based on the comparable properties and characteristics observed in both materials. Therefore, while the clay fill was not explicitly tested, the results from the native clay can be reasonably extrapolated to infer the performance of the clay fill. This is further supported with results of hydraulic conductivity testing completed by AECOM and KGS for the geotechnical investigations of the Resource Management Facility of Area B and the Detailed Desing Emergency Cell D, respectively. Results of hydraulic conductivity testing at these two facilities confirmed hydraulic conductivity values in the order of 1.1x10⁻⁸ cm/s to 9.6x10⁻⁹ cm/s for similar index parameters as those determined for this site. Additional testing of the clay fill samples to determine their index parameters can be completed on request.

Based on the analysis, it is suggested that the combination of the clay fill and native clay materials is adequate to serve as a functional clay liner. The inherent properties of both the clay fill and the native clay contribute to the overall effectiveness of the low permeability barrier, ensuring that it meets the necessary performance criteria. Therefore, the existing combination of these materials is considered sufficient to meet the hydraulic soil requirements.

9 CONSTRUCTION MONITORING AND TESTING

All engineering design recommendations presented in this report are based on the assumption that an adequate level of testing and monitoring will be provided during construction by either the designer or other suitably qualified personnel. Furthermore, it is assumed that all construction will be carried out by a suitably qualified contractor experienced in foundation and earthworks construction. An adequate level of testing and monitoring is considered to be full-time monitoring of fill quality and subgrade conditions and compaction testing of granular materials and laboratory testing of the samples provided.

² Plate 2 Depth to Till. Geological Engineering Report for Urban Development Winnipeg – Department of Geological Engineering – The University of Manitoba.



On the basis of the above and given WSP's familiarity with the subsurface conditions at this site as the Geotechnical Engineer of Record, WSP requests the opportunity to review the design drawings, and the installation of the pavement structure, to confirm that the geotechnical recommendations have been correctly interpreted. WSP would be pleased to provide any further information that may be needed during design and to advise on the geotechnical aspects of specifications for inclusion in contract documents. WSP can provide design modifications as required at the time of construction should subsurface conditions be found to vary from those described herein.

10 CLOSURE

The findings and recommendations presented in this report were based on geotechnical evaluation of the subsurface conditions and groundwater data observed during the site investigation described in this report. If conditions other than those reported in this report are noted during subsequent phases of the project, or if the assumptions stated herein are not in keeping with the current and/or future design stage, this office should be notified immediately in order that the recommendations can be verified and revised as required. Recommendations presented herein may not be valid if an adequate level of inspection is not provided during construction, or if relevant building code requirements are not met.

The site investigation conducted and described in this report was for the sole purpose of identifying geotechnical conditions at the project Site. Although no environmental issues were identified during the fieldwork, this does not indicate that no such issues exist. If the owner or other parties have any concern regarding the presence of environmental issues, then an appropriate level environmental assessment should be conducted.

Soil conditions, by their nature, can be highly variable across a site. The placement of fill and prior construction activities on a site can contribute to the variability especially in near surface soil conditions. A contingency should always be included in any construction budget to allow for the possibility of variation in soil conditions, which may result in modification of the design and construction procedures.

This report has been prepared for the exclusive use of the Province of Manitoba and their agents, for specific application to the project described in this report. The data and recommendations provided herein should not be used for any other purpose, or by any other parties, without review and written advice from WSP. Any use that a third party makes of this report, or any reliance or decisions made based on this report, are the responsibility of those parties. WSP accepts no responsibility for damages suffered by a third party as a result of decisions made or actions based on this report.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, either expressed or implied, is made.

Respectfully submitted,

WSP Canada Inc.



Signature Page



Duncan Platts E.I.T. Geotechnical Engineer-in-Training



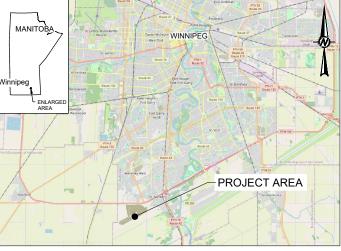
Senior Principal Geotechnical Engineer

FIGURE 1

Test Hole Location Plan



TEST HOLE LOCATION



NOT TO SCALE

IMAGE OBTAINED FROM GOOGLE EARTH © 2025 GOOGLE INC. USED WITH PERMISSION. GOOGLE AND GOOGLE LOGO ARE REGISTERED TRADEMARKS OF GOOGLE INC. IMAGERY DATE: MAY 5, 2025. GOOGLE EARTH IMAGE IS NOT TO SCALE. KEY MAP © OPENSTREETMAP CONTRIBUTORS. DATUM: NAD 83, PROJECTION: UTM ZONE 14.

0	50	100
1:2,000	(APPROX.)	METRES

PROJECT
HUMANITARIAN SEARCH - BRADY LANDFILL
PROPOSED SEARCH FACILITY AND ACCESS ROAD WINNIPEG, MANITOBA

SITE AND TESTHOLE LOCATION PLAN

CONSULTANT	YYYY-MM-DD	2025-07-02	
	PREPARED	SL	
11717	DESIGN	DP	
	REVIEW	DP	
•	APPROVED	DP	
PROJECT No. CONTROL CA0054372.5789 2000.4-HS-0	0001 0	∌V.	FIGURE 1

APPENDIX A

Test Hole Logs

CLIENT: Province of Manitoba DATE: June 19, 2025 ELEVATION: Data Not Available

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513380.6 m E: 630153.2 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

LOCATION: Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

SHEAR STRENGTH (kPa) MATERIAL PROFILE SAMPLES WATER CONTENT GROUNDWATER OBSERVATIONS ADDITIONAL OBSERVATIONS ADDITIONAL LAB TESTING DRILL METHOD DEPTH (m) DRILLRIG ELEV. Plastic & Liquid Limits STRATA PLOT nscs (%)

Water Content (%) DESCRIPTION N-VALUE Q U REC % BLOWS DEPTH TYPE Nonplastic (m) Torvane 50 100 150 200 FILL - (GM) Silty gravel, mostly medium to 0.00 GM gs 0.10 m: geogrid separator between gravel fill and clay fill coarse angular GRAVEL, few sand; tan 0.10 layers brown; limestone; non-cohesive, moist, GS 0 compact.
FILL - (CH) Fat clay, mostly high plasticity
FINES, trace sand, trace gravel; dark brown; cohesive, w > PL, firm, occasional wood and garbage fragments. - 0.60 m: stiff to very stiff GS 0 110.5 (CH) Fat clay, mostly high plasticity FINES; dark grey; cohesive, w > PL, stiff. 0.91 GS Ю 1.50 m: Particle Size Analysis - Sample 4 @ 1.5 m: Gravel = 0% 73.5 Sand = 2.8% Silt = 16.2% Clay = 81.0% - 1.83 m: brownish grey gs 2 C - 2.29 m: firm SSA - 125-mm Hole Dia 49.0 Geoprobe 3230 DT 끙 gs GS 0 4.60 m: Unconfined Compressive Test - Sample 8 @ 4.6m: 12.5 Max Stress = 65.2 kPa Bulk Density = 1723 kg/m3 Dry Density = 1147 kg/m3 2 100 End of hole at 5.18 m.
TEST HOLE TERMINATED AT 5.18 m
BELOW EXISTING GRADE
-Neither sloughing nor seepage observed during drilling.
-Test hole remained open to 5.18m with no water accumulated prior to backfilling. -Test hole backfilled with auger cuttings and bentonite.

DEPTH SCALE: 1:30

HAMMER TYPE:



REV:

LOGGED: DP CHECKED: GC DATE: Jun 19, 2025

CLIENT: Province of Manitoba DATE: June 19, 2025 ELEVATION: Data Not Available

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513324.0 m E: 630195.1 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

LOCATION:

Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

	9	MATERIAL PROFILE					SAN	//PLI	ES		WATE	ER CON	ITENT	S STREM	HEAR NGTH (kPa)	0 د	NS ER	NS NS
DEPTH (m) DRILL RIG	DRILL METHOD	DESCRIPTION	nscs	STRATA	ELEV. DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	N-VALUE			_	⊕ Re ■ Po ● Q ○ U ▲ Toi	t Vane em Vane cket Pen Su rvane 40 60 80	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
- 1		FILL - (CH) Fat clay, mostly high plasticity FINES, trace sand, trace gravel; dark grey; cohesive, w < PL, stiff.	HO		0.00	2 1	89 89)		20 4	49.0			
		(OH) Organic clay, mostly high plasticity FINES; black; cohesive, w > PL, stiff, occasional roots. (CH) Fat clay, mostly high plasticity FINES;	Ю		1.37	4 3						0			73.5			
Geoprobe 3230 DT	SSA - 125-mm Hole Dia.	grey; cohesive, w > PL, stiff. - 2.44 m: brownish grey			9	5	SS					0			86.0 			
- 3		- 3.05 m: firm	Ю			9 2	TO GS	100				0		-	49.0			3.00 m: Unconfined Compressive Test - Sample 7 @ 3.0m: Max Stress = 87.0 kPa Bulk Density = 1787 kg/m3 Dry Density = 1256 kg/m3
- 4		End of hole at 4.57 m. TEST HOLE TERMINATED AT 4.57 m BELOW EXISTING GRADE -Neither sloughing nor seepage observed during drilling. -Test hole remained open to 4.57 m with no water accumulated prior to backfilling. -Test hole backfilled with auger cuttings and bentonite.			9	8	S9					0			24.5			
. 6		AI F: 1:30																REV:

DEPTH SCALE: 1:30

HAMMER TYPE:



REV:

LOGGED: DP CHECKED: GC DATE: Jun 19, 2025

CLIENT: Province of Manitoba DATE: June 19, 2025 ELEVATION: Data Not Available

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513366.5 m E: 630262.7 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

LOCATION: Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

	Т	MATERIAL PROFILE					SAM	/PIF	S	П	WATER	CONT	FNT		SHE	EAR TH (kl			α ω	m
	<u> </u>	WATENIAL FROFILE			ELEV.		JAIV	.,						×	Nat Va Rem \	ane	-a)	ONAL	MATE	NAAL TION:
DRILL RIG	DRILL ME I HOD	DESCRIPTION	nscs	STRATA	DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	N-VALUE	H Plastic (%) O Water (NP No	& Liquid (Content (nplastic	%)			et Pen S	ш	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
1		FILL - (CH) Fat clay, mostly high plasticity FINES, trace sand, trace gravel; grey; cohesive, w < PL, stiff. - 0.30 m: firm	НО		0.00	2 1	S9			2	0	09	08	50	0 100	98	3.0			
2 - 5		(OH) Organic clay, mostly high plasticity FINES; black; cohesive, w < PL, stiff, occasional roots.	Ю		1.52	4 5 3	SS	62			0			•		24.5 O 73	3.5			1.50 m: Unconfined Compressive Test - Sample 4 @ 1.5m Max Stress = 144.1 kPa Bulk Density = 1853 kg/m3 Dry Density = 1392 kg/m3
Geoprobe 3230 DT	SSA - 125-mm	(CH) Fat clay, mostly high plasticity FINES; grey; cohesive, w > PL, stiff. - 2.59 m: brownish grey			2.13	9					0				-	122	2.5			
4		- 3.05 m: firm	ъ			7	89									49	0.0			
5		End of hole at 4.57 m. TEST HOLE TERMINATED AT 4.57 m BELOW EXISTING GRADE -Neither sloughing nor seepage observed during drillingTest hole remained open to 4.57 m with no water accumulated prior to backfillingTest hole backfilled with auger cuttings and bentonite.				8	89					0		-		24.5				

HAMMER TYPE:



DATE: Jun 19, 2025 DATE:

LOGGED: DP CHECKED: GC

CLIENT: Province of Manitoba DATE: June 20, 2025 ELEVATION: Data Not Available

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513233.8 m E: 630065.1 m

CA0054372.5789 PROJECT NO: COORD SYS: UTM Zone 14N

LOCATION: Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

		ОО	MATERIAL PROFILE					SAME	PLES		WATE	ER CON	ITENT			TH (kPa)	- 9 - 9	TER	S S
DEPTH (m)	DRILL RIG	METH		SS	Α̈́	ELEV.				T	H Plast			× ⊕			TION	NDWA:	TIONA
DEF	DRI	DRILL METHOD	DESCRIPTION	nscs	STRATA	DEPTH (m)	NUMBER	TYPE	BLOWS	N-VALUE	O Wate	Nonplastic	;	0	Q U Torvan		ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
-			FILL - (CH) Fat clay, mostly high plasticity FINES; mottled grey; cohesive, w > PL, stiff, frequent glass fragments.			0.00		es S5		z	07 C	90	-80	2	0 40	49.0			
- - - - 1				СН			2	GS			C					7 3.5			
			(OH) Organic clay, mostly high plasticity FINES; black; cohesive, w > PL, stiff, occasional roots.	НО		1.22	8	SS				0				■ 73.5			
-			(ML) Silt, mostly low plasticity FINES, trace sand; grey; cohesive, w > PL, very soft.			1.68	4	GS			0								
- 2 -	Acker MP5	SSA - 125-mm Hole Dia.	- 1.98 m: brownish grey	ML			2	SS			0			0.0					
- - - - 3		SSA	(CH) Fat clay, mostly high plasticity FINES; brownish grey; cohesive, w > PL, stiff. - 3.05 m: firm			2.59	9	68			C				•	49.0			
- - - - 4 - -			- 3.96 m: soft	НО			7	SS				0							
5			End of hole at 4.57 m. TEST HOLE TERMINATED AT 4.57 m BELOW EXISTING GRADE -Sloughing and seepage observed between 1.7 m and 2.6 m during drillingTest hole remained open to 3.0 m with no water accumulated above slough prior to backfillingTest hole backfilled with auger cuttings and bentonite.												12.5	5			
- 6																			

DEPTH SCALE: 1:30

HAMMER TYPE:



LOGGED: DP CHECKED: GC DATE: Jun 20, 2025

DATE:

REV:

CLIENT: Province of Manitoba DATE: June 19, 2025 ELEVATION: Data Not Available

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513297.3 m E: 630186.6 m

CA0054372.5789 PROJECT NO: COORD SYS: UTM Zone 14N

LOCATION: Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

WATER CONTENT SHEAR STRENGTH (kPa) ۵ MATERIAL PROFILE SAMPLES . Ω E S <u>S</u>

		ОО	MATERIAL PROFILE					SAME	PLES		WATER	CONTENT	٥		GTH (kF	<u>ه)</u> ا	L S S	NS SS
DEPTH (m)	DRILLRIG	DRILL METHOD	DESCRIPTION	nscs	STRATA	ELEV. DEPTH (m)	NUMBER	TYPE REC %	BLOWS	N-VALUE	(%) Water Co	olastic		Rem Poci Q U Torv	Vane n Vane ket Pen Su vane 0 150 20	ADDI LAB T	GROUNDWATER	ADDITIONAL
-			FILL - (CH) Fat clay, mostly high plasticity FINES, trace sand, trace gravel; grey; cohesive, w > PL, firm.			0.00	1	S9			0			•	37.0			
- 1							2	GS GS			0			•	49	0		
-			- 1.22 m: dark grey, stiff				3	SS			0							
-			(CH) Fat clay, mostly high plasticity FINES; dark grey; cohesive, w > PL, stiff, occasional silt inclusions.	=		1.52	4	70 6	3						73	.5		
_ 2	Geoprobe 3230 DT	SSA - 125-mm Hole Dia.	- 2.13 m: brownish grey	Н			2	SS			I O−		4	-	49			2.30 m: Particle Size Analysis - Sample 5 @ 2.3 m: Gravel = 0% Sand = 1.3% Silt = 13.0% Clay = 85.7%
- 3			- 3.05 m: firm				9	89			0				61	.5		
- 4							7	89			0							
5			End of hole at 4.57 m. TEST HOLE TERMINATED AT 4.57 m BELOW EXISTING GRADE -Neither sloughing nor seepage observed during drillingTest hole remained open to 4.57 m with no water accumulated prior to backfillingTest hole backfilled with auger cuttings and bentonite.												24.5			
- 6																		

DEPTH SCALE: 1:30

HAMMER TYPE:



REV:

LOGGED: DP CHECKED: GC DATE: Jun 19, 2025

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513201.7 m E: 630183.0 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

LOCATION: Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

		T	MATERIAL PROFILE					SAN	1PLI	ES	WA	ATER	CON	TENT	Τ.	TDE	SHEA	IR H (kPa	\	ĸω	ω
H (m)		밀			<	ELEV.					Н РІ	lastic 8		Limits	×	N	lat Van Rem Va	ne	ONAL	WATE	ONAL
DEPTH (m) DRILL RIG	OBILI METHOD	DRILL M	DESCRIPTION	nscs	STRATA	DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	(% () W	6) /ater C Non	ontent			T	Pocket F Q J Forvane 40 6		ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
			(OH) Organic clay, mostly high plasticity FINES; black; cohesive, w < PL, stiff, occasional roots.	Н	\$ \$ \$ \$ \$ \$ \$ \$ \$	0.00	1	GS GS				0						49.0			
-			(CH) Fat clay, mostly high plasticity FINES; grey; cohesive, w < PL, stiff.	H)		0.46	2	SS			c	0						86.0			
- 1			(ML) Silt, mostly low plasticity FINES; tan brown; cohesive, w > PL, firm.	ML		0.91															
-		_	(CH) Fat clay, mostly high plasticity FINES; brownish grey; cohesive, w > PL, stiff, occasional silt inclusions.			1.52	Е	SS				0				-	:	24.5			
Geoprobe 3230 DT	SCA - 175-mm Hole Dis	SSA - 125-mm Hole Dia.					4	SS				0					•	61.5			
- 3			- 3.05 m: firm	Ю			6 5	TO GS	100			C.	D					24.5 O			3.00 m: Unconfined Compressive Test - Sample 6 @ 3.0n Max Stress = 72.7 kPa Bulk Density = 1751 kg/m3 Dry Density = 1203 kg/m3
- 4																		61.5			
- 5			End of hole at 4.57 m. TEST HOLE TERMINATED AT 4.57 m BELOW EXISTING GRADE -Sloughing and seepage observed from 0.9 m to 1.5 m during drilling. Test hole remained open to 4.0 m with no water accumulated above slough prior to backfillingTest hole backfilled with auger cuttings and bentonite.				7	S9 G8					0			-		24.5			

DEPTH SCALE: 1:30

HAMMER TYPE:



REV:

Sheet 1 of 1

LOGGED: DP CHECKED: GC DATE: Jun 19, 2025

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513142.6 m E: 630127.3 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

LOCATION: Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

(5)	00	MATERIAL PROFILE	T		1		SAM	1PLE	S	WA	TER C	ONTENT			R H (kPa)	구일	TER	N.C.
DRILL RIG	METH		S	Α̈́	ELEV.					(%))	quid Limits	⊕	Nat Vane Rem Var Pocket P	ie	TIONA	JDWA-	TIONA
DRIL	DRILL METHOD	DESCRIPTION	nscs	STRATA	DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	O Wa	iter Cont Nonpla		<u></u>	Q U Torvane 40 60		ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
		FILL - (SP-SM) Poorly graded sand with silt, mostly fine to medium SAND; brown; non-cohesive, moist, compact, occasional sand bag fragments.			0.00	-	SS			0	4	\$ \$	= 20	40 60	0 80			
			SP-SM			2	GS GS			0								
		FILL - (CH) Fat clay, mostly high plasticity FINES, few sand; mottled grey; cohesive, w > PL, soft. - 1.52 m: stiff			1.22	3	CS CS				0		•	12.5				
Acker MP5	SSA - 125-mm Hole Dia.	(CH) Fat clay, mostly high plasticity FINES;			2.59	4	CS CS			F	0				61.5			2.30 m: Particle Size Analysis - Sample 4 @ 2.3 m: Gravel = 0% Sand = 5.7% Sitt = 27.5% Clay = 66.8%
	SSA - 125	grey; cohesive, w > PL, stiff.			2.59	5	SS				0							
3		- 3.05 m: firm, brownish grey, occasional silt inclusions	ᆼ			43	9								■ 73.5			
1						9	GS S				0							
															24.5			4.60 m: Unconfined Compressive Test - Sample 7 @ 4. Max Stress = 56.3 kPa Bulk Density = 1739 kg/m3 Dry Density = 1164 kg/m3
5						7	OT	28						0				, ,
		End of hole at 5.18 m. TEST HOLE TERMINATED AT 5.18 m BELOW EXISTING GRADE -Sloughing and seepage observed from 0.3 m to 1.2 m during drillingTest hole remained open to 4.3 m with water accumulated to 2.7 m prior to backfillingTest hole backfilled with auger cuttings and	1											2	24.5			

DEPTH SCALE: 1:30

HAMMER TYPE:

REV:

Sheet 1 of 1

LOGGED: DP CHECKED: GC DATE: Jun 20, 2025

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513187.8 m E: 630241.7 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

LOCATION: Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

	ОО	MATERIAL PROFILE				SAMF	PLES		WATER CONTENT		SHEAR TRENGTH (kPa)	- j g	TER SNS	NS SNS
DRILLRIG	DRILL METHOD	DESCRIPTION (OH) Organic clay, mostly high plasticity FINES; black; cohesive, w > PL, soft, occasional roots.	H USCS	DEPTH (m)	NUM	GS TYPE	BLOWS	N-VALUE	H Plastic & Liquid Limits (%) O Water Content (%) NP Nonplastic	100	Nat Vane Rem Vane Pocket Pen Su Q U Torvane 20 40 60 80	ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL
1		(CH) Fat clay, mostly high plasticity FINES; grey; cohesive, w > PL, stiff.	5 3 4 5 4 <t< td=""><td>0.61</td><td>2</td><td>SS</td><td></td><td></td><td>o</td><td></td><td>12.5</td><td></td><td></td><td></td></t<>	0.61	2	SS			o		12.5			
		- 1.52 m: brownish grey, occasional silt inclusions			3	es es			O		■ 73.5			
Geoprobe 3230 DT	SSA - 125-mm Hole Dia.	- 2.13 m: soft	5		4	- GS			0		12.5			
3					S	SS			0		19.5			
4					9	GS S			0					
5		End of hole at 4.57 m. TEST HOLE TERMINATED AT 4.57 m BELOW EXISTING GRADE -Neither sloughing nor seepage observed during drillingTest hole remained open to 4.57 m with no water accumulated prior to backfillingTest hole backfilled with auger cuttings and bentonite.									24.5			
3		ALE: 1:30												REV:

DEPTH SCALE: 1:30

HAMMER TYPE:



LOGGED: DP CHECKED: GC DATE: Jun 19, 2025

DATE:

Sheet 1 of 1

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513144.0 m E: 630187.3 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

LOCATION: Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

	MATERIAL PROP	ILE	1	ı	,	SAMP	LES		WATER CO	ONTENT	STRE	SHEAR ENGTH (kPa)	48	TER	AL ONS
DRILL RIG	DESCRIPTION	nscs	STRATA	ELEV. DEPTH	NUMBER	TYPE REC %	BLOWS		H Plastic & Li (%) Water Cont NP Nonpla	ent (%)	⊕ R		ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
, NO	(CH) Fat clay, mostly high plasticity FIN mottled grey; cohesive, w > PL, firm, occasional silt layers.		8	(m) 0.00		GS TY	BTC	√\-N	0		20	37.0	<u> </u>	GR	▼ 80
	(ML) Silt, mostly low plasticity FINES; ta brown; cohesive, w > PL, very soft.	n W		0.61	2	98			0		0.0				
Geoprobe 3230 DT SSA - 125-mm Hole Dia.	(CH) Fat clay, mostly high plasticity FIN brownish grey; cohesive, w > PL, stiff, occasional silt inclusions.	ES;		1.22		SS			0			7 3.5			
2		ОН			4	89			0			■ 49.0			
3	End of hole at 3.05 m. TEST HOLE TERMINATED AT 3.05 BELOW EXISTING GRADE -Neither sloughing nor seepage obser during drilling. -Test hole remained open to 3.05 m wit water accumulated prior to backfilling. -Test hole backfilled with auger cuttings bentonite.	ved			ا ي	89			c		-	24.5			

DEPTH SCALE: 1:20

HAMMER TYPE:



REV:

Sheet 1 of 1

LOGGED: DP CHECKED: GC DATE: Jun 19, 2025

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513162.5 m E: 630236.9 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

LOCATION: Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

	,																			
چ آ "	2	MATERIAL PROFILE					SAM	1PLE	S		WA	TER C	CONTENT	STI	SHE	EAR STH (k	Pa)	무일	TER	JAL SNO
DEPTH (m)	/FTH	!	S	ĕ⊢	ELEV.			-			H Pla	nstic & L	iquid Limits	× ⊕ ■	Nat Vi Rem ' Pocke	/ane Vane et Pen S	Su	TION/ ESTIN	DWA	TION≽ VATIC
PEP.	DRII I METHOD	DESCRIPTION	nscs	STRATA	DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	N-VALUE	O Wa	nter Cor Nonpl	ntent (%)	• • • • • • • • • • • • • • • • • • •	Q U Torva	ine		ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL
	-	(OH) Organic clay, mostly high plasticity		n n n	0.00	N	_	۳	В	ź	0 8	40	φ φ			60 8	80		00	0
		FINES; black; cohesive, w > PL, stiff, occasional roots.																		
			동			-	SS					0								
																	•			
		(ML) Silt, mostly low plasticity FINES; tan		333	0.46											9	8.0			
		brown; cohesive, w > PL, very soft.			0.40															
						2	38					5								
			ML											-						
														0.0	D					
- 1																				
		(CH) Fat clay, mostly high plasticity FINES; brownish grey; cohesive, w > PL, stiff,		////	1.07															
		occasional silt inclusions.																		
	<u>.</u> .	3																		
Geommbe 3230 DT	SSA - 125-mm Hole Dia					3	SS					0								
inhe 3	25-mm]												1.5			
J. Oab	SSA - 1		[/														1.5			
		- 1.83 m: firm																		
- 2																				
			ఠ																	
				///		4	SS					C								
																24.5	,			
		- 2.74 m: very soft																		
				///																
- 3						2	89						0							
		End of hole at 3.05 m. TEST HOLE TERMINATED AT 3.05 m BELOW EXISTING GRADE													5.0					
		-Neither sloughing nor seepage observed during drilling.																		
		-Test hole remained open to 3.05 m with no water accumulated prior to backfilling.																		
		-Test hole backfilled with auger cuttings and bentonite.																		
4	_		Ш																1	
EPTI	I S	CALE: 1:20							_		_									REV:

HAMMER TYPE:



LOGGED: DP

CHECKED: GC

Sheet 1 of 1

DATE: Jun 19, 2025

CLIENT: Province of Manitoba DATE: June 19, 2025 ELEVATION: Data Not Available PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513186.1 m E: 630289.1 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

LOCATION:

Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

																					ı	
ر ج	,	무	MATERIAL PROFILE		1	1		SAI	ИPL	ES		٧	VATER	R CON	ITENT	STR	SHE RENG Nat Va	AR TH (kPa	a)	AP NG	TER	AL ONS
DEPTH (m)	DRILL RIG	METH		ŵ	Α̈́F	ELEV.					I .	Н	Plastic (%)	& Liquid	d Limits	× ⊕ ■ • ○	Rem \ Pocke	ine /ane t Pen Su		TION	NDWA WATIC	TION,
	ב	DRILL METHOD	DESCRIPTION	nscs	STRATA	DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	N-VALUE	O NP	Water	Content nplastic	(%)	• 0 •	Q U Torvar	ne		ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
	-		(CH) Fat clay, mostly high plasticity FINES;			0.00	₹		œ	BI	ź	ę.	-50	9	8 5			60 80	4		00	0
			dark grey; cohesive, w > PL, stiff.		Y///																	
					Y///	1	_	GS					0									
					Y///	1												-				
						1												73.5	5			
							_	(O														
			- 0.76 m: occasional silt inclusions				2	es					0					,				
			- 0.76 m. occasional silt inclusions		V//													93.0				
					Y///																	
1					Y///	1																
					Y///	1																
						1																
ż	5	e Dia.																				
000	Geoprope 3230 D.I	SSA - 125-mm Hole Dia.		공			3	SS					0									
	aobtos	- 125-r	- 1.52 m: brownish grey		V//.													73.5	5			
(5	SSA			V///																	
					Y///																	
					Y///	1																
2					Y///	1																
						1																
							4	GS						b				_				
			- 2.29 m: firm														-	49.0	,			
					V///																	
					V///																	
					Y///																	
					Y///																	
3					1///	1	2	SS						0								
	+		End of hole at 3.05 m. TEST HOLE TERMINATED AT 3.05 m														+	24.5	\parallel			
			BELOW EXISTING GRADE -Neither sloughing nor seepage observed															24.0				
			during drillingTest hole remained open to 3.05 m with no water accumulated prior to backfilling.																			
			water accumulated prior to backfillingTest hole backfilled with auger cuttings and bentonite.																			
			bentonite.																			
4-	11.		M.F. 4.20		•	•					•	"						-	-11			REV:
EPI	H :	SC	ALE: 1:20							_		_			_							INLV.

HAMMER TYPE:



Sheet 1 of 1

LOGGED: DP CHECKED: GC DATE: Jun 19, 2025

ELEVATION:

Data Not Available

PROJECT: Humanitarian Search - Brady Landfil END DATE: June 12, 2025 COORDINATES: N: 5513240.6 m E: 630345.1 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

START DATE:

LOCATION: Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

							ı					1									ı		
٠ ١	, 2	م م	MATERIAL PROFILE					SA	MPL	.ES		'	WATE	R CON	ITENT	STR	SH	EAR STH (k	(Pa)	AP VG	TER	ons	
DEPTH (m)	ŀ	MEIF		S	₹.	ELEV.	L					ļH	Plastic	& Liqui	d Limits	X 🕀 🔳 🕕 🔾		/ane Vane et Pen S	Su	TION	IDWA WATIC	TION	
DEP		DRILL METHOD	DESCRIPTION	nscs	STRATA	DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	N-VALUE	ON) Water NP No	Content	t (%)		Q U Torva			ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS	
	-	+	FILL - (CH) Fat clay, mostly high plasticity			0.00	Z		_	ш	Ż	9	-20	β &	8 5	20	40	60 8	30		00	0	
			FINES, trace gravel; dark grey; cohesive, w > PL, firm, occasional glass and metal fragments.			1																	
			magmonio.			}	-	GS					0										
																		24.5					
						1																	
			(CH) Fat clay, mostly high plasticity FINES; brownish grey; cohesive, w > PL, firm.			0.61	2	SS															
						1											•	37.0					
																		37.0					
1																							
					V///																		
	. 2	Dia.				1																	
Geommbe 3930 DT		SSA - 125-mm Hole Dia.		_		1	က	GS					(
adora	200	125-m	- 1.52 m: dark grey	공													1	37.0					
ق	5	SSA -																					
					V///																		
- 2						1																	
			- 2.13 m: stiff			1																	
							4	GS GS					0										
																			3.5				
			- 2.44 m: brownish grey, firm, occasional silt inclusions		V///																		
			iliciusions																				
						1																	
							-	S															
3	+	_	End of hole at 3.05 m.		///		5	GS				-											
			TEST HOLE TERMINATED AT 3.05 m BELOW EXISTING GRADE															24.5	5				
			-Neither sloughing nor seepage observed during drilling.																				
			-Test hole remained open to 3.05 m with no water accumulated prior to backfilling. -Test hole backfilled with auger cuttings and																				
			bentonite.																				
4 -			N.F. 400		1	1													1 1		I	I .	REV:
EPT!	H S	C/	ALE: 1:20						_			_			_								IXLV.

HAMMER TYPE:

CLIENT:

Province of Manitoba



Sheet 1 of 1

LOGGED: DP CHECKED: GC DATE: Jun 19, 2025

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513289.0 m E: 630323.0 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

LOCATION: HORZ DATUM: NAD83

Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd.

		Γ														01	- 4 5	,			
و ا ق	НОБ	MATERIAL PROFILE	1				SAM	ИPL	ES					TENT	X	Nat V	EAR STH (kF ane	Pa)	ING IN	GROUNDWATER OBSERVATIONS	IONS
DEPTH (m) DRILL RIG	DRILL METHOD	DE005::	SS	ATA	ELEV.	~		-		17.7	H PI	lastic 8	& Liqui	d Limits	(⊕ ■ ⊕ 0	Rem '	Vane et Pen Su	.	ADDITIONAL LAB TESTING	NDW,	ADDITIONAL OBSERVATIONS
	JRILL	DESCRIPTION	nscs	STRATA	DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	N-VALUE	NP		content		A	Q U Torva	ne		ADD LAB	ROUI	ADD
		FILL - (GM) Silty gravel, mostly GRAVEL,		XXX	0.00	ž	Ċ	-	В	ż	o 8	8 4	φ	8 5	50	100	150 20	0		00	0
		few sand; dark grey; non-cohesive, moist, compact.																			
			GM			1	GS				0										
		FILL - (CH) Fat clay, mostly high plasticity FINES, trace sand, trace gravel; dark grey; cohesive, w > PL, very stiff, occasional			0.46																
		cohesive, w > PL, very stiff, occasional garbage and organic inclusions.																			
						2	SS					0									
																	110	.5			
1		(CH) Est aloy mostly high placticity FINES:			1.07																
		(CH) Fat clay, mostly high plasticity FINES; brownish grey; cohesive, w > PL, stiff.		Y///	1.07																
				Y///	1																
	Dia.				1																
Geoprobe 3230 DT	SSA - 125-mm Hole Dia.					က	GS GS					0									
oprobe	125-m															-	73	.5			
æ	SSA-																				
			공																		
				V///																	
2					1																
		0.40 5		Y///	1																
		- 2.13 m: firm		Y///	1	4	GS					0									
				\ <i>///</i>	1										•						
]												49	.0			
					4																
					4	2	es														
3		End of hole at 3.05 m.	_		1		-								+	+	+	\dashv			
		TEST HOLE TERMINATED AT 3.05 m BELOW EXISTING GRADE															49	.0			
		-Neither sloughing nor seepage observed during drilling.																			
		-Test hole remained open to 3.05 m with no water accumulated prior to backfillingTest hole backfilled with auger cuttings and																			
		bentonite.																			
4			1																		
EPTH	SC	ALE: 1:20																			REV:

HAMMER TYPE:



Sheet 1 of 1

LOGGED: DP CHECKED: GC DATE: Jun 19, 2025

CLIENT: Province of Manitoba DATE: June 20, 2025 ELEVATION: Data Not Available

PROJECT: Humanitarian Search - Brady Landfil COORDINATES: N: 5513377.0 m E: 630169.0 m

PROJECT NO: CA0054372.5789 COORD SYS: UTM Zone 14N

LOCATION: Winnipeg, MB CONTRACTOR: Maple Leaf Drilling Ltd. HORZ DATUM: NAD83

<u></u>	ОО	MATERIAL PROFILE					SA	MPL	.ES		W	VATER	R CON	ITENT	STF	SHE	EAR STH (kPa)	70	TER	NS SNS
DEPTH (m) DRILL RIG	/ETH		S	_ ≱ _	ELEV.						н	Plastic (%)	& Liqui	d Limits	× ⊕	Nat Va Rem \ Pocke	Vane	Su	FIONA	DWA'	VATIC
DEPT	DRILL METHOD	DESCRIPTION	nscs	STRATA	DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	N-VALUE	O NP	Water 0	Content	: (%)	0	Q U Torvar	ne		ADDITIONAL LAB TESTING	GROUNDWATER OBSERVATIONS	ADDITIONAL OBSERVATIONS
		FILL - (GM) Silty gravel, mostly medium to coarse angular GRAVEL, few sand; tan	ωg		0.00	1					0										
		brown; non-cohesive, moist, compact. FILL - (CH) Fat clay, mostly high plasticity	\vdash		0.10		9														0.10 m: geogrid separator between gravel fill and clay fill layers
		FINES, trace sand, trace gravel; dark grey; cohesive, w > PL, stiff.			1	2	GS					0									
																	+				
					4													61.5			
	Dia.				\$	3	GS S					0									
Acker MP5	nm Hole						9														
Acke	SSA - 125-mm Hole Dia.		동															19.0			
	SS/	(CH) Fat clay, mostly high plasticity FINES; grey; cohesive, w > PL, stiff.			0.91																
- 1		grey; cohesive, w > PL, stiff.																			
						4	SS					0									
		End of hole at 1.52 m. TEST HOLE TERMINATED AT 1.52 m																-			
		BELOW EXISTING GRADE -Neither sloughing nor seepage observed															1	86.0			
		during drillingTest hole remained open to 1.52 m with no water accumulated prior to backfilling.																			
		-Test hole backfilled with auger cuttings and bentonite.																			
- 2																					
•																					
DEPTH	SC	ALE: 1:15						_			_										REV:

HAMMER TYPE:



LOGGED: DP CHECKED: GC DATE: Jun 20, 2025

APPENDIX B

Laboratory Testing Report



MOISTURE CONTENT OF SOIL AND ROCK (ASTM D2216)

Client: Manitoba Government Project No.: CA0054372.5789

Project:Humanitarian Search - Brady LandfillReport Date: Jul 04, 2025Date Sampled:Jun 19, 2025Date Tested: Jun 25, 2025

Sampled By: Duncan Platts Tested By: RR/JM

Test Hole No.	Sample No.	Depth (ft)	Moisture Content (%)
TH25-01	S1	0.5	2.5
TH25-01	S2	1.0	27.9
TH25-01	S3	2.5	35.5
TH25-01	S4	5.0	35.6
TH25-01	S5	7.5	37.8
TH25-01	S6	10.0	43.5
TH25-01	S7	15.0	54.1
TH25-02	S1	1.0	33.7
TH25-02	S2	2.5	32.2
TH25-02	S3	5.0	35.6
TH25-02	S4	6.0	38.5
TH25-02	S 5	7.5	35.8
TH25-02	S6	10.0	40.5
TH25-02	S8	15.0	52.9
TH25-03	S1	1.0	24.4
TH25-03	S2	2.5	29.5
TH25-03	S3	5.0	31.6
TH25-03	S5	6.0	36.6
TH25-03	S6	7.5	34.9
TH25-03	S7	10.0	38.9
TH25-03	S8	15.0	53.5
TH25-04	S1	1.0	29.4
TH25-04	S2	2.5	31.8
TH25-04	S3	5.0	37.2
TH25-04	S4	6.0	23.7
TH25-04	S 5	7.5	22.9
TH25-04	S6	10.0	31.4
TH25-04	S7	15.0	39.1
TH25-05	S1	1.0	34.6
TH25-05	S2	2.5	26.9
TH25-05	S 3	5.0	30.8



MOISTURE CONTENT OF SOIL AND ROCK (ASTM D2216)

Project No.: CA0054372.5789 Client: Manitoba Government

Project: Humanitarian Search - Brady Landfill Report Date: Jul 04, 2025

Date Sampled: Jun 19, 2025 Date Tested: Jun 25, 2025

Sampled By: **Duncan Platts** Tested By: RR/JM

Test Hole No.	Sample No.	Depth (ft)	Moisture Content (%)
TH25-05	S5	7.5	32.0
TH25-05	S6	10.0	40.0
TH25-05	S7	15.0	38.7
TH25-06	S1	1.0	30.7
TH25-06	S2	2.5	23.9
TH25-06	S3	5.0	29.4
TH25-06	S4	7.5	39.9
TH25-06	S 5	10.0	45.6
TH25-06	S7	15.0	52.1
TH25-07	S1	1.0	6.2
TH25-07	S2	2.5	8.9
TH25-07	S3	5.0	40.2
TH25-07	S4	7.5	32.0
TH25-07	S5	10.0	35.7
TH25-07	S6	15.0	50.3
TH25-08	S1	1.0	44.9
TH25-08	S2	2.5	35.9
TH25-08	S3	5.0	35.3
TH25-08	S4	7.5	49.0
TH25-08	S5	10.0	48.0
TH25-08	S6	15.0	44.4
TH25-09	S1	1.0	33.3
TH25-09	S2	2.5	24.1
TH25-09	S3	5.0	35.0
TH25-09	\$3 \$4		
TH25-09	S5	7.5 10.0	48.1 51.5
1 1123-09	35	10.0	31.3
TH25-10	S1	1.0	32.3
TH25-10	S2	2.5	26.7
TH25-10	S3	5.0	41.1
TH25-10	S4	7.5	49.3



MOISTURE CONTENT OF SOIL AND ROCK

(ASTM D2216)

Client: Manitoba Government Project No.: CA0054372.5789

Project: Humanitarian Search - Brady Landfill Report Date: Jul 04, 2025

Date Sampled:Jun 19, 2025Date Tested:Jun 25, 2025Sampled By:Duncan PlattsTested By:RR/JM

Test Hole No.	Sample No.	Depth (ft)	Moisture Content (%)
TH25-10	S5	10.0	55.6
TH25-11	S1	1.0	33.5
TH25-11	S2	2.5	34.5
TH25-11	S3	5.0	34.9
TH25-11	S4	7.5	44.1
TH25-11	S5	10.0	50.5
TH25-12	S1	1.0	32.3
TH25-12	S2	2.5	38.1
TH25-12	S3	5.0	40.2
TH25-12	S4	7.5	31.5
TH25-12	S 5	10.0	38.0
TH25-13	S1	1.0	8.3
TH25-13	S2	2.5	28.7
TH25-13	S3	5.0	27.1
TH25-13	S4	7.5	36.7
TH25-13	S5	10.0	39.8
TH25-14	S1	0.3	5.7
TH25-14	S2	1.0	36.3
TH25-14	S3	2.5	34.9
TH25-14	S4	5.0	36.4

Reviewed by:



Md Nazri Mohidin, E.I.T

Experienced Laboratory Technician



ATTERBERG LIMITS (ASTM D4318)

Client: Manitoba Government Project No.: CA0054372.5789

Project: Humanitarian Search - Brady Landfill Report Date: Jul 02, 2025

Date Sampled: Jun 19, 2025 **Date Tested:** Jun 27, 2025

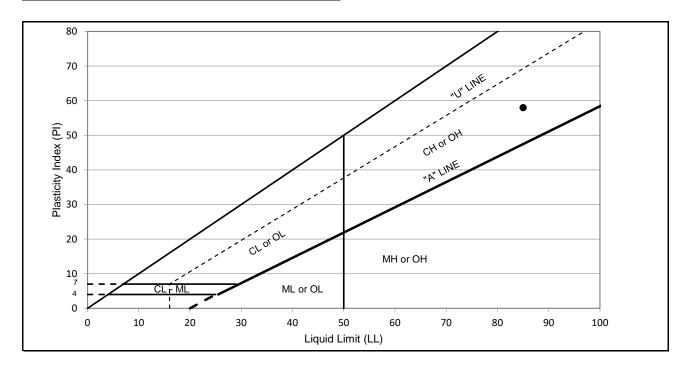
Sampled By: Duncan Platts Date Received: Jun 19, 2025 Tested By: Rolando Rongcal

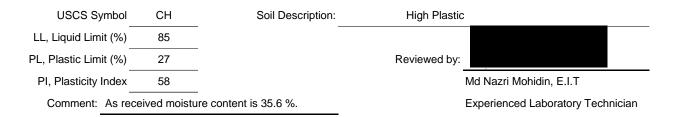
Testhole No.: TH25-01 **Sample No.:** S4 **Depth (ft):** 5

Drying Method: Oven Method: Multi-Point

	quid Limit Te Plastic Groov											
Trial	Trial A B											
No. of Blows	30	25	18									
Moisture Content (%)	83.5	84.7	86.4									

Plastic Limit Test (Hand rolled)			
Trial	Α	В	
Moisture Content (%)	27.4	27.0	





The test data given herein pertain to the sample provided. Reporting of these data constitutes a testing service. Engineering review and interpretation may be provided upon written request.



ATTERBERG LIMITS (ASTM D4318)

Client: Manitoba Government Project No.: CA0054372.5789

Project: Humanitarian Search - Brady Landfill Report Date: Jul 02, 2025

Date Sampled: Jun 19, 2025 **Date Tested:** Jun 27, 2025

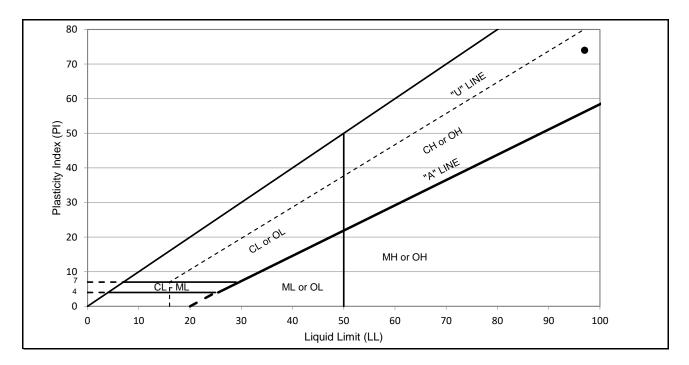
Sampled By: Duncan Platts Date Received: Jun 19, 2025 Tested By: Rolando Rongcal

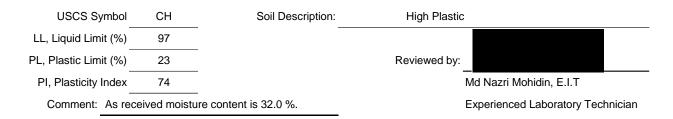
Testhole No.: TH25-05 **Sample No.:** 5.0 feet **Depth (ft):** 7.5

Drying Method: Oven Method: Multi-Point

Liquid Limit Test (Manual, Plastic Grooving tool)			
Trial	Α	В	С
No. of Blows	34	27	19
Moisture Content (%)	93.6	96.0	98.9

Plastic Limit Test (Hand rolled)			
Trial	Α	В	
Moisture Content (%)	23.0	23.1	





The test data given herein pertain to the sample provided. Reporting of these data constitutes a testing service. Engineering review and interpretation may be provided upon written request.



ATTERBERG LIMITS (ASTM D4318)

Client: Manitoba Government Project No.: CA0054372.5789

Project: Humanitarian Search - Brady Landfill Report Date: Jul 02, 2025

Date Sampled: Jun 19, 2025 **Date Tested:** Jun 27, 2025

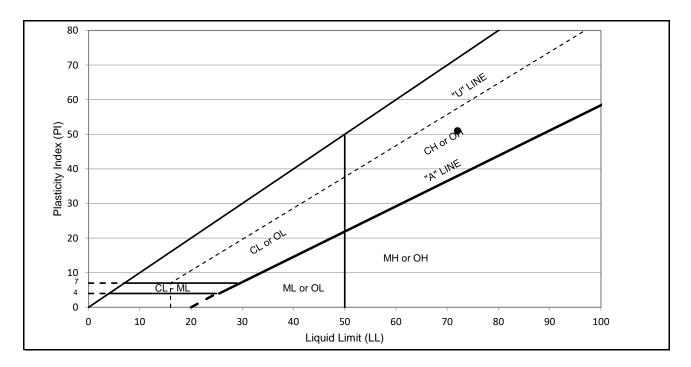
Sampled By: Duncan Platts Date Received: Jun 19, 2025 Tested By: Rolando Rongcal

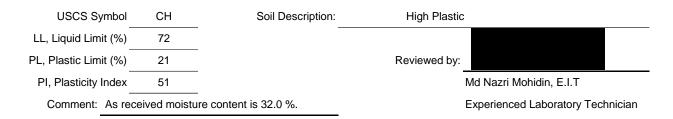
Testhole No.: TH25-07 **Sample No.:** S4 **Depth (ft):** 7.5

Drying Method: Oven Method: Multi-Point

Liquid Limit Test (Manual, Plastic Grooving tool)			
Trial	Α	В	С
No. of Blows	32	24	19
Moisture Content (%)	70.2	72.3	73.8

Plastic Limit Test (Hand rolled)			
Trial	Α	В	
Moisture Content (%)	21.4	21.4	





The test data given herein pertain to the sample provided. Reporting of these data constitutes a testing service. Engineering review and interpretation may be provided upon written request.



Manitoba Government CLIENT:

Humanitarian Search - Brady Landfill PROJECT:

PROJECT NO.: CA0054372.5789

OFFICE: Winnipeg, MB.

TEST DATE: 30-Jun-25

SAMPLE DATE: 19-Jun-25

LENGTH:

AVERAGE:

ATTENTION:

TECHNICIAN:

MOISTURE:

TEST HOLE: TH25-01

Nazri Mohidin

SAMPLE #: **DEPTH (m):** 4.6 - 5.2 ATTERBERG LIMITS: HYDROMETER:

Yes

146.55 mm

146.47 mm

146.51 mm

No

Х

Х

WET WEIGHT: 1045.8 g

50.2 %

WET DENSITY: 1722.7 (kg/m³)

1146.8 (kg/m³) DRY DENSITY:

INITIAL AREA: 4143.45 mm²

SAMPLE DIAMETER: 72.87 mm

72.73 mm 72.30 mm

AVERAGE: 72.63

HEIGHT TO DIAMETER RATIO: 2.0

> 1.66 STRAIN RATE: %/ min. (to failure) (0.5% to 2% per min as per ASTM)

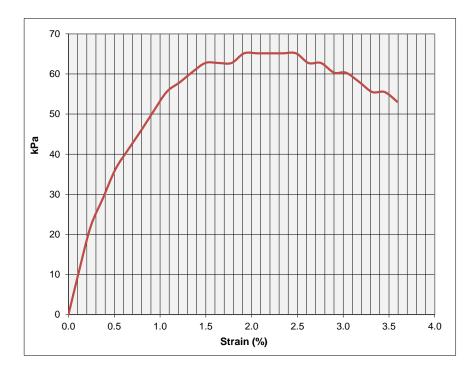
Stress (kPa)

VOLUME: 0.000607 m³

65.2

Maximum Compressive

Photo of Failed Specimen





Pocket Pen kPa Top 50 50 50 50 50 Avg Bottom 50 75 100 75

Torvane
kPa
Тор
65
75
75
75
73
Avg
Bottom
65
70
70
70
69
Avg
1
Torvane Facto

COMMENTS:

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

WSP Canada Inc. 6 High Level Road Oak Bluff, Manitoba R4G 0E2, Canada





Manitoba Government CLIENT:

Humanitarian Search - Brady Landfill PROJECT:

PROJECT NO.: CA0054372.5789

OFFICE: Winnipeg, MB.

TEST DATE: 30-Jun-25

SAMPLE DATE: 19-Jun-25

LENGTH:

ATTENTION:

TECHNICIAN:

MOISTURE:

TEST HOLE: TH25-02

Nazri Mohidin

SAMPLE #: **DEPTH (m):** 3.0 - 3.7 ATTERBERG LIMITS: HYDROMETER:

146.55 mm

Yes

No

Х

Х

WET WEIGHT: 1083.5 g

42.4 %

WET DENSITY: 1787.4 (kg/m³)

1255.5 (kg/m³) DRY DENSITY:

INITIAL AREA: 4134.33 mm²

SAMPLE DIAMETER:

AVERAGE:

72.65 mm 72.66 mm

72.35 mm

72.55

HEIGHT TO DIAMETER RATIO: 2.0

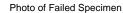
> STRAIN RATE: 1.64 %/ min.

(to failure) (0.5% to 2% per min as per ASTM)

146.69 mm AVERAGE: 146.62 mm

VOLUME: 0.000606 m³

Maximum Compressive Stress (kPa) 87.0





Pocket Pen
kPa
Тор
100
100
100
100
100
Avg
Bottom
50
50
50
50
50
Avg

Torvane
kPa
Тор
85
75
75
80
79
Avg
Bottom
65
60
65
65
64
Avg
1
Torvane Facto

100 90 80 70 кРа 60 50 40 30 20 10 0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 Strain (%)

COMMENTS:

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

WSP Canada Inc. 6 High Level Road Oak Bluff, Manitoba R4G 0E2, Canada





CLIENT: Manitoba Government

PROJECT: Humanitarian Search - Brady Landfill

PROJECT NO.: CA0054372.5789

OFFICE: Winnipeg, MB.

TEST DATE: 30-Jun-25

SAMPLE DATE: 19-Jun-25

ATTENTION:

TECHNICIAN:

MOISTURE:

TEST HOLE: TH25-03

Nazri Mohidin

SAMPLE #: S4 **DEPTH (m)**: 1.5-2.1

ATTERBERG LIMITS: HYDROMETER:

<u>'</u>

146.59 mm

146.75 mm

146.67 mm

Yes

No

Х

Х

WET WEIGHT: 1131.4 g

33.1 %

WET DENSITY: 1852.9 (kg/m³)

DRY DENSITY: 1392.2 (kg/m³)

INITIAL AREA: 4163.25 mm²

SAMPLE DIAMETER: 72.95 mm

72.77 **mm** 72.70 **mm**

AVERAGE: 72.81 mm

HEIGHT TO DIAMETER RATIO: 2.0

STRAIN RATE: 1.67 % / min. (to failure) (0.5% to 2% per min as per ASTM)

VOLUME: 0.000611 m³

LENGTH:

AVERAGE:

Maximum Compressive Stress (kPa) 144.1

Photo of Failed Specimen



		H	
A. C.			
		1	
	M		
291481			

Pocket Pen
kPa
Тор
200
200
275
200
219
Avg
Bottom
175
175
175
200
181
Avg

COMMENTS:

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

WSP Canada Inc. 6 High Level Road Oak Bluff, Manitoba R4G 0E2, Canada Reviewed by:



CLIENT: Manitoba Government OFFICE: Winnipeg, MB.

 PROJECT:
 Humanitarian Search - Brady Landfill
 TEST DATE:
 30-Jun-25

PROJECT NO.: CA0054372.5789 SAMPLE DATE: 19-Jun-25

ATTENTION:

 Yes No

 TEST HOLE: TH25-05
 SAMPLE #: S4
 ATTERBERG LIMITS: X

 TECHNICIAN: Nazri Mohidin
 DEPTH (m): 1.5 - 2.1
 HYDROMETER: X

WET WEIGHT: - g SAMPLE DIAMETER: - mm LENGTH: - mm - mm - mm

- mm - mm
MOISTURE: 33.1 % - mm AVERAGE: - mm
AVERAGE: - mm

WET DENSITY: - (kg/m³) VOLUME: - m³

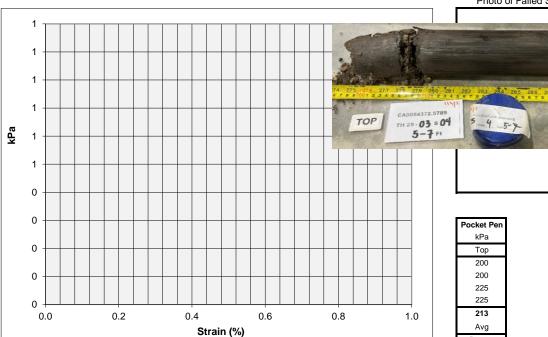
HEIGHT TO DIAMETER RATIO : - DRY DENSITY: - (kg/m³)

 STRAIN RATE:
 0.00 %/ min.
 Stress (kPa)

 INITIAL AREA:
 - mm²
 (to failure)
 (0.5% to 2% per min as per ASTM)

Photo of Failed Specimen

Maximum Compressive



COMMENTS: Sample strength was not adequate to conduct the test. 125
125
125
125
125

BOTTOM

Torvane

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

WSP Canada Inc. 6 High Level Road Oak Bluff, Manitoba R4G 0E2, Canada



Md Nazri Mohidin, E.I.T Experienced Laboratory Technician

Bottom

125

Torvane Facto



Manitoba Government OFFICE: Winnipeg, MB. CLIENT:

Humanitarian Search - Brady Landfill TEST DATE: 30-Jun-25 PROJECT:

PROJECT NO.: CA0054372.5789 SAMPLE DATE: 19-Jun-25

ATTENTION:

No Yes **TEST HOLE:** TH25-06 SAMPLE #: ATTERBERG LIMITS: Х HYDROMETER: **TECHNICIAN:** Nazri Mohidin **DEPTH (m):** 3.0 - 3.7 Х

WET WEIGHT: 1057.8 g SAMPLE DIAMETER: 72.53 LENGTH: 146.32 mm mm

72.52 mm 146.50 mm AVERAGE: MOISTURE: 72.39 146.41 mm 45.6 % mm

AVERAGE: 72.48 WET DENSITY: 1751.1 VOLUME: 0.000604 m³ (kg/m³)

HEIGHT TO DIAMETER RATIO: 2.0 1202.9 (kg/m³) DRY DENSITY:

1.70 STRAIN RATE: %/ min.

Stress (kPa) INITIAL AREA: 4125.97 mm² (to failure) (0.5% to 2% per min as per ASTM) 72.7





Maximum Compressive

Pocket Pen
kPa
Тор
100
100
100
100
100
Avg
Bottom
75
75
75
75
75
Avg

Torvane
kPa
Тор
80
80
80
80
80
Avg
Bottom
70
75
70
70
71
Avg
1
Torvane Factor

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

WSP Canada Inc. 6 High Level Road Oak Bluff, Manitoba R4G 0E2, Canada

COMMENTS:



Reviewed by:



Manitoba Government CLIENT:

Humanitarian Search - Brady Landfill PROJECT:

PROJECT NO.: CA0054372.5789

OFFICE: Winnipeg, MB.

TEST DATE: 30-Jun-25

SAMPLE DATE: 19-Jun-25

ATTENTION:

MOISTURE:

TEST HOLE: TH25-07 TECHNICIAN:

Nazri Mohidin

SAMPLE #: **DEPTH (m):** 4.6 - 5.2 ATTERBERG LIMITS: HYDROMETER:

146.59 mm

146.67 mm

146.63 mm

Yes

No

Х

Х

WET WEIGHT: 1041.3 g

> 49.4 %

WET DENSITY: 1739.2 (kg/m³)

1163.9 (kg/m³) DRY DENSITY:

4083.20 mm² INITIAL AREA:

SAMPLE DIAMETER:

AVERAGE:

72.03 mm 72.01 $\mathbf{m}\mathbf{m}$

72.27 mm

72.10

HEIGHT TO DIAMETER RATIO: 2.0

> 1.66 STRAIN RATE: %/ min. (to failure) (0.5% to 2% per min as per ASTM)

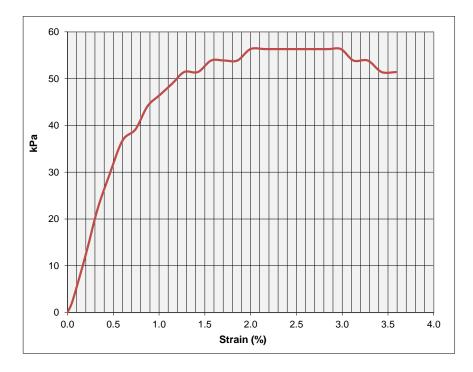
VOLUME: 0.000599 m³

LENGTH:

AVERAGE:

Maximum Compressive Stress (kPa) 56.3

Photo of Failed Specimen





Pocket Pen kPa Top 75 75 75 75 Avg Bottom 75 75 100 81 Avg	
Top 75 75 75 75 Avg Bottom 75 75 100 81	Pocket Pen
75 75 75 75 75 Avg Bottom 75 75 75 100	kPa
75 75 75 75 Avg Bottom 75 75 75 100	Тор
75 75 Avg Bottom 75 75 75 100	75
75 Avg Bottom 75 75 100 81	75
75 Avg Bottom 75 75 75 100	75
Avg Bottom 75 75 75 100 81	75
81 Bottom 75 75 75 100	75
75 75 75 100 81	Avg
75 75 100 81	Bottom
75 100 81	75
100 81	75
81	75
	100
Avg	81
	Avg

Torvane
kPa
Тор
80
75
75
70
75
Avg
Bottom
70
70
65
65
68
Avg
1
Torvane Factor

COMMENTS:

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is

WSP Canada Inc. 6 High Level Road Oak Bluff, Manitoba R4G 0E2, Canada

provided only on written request.

Reviewed by:



PARTICLE-SIZE DISTRIBUTION OF SOILS USING SIEVE AND HYDROMETER ANALYSIS

(ASTM D6913 and D7928)

Client: Manitoba Government Project No.: CA0054372.5789

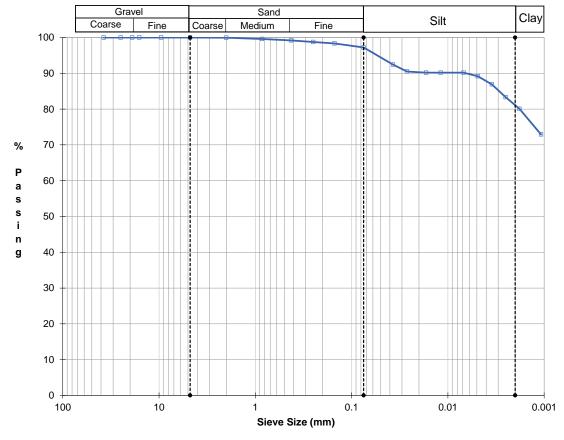
Project: Humanitarian Search - Brady Landfill

Testhole No.: TH25-01 Sampled by: Duncan Platts Sample Source: TH25-01

Sample No.: S4 Date Sampled: June 19, 2025 Date Received: June 19, 2025

Depth (ft): 5.0 Tested By: JM

Dispersion Method: Stirring Dispersion Period (min): 1 S.G. (assumed): 2.7



Sieve Size	Percent Passing
(mm)	(%)
37.5	100.0
25.0	100.0
19.0	100.0
12.5	100.0
9.5	100.0
4.75	100.0
2.00	100.0
0.850	99.6
0.425	99.2
0.250	98.8
0.150	98.3
0.075	97.2
0.037	92.4
0.027	90.5
0.017	90.2
0.012	90.2
0.0069	90.2
0.0049	89.2
0.0035	86.9
0.0025	83.3
0.0018	80.1
0.00108	72.9

Percent of: Gravel = 0.0% Sand = 2.8% Silt = 16.2% Clay = 81.0%

Sample Discription:

Clay, little silt, trace sand

Remarks:

Separation made on No 10 sieve (2.0 mm).

Reviewed by:

Md Nazri Mohidin, E.I.T Experienced Laboratory Technician



PARTICLE-SIZE DISTRIBUTION OF SOILS USING SIEVE AND HYDROMETER ANALYSIS

(ASTM D6913 and D7928)

Client: Manitoba Government Project No.: CA0054372.5789

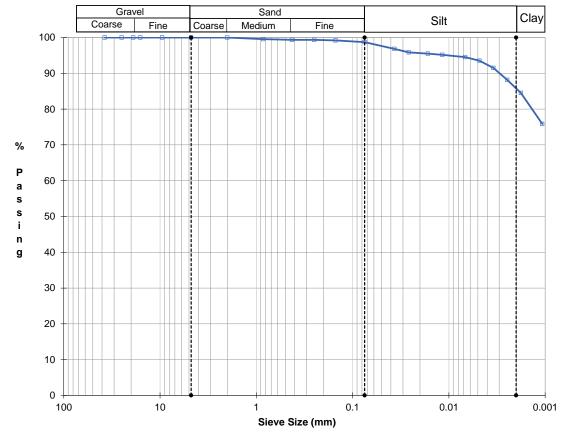
Project: Humanitarian Search - Brady Landfill

Testhole No.: TH25-05 Sampled by: Duncan Platts Sample Source: TH25-05

Sample No.: S5 Date Sampled: June 19, 2025 Date Received: June 19, 2025

Depth (ft): 7.5 Tested By: JM

Dispersion Method: Stirring Dispersion Period (min): 1 S.G. (assumed): 2.7



Percent
Passing
(%)
100.0
100.0
100.0
100.0
100.0
100.0
100.0
99.6
99.4
99.3
99.2
98.7
96.8
95.8
95.5
95.2
94.5
93.5
91.5
88.2
84.5
75.9

Percent of: Gravel = 0.0% Sand = 1.3% Silt = 13.0% Clay = 85.7%

Sample Discription:

Clay, few silt, trace sand

Remarks:

Separation made on No 10 sieve (2.0 mm).

Reviewed by:

Md Nazri Mohidin, E.I.T Experienced Laboratory Technician



PARTICLE-SIZE DISTRIBUTION OF SOILS USING SIEVE AND HYDROMETER ANALYSIS

(ASTM D6913 and D7928)

Client: Manitoba Government Project No.: CA0054372.5789

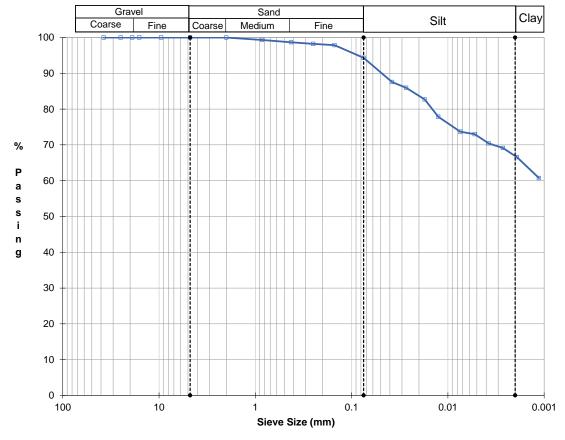
Project: Humanitarian Search - Brady Landfill

Testhole No.: TH25-07 Sampled by: Duncan Platts Sample Source: TH25-07

Sample No.: S4 Date Sampled: June 19, 2025 Date Received: June 19, 2025

Depth (ft): 7.5 Tested By: JM

Dispersion Method: Stirring Dispersion Period (min): 1 S.G. (assumed): 2.7



Sieve	Percent
Size	Passing
(mm)	(%)
37.5	100.0
25.0	100.0
19.0	100.0
12.5	100.0
9.5	100.0
4.75	100.0
2.00	100.0
0.850	99.3
0.425	98.7
0.250	98.2
0.150	97.9
0.075	94.3
0.038	87.6
0.027	85.9
0.017	82.7
0.013	77.9
0.0074	73.7
0.0053	73.0
0.0038	70.4
0.0027	69.1
0.0019	66.6
0.00113	60.7

Percent of: Gravel = 0.0% Sand = 5.7% Silt = 27.5% Clay = 66.8%

Sample Discription:

Mostly clay, little silt, few sand

Remarks:

Separation made on No 10 sieve (2.0 mm).

Reviewed by:

Md Nazri Mohidin, E.I.T Experienced Laboratory Technician

Moisture / Density Relationship

Report Date: July 07, 2025

Client

Name: Manitoba Government

Address:

Attention: Manitoba Government

PO Number:

Sample Date: 6/19/2025 by Duncan Platts

Source: TH25-09, TH25-10, TH25-11, TH25-12, TH25-13

Combined Bulk Samples

Project

Name: (CA0054372.5789) Humanitarian Search - Brady

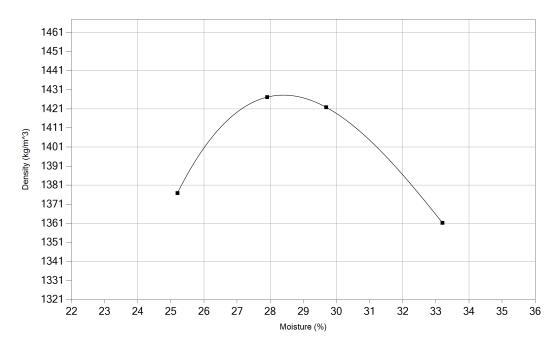
Landfill

Address: Winnipeg, MB Phase: N/A Task: N/A

Manager: Randell Johnson

Lab/Ref. #: CA0054372.5789-Proc01

Description: Combined Bulk Clay Samples



Moisture Density Relationship: (ASTM D698-12) Method: A

Preparation Method: Dry

Rammer Type: Mechanical

Maximum Density (kg/m³): 1428 Optimum Moisture (%): 28.4

Received Moisture Content (%): 32.9%

Remarks:

Distribution: Duncan Platts, German Ciro

Reviewed By: Md Nazri Mohidin



Reporting of these results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

WSP Canada Inc.. - 6 High Level Road - Oak Bluff (Wpg), Mb



CCIL Certified Aggregate Type C, Type D & Concrete Aggregate Type R in accordance with CSA A283-19





CALIFORNIA BEARING RATIO (CBR) ASTM D1883

Client: Manitoba Government

Project: Humanitarian Search - Brady Landfill

Job No.: CA0054372.5789

Report Date: Jul 09, 2025

Sample Description: Combined Bulk Clay Samples

Sample Location: TH25-09, TH25-10, TH25-11, TH25-12, TH25-13 Combined

Sampled By:	Duncan Platts
Tested By:	Nazri Mohidin

Date Sampled: Jun 19, 2025

Test Date: Jul 06, 2025

Sample No.: CBR01

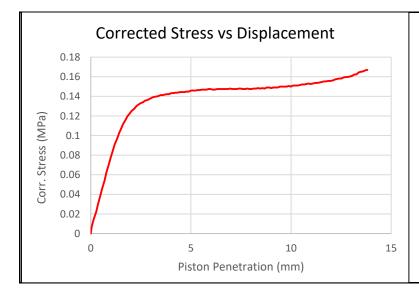
Standard Proctor Results (ASTM D698)		
Max. Dry Density (kg/m³)	1428	
Optimum Moisture Content (%)	28.4	
% Retained about 4.75 mm	0.0	

Immersion Data	1
Mass of Surcharge (kg)	4.54
Immersion Time (h)	96.0
Swell	5.8%
Moisture Content of top 25.4 mm	42.9%

CBR Preparation	
Initial Dry Density (kg/m³)	1361
Initial Moisture Content (%)	28.9
Initial Percent of Proctor (%)	95.3

Soaked CBR Test Results		
CBR at 2.5 mm (0.1")	1.9%	
CBR at 5.1 mm (0.2")	1.4%	
Correction (mm)	0	

Stress Data



Otross Data		
Penetration (mm)	Corrected Stress (Mpa)	
0.635	0.05	
1.270	0.09	
1.905	0.12	
2.540	0.13	
3.175	0.14	
3.810	0.14	
4.445	0.14	
5.080	0.15	
6.350	0.15	
7.620	0.15	
8.890	0.15	
10.160	0.15	
11.430	0.15	
12.700	0.16	

Comments:

Reviewed by:

1

Md Nazri Mohidin, E.I.T Experienced Laboratory Technician

Appendix D

Conference Paper Supporting 2:1 Excavation Slopes

Case study: deformations of a steep slope excavated in a municipal solid waste landfill

I.R.Fleming, M.K. Singh
University of Saskatchewan, Saskatoon, Canada
P.J Dewaele, F.S. Barone
Golder Associates Ltd., Barrie and Mississauga, Ontario.



ABSTRACT

Commencing in autumn 2007, a full scale pilot of landfill mining and reclamation was carried out at the Barrie Municipal Landfill in Barrie, Ontario. This landfill has been in operation for several decades and currently holds in excess of 2 million tonnes of waste. In order to mitigate environmental impacts and provide secure waste disposal for the City, the site is to be "re-engineered", which will involve excavation of approximately 1.5 million m³ of waste, and screening to segregate fines (largely excess sand that had been used as daily and interim cover). Fines will be stockpiled for use as daily cover for the remainder of the site's operating life. As each area of the landfill is progressively excavated, a base liner and leachate collection system will be installed and the area re-filled with waste. A significant challenge for this project is the lack of space within which to work. According to requirements of the provincial Environment Ministry, temporary slopes are to be no steeper than 3H:1V. Using such grading, however, there would be insufficient space for over 400,000 m³ of waste during years 2 to 4 of the anticipated 8 years of the project. Accordingly, as part of a full-scale pilot of the landfill mining and segregation process, instrumentation (pneumatic piezometers and inclinometer casings) were installed in an existing 4H:1V slope which was then progressively cut up to 1H:1V as approved by the MOE. Ongoing measurements of lateral displacements and pore pressure were made during steepening of the slope. The displacements were found to be at the low end of the range predicted by a numerical simulation and the slope in this part of the site was determined to be stable.

RÉSUMÉ

En automne 2007, une projet de demonstration ont été effectuées au site d'enfuissment municipal à Barrie, Ontario. Ce projet concerne l'excavation et la segregation des residus et remblai avec compaction pour effectuer un densité supérieur. Le site d'enfuissment a été en fonction pendant plusieurs décennies et se tient actuellement au-dessus de 2 millions de tonnes. Afin atténuer les effets sur l'environnement et pour fournir securité de gestion des déchets, la ville vont effuctuer l'excavation d'approximativement 1.5 million de tonnes avec segregation par écran pour séparer des fines que se compose le sable qui avait été employé comme couverture intérimaire. Des fines seront stockées pour l'usage comme couverture quotidienne pour la durée de fonctionnement de l'enfuissment. Car chaque secteur est progressivement excavé, une barriere et un couche de drainage de lixiviat sera installé et le secteur sera rempli. Un défi significatif pour ce projet est le manque de l'espace dans lequel pour travailler. Selon des conditions du ministère provincial d'environnement, les pentes provisoires sont de n'être pas plus raides que 3H: 1V. En ce cas, il y aurait l'espace insuffisant pour plus de 400.000 m3 des residus pendant les années 2 4 des 8 années prévues du projet. En conséquence, l'instrumentation ont été installées que se compose des piézomètres et inclinomètre dans un pente à 4H:1V qui a été progressivement coupée jusqu'à 1H:1V. Des mesures des déplacements et de la pression d'eau ont été faites pendant l'augmentation de la pente. Les déplacements se sont avérés au bas de gamme de la gamme prévue par une simulation numérique et la pente raide s'est avérée stable.

1 INTRODUCTION

The City of Barrie carried out a Pilot Reclamation and Re-Engineering project at the Barrie (Sandy Hollow) Landfill Site, in order to provide information to assess the costs and issues related to full scale Reclamation and Re-Engineering of the Site. It had previously been determined (GAL, 2007) that excavation of the waste with interim slopes of at least 2(H):1(V) will be necessary in order to open up sufficiently large areas to construct lined landfill cells for the reclaimed materials. This required 2:1 slope is steeper than the 3:1 allowed under the current Certificate of Approval (C of A) issued for the site by the provincial Ministry of the Environment (MOE).

In order to support excavation of the waste to steeper slopes than currently allowed in the C of A, a trial excavation was included as part of the Pilot Reclamation, which was carried out from November 2007 to February 2008, approved by the MOE This paper presents the results of real time field monitoring of deformations and pore pressures as the 20 m high south slope of this landfill was progressively steepened by excavating material from the surface of the slope. Figure 1 shows the progress of excavation and Figure 2 shows an excavated portion of the slope cut to an inclination of 1H:1V. The measured deformations are verified with the results of numerical modelling. Additionally, stability analyses were carried out using the shear strength models provided by various researchers to assess the stability of this cut slope.

2 LITERATURE SURVEY OF SHEAR STRENGTH OF MUNICIPAL SOLID WASTE (MSW)

Comprehensive literature reviews of published values of the shear strength parameters for MSW have been reported by Gharabaghi et al (2008) and Dixon & Jones (2005). From these reviews, three sets of shear strength parameters were selected as representing reasonable values for engineering design and analysis of slopes in Municipal Solid Waste (MSW).



Figure 1. Excavation in progress at the south slope of Barrie landfill.



Figure 2. Slope steepened to 1H:1V

A bi-linear shear strength envelope was proposed by Kavazanjian et al. (1995) and depends on the magnitude of applied normal stresses (σ'). This was determined from back-analysis of existing stable landfill slopes (assumed Factor of Safety, FS = 1.2), together with published data from laboratory testing of recompacted samples. The authors suggest that:

- i) for σ'< 30 kPa, MSW behaves as a purely cohesive material with c' approx. 24 kPa.
- ii) for σ'>30 kPa, MSW behaves as a purely frictional material with φ' approx. 33°.

This model suggests that at the toe of waste slope, "cohesion" associated by interlocking and the presence of tensile reinforcement (associated with fibrous and sheet-like materials) may be a significant factor in contributing to shear strength of MSW, but when normal stress exceeds 30 kPa, cohesion is negligible and the angle of internal friction is approximately 33°. This model is generally considered to be inherently conservative, given that stable slopes were assumed to have a FS of 1.2.

A similar but tri-linear shear strength envelope proposed by Manassero et al. (1996) suggests that:

- i) for σ' ≤ 26 kPa, MSW behaves as a purely cohesive material with c' = 20 kPa.
- for 26 < σ' ≤ 60 kPa, MSW is considered a purely frictional material with φ' = 38°.
- iii) for $\sigma' > 60$ kPa, it is suggested that c' = 20 kPa and $\phi' = 24$ °.

A third simple linear failure criteria, (Eid et al, 2000) proposes that c'=40 kPa and $\phi'=35\,^{\circ}$. This model was developed from large direct shear tests as well as the back-analysis of a failed slope. Relative to Kavazanjian et al. (1995) strength model, this simple linear model predicts higher strength, which is not surprising since it is based, in part, on Limit Equilibrium Analysis of a large failed slope.

Table 1, presents a summary of published shear strength parameters. It is evident that there is considerable scatter in these values. The average of the minimum and maximum reported values are, however, reasonably consistent with the three models discussed above. The "cohesion intercept" c' (associated mostly with the reinforcing effect of fibrous and sheet-like reinforcing materials) may be characterized by averages of the minimum and maximum values = 22 and 25 kPa respectively. Similarly, for the angle of shearing resistance, ϕ , the average of the minimum and maximum values are 29 and 35°.

3 APPROACH

3.1 Field monitoring

Two boreholes (BH-1 and BH-2) were drilled at the anticipated location of the crest of the planned excavation in order to obtain information regarding waste depth, character and leachate pore pressure. casing and pneumatic piezometers were installed in these The piezometers were placed at depths boreholes. selected on the basis of observations made during drilling (saturated zones, etc). Deformations were measured by using a RST digital inclinometer system which is comprised of a digital inclinometer probe, cable system, reel with a battery power and a window pocket PC that functions as a readout, analysis and data storage device. Continuous measurements of pore pressures and deformations were recorded over the period from November 2007 to February 2008.

3.2 Numerical modelling

The pre-failure stress-deformation behaviour of MSW has been modelled using a non-linear elastic hyperbolic constitutive model (Singh et al. 2008). This model has been used in this study to verify deformations observed during real-time monitoring of the cut slope using a finite element software SIGMA/W of GeoStudio 2007(GeoSlope International). The parameters of this model are specific to MSW and have been discussed in detail by Singh et al. (2008). The lower and upper bounds of these parameters were used to obtain range of anticipated lateral deformation at this site as the slope was steepened.

Table 1: Shear strength parameters of MSW from published literature

Reference	Strength Parameter		Method of estimation	
	c' (kPa)	φ'(°)	Method of estimation	
Cowland et al. (1993)	10	25	Back analysis of deep trench cut in waste	
Caicedo et al. (2002)	67	23	Large DS, pressure phicometer	
Edincliler et al. (1996)	27	42	DS	
Eid et al. (2000)	25	35	Large DS and also back calculation from four failed slopes	
Gabr & Valero (1995)	17	34	Small CU triaxial (values at 20% axial strain	
Grisolia et al. (1995)	2-3	15-20	Large Triaxial (at 10-15% axial	
	10	30-40	strain)	
Harris et al. (2006)	9-14	20-29	DSS, DS, Large CU triax	
Houston et al. (1995)	5	33-35	Large DS on undisturbed samples	
Jessberger and Kockel (1995)	0	31-49	Both large and small Triaxial	
Kavazanjian et al.	24	0	For normal stress < 30 kPa	
(1995)	0	30	For normal stress > 30 kPa	
Landva & Clark (1990)	0-23	24-41	DS	
Landva & Clark (1986)	10-23	24-42	DS on waste from various canadian landfills	
Mahler & De Lamare Netto (2003)	2.5-4	21-36	DS	
Mazzucato et al. (1999)	43	31	Large DS	
Pelkey et al. (2001)	0	26-29	Large DS	
Siegel et al. (1990)	0	39-53	DS. At 10 % shear disp.	
			and cohesion assumed zero	
Stoll (1971)	0	24-42	Small triaxial	
Vilar & Carvalho (2002)	39.2	29	At natural water content	
	60.7	23	Saturated sample	
Whitian et al. (1995)	10	30	Large DS	
Zekkos et al. (2007)		36-41	CU	
Zwanenburg et al. (2007))	35-37	Large Triaxial	
Average (low-high)	22-25 kPa	29-35°		

Note: DS- Direct Shear test, CU- Consolidated undrained triaxial test

Published data on the unit weight of MSW indicate a non-linear relationship between the unit weight and the effective confining stress (Zekkos et al., 2006, Kavazanjian et al. 1999). However, for simplicity the stress-deformation analyses conducted in this study considers a constant unit weight of 12.5 kN/cum for MSW, which is typical of most landfills with average

compaction. The Young's modulus of elasticity has also been observed to increase with depth and increasing confining stress (Singh and Fleming 2008, Beaven and Powrie 1995). Accordingly, a power function first proposed by Janbu (1963) for a wide range of geomaterials is used which is given by:

$$E = KP_a \left[\frac{\sigma_3'}{P_a} \right]^n \tag{1}$$

where E is Young's modulus of elasticity, P_a is the atmospheric pressure used for normalization of above equation, σ_3' is effective confining stress and K and n are the model parameters for a non-linear elastic hyperbolic model of MSW.

A maximum horizontal displacement of the waste slope on the order of 150 mm was expected, as the slope was steepened from 4H:1V to 1H:1V, based upon the results of a Finite Element analyses of the cut slope using parameters shown in Table 2. Significant deviation in displacement (as observed from inclinometer data) from this expected behaviour would represent a trigger to cease steepening of the slope. The slope stability analyses were based on Mohr-Coulomb failure criterion.

Table 2. Parameter of hyperbolic model of MSW used in finite element analysis of cut slope

	K	n	Rf
Upper bound	58	0.88	0.82
Lower bound	36	0.61	0.65

4 RESULTS & DISCUSSION

Real-time monitoring was conducted using inclinometers placed at the crest of the slope of existing landfill and deformations were monitored as the slope was steepened by cutting. No significant lateral movement was observed and the slope remained stable even at 1H: 1V. A maximum horizontal displacement of 50 mm was observed in the waste slope. This was less than the expected deformation (130 to 250 mm) based upon the results of Finite Element analyses of the cut slope. Such small deformations likely reflect the effect of large proportion of granular sandy material in the waste, which would tend to make the material stiffer.

Figures 3 and 4 show the results for selected monitoring at BH-1 and BH-2. The apparent movement below 20 m depth in Figures 3 and 4 likely reflects a combination of error (at low displacements corresponding to the precision of the monitoring system) and some small movement of the inclinometer casing within the borehole, which had been drilled to a larger diameter, leaving an open annular space which had partially squeezed or sloughed in, thus precluding backfilling. This effect can be seen by the apparent upslope deformation at approximately 20 m depth (the location of the toe of the slope). This is attributable to the fact that the

inclinometer casing itself has some bending stiffness and that immediately below the lowest zone of downslope movement, the casing would tend to bend up-slope, particularly given the presence of a gap between the borehole wall and the outside of the inclinometer casing. Notwithstanding this, it is evident that consistent, but minor downslope movement may be seen from approximately 17 m depth to surface.

The potential presence of a weak zone, which might control the stability of the cut slope and reduce the global FS was considered possible and would also have been detected through monitoring of the inclinometers. Rather than a reasonably "smooth" or C-shaped deformation pattern shown by the inclinometer data (with small but measurable horizontal deformations), the presence of a zone or layer of weaker material would manifest itself as a "kink" in the inclinometer traces as evident from figures 3 and 4. Such weaker zones are consistently less stiff, as has been shown by Singh et al. (2007a) in a parametric study of a four-component model of MSW.

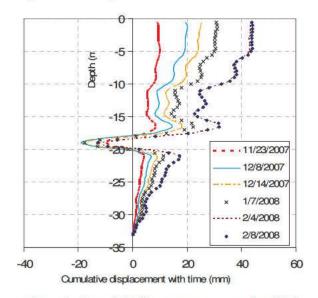


Figure 3. Lateral displacements measured at BH-1

An evaluation of waste slope stability (Limit Equilibrium Analyses) of this cut slope was carried out using Slope/W software of GeoStudio 2007 (GSI, 2007). The conservatively low shear strength parameters of Kavazanjian et al, (1995) provided a lower bound estimate of the factor of safety (as these parameters are based upon stable slopes), whereas the shear strength parameters proposed by Eid et al, (2000), which are based on an actual failure, provided the highest estimates for the factor of safety for this cut slope (Table 3).

Based upon the studies cited above, as well as recent work from University of Saskatchewan, including waste samples from Toronto's Brock West Landfill (Singh et al. 2007) and Saskatoon's Spadina Landfill (Singh et al 2008), a reasonable, although conservative estimate for the shear strength parameters of MSW is c'=20 kPa, ϕ' =32°. Based on the stability analysis noted above, the estimated factor of safety under such an assumption is

1.58 for a slope 20 m high at 1H: 1V with no pore pressure.

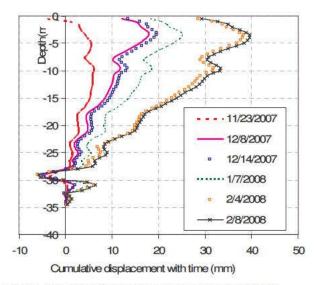


Figure 4: Lateral displacements measured at BH-2

Table 3. Estimated FS of cut slope

Shear strength model	Estimated FS	
Kavazanjian et al.(1995)		
$c' = 24 \text{ kPa}, \phi' = 0 \text{ (for } \sigma' < 30 \text{ kPa)}$	FS = 1.00	
$c' = 0$, $\phi' = 33^{\circ}$ (for $\sigma' > 30 \text{ kPa}$)		
Manassero et al. (1996)		
$c' = 20 \text{ kPa}, \phi' = 0 \text{ (for } \sigma' < 26 \text{ kPa)}$	FO 4.04	
$c' = 0$, $\phi' = 38^{\circ}$ (for 26 kPa $< \sigma' < 60$ kPa)	FS = 1.24	
c' = 20 kPa, ϕ' = 24° (for σ' > 60 kPa)		
Eid et al. (2000)	FO 045	
c' = 40 kPa, φ' = 35°	FS = 2.15	
Values selected on the basis of Table 2 c' = 20 kPa, φ' = 32°	FS = 1.58	

5 CONCLUSIONS

The review of the current literature regarding the strength of waste and the stability of waste slopes was carried out and it was concluded that MSW is stable at steeper slopes than 3:1, up to as much as 1:1. This was verified at the Barrie Landfill in the course of a carefully planned and executed temporary steepening of an instrumented section of the south slope of the Barrie Landfill.

The low magnitude of observed displacements confirms that only a small portion of the shearing resistance of the waste had been mobilized (i.e. high FS) pointing towards the existence of high angle of shearing resistance of MSW. This observation is well substantiated

with the results of slope stability analysis as well as physical evidence of cut slope observed in this study.

The assessment of slope stability in waste is site specific owing to the heterogeneous and changing characteristics of waste during decomposition. It is cautioned that a qualified engineer should assess the stability of waste slopes on the basis of experience, judgment and observation of local waste characteristics.

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Appendix E

Asbestos and Hazardous Materials Management Plan



REPORT

Asbestos and Hazardous Materials Management Plan

Brady Road Resource Management Facility, Winnipeg, Manitoba

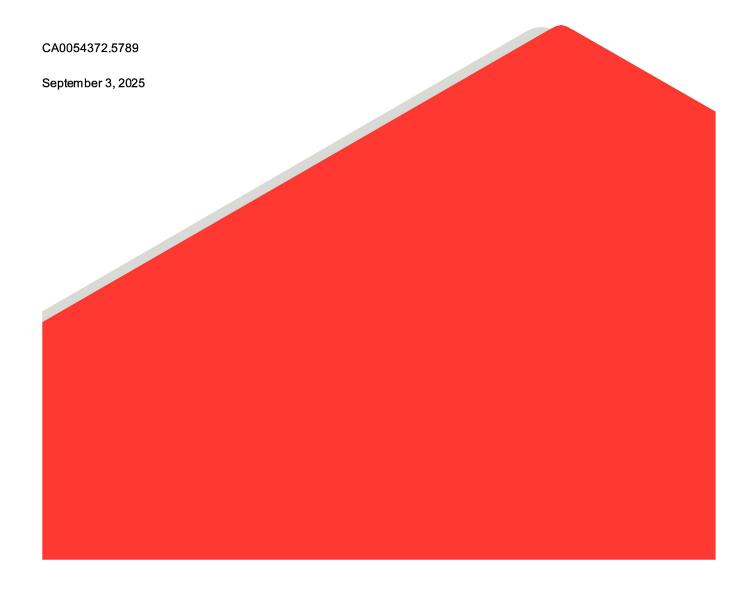
Submitted to:

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Submitted by:

WSP Canada Inc.

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Rev0	2025-07-28	Preliminary/draft version	
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Role	Name (printed)	Date	Signature
Prepared by	Meghan Hennig, BA., CRSP WSP, Advisor, Health, Safety & Environment	09-03-2025	
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Asbestos Handling Procedure

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1.0 INTRODUCTION

WSP Canada Inc. (WSP/the Environmental Consultant) was retained by The Government of Manitoba (GoM) to prepare an Asbestos and Hazardous Materials Management Plan (AHMMP) for the Search activities to be conducted at the Brady Road Resource Management Facility (BRRMF) located in the city of Winnipeg, Manitoba. The activities associated with the Search include:

- Excavation of waste materials in the cell of interest (Cell 32) and hauling of this material to the search facility.
- Waste materials will be deposited at the Search Facility and then spread into rows by skid steers within the facility.
- A search of the waste materials will be conducted by teams of search technicians.

The preparation of this AHMMP is in relation to the Notice of Alteration (NOA) submitted by WSP on behalf of City of Winnipeg (CoW), owner of the BRRMF, in relation to the project that is being undertaken by GoM for the upcoming Humanitarian Search Project to be conducted at the Brady Road Landfill.

2.0 BACKGROUND

This Asbestos and Hazardous Materials Management Plan (AHMMP) has been developed to assist in preventing the release of airborne asbestos fibres and controlling worker exposure to asbestos and hazardous materials during excavation and search activities to be conducted as part of the Humanitarian Search project. This plan is a procedural manual to provide direction to workers, including Equipment Operators, Search Technicians and Forensic Anthropologists.

The AHMMP provides for the ongoing management of the following hazardous materials, at a minimum:

- gases such as hydrogen sulfide (H2S), hexane (HEX), carbon monoxide (CO), methane
 (CH4), oxygen (O2) and volatile organic compounds (VOCs)
- asbestos-containing materials (ACM)
- lead-containing materials
- polychlorinated biphenyls (PCBs)
- mercury-containing materials
- biological hazards
- leachate

The main objectives of the AHMMP are:

- to provide awareness of potential asbestos and hazardous materials while performing search activities
- to minimize exposures to asbestos and hazardous materials if encountered
- procedures to follow if suspect asbestos and/or hazardous materials are identified
- how to contain and remove suspect asbestos and/or hazardous materials from the waste stream when identified



The objective of this program is to assist in preventing the release of airborne asbestos fibres and protect the health and safety of persons who may potentially encounter asbestos and hazardous materials during excavation and search activities in accordance with Manitoba's Workplace Safety and Health Act and Regulation.

3.0 COMPONENTS OF AN ASBESTOS AND HAZARDOUS MATERIALS MANAGEMENT PLAN

Management of asbestos and hazardous materials requires that employees understand their roles and responsibilities and are prepared to follow appropriate control procedures. The main components of the AHMMP include:

- •delegation of responsibilities
- •communication of asbestos and hazardous materials awareness
- •training of employees involved in the plan
- •regular surveillance, inspection and air monitoring in areas where asbestos and hazardous materials are present
- •development of procedures to control release or generation of asbestos and hazardous materials
- •design and implementation for asbestos and hazardous materials handling and emergency response planning

3.1 Program Participants and Responsibilities

Personnel involved with this management plan include the following:

- Client representatives
- Health and Safety Coordinators
- City of Winnipeg, Brady Landfill site personnel and their contractors
- Environmental Health and Safety Consultant

The AHMMP outlines the responsibility of everyone involved in the plan. The Program Participants and anticipated responsibilities are provided below.

3.1.1 Director of Operations (The Client)

A successful program requires the commitment from all levels of management. It is recommended that The Director of Operations, as the overall Client, be responsible for the following:

- Reviewing and approving Health and Safety and Environmental Protection Plans (HaSEP) for the work to be performed by workers that include measures required to address potential exposure and hazards arising from asbestos and hazardous materials at the work sites and emergency measures deemed necessary (e.g., procedures, equipment).
- Reviewing Safe Work Procedures (SWPs) to ensure all required measures relating to exposure controls and administrative controls related to asbestos and hazardous materials are met and followed,
- Ensuring workers conduct Job Safety Assessments (JSAs), tailgate meetings and use knowledge of the worksite to identify hazards and measures required to address those hazards.



Being alert to site conditions and changing situations that may require modifications of exposure control measures.

- Ensuring appropriate respiratory protection is available, that the workers are fit-tested and trained in the use of respirators, and monitoring workers' use of respirators, as well as possible issues that may occur, such as interference from protective equipment or clothing, discomfort, skin irritation or breakthrough of contaminants causing breathing difficulty.
- Maintaining a supply of required personal protective equipment such as disposable coveralls, respirators, multi-gas respirator cartridges, clean-up tools, and labelled waste disposal bags.
- Ensuring that workers use the assigned protective equipment in an effective and safe manner.
- Ensuring that workers' protective equipment, including respirators, are properly cleaned, inspected, maintained and stored.
- Ensuring that measurements of airborne contaminants are being conducted during work activities as prescribed and the results of such testing and monitoring are being reviewed, in consultation with the Site Health and Safety Coordinator(s) and are provided to workers without undue delay by posting and communicating results at daily briefing meetings.
- Review of required training to address the above requirements and for the maintenance of training records, fit-test results and health and safety inspections.

3.1.2 Project Manager

It is recommended that the Project Manager be responsible for the management of the program which will include the following:

- •Notifying all employees conducting excavation or search activities of potential asbestos and hazardous materials in their respective work areas.
- •Ensuring that employees are informed of the presence of asbestos and hazardous materials and cautioned to avoid disturbance of the materials
- •Assessing potential impact of excavation and search activities on potential asbestos and hazardous materials.
- •Ensuring the required personal protective equipment such as disposable coveralls, respirators, multi-gas respirator cartridges, clean-up tools, and labelled waste disposal bags are being provided to workers conducting excavation or search activities as required.

3.1.3 Environmental Consultant

WSP, as the Client representative, may be retained to aid with specific tasks required under the AHMMP. Based on experience and specific expertise, WSP may provide assistance with the following:

- •Identifying asbestos and hazardous materials in the excavation and search work areas.
- •Developing work procedures for removal of asbestos and hazardous waste materials if identified.
- •Developing and implementing emergency response procedures for clean-up and control of asbestos and hazardous materials (for example clean-up of ACMs following accidental impact or disturbance).
- •Assisting the Project Manager in matters concerning the AHMMP and performing inspection of suspect asbestos and hazardous materials and clean-up activities.



3.1.4 Asbestos and Hazardous Material Abatement Contractor

If in the event of encountering asbestos during the search activities it is deemed that a contractor specializing in abating asbestos and hazardous materials may be required to complete clean-ups and emergency response activities, this contractor will be required to demonstrate that it is qualified to undertake asbestos abatement as per Manitoba's Workplace Safety and Health Act and Regulation.

For asbestos abatement, workers trained in handling asbestos must complete all asbestos abatement work which must be accompanied by the necessary air monitoring conducted by WSP as outlined in the Safe Work Manitoba Guide for Asbestos Management. The Asbestos and Hazardous Materials Abatement Contractor should be responsible for the following:

- provision of asbestos and hazardous materials abatement services authorized by the Project Manager or their authorized representative for planned or emergency abatement
- •performance of their work in accordance with the Manitoba Workplace Safety and Health Act and Regulation •packaging, transporting and disposing of asbestos in accordance with applicable regulatory requirements.

The abatement contractor is also qualified for the appropriate removal, clean-up, and disposal of lead-containing materials, PCB-containing materials, and smoke detectors.

If encountered, removal and replacement of ODS from refrigeration units will need to be conducted by a trained refrigeration contractor.

4.0 HAZARD SUMMARY

The following section provides a hazard summary for the anticipated activities and associated work with the highest potential for the release of airborne asbestos fibres and hazardous materials with potential to cause worker exposure at the Site.

4.1 Special Wastes

The Brady Road Landfill accepts "special wastes" as defined in the operating license to include "bagged asbestos containing materials, dead animals including specified risk material (SRM), slaughterhouse waste and food products deemed to be unacceptable by the Canadian Food Inspection Agency (CFIA), biosolids, and any other waste identified by the Director". Special wastes are accepted in approved containers and following regulatory requirements for the specific type of waste. As per the operating license, records are kept by Global Positioning System (GPS) of the locations of buried special wastes. During excavation and search activities, if special wastes are discovered, the location will be recorded by GPS coordinates and precautions will be taken to keep work zones safe thorough implementing procedures to avoid worker exposure to contaminants and manage dust to prevent the spread of contamination offsite. Workers will wear protective clothing, including and wash or dispose of their rubber boots and other Personal Protective Equipment (PPE) before leaving the site to avoid carrying contaminates away from the work area. Trucks and earth-moving equipment involved in excavation and or relocating special wastes will be washed in the work area before leaving the site to avoid tracking waste and potential contamination from the work area.

4.2 Asbestos and Hazardous Materials Management

The Brady Road Landfill accepts disposal of asbestos containing materials (ACM) generated from site remediation projects. The Site does not accept unbagged asbestos waste and all ACM must be contained and transported in accordance with all applicable Provincial guidelines and regulations. The Excavation Area will



include ACM that had been contained in designated yellow bags (or potentially other labelled asbestos waste bags) to prevent the release of asbestos fibres and asbestos containing dust.

To determine the affects of the excavation activities on the ambient environment as part of the pilot test excavation program, WSP completed monitoring of the air quality in the vicinity of the excavation. Air monitoring for asbestos fibers was undertaken as a safety precaution, as there was a potential that asbestos may be encountered during the excavation process. The direction of wind on the days of the pilot excavation and drilling activities were observed and monitoring locations were selected to be in the following configurations; occupational air samples from 2 locations 20 meters downwind and 1 location 20 meters upwind of the pilot program activities, and gas monitoring from 20 meters downwind of the pilot program activities.

During the pilot test excavation program, one RKI Eagle II and one RKI GX-6000 gas monitors were used to conduct the air quality measurements with one measuring hexane (HEX) concentrations and the other measuring hydrogen sulfide (H₂S), methane (CH₄), and carbon monoxide (CO), all in levels of parts per million (ppm). The autocalibration for the RKI Eagle II's is set to 50% CH4, 25 ppm H₂S, 50 ppm CO, and 12.0 % vol O₂. The RKI Eagle II air monitor was bump tested daily to 15% lower explosive limit using a hexane standard.

As part of the air monitoring program during the pilot test activities, to monitor for and assess worker exposure risk, searchers were equipped with personal gas monitors positioned in their breathing zone.

Area air sampling results that monitor for potential releases of airborne contaminants of concern will continue for the duration of the project at a frequency recommended by the project occupational hygienist. It is anticipated that the potential for release of airborne contaminants is low, will remain localized, and will not have an impact to the environment based on results of the pilot test excavation program. Additional considerations will be given to operational limitations of the testing equipment in cold weather temperatures; the primary concern being decreased battery life for battery operated units.

The project-specific Asbestos Handling Procedure document has been included as Appendix A, and provides further details on the following:

The Brady Road Landfill does not accept ACM without applicable containment, but general construction and demolition debris producing dusts and other fibres will be present in the waste stream. In addition, bagged asbestos waste may have been damaged during disposal or excavation. Therefore, extra precaution will be taken, and during excavation activities, if construction waste that has the potential to produce high levels of dusts and particulate is uncovered, it will be handled with care and wetted as required to control airborne contaminants.

These materials will be segregated and wetted down by a water truck available at the Excavation Area to prevent dust particles from becoming airborne. All attempts will be made to ensure that no bagged, or otherwise sealed and labelled waste found in the Excavation Area will be transported to the Search Facility. If bagged ACM wastes are found or identified by equipment operators in the Excavation Area, all operations will immediately stop. Non-essential personnel and equipment will be required to evacuate to a pre-determined upwind location. The Brady Road Landfill Humanitarian Search Asbestos Management Procedure will be initiated. Excavation of asbestos containing materials is to be suspended if wind speeds are above 20km/hr. A windsock should be installed so that wind direction and qualitative wind speeds can be monitored.

During the relocation of labelled or potential ACM, all operators are required to wear Tyvek coveralls, Tyvek boot covers, disposable gloves, respirator with multi-gas/vapour/P100 filter cartridges. Overburden is to be excavated over identified ACM in the excavation area if discovered during excavation. The identified ACM area is to be continuously wetted during excavation with the use of a water truck. Material should be wetted with a volume of



water adequate to saturate the material and prevent airborne dust and fiber generation. During cold weather, wetting of ACM may require the use of additives in the water to prevent freezing.

The wetted ACM is to be loaded into vehicles for hauling. The load must be wetted after being loaded and covered with minimum of 20 cm of soil or another approved medium. All operators are to remain in cabs of machine with windows closed during this operation. If the primary asbestos containment, bag or liner, is found to be damaged or does not remain intact during excavation, once thoroughly wetted, it will be repackaged in a lined collection bin, sealed and disposed of as asbestos waste in the designated asbestos cell at the landfill. The identified ACM will be hauled to the designated asbestos placement/depression area travelling at a speed of 10 km/hr or slower. Dozer will be ready at the receiving end, to spot and guide trucks to deposit loads in the trench. The ACM must be covered immediately after each load is placed with a minimum of 20-25 cm of cover. No operator should track equipment directly over the asbestos area to place cover. At the end of the day a minimum of 1 m of cover should be placed over the asbestos placement area and the excavation area. The excavation and placement area are to be kept as small as possible to ensure that the effort required to cover asbestos is minimal. The location of asbestos burial is to be tracked with GPS and maintained in written records at the BRRMF, in accordance with operating license requirements.

Decontamination facilities will be made available near the excavation site for personnel to doff PPE and decontaminate to prevent the spread of potential asbestos fibres and mitigate exposure risks to the workers and others.

Equipment in accidental contact with ACM or used to remove identified ACM in the excavation area will be thoroughly wetted and washed before leaving the work area within the landfill, paying particular attention to tracks, tires, buckets and truck boxes to reduce the likelihood of asbestos fibres being tracked from the work area.

4.3 Specified Risk Material

The Brady Landfill accepts specified risk material (SRM) that includes carcasses, rendering and biproducts of infected or diseased animal mortalities. Locations of burial of these wastes are recorded by GPS and kept on record. Attempts will be made to not excavate in the specific areas of Cell 32 where it is known to have burial of SRM.

If SRM or other areas of landfilled animal carcasses are discovered during excavation work will temporarily stop and the exposed animal remains will be covered. Excavating landfilled material around or near buried SRM carries the potential for contaminates to be present at the excavation site or in the search facility and as such, workers will be required to complete robust decontamination with a suitable disinfectant, and follow personal hygiene protocols each time they leave the Search Facility. In addition to completing thorough cleaning and disinfection of PPE, practicing good hand hygiene will be imperative. Alcohol hand sanitizer rub will be used after removing nitrile gloves, however washing hands with soap and water after every shift is mandatory.

4.4 Excavating Bulk Material

Excavating bulk material from the landfill will involve a series of particular activities to ensure efficiency and worker safety. Initially, Cell 32 must be surveyed and assessed for potential hazards or obstacles. Following this, heavy machinery such as excavators, bulldozers, and loaders will be deployed to remove layers of waste systematically. Excavation of material from Cell 32 will occur in a horizontal layer system to ensure cell integrity and prevent side slope failure. Large materials, such as mattresses, furniture, etc., should be separated by the excavator operator. During the excavation activities, monitoring for gas emissions (e.g., H₂S, CO, %LEL, and VOCs) and asbestos fibres will be conducted inside of the heavy machinery and on the Search Technicians and



Forensic Anthropologists who may be conducting the work activities. Adherence to regulatory guidelines and safety protocols will be paramount during excavation activities to safeguard both workers and the surrounding ecosystem. Finally, daily cover will be applied to the exposed waste at the end of each work shift.

It is important to provide and properly maintain the air filtration for vehicles and heavy equipment cabs used at the excavation work areas. High-efficiency particulate air filters will be used, and the interior of vehicles and heavy equipment will be cleaned with water and suitable disinfectant at the beginning or end of each shift to minimize airborne dust generation and potential contamination inside the cabs. During operation, all equipment doors and windows shall be closed.

4.5 Work Activities in the Designated Searching Facility

Once excavated, the bulk material from Cell 32 will be placed into a haul truck and brought into the designated Search Facility, dumped and spread into straight lines on the floor of the building to facilitate the manual searching of the waste by the Search Technicians. An approved floor sealant will be applied to the asphalt floor of the Search Facility to allow for routine floor cleaning and minimize potential contamination related to asbestos and hazardous materials.

A total of two teams of six Search Technicians will be involved with the search of the waste stream. Each team of six Search Technicians will be located on either side of the waste stream in a staggered format in order to view all of the material as many times as possible. The team will be divided into three areas of focus: 1) Front of line is to remove large items and open bags, 2) Middle of line is to open any remaining bags, remove plastic and search medium sized material, and 3) Back of line is to complete the searching of fine materials. The Search Technicians will use rakes and hand tools to break apart bags or clumps of material or to move the material around to allow for thorough visual inspection. At any point, should a Search Technician identify something of interest, they will alert the Team Lead and that material must be placed into a clearly labelled collection container. The container must then be placed into a restricted access refrigerated storage trailer by assigned personnel for assessment by the Forensic Anthropologist.

Searching of the excavated materials from the landfill presents various hazards that require careful management to ensure the safety of workers. One significant risk is the potential presence of hazardous materials within the excavated waste, such as asbestos-containing materials, which can pose immediate health dangers if mishandled. It is crucial for workers to undergo thorough training, utilize appropriate personal protective equipment and personal decontamination protocols to mitigate these risks effectively. Regular monitoring of air quality (e.g., airborne fibre monitoring) and adherence to decontamination and other safety guidelines are essential to prevent injury and illness and ensure a safe working environment.

4.6 Return of Material to Landfill

Prior to any searched materials being returned to the landfill, a Forensic Anthropologist must review all material recovered. If human remains are included in the material recovered, a decision can be made to search the excavated waste material a second time. Once the material has been deemed fully searched, the bulk materials will be excavated from the floor of the Search Facility, loaded into haul trucks and deposited back to the active face of the landfill, as per the regulatory approved protocols.

4.7 Decontamination

Search Technicians and the Forensic Anthropologist are at risk of exposure to a myriad of inhalation hazards encompassing chemical, physical, and biological agents. Chemical hazards stem from the release of LFG, volatile



organic compounds (VOCs), and other toxic substances. Physical hazards include dust and particulates, asbestos fibres, lead and other airborne debris stirred up during excavation and searching activities, posing risk of lung irritation, fibrosis, and silicosis. Additionally, biological hazards such as mould spores, pathogens, bacteria, viruses and potential diseases exist in landfill environments.

As such, personal protective equipment (PPE), including respiratory protection and personal decontamination, will be an essential component of the project. The process of personal decontamination can also pose a significant risk of exposure to the above-listed airborne contaminants if not completed correctly. A strong commitment to worker training and ensuring procedure adherence is a must.

5.0 AIRBORNE CONTAMINANT EXPOSURE MANAGEMENT

5.1 Pre-Job Hazard Assessment

For any task or activity where contaminants may be present, a pre-job hazard assessment must be conducted, and a work plan must be developed prior to the commencement of work.

All affected workers (i.e., the work crew and other workers in the surrounding area) must be accounted for in the pre-job hazard assessment.

The following must be considered during the hazard assessment and reviewed with on-site personnel during the pre-job safety meeting:

- job-specific procedures
- contaminant hazards and where they may be found
- monitoring requirements (continuous or specified intervals)
- tending worker or safety watch, and rescue personnel requirements
- muster point location(s)
- alarms and emergency response and rescue procedures
- Personal Protective Equipment (PPE), including respiratory protection

6.0 EXPOSURE MONITORING

Instantaneous (real-time) and integrated air sampling will be conducted for the airborne contaminants of concern for the duration of the project, or at the discretion of the project Occupational Hygienist, to evaluate the potential for worker exposure to airborne contaminants and determine if the engineering controls/administrative controls and appropriate respiratory protective equipment is being worn. The monitoring will include the collection of occupational air samples from at least one worker in each of the similar exposure groups (SEGs) working at the Site. This could include monitoring from inside of the cab of one excavator, and one searcher from each the front, middle and end of the search line per work shift during the excavation and search work activities in accordance with acceptable sampling methods as outlined in the Manitoba Workplace Safety and Health Act and Regulation. For the integrated air sampling, it is expected that with rush analysis, results can be available within 48 hours following submission. Air sampling reports will be provided by email daily to the Director of Operations (The Client) for communication to workers without undue delay during daily tailgate meetings. Air monitoring reports will be reviewed by the Occupational Hygienist in consult with on-site Health and Safety Coordinator(s).



The exposure monitoring described below will be updated and modified as warranted based on actual site conditions encountered.

For all types of monitoring below, the readings or values must be recorded in tabular format with reference to the parameter monitored, the approximate location of the measurement relative to the work areas, tasks in progress and general observations at the time of the measurement.

Discontinuation of daily personal monitoring of one or more of the airborne contaminants of concern will be at the discretion of the project Occupational Hygienist and the Client if enough monitoring data has been collected to determine that the exposure risk to a particular airborne contaminant is negligible.

6.1 Airborne Fibre Sampling

At a minimum, occupational integrated air samples for airborne asbestos fibres will be collected from select workers daily for the first 10 days, then periodically for the duration of the first 10-days of excavation and searching activities to assess the exposure risk to workers and to ensure that appropriate PPE and RPE are being worn. In addition to the collection of occupational air samples, area air samples will be collected within the Search Facility and within the Decontamination Trailer for the duration of the project to ensure that airborne fibre concentrations are within acceptable levels and that any potential releases of hazardous materials or asbestos into the air is documented to protect the environment.

Ten days after project start up, up to 10 of the highest fibre count samples will be sent under chain of custody to an independent American Industrial Hygiene Association (AIHA) accredited laboratory for rush turnaround analysis. One field blank will also be submitted for analysis for quality control purposes.

Discontinuation of or changes to the frequency of occupational and area integrated air samples for airborne asbestos fibres will be determined by the project Occupational Hygienist once an appropriate number of samples have been collected and evaluated for potential exposure. The collection of additional occupational and area integrated air samples throughout the duration of the project will be at the discretion of the project Occupational Hygienist.

6.1.1 Sampling and Monitoring Methods and Set Points

Occupational integrated samples for airborne asbestos fibres will be collected using a sampling pump calibrated to draw a known amount of air through appropriate sampling media. The air samples will be analyzed following NIOSH 7400A methodology. If determined by the project Occupational Hygienist, occupational and area air samples will be submitted for laboratory analysis by transmission electron microscopy (TEM). TEM is capable of analyzing samples at high magnification (20,000 X and higher) and identifies asbestos fibres by morphology, crystalline structure and elemental analysis.

Due to the potential for airborne contaminants of concern at the Site and the ongoing requirement for respiratory protection during searching activities for worker protection, the occupational air samples will be compared to the maximum use concentration for asbestos, which in this case relies on the assigned protection factor (APF) of a half mask respirator. A half-mask respirator has an APF of 10; therefore, workers will be deemed to be protected if the occupational integrated air samples for airborne asbestos fibres are below 1.0 f/cc (10 x the TLV-TWA of 0.1 f/cc).

6.2 Monitoring for H₂S, %LEL, CO, O₂ and VOCs

Workers working in the excavation area or inside of the Search Facility where H₂S, %LEL, CO and VOCs may be present will don a personal monitor equipped with H₂S, combustible gas (%LEL), CO and O₂ electrochemical



sensors and photoionization (PID) sensors. The monitor will be donned with the sensors exposed to the atmosphere in the worker's breathing zone for life safety protection.

Workers monitoring H₂S, %LEL, CO, O₂ and VOCs must be aware of the potential limitations and interference associated with the use of gas detection equipment. All equipment must be properly calibrated, bump-tested and maintained in accordance with the manufacturer's specifications. Each monitoring instrument will have documented up-to-date factory certification/calibration.

Ambient air sampling for H2S, %LEL, CO, O2 and VOCs will be taken at the perimeter of the excavation.

6.2.1 Calibration and Bump Testing

Each monitoring instrument must have documented up-to-date factory certification/calibration. Each instrument must be calibrated bump tested by a qualified person at the beginning of each workday and after an exceedance of an action level. A failed bump test (i.e., instrument response outside of +/- 10% of the expected) will be followed by a field calibration. Field calibrations must be conducted according to the instrument manufacturer's operating instructions using appropriate calibration gases. Zero gas (i.e., nitrogen), rather than ambient air, should be used to set the instrument zero point during field calibration.

All bump tests, field calibrations and equipment maintenance must be documented, and the documentation must be kept on file after the completion of the project.

6.2.2 Sampling and Monitoring Methods and Set-Points

Real-time monitoring for H₂S, %LEL, CO, O₂ and VOCs will be conducted using personal real-time gas monitors that measure H₂S, %LEL, CO, O₂, and VOCs. The low alarm for H₂S will be 0.5 ppm, the low alarm for %LEL will be 10%, the low alarm for CO will be 12 ppm, the low alarm for O₂ will be 19.5%, and the low alarm for VOCs will be 25 ppm. The H₂S sensor resolution is 0.1 ppm.

7.0 EXPOSURE CONTROLS

The regulatory background, training, safe work procedures, personal protective equipment, personal hygiene and decontamination, engineering controls, administrative controls and other precautions are described in this section. The project Exposure Control Plan document has been included as Appendix C and provides further details of the information to follow:

The Manitoba Workplace Safety and Health Act and Regulation (2022) provides the following requirements for exposure control measures:

- If there is a risk to a worker from exposure to a hazardous substance by any route of exposure, the employer must eliminate the exposure or otherwise control it below harmful levels and below the applicable ACGIH Threshold Limit Values (TLVs) by:
- elimination of the hazard
- substitution with a less hazardous material or method
- engineering controls
- administrative controls, and/or the use of
- personal protective equipment
- The use of personal protective equipment as the primary means to control exposure is permitted only when:
- elimination of the hazard, substitution with a less hazardous material or method, engineering controls, and administrative controls are not practicable; or



 additional protection is required because engineering or administrative controls are insufficient to reduce exposure below the acceptable ACGIH-TLVs; or

- the exposure results from temporary emergency conditions only.
- Whenever possible, the hazard must be eliminated. Where this is not feasible, substitution must be considered. Substitution is the process of replacing a hazardous material or task with a less hazardous material or task. Given that the airborne contaminants at the Site are a byproduct of landfill gases and hazardous materials deposited in the landfill, elimination or substitution of the product is not practical.
- Administrative controls include training workers on the hazards of the materials they work with and how to protect themselves, developing and implementing work procedures that outline the best methods by which to do the work to prevent worker exposure, safety inspections, safety audits, and supervision. Administrative controls look to minimize worker exposure by changing worker behaviour and how workers carry out their work.
- The use of personal protective equipment, such as respirators and protective clothing, is a frequently used control method; however, it has potential drawbacks in that respirators and other protective measures must be correctly utilized and maintained, they may be uncomfortable for employees to wear, and it may present additional hazards resulting from the use of the equipment. As a result, personal protective equipment must typically only be used as a temporary control measure or when other control options have been investigated and found to be unfeasible or insufficient. The use of personal protective equipment as a control option requires a strong commitment to worker training and supervision.
- A combination of engineering controls, administrative controls and personal protective equipment will be utilized to minimize the exposure to the airborne contaminants of concern at Site.

7.1 Engineering Controls and Partial Elimination

Engineering controls can consist of general exhaust ventilation or portable fans to blow fresh air into the work area, with the objective of removing and diluting the airborne contaminants of concern inside the Search Facility. If ventilation is deemed necessary at the worksite, a nominal recommended fan size is 3,200 cubic feet per minute (CFM). The Client shall appropriately size the fans for the work area and determine the necessity of the fans, which will depend on ambient environmental conditions, such as temperature and windspeed, during the work.

In addition to ventilation, operational controls will be implemented at the Search Facility to control the generation of airborne contaminants.

7.2 Administrative Controls and Other Precautions

Administrative controls that will be considered, as warranted, are job rotation, taking micro-breaks, instituting a windows-up / doors-closed policy for vehicles and equipment, and avoiding heavy-duty tasks of high physical demands. These minimize exposure duration and respiratory rate.

Workers in the excavation area must be aware of the wind direction on Site and position themselves upwind and away from the impacted areas as feasible. Workers should limit the duration of time spent in the impacted areas and the number of times the areas are entered for on-site tasks.



Contingent measures for partial elimination or suppression of airborne contaminants of concern that will be implemented while working inside the Search Facility, if warranted, is to use water or a water-based surfactant to spray onto the waste piles inside of the Search Facility for dust/fibre control.

Additional information related to administrative controls is provided in the following sections.

7.3 Training

Workers will receive training on the following topics, with training documented.

- Complete a training course that informs workers of the hazards and control measures including use of personal protective equipment and decontamination procedures, associated with the airborne contaminants of concern and document that the training has been provided to the employees.
- A general overview of the potential health effects, symptoms, and control options associated with the airborne contaminants of concern.
- Receive an orientation on the Site's rules and procedures along with the relevant emergency response and rescue/evacuation procedures.
- Requirements of the Manitoba Workplace Safety and Health Act and Regulations for working with chemical, physical, and biological hazards, Workplace Hazardous Materials Information System 2015.
- Employee responsibility to follow prescribed safe work procedures, use personal protective equipment and decontaminate as appropriate for the level of exposure.
- Exposure controls to be utilized on-site (training, engineering controls, safe work procedures, personal hygiene and decontamination, and personal protective equipment usage).
- Respiratory protection training users, limitation, care and maintenance, user seal checks and fit-testing.
- Asbestos Awareness training

It is The Client's responsibility to ensure training is provided to all workers involved with excavation and searching activities and First Nation members visiting the site based on the Workplace Safety and Health Act and Regulations requirements.

7.4 Administrative Controls and Safe Work Procedures

Where contact with the airborne and dermal contaminants of concern are anticipated, work practices shall be implemented to reduce potential exposure. These include but are not limited to the following:

- Conduct pre-job hazard assessments.
- Erect conspicuous signage to inform workers of asbestos and hazardous material hazards at the entrances to the Search Facility and limit access to authorized persons only.
- Use available engineering controls to minimize airborne contaminant release.
- Use job rotation where possible to minimize worker exposure to airborne contaminants.



Avoid heavy-duty tasks of high physical demands in areas with known concentrations of airborne contaminants.

- Perform routine inspections of the Search Facility to ensure that controls are implemented, and appropriate work practices are in place to address the potential exposure to asbestos and hazardous materials.
- For real-time monitoring of landfill gases, record H2S, %LEL, CO, O2 and VOC alarm events.
- Preparation of daily Air Monitoring Reports with the results of the real-time monitoring and integrated air sampling laboratory reports.

Safe Work Procedures (SWPs) must be prepared that outline the potential hazards of the task, the tools required for the task, the personal protective equipment required for the task, the exposure controls utilized for each step in the task, and emergency response procedures.

7.5 Respiratory Protective Equipment

Due to the known airborne contaminants of concern and odours anticipated during excavation and searching activities, respiratory protection will be required for workers. Half-mask air-purifying respirators fitted with multigas/vapour/P100 filter cartridges will be the minimum respiratory protection worn by workers for the duration of the project. The multi-gas/vapour cartridges with P100 particulate filter protect against 11 different gas/vapours including: Organic Vapours, Chlorine, Hydrogen Chloride, Sulfur Dioxide, Hydrogen Sulfide, Hydrogen Fluoride, Chlorine Dioxide, Ammonia, Methylamine, Formaldehyde, and Particulates.

Respirator requirements may be reassessed by the project Occupational Hygienist upon receipt of real-time monitoring and integrated air sampling laboratory results. Workers required to wear respiratory protection will be properly trained on their use, limitations, care and maintenance and have passed a fit test conducted by a qualified individual. These half-mask respirators have a maximum protection factor of 10; thus, work must cease if concentrations exceed a value equivalent to 10 times the 15-minute short-term exposure limit (STEL) or 10 times the 8-hour ACGIH TLV-TWA.

7.6 Other Personal Protective Equipment

The following personal protective equipment must be utilized by all Search Technicians, Forensic Anthropologists, volunteers, and any First Nation visitors or family members:

- Coveralls Hooded disposable coveralls (e.g., Tyvek®, or alternative) will be worn by the Search Technicians during searching activities; disposable coveralls must be removed and discarded before leaving the work area. These are required for two reasons: 1) to prevent skin contact with contaminants and 2) to prevent the spread of contamination from the work areas to other areas or personal property.
- Gloves Workers will use nitrile gloves under thermal or non-thermal, cut and puncture resistant, full latex dipped work gloves for all tasks in the work areas.
- CSA Approved Steel-Toed Boots and boot covers Workers shall wear heavy-duty steel-toed boots to protect their feet. To prevent the spread of contamination, workers will utilize disposable boot covers and wash boots with a disinfectant water solution when leaving the Search Facility work area.
- Hearing protection appropriate for noise levels at the worksite, where required.



- Hardhat and high visibility apparel, where required.
- Safety Googles or full-face respirator.
- Five-head gas monitor, including sensors for H2S, %LEL, CO, O2 and VOCs.

7.7 Personal Hygiene and Decontamination

No eating, drinking or smoking will take place in any of the work areas. Workers are required to decontaminate prior to eating, drinking or smoking. Decontamination must include removal of disposable PPE (e.g., Tyvek®, or alternative) and wiping and sanitizing reusable PPE (e.g. steel toe boots, googles, and respirators) and any exposed skin surfaces. Wipes must be used to clean the exterior and interior surfaces of respiratory protection. Non-disposable protective apparel will be sanitized after each use and laundered onsite.

To minimize the spread of contamination outside of the worksite, employees will be required to decontaminate each time they leave the Search Facility. In addition to following the decontamination procedures listed above, the workers will change footwear prior to exiting the Locker Trailers, no steel-toed rubber boots used inside the Search Facility shall be worn in the trailer village. PPE shall be stored in a container (bag or bin) and thoroughly decontaminated upon completion of the project site work.

7.7.1 PPE Disposal and Decontamination

Disposable coveralls and nitrile gloves, and all wipes will be double bagged in polyethylene labelled asbestos waste bags and will be disposed of as potential asbestos waste. The bagged PPE and other potentially contaminated wastes will be placed it a covered asbestos waste storage bin that will be hauled to the designated Asbestos area of the active cell at the landfill, where the location of burial by GPS will be recorded in accordance with the landfill operating license.

7.7.2 Equipment Decontamination

Decontamination of equipment that may come in contact with asbestos-containing materials or SRM in the excavation work areas should include wetting and cleaning, with suitable disinfectant, of equipment after use paying close attention to tracks, tires, buckets and truck boxes. The spraying down of heavy equipment and vehicles must be done in the designated area withing the landfill footprint and the wetted area is to be covered in accordance with the BRRMF operating license.

Tools and equipment used in the Search facility, including reusable PPE must be cleaned with a disinfectant solution. Wash-water from the search facility will be collected in the facility's holding tank. Wastewater disposal will be handled by a licensed carrier.

7.7.3 Wastewater Collection

Wastewater from the search facility is collected and held in the search facility's holding tank. Wastewater will be tested prior to disposal. Testing parameters will be confirmed with the City of Winnipeg to ensure appropriate filtration and or treatment prior to disposal in accordance with the landfill operating licence and Manitoba regulatory requirements.

8.0 EMERGENCY RESPONSE PROCEDURE

Given that suspect ACMs and hazardous materials may be present during excavation and search procedures, unplanned exposure to asbestos fibres and hazardous materials may potentially occur. Site Personnel will be



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trained in accordance with the Manitoba Workplace Safety & Health Act and Regulation and the SafeWork MB Guide to Asbestos Management.

The project-specific Asbestos Handling Procedure document has been included as Appendix A, and outlines the procedures to be followed if ACM waste is discovered in the search material while searching in the Search Facility and includes further details on the following:

If ACM waste is discovered during search activities in the Search Facility, search activities in the area of the identified ACM waste will be suspended, and the On-site HS Officer will be notified. The searcher who identifies any potential ACM waste will immediately wet the ACM waste using deck sprayers and other water located in the Search Facility. Team Leader will turn off the exhaust fans at the main power switch in the Search Facility to prevent the release of airborne fibres. All search workers, other than the designated worker, who is trained in the asbestos waste removal procedure, and their assistant will move to the opposite end of the search line during the clean-up. An occupational sample for asbestos will be collected from at least one individual conducting cleaning activities. The worker performing the removal and their assistant will continue to wet the ACM waste using deck sprayers and other spray bottles located in the Search Facility. If the ACM waste is small enough, it will be double bagged in labelled 6 mil poly asbestos waste bags and sealed with duct tape, using a 'gooseneck' method. If the ACM waste is too large or awkwardly shaped to fit in an asbestos waste bag, it will be wrapped in polyethylene sheeting and sealed with duct tape. The exteriors of the waste containers will be wet wiped to remove any small fibers or debris and loaded into a covered asbestos waste storage bin and hauled to a designated disposal area in the Landfill in accordance with the requirements set out by Environment Approvals Branch in the Asbestos Disposal at a Landfill Guideline and BRRMF Operating License. The surfaces within the immediate area of the search facility will be visibly inspected for remaining ACM waste debris, including floor and wall surfaces. If visible ACM debris remains within the area of the Search Facility the worker removing the ACM waste and their assistant will wet wipe the surfaces to remove the debris and re-inspect the areas. Following the successful completion of cleaning activities the HS Officer may permit search activities to resume. The worker who performs the removal and their assistant must fully decontaminate using the decontamination procedure outlined in the decontamination SWP. Occupational air sampling results will be reviewed upon receipt of real-time monitoring and integrated air sampling laboratory results, by the Occupational Hygienist, Director of Operations and on-site HS Officer to determine worker exposure. Worker exposures will be documented, communicated to the worker, Site Health & Safety Committee and reported as required without undue delay.

END OF DOCUMENT



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Asbestos Handling Procedures



ASBESTOS HANDLING PROCEDURE – DURING SEARCH ACTIVITIES

1 PURPOSE AND SCOPE

This asbestos handling procedure is intended to provide instruction to Search Facility workers during search activities about how to reduce the risk of exposure to asbestos if asbestos-containing waste materials failed to be separated from the waste stream during excavation activities and brought within the Search Facility.

2 BACKGROUND

2.1 Asbestos Facts

2.1.1 What is Asbestos?

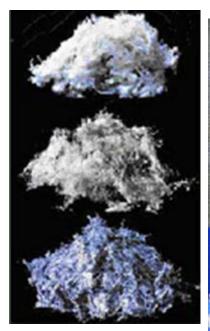
- Asbestos is a generic term that refers to a family of naturally occurring minerals from the Earth's crust belonging to a class of fibrous silicates. They are distinct in its structure and size of their fibers, contain the presence of typical impurities, and can be separated into flexible fibres.
- The asbestos-bearing rocks belong to two families of silicates: amphiboles and serpentines.

ASBESTOS FAMILIES	VARIETIES					
Serpentines	Chrysotile (white asbestos)	The most exploited and widely used type of asbestos, mainly used in asbestos cement products.				
Amphiboles	Actinolite	Mining production may still exist, but only in small quantities and used locally.				
	Anthophyllite	qualities aria assa issang.				
	Tremolite					
	Amosite (brown asbestos)	No longer exploited in mining.				
	Crocidolite (blue asbestos)					

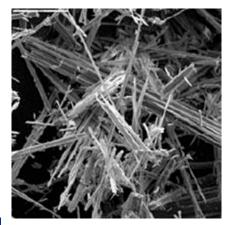
- Asbestos is utilized as a reinforcing and binding agent when combined with cement or plastic, because of its incombustibility, strength and flexibility when separated into fibres. Its multiple properties explain the many uses of asbestos and its widespread presence in industrial plants and buildings, especially those built before 1980. Some examples include:
 - Flexibility
 - Resistance to fire (up to 1200°C)
 - Resistance to corrosives and microorganisms
 - Resistance to traction, abrasion, and friction.
 - Excellent electrical, acoustical, and thermal insulating qualities.
- Asbestos fibres are placed into friable and non-friable materials. Friable material can be crumbled by hand. The more friable the material, the greater the potential hazard due to fibre release. Non-friable material cannot be crushed by hand and therefore is less likely to release fibres into the air unless they are cut, crushed, ground, sanded or broken.
- Asbestos Waste Materials should be assumed to be friable and treated as such.

2.1.2 What Does it Look Like?

Asbestos can be found as white, brown, or blue fibres, with breaths of less than 1 micrometre and occur in bundles. They can appear as curly fibres or straight and needle-like. Each different classification of asbestos has its own unique chemical composition which makes it unique. It is important to know which type of asbestos you will be working around to ensure you understand these qualities.







2.1.3 Potential Health Effects

- ▶ How exposure to asbestos can affect you depends on:
 - The number of asbestos fibres in the air.
 - How long your exposure lasts.
 - How often you were exposed.
 - The size of the asbestos fibres inhaled.
 - The amount of time since your first exposure.
 - The type of asbestos fibre.
 - Personal predispositions.
- Asbestos only constitutes a health risk if fibers are present in the breathable air.
- The magnitude of the exposure risk depends on the type of material (friable or not), its condition (damaged, broken, used) and the nature of the work performed (sanding, drilling, demolition, etc.).
 - If asbestos fibres are enclosed or sealed in the product, the risk is minimal.
 - If the materials are very friable, the asbestos fibres may detach easily during the work and could be dispersed into the air.
- The health hazards associated with asbestos are due to the fibres entering the lungs. Due to the fibres size, the fibres can settle in the lungs and remain for an extended period of time. Health hazards include:
 - Pleural plaques thickening or hardening of the pleura
 - Asbestosis pulmonary fibrosis or scarring of the lung tissue developing slowly after a relatively intense exposure to asbestos fibres. Can only be detected with an x-ray after a latency period (15 to 20 years).
 - Lung Cancer the latency period is 20 to 30 years.
 - Mesothelioma an otherwise rare cancer of the pleura (membrane covering the lung) or of the peritoneum (membrane covering abdominal organs) causing frequent shortness of breath and abdominal pain. When it occurs, after 30 to 40 years, it is too late to intervene.
 - Other cancers (including cancer of the larynx, trachea, stomach, colon, and rectum).

- Asbestos, cancer, and pleural plaques can lead to reduced pulmonary function and death.
- NOTE: Smoking combined with inhaled asbestos greatly increases the risk of lung cancer.

3 PROCEDURE

3.1 When Asbestos Waste is Excavated

During excavation activities if construction waste that has the potential to produce high levels of dusts and particulate is uncovered it should be handled with care and wetted as required to control airborne contaminants.

Additionally, packaged and labelled asbestos-containing waste may be uncovered. All asbestos- containing waste must be wetted to control potential release of fibers.







Examples of Asbestos Waste Labelling

If labelled asbestos containing material bags are found or identified by equipment operators in the Excavation Area, all operations will immediately stop.

Non-essential personnel and equipment will be required to evacuate to a pre-determined upwind location.

When exiting the cab of mobile equipment to confirm the nature of uncovered waste or conducting cleaning activities, the following personal protective equipment (PPE) must be worn in addition to other PPE required for the Excavation Area:

- a fit-tested, half-face dual cartridge respirator equipped with P100 filters
- double glove system includes 2 pairs of disposable nitrile glove or nitrile glove under rubber or coated work gloves
- disposable hooded (Tyvek) coveralls
- disposable (Tyvek) boot covers

Please note: a dust mask does not provide sufficient protection and must never be worn.

A water truck must be in-place to wet down the waste materials and other mobile equipment staged upwind.

If a water truck is not immediately available or not feasible due to freezing conditions, the discovered asbestos waste bags must be re-covered to control potential release of fibers until the appropriate equipment and personnel are in place for asbestos removal and relocation.

Construction waste assumed to be asbestos containing and any punctured, labelled asbestos waste should be wetted down by a water truck to prevent dust particles from becoming airborne.

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The wet asbestos containing materials will be directly loaded into a haul truck and covered, then hauled to a designated asbestos disposal area in the Landfill.

All equipment utilized to load and transport asbestos containing materials must be promptly washed down and the wash water contained to also be disposed of as asbestos containing waste.

Personnel potentially contacting asbestos containing materials must also promptly decontaminate by:

- removing their disposable coveralls and boot covers (while still wearing their respirator).
- using wet wipes to clean the outside of their respirator and any exposed skin (hands, face and neck) and disposing of wet wipes as asbestos containing waste.
- removing and storing respirator in a clean, sealed container.

3.2 If Asbestos Waste Enters the Search Facility

Workers and Visitors within the Search Facility must wear, at a minimum, the required PPE listed in the Humanitarian Search Site Health and Safety Plan.

Construction waste that has the potential to produce high levels of dust or particulate and any punctured, labelled asbestos waste should be wetted to prevent dust particles from becoming airborne.

If ACM waste is discovered during search activities in the Search Facility, search activities will be suspended in the area of the identified ACM waste, and the On-site HS Officer will be notified.

The searcher who identifies any potential ACM waste will immediately notify their Team Leader and wet the ACM waste using deck sprayers and other water supply located in the Search Facility.

All search workers, other than the workers conducting the removal will move to the opposite end of the search line or onto another search line, during the clean-up.

An occupational sample for asbestos will be collected from at least one individual conducting cleaning activities, when practicable.

The workers conducting the removal will continue to wet the ACM waste using deck sprayers and other water supply located in the Search Facility.

If the ACM waste is small enough to fit in a standard asbestos waste bag, it will be double bagged in labelled asbestos waste bags and sealed with duct tape, using a 'gooseneck' method.

If the ACM waste is too large or awkwardly shaped to fit in an asbestos waste bag, it will be wrapped in two layers of 6 mil polyethylene sheeting and sealed with duct tape.

The exteriors of the waste containers will be wet wiped to remove any fiber or debris and loaded into an enclosed asbestos waste storage bin. This bin will be transported to a designated asbestos disposal area in the Landfill.

The surfaces within the immediate area of the ACM waste will be visibly inspected for remaining ACM waste debris.

If visible ACM debris remains within the area of the Search Facility the workers completing the removal will wet and remove debris and re-inspect the areas.

Following the successful completion of cleaning activities as reported by the workers completing the removal, the HS Officer may permit search activities to resume in the area of the search line from which the ACM waste was removed.

The workers who have conducted the ACM removal and clean up must fully decontaminate using the decontamination procedure outlined in the decontamination SWP.

An inspection report must be completed to document the ACM waste event and cleaning activities.

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4 TRAINING

- Operators working in the Excavation Area and workers within the Search Facility must complete an awareness level training and be trained in task specific safe work procedures as applicable.
- ▶ WHMIS 2015
- ▶ Respirator training (selection, use, and care of)
- ▶ Respirator fit test
- Workers who re-package and clean up asbestos in the Search Facility must complete additional task specific training for the removal of asbestos waste.

5 RESPONSIBILITIES

R C	responsible consulted	A	accountable informed		Employer	Worker	HSE Support	
Conduct pre-work hazard assessments to determine presence/potential presence of ACM					R	- 1	С	
Communicate the potential hazard(s) and the required controls					R	1	С	
Verify workers have the required training					erify workers have the required training			
Verify workers are implementing controls					R			

6 REVISION HISTORY

Revision	Date	Reviewed by	Approved by	Description of the change
0	07-28-2025	Meghan Hennig		Draft Revision for use at Brady Landfill

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Exposure Control Plan





REPORT

Exposure Control Plan

Brady Road Resource Management Facility, Winnipeg, Manitoba

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APPENDIX B

Summary of Airborne Contaminant Action Levels and Mitigation

1.0 INTRODUCTION

WSP Canada Inc. (WSP) was retained by The Government of Manitoba (GoM) to prepare this Exposure Control Plan (ECP) for contractor employees working at the Brady Road Resource Management Facility (herein the "Brady Road facility") located between Brady Road and Waverly Street in Winnipeg, Manitoba. The preparation of this ECP is to address the highly sensitive and confidential humanitarian search for victims of homicide considered to be buried at the Brady Road facility.

2.0 BACKGROUND

In coordination with Winnipeg Police Services, City of Winnipeg Brady Road facility staff, and WSP personnel, a target zone assessment is being undertaken and has identified cell 32 as the area where remains were potentially landfilled.

To accommodate the search of the victims, a temporary prefabricated building will be constructed on Brady Road facility property to act as a search facility ("the Search Facility"). The search process will include mechanically excavating bulk material from and targeted area in Cell 32, hauling the waste by haul truck to the Search Facility, where the waste will be laid out in rows on the floor of the building and manually searched by Search Technicians using rakes and hand tools. A decontamination area will also be constructed adjacent to the Search Facility, equipped with decontamination supplies. The facility will be equipped with a safety shower, eye wash stations, and first aid kits.

For the duration of the project, a space for healing will be included at site and made available for First Nation Ceremony for Elders, Knowledge Keepers, counsellors and family members. All aspects of this Exposure Control Plan will need to be followed by Brady Road facility personnel conducting excavation activities in Cell 32, Search Technicians involved with searching activities, Forensic Anthropologists, consultants, and First Nation members and family members visiting the site.

2.1 Airborne Contaminants of Concern Expected at Site

Excavating material from a landfill poses significant airborne exposure risks due to the potential release of hazardous substances and contaminants into the air. Landfill gas (LFG) is a natural byproduct of the decomposition of organic material in landfills. LFG contains many different gases. Methane and carbon dioxide (CO₂) make up 90% to 98% of LFG. The remaining 2% to 10% includes nitrogen, oxygen, ammonia, sulphides, carbon monoxide, nonmethane organic compounds, hydrogen sulphide and various other gases. Landfill gases are produced when bacteria break down organic waste. The amount of these gases depends on the type of waste present in the landfill, the age of the landfill, oxygen content, the amount of moisture, and temperature.

Some of the known airborne contaminants that workers will need to be protected against include landfill gases (e.g., hydrogen sulphide, methane), volatile organic compounds, respirable particulates, asbestos, and biological pathogens.

3.0 HAZARD SUMMARY

The following section provides a hazard summary for the anticipated activities associated with work with the highest potential for worker exposure to airborne contaminants of concern at the Site.



3.1 Asbestos Management

The Brady Road facility accepts for disposal asbestos containing materials (ACM) generated from site remediation projects. The Site does not accept unbagged asbestos waste and all ACM must be contained and transported in accordance with all applicable Provincial guidelines and regulations. The Excavation Area will include ACM that had been contained in designated yellow bags (or potentially other labelled asbestos waste) to prevent the release of asbestos fibres and asbestos containing dust.

The Brady Road facility does not accept ACM without applicable containment, but general construction and demolition debris containing trace elements of asbestos may be potentially present in the waste stream. In addition, bagged asbestos waste may have been damaged during disposal or excavation. Therefore, extra precaution will be taken, and construction and demolition debris identified during excavation will be managed as having the potential to contain ACM. These materials will be segregated and wetted down by a water truck available at the Excavation Area to prevent dust particles becoming airborne.

All efforts will be made to ensure that no bagged or otherwise sealed and labelled asbestos waste found in the Excavation Area will be transported to the Search Facility. If bagged ACM waste is found or identified by equipment operators in the Excavation Area, all operations will immediately stop. Non-essential personnel and equipment will be required to evacuate to a pre-determined upwind location. Once the Excavation Area has been safely setup (i.e., water truck in-place, equipment staged upwind, etc.), the ACM waste will be directly loaded and hauled to a designated disposal area for ACM. This area will be located more than approximately 46 m (150 feet) from the commercial tipping floor and downwind to prevent airborne fibres from posing a risk to workers.

If any bags of ACM waste are punctured during excavation, a water truck will be available to the Excavation Area to wet down the ACM and prevent airborne fibres from becoming airborne. Additionally, provisions will be made for personnel to decontaminate in case of spills or other circumstances resulting in contamination of their work clothing or person.

Equipment in accidental contact with ACM will be thoroughly wetted to reduce the likelihood of asbestos fibres from becoming airborne in the vicinity of the disturbance area.

3.2 Excavating Bulk Material

Excavating bulk material from the landfill will involve a series of particular activities to ensure efficiency and worker safety. Initially, Cell 32 must be surveyed and assessed for potential hazards or obstacles. Following this, heavy machinery such as excavators, bulldozers, and loaders will be deployed to remove layers of waste systematically. Excavation of material from Cell 32 will occur in a horizontal layer system to ensure cell integrity and prevent side slope failure. Large materials, such as mattresses, furniture, etc., should be separated by the excavator operator. A trained worker will be in a vehicle and positioned adjacent to the excavation areas such that as material is excavated, it can be observed for the presence of potential human remains or material that requires assessment immediately. During the excavation activities, monitoring for gas emissions (e.g., H₂S, CO, %LEL, and VOCs) and asbestos fibres will be conducted from select workers who may be conducting the work activities. Adherence to regulatory guidelines and safety protocols will be paramount during excavation activities to safeguard both workers and the surrounding ecosystem. Finally, daily cover will be applied to the exposed waste at the end of each work shift.

It is important to provide and properly maintain the air filtration for vehicles and heavy equipment cabs used at the excavation work areas. HEPA filters must be used, and the interior of vehicles and heavy equipment must be



cleaned at the beginning or end of each shift to minimize airborne dust generation inside the cabs. During operation, all equipment doors and windows shall be closed.

3.3 Work Activities in the Designated Search Facility

Once excavated, the bulk material from Cell 32 will be placed into a haul truck and brought into the designated Search Facility, dumped and spread into straight lines on the floor of the building by skid steers, to facilitate the manual searching of the waste by the Search Technicians.

A total of two teams of six Search Technicians will be involved with the sorting of the waste stream. Each team of six Search Technicians will be located on either side of the waste stream in a staggered format in order to view all of the material as many times as possible. The team will be divided into three areas of focus: 1) Front of line is to remove large items and open bags, 2) Middle of line is to open any remaining bags, remove plastic and search medium sized material, and 3) Back of line is to complete the searching of fine materials. The Search Technicians will use rakes and hand tools to break apart bags or clumps of material or to move the material around to allow for thorough visual inspection. At any point, should a Search Technician identify something of interest, they will alert the Team Lead and that material must be placed into a clearly labelled collection container. The container must then be placed into a restricted access refrigerated storage trailer by assigned personnel for assessment by the Forensic Anthropologist.

Searching of the excavated materials from the landfill presents various hazards that require careful management to ensure the safety of workers. One significant risk is the potential presence of hazardous materials within the excavated waste, such as asbestos-containing materials, which can pose immediate health dangers if mishandled. It is crucial for workers to undergo thorough training, utilize appropriate personal protective equipment and personal decontamination protocols to mitigate these risks effectively. Regular monitoring of air quality (e.g., airborne fibre monitoring) and adherence to safety guidelines are essential to prevent injury and illness and ensure a safe working environment.

3.4 Return of Material to Landfill

Prior to any searched materials being returned to the landfill, a Forensic Anthropologist must review all material recovered. If human remains are included in the material recovered, a decision can be made to search the excavated waste material a second time. Once the material has been deemed fully searched, the bulk materials will be excavated from the floor of the Search Facility, loaded into haul trucks and deposited back to the active face of the landfill, as per the regulatory approved protocols.

3.5 Decontamination

Search Technicians and the Forensic Anthropologist are at risk of exposure to a myriad of inhalation hazards encompassing chemical, physical, and biological agents. Chemical hazards stem from the release of LFG, volatile organic compounds (VOCs), and other toxic substances. Physical hazards include dust and silica particles, asbestos fibres, and airborne debris stirred up during excavation and sorting activities, posing risk of lung irritation, fibrosis, and silicosis. Additionally, biological hazards such as mould spores, bacteria, and viruses exist in landfill environments. As such, personal protective equipment (PPE), including respiratory protection and personal decontamination, will be an essential component of the project. The process of personal decontamination can also pose a significant risk of exposure to the above-listed airborne contaminants if not completed correctly.



4.0 EXPOSURE HAZARD SUMMARY

It is important to note that the Brady Road facility does not accept hazardous materials at the landfill; however, it may be present in small quantities from generators who do not dispose of it correctly. This could include batteries, typical household waste like paint, gasoline, compressed gas cylinder or other hazardous materials generated in industrial processes. Leachate and other liquid waste that are inappropriately disposed of may also present a potential hazard at the landfill. Radioactive materials (e.g., household smoke detectors, etc.) are not allowed to be accepted by landfills in the province of Manitoba; however, there may be a small risk of encountering radioactive materials in the waste stream.

Hydrogen sulphide, methane (as combustible gas), volatile organic compounds, airborne particulates (e.g., respirable particulate and crystalline silica), asbestos fibres, and biological pathogens have been identified as potential inhalation risks at Site. The following section is a summary of the exposure hazards of worker exposure to airborne contaminants at the Site.

4.1 Hydrogen Sulfide

Hydrogen sulphide (H₂S) is a colourless, flammable, extremely hazardous gas with a "rotten egg" smell. It occurs naturally in crude petroleum, natural gas, and hot springs. In addition, hydrogen sulfide is produced by bacterial breakdown of organic materials and human and animal wastes (e.g., sewage). Industrial activities that can produce the gas include petroleum/natural gas drilling and refining, wastewater treatment, coke ovens, tanneries, and kraft paper mills.

H₂S is heavier than air and may travel along the ground. It collects in low-lying and enclosed, poorly ventilated areas such as basements, manholes, sewer lines, underground telephone vaults and manure pits.

The primary route of exposure is inhalation, and the gas is rapidly absorbed by the lungs. Absorption through the skin is minimal. People can smell the "rotten egg" odour of H₂S at low concentrations in air. However, with continuous low-level exposure or at high concentrations, a person loses his/her ability to smell the gas even though it is still present (olfactory fatigue). This can happen very rapidly and at high concentrations, the ability to smell the gas can be lost instantaneously. Therefore, DO NOT rely on your sense of smell to indicate the continuing presence of hydrogen sulphide or to warn of hazardous concentrations.

In addition, hydrogen sulphide is a highly flammable gas and gas/air mixtures can be explosive. It may travel to sources of ignition and flash back. If ignited, the gas burns to produce toxic vapors and gases, such as sulphur dioxide.

H₂S is both an irritant and a chemical asphyxiant with effects on both oxygen utilization and the central nervous system. Its health effects can vary depending on the level and duration of exposure. Repeated exposure can result in health effects occurring at levels that were previously tolerated without any effect. Low concentrations irritate the eyes, nose, throat and respiratory system (e.g., burning/ tearing of eyes, cough, shortness of breath). Asthmatics may experience breathing difficulties. The effects can be delayed for several hours, or sometimes several days, when working in low-level concentrations. Repeated or prolonged exposures may cause eye inflammation, headache, fatigue, irritability, insomnia, digestive disturbances and weight loss. Moderate concentrations can cause more severe eye and respiratory irritation (including coughing, difficulty breathing, and accumulation of fluid in the lungs), headache, dizziness, nausea, vomiting, staggering and excitability.



4.2 Methane (as %LEL)

Methane, a byproduct of organic waste decomposition, is highly flammable and can ignite in the presence of an ignition source, posing fire and explosion hazards. Additionally, methane is an asphyxiant, displacing oxygen in confined spaces and potentially leading to suffocation if present in high concentrations. Prolonged exposure to methane due to low oxygen levels can also cause symptoms such as headache, dizziness, nausea, and respiratory issues. Furthermore, methane is a potent greenhouse gas contributing to climate change. Proper training, use of PPE, gas monitoring, and adherence to safety protocols are essential for mitigating these risks and ensuring the health and safety of workers at landfill sites.

Low concentrations of methane are not harmful; however, higher concentrations can displace oxygen in the air. If less oxygen is available to breathe, symptoms such as rapid breathing, rapid heart rate, clumsiness, emotional upsets and fatigue can result. As less oxygen becomes available, nausea and vomiting, collapse, convulsions, coma, and death can occur. Symptoms occur more quickly with physical effort. Lack of oxygen can cause permanent damage to organs, including the brain and heart.

The Lower Explosive Limit (LEL) of a gas or vapour is its minimum concentration in air needed for the gas to explode if an ignition source is present. The LEL of methane gas is approximately 5.0% in air. The Upper Explosive Limit (UEL) is the highest concentration of a gas or a vapour in air capable of producing an explosion if an ignition source is present. The UEL of methane gas is approximately 15.0% by volume in air. If a highly concentrated emission of methane gas is diluted with air, explosive mixtures of methane gas and air can be formed. For an explosion to occur, there must also be an ignition source (e.g., spark, static electricity, open flame, etc.).

4.3 Carbon Monoxide

Carbon monoxide is an odorless, colorless and toxic gas. The effects of CO exposure can vary greatly from person to person depending on age, overall health and the concentration and length of exposure. At low concentrations, CO exposure can cause fatigue in healthy people and chest pain in people with heart disease. At higher concentrations, CO exposure can cause impaired vision and coordination; headaches; dizziness; confusion; nausea. Acute effects are due to the formation of carboxyhemoglobin in the blood, which inhibits oxygen intake. At moderate concentrations, angina, impaired vision, and reduced brain function may result. At higher concentrations, CO exposure can be fatal.

4.4 Volatile Organic Compounds

Workers excavating materials from a landfill may encounter various types of volatile organic compounds (VOCs) that pose hazards to their health. Some common VOCs found in landfills include:

- **Benzene**: Often present due to the decomposition of organic materials like plastics, rubber, and petroleum products.
- **Toluene**: Found in solvents, paints, and some building materials that end up in landfills.
- **Xylene**: Similar to toluene, it is found in various industrial products and waste.
- **Trichloroethylene (TCE)**: Used in industrial processes and can be present in groundwater and soil near landfills.
- Vinyl chloride: Found in PVC materials and can be released during their degradation.



■ **Formaldehyde**: Found in building materials, adhesives, and some household products that may end up in landfills.

These VOCs can evaporate into the air from landfill materials and pose inhalation risks to workers, potentially causing respiratory irritation, headaches, dizziness, or more severe health effects with prolonged exposure.

Proper PPE and monitoring for VOC levels are essential to mitigate these risks during landfill excavation activities.

4.5 Respirable Particulate and Crystalline Silica

Silica is the second most common mineral on earth, found in the common form as "sand" and "rock". Silica is the compound formed from the elements silicon (Si) and oxygen (O) and has a molecular form of silicon dioxide (SiO₂). The three main forms of silica are quartz, cristobalite and tridymite, with quartz being the main species present.

The health hazards associated with silica come from breathing in the respirable-sized particles. The respirable fraction of dust are those particles with diameters of 10 microns or less. These particles are so small they are not visible to the naked eye and, when breathed in, end up travelling deep into the lungs. If respirable crystalline silica becomes airborne, exposure to fine crystalline silica dust can lead to a disabling, sometimes fatal disease called silicosis. The fine particles are deposited in the lungs, causing thickening and scarring of the lung tissue. The scar tissue restricts the lungs' ability to extract oxygen from the air. The symptoms of silicosis may not appear for many years, but the damage is permanent.

4.6 Asbestos-Containing Materials

Asbestos is a naturally occurring fibrous mineral silicate once widely used in the construction industry and in the manufacturing of some vehicle parts. Asbestos fibres, when disturbed or degraded, can become airborne and easily inhaled, leading to serious respiratory conditions such as asbestosis, lung cancer, and mesothelioma. Moreover, these fibres can persist in the environment for long periods, increasing the likelihood of exposure to unprotected workers or members of the general public visiting the landfill. Asbestos-containing materials are known to have been landfilled in Cell 32 and, therefore, may pose a significant health hazard to workers during excavation and sorting activities.

4.7 Biological and Other Contaminants

Excavated waste materials from a landfill can pose various biological hazards, primarily due to the presence of pathogens, contaminants, and organic matter. Potential biological waste in the form of needles (sharps) from general waste bins, dialysis equipment, and other inappropriately disposed of materials have the potential to be present in the waste stream at the landfill. The Brady Road facility accepts specified risk material (SRM) that includes carcasses, rendering and biproducts of infected or diseased animal mortalities, that are known to have been landfilled in Cell 32. These hazards include the potential for the spread of infectious diseases caused by bacteria, viruses, and parasites present in the waste.

For instance, pathogens such as *E. coli*, *Salmonella*, and Hepatitis A may thrive in organic waste within landfills, posing a risk of contamination if released during excavation. Additionally, decomposing organic matter can attract vectors like flies, rodents, and other pests, further spreading disease and causing environmental contamination. Additionally, biological hazards such as mould spores, pathogens, bacteria, viruses and potential diseases exist in landfill environments. Furthermore, exposure to airborne particulates and aerosols generated during excavation activities can exacerbate respiratory conditions and pose risks to the health of workers working in Cell 32 and the Search Facility.



5.0 REGULATORY REQUIREMENTS

The Manitoba Workplace Safety and Health Act and Regulations (2022) sets the safety and health requirements for provincially regulated businesses in the province.

5.1 Occupational Exposure Limits

In Manitoba, employers must establish occupational exposure limits where the presence of an airborne chemical or biological substance may create a risk to the safety or health of a worker. Section 36.5(1) of the *Workplace Safety and Health Act and Regulation* adopts airborne threshold limit values (TLVs) to chemical and biological substances established by the American Conference of Governmental Industrial Hygienists (ACGIH).

The ACGIH recommends that worker exposure to airborne contaminants does not exceed the threshold limit value – time-weighted average (TLV-TWA). The TLV-TWA is the maximum recommended airborne concentration of a chemical agent that should not be exceeded when averaged over an 8-hour workday and a 40-hour workweek. Short-term exposure limit (STEL) means the TWA concentration of a substance in air, which may not be exceeded over any 15-minute period, limited to no more than four such periods in an 8-hour work shift with at least one hour between any two successive 15-minute excursion periods.

The applicable occupational exposure limits for the anticipated airborne contaminants anticipated during the project are presented in Table 1: Applicable Occupational Exposure Limits.

Table 1: Applicable Occupational Exposure Limits

Parameter	ACGIH TLV-TWA	Short Term Exposure Limit (STEL)
Hydrogen Sulphide	1 ppm	5 ppm
Volatile Organic Compounds (as n-hexane)	50 ppm ^(a)	
Carbon Monoxide	25 ppm	
Respirable Particulate	3 mg/m³	
Crystalline Silica (Quartz)	0.025 mg/m ³	
Asbestos Fibres	0.1 f/cc	

a) a TWA-TLV for the parameter is not established by the ACGIH. It should be noted that an industry best practice is to adopt the TWA-TLV for n-hexane in lieu of a value for TVOCs, which is 50 ppm.

ppm = parts per million; STEL = short term exposure limit is the acceptable average exposure over a 15-minute time period; mg/m³ = milligrams per cubic metre of air; f/cc = fibres per cubic centimetre of air

A more detailed summary of the applicable occupational exposure limits that will be used for the project are provided in Appendix A.

5.2 Combustible Gases (Methane)

Section 19.8(1) Flammable or explosive substance in atmosphere of Part 19 Fire and Explosive Hazards in the Manitoba *Workplace Safety and Health Regulation* states that "an employer must ensure that a worker does not enter a workplace where a flammable or explosive substance is present in the atmosphere at a level that is more than 10% of the lower explosive limit of the substance".

5.3 Biological Contaminants

A "biological substance" is defined as a substance containing living organisms or parts of living organisms in their natural or modified forms. The Manitoba *Workplace Safety and Health Regulation* does not specifically address



worker exposure to biological contaminants; however, it does state that "it is necessary to identify and control any existing or potential hazards with respect to a workplace or any process, procedure or biological or chemical substance used at a workplace."

Potential worker exposure to biological contaminants at the Site will be addressed in the Exposure Controls and Personal Protective Equipment sections of this ECP.

6.0 ROLES AND RESPONSIBILITIES

The GoM is responsible for:

- reviewing and approving subcontractors' Health and Safety and Environmental Protection Plans (HaSEP) for the work to be performed by workers that include measures required to address potential exposure and hazards arising from airborne contaminants and combustible gas at the work site and emergency measures deemed necessary (e.g., procedures, equipment)
- reviewing subcontractors' Safe Work Procedures (SWPs) to ensure that all required measures relating to exposure controls and administrative controls described in the ECP
- ensuring subcontractors conduct Job Safety Assessments (JSAs), tailgate meetings and use knowledge of the worksite to identify hazards and measures required to address those hazards
- being alert to site conditions and changing situations that may require modifications of exposure control measures
- ensuring appropriate respiratory protection is available, that the workers are fit-tested and trained in the use of respirators, and monitoring workers' use of respirators, as well as possible issues that may occur, such as interference from protective equipment or clothing, discomfort, skin irritation or breakthrough of contaminants causing breathing difficulty
- ensuring that subcontractor workers use the assigned protective equipment in an effective and safe manner
- ensuring that subcontractor workers' protective equipment, including respirators, are properly cleaned, inspected, maintained and stored
- ensuring that daily measurements of airborne H₂S, %LEL, VOC, and asbestos fibres are being conducted during work activities and providing this information to workers without undue delay
- review subcontractor training required to address the above requirements and maintenance of training records, fit-test results and health and safety inspections

7.0 AIRBORNE CONTAMINANT EXPOSURE MANAGEMENT

7.1 Pre-Job Hazard Assessment

For any task or activity where contaminants may be present, a pre-job hazard assessment must be conducted, and a work plan must be developed prior to the commencement of work.

All affected workers (i.e., the work crew and other workers in the surrounding area) must be accounted for in the pre-job hazard assessment.



The following must be considered during the hazard assessment and reviewed with on-site personnel during the pre-job safety meeting:

- job-specific procedures
- contaminant hazards and where they may be found
- monitoring requirements (continuous or specified intervals)
- tending worker or safety watch, and rescue personnel requirements
- muster point location(s)
- alarms and emergency response and rescue procedures
- Personal Protective Equipment (PPE), including respiratory protection

8.0 EXPOSURE MONITORING

Instantaneous (real-time) and integrated air sampling will be conducted for the airborne contaminants of concern for the duration of the project, or at the discretion of the project Occupational Hygienist, to evaluate the potential for worker exposure to airborne contaminants and to determine if the engineering controls/administrative controls and appropriate respiratory protective equipment is being worn. The monitoring will include the collection of occupational air samples from at least one worker in each of the similar exposure groups (SEGs) working at the Site in accordance with acceptable sampling methods as outlined in the Manitoba *Workplace Safety and Health Act and Regulations*. For the integrated air sampling, it is expected that with rush analysis, results can be available within 48 hours following submission.

The exposure monitoring described below will be updated and modified as warranted based on actual site conditions encountered.

For all types of monitoring below, the readings or values must be recorded in tabular format with reference to the parameter monitored, the approximate location of the measurement relative to the work areas, tasks in progress and general observations at the time of the measurement.

Discontinuation of daily personal monitoring of one or more of the airborne contaminants of concern will be at the discretion of the project Occupational Hygienist and The GoM if enough monitoring data has been collected to determine that the exposure risk to a particular airborne contaminant is negligible.

8.1 Personal Monitoring for H₂S, %LEL, CO, O₂ and VOCs

Workers working in the excavation area or inside of the Search Facility where H₂S, %LEL, CO and VOCs may be present will don a personal monitor equipped with H₂S, combustible gas (%LEL), CO and O₂ electrochemical sensors and photoionization (PID) sensors. The monitor will be donned with the sensors exposed to the atmosphere in the worker's breathing zone for life safety protection.

Workers monitoring H₂S, %LEL, CO, O₂ and VOCs must be aware of the potential limitations and interference associated with the use of gas detection equipment. All equipment must be properly calibrated, bump-tested and maintained in accordance with the manufacturer's specifications. Each monitoring instrument will have documented up-to-date factory certification/calibration.



8.1.1 Calibration and Bump Testing

Each monitoring instrument must have documented up-to-date factory certification/calibration. Each instrument must be calibrated bump tested by a qualified person at the beginning of each workday and after an exceedance of an action level. A failed bump test (i.e., instrument response outside of +/- 10% of the expected) will be followed by a field calibration. Field calibrations must be conducted according to the instrument manufacturer's operating instructions using appropriate calibration gases. Zero gas (i.e., nitrogen), rather than ambient air, should be used to set the instrument zero point during field calibration.

All bump tests, field calibrations and equipment maintenance must be documented, and the documentation must be kept on file after the completion of the project.

8.1.2 Sampling and Monitoring Methods and Set-Points

Real-time monitoring for H_2S , %LEL, CO, O_2 and VOCs will be conducted using personal real-time gas monitors that measure H_2S , %LEL, CO, O_2 , and VOCs. The low alarm for H_2S will be 0.5 ppm, the low alarm for %LEL will be 10%, the low alarm for CO will be 12 ppm, the low alarm for O_2 will be 19.5%, and the low alarm for VOCs will be 25 ppm. The H_2S sensor resolution is 0.1 ppm.

8.2 Airborne Fibre Sampling

At a minimum, occupational integrated air samples for airborne asbestos fibres will be collected from select workers for the first 10-days of excavation and sorting activities to assess the exposure risk to workers and to ensure that appropriate PPE and RPE are being worn by workers.

Ten days after project start up, up to 10 of the highest fibre count samples will be sent under chain of custody to an independent American Industrial Hygiene Association (AIHA) accredited laboratory for rush turnaround analysis. One field blank will also be submitted for analysis for quality control purposes.

Discontinuation of occupational integrated air samples for airborne asbestos fibres will be determined by the project Occupational Hygienist once an appropriate number of samples have been collected and evaluated for potential exposure. The collection of additional occupational integrated air samples throughout the duration of the project will be at the discretion of the project Occupational Hygienist.

8.2.1 Sampling and Monitoring Methods and Set Points

Occupational integrated samples for airborne asbestos fibres will be collected using a sampling pump calibrated to draw a known amount of air through appropriate sampling media. The air samples will be analyzed following NIOSH 7400A methodology.

Due to the airborne contaminants of concern at the Site and the ongoing requirement for respiratory protection during sorting activities for worker protection, the occupational air samples will be compared to the maximum use concentration for asbestos, which in this case relies on the assigned protection factor (APF) of a half mask respirator. A half-mask respirator has an APF of 10; therefore, workers will be deemed to be protected if the occupational integrated air samples for airborne asbestos fibres are below 1.0 f/cc (10 x the TLV-TWA of 0.1 f/cc).

Based on the results of the air monitoring program completed by WSP during the pilot test excavation at the Brady Road facility on Aug 11-13, 2025, daily sampling for airborne contaminants will not be completed in the cabs of heavy equipment (e.g., excavators, haul trucks, etc.) used at Site. In addition, there is no requirement for equipment operators to wear disposable coveralls and respiratory protection while inside the heavy equipment cabs during excavation activities to remove overburden and excavate target zone materials unless asbestos



waste is identified by the operators, at which time the work will be paused and the project-specific asbestos management procedure will be initiated.

8.3 Action Limits and PPE Requirements

A detailed explanation of the action limits for H_2S , %LEL, CO, O_2 , VOCs, RP, RCS, and asbestos fibres and the PPE requirements are provided in Appendix B.



9.0 EXPOSURE CONTROLS

The regulatory background, training, safe work procedures, personal protective equipment, personal hygiene and decontamination, engineering controls, administrative controls and other precautions are described in this section.

The Manitoba *Workplace Safety and Health Act and Regulations* (2022) provides the following requirements for exposure control measures:

- If there is a risk to a worker from exposure to a hazardous substance by any route of exposure, the employer must eliminate the exposure or otherwise control it below harmful levels and below the applicable ACGIH Threshold Limit Values (TLVs) by:
 - elimination of the hazard
 - substitution with a less hazardous material or method
 - engineering controls
 - administrative controls, and/or the use of
 - personal protective equipment
- The use of personal protective equipment as the primary means to control exposure is permitted only when:
 - elimination of the hazard, substitution with a less hazardous material or method, engineering controls, and administrative controls are not practicable; or
 - additional protection is required because engineering or administrative controls are insufficient to reduce exposure below the acceptable ACGIH-TLVs; or
 - the exposure results from temporary emergency conditions only.
- Whenever possible, the hazard must be eliminated. Where this is not feasible, substitution must be considered. Substitution is the process of replacing a hazardous material or task with a less hazardous material or task. Given that the airborne contaminants at the Site are a byproduct of landfill gases and hazardous materials deposited in the landfill, elimination or substitution of the product is not practical.
- Administrative controls include training workers on the hazards of the materials they work with and how to protect themselves, developing and implementing work procedures that outline the best methods by which to do the work to prevent worker exposure, safety inspections, safety audits, and supervision. Administrative controls look to minimize worker exposure by changing worker behaviour and how workers carry out their work.
- The use of personal protective equipment, such as respirators and protective clothing, is a frequently used control method; however, it has potential drawbacks in that respirators and other protective measures must be correctly utilized and maintained, they may be uncomfortable for employees to wear, and it may present additional hazards resulting from the use of the equipment. As a result, personal protective equipment must typically only be used as a temporary control measure or when other control options have been investigated and found to be unfeasible or insufficient. The use of personal protective equipment as a control option requires a strong commitment to worker training and supervision.
- A combination of engineering controls, administrative controls and personal protective equipment will be utilized to minimize the exposure to the airborne contaminants of concern at Site.



9.1 Engineering Controls and Partial Elimination

Engineering controls can consist of general exhaust ventilation or portable fans to blow fresh air into the work area, with the objective of removing and diluting the airborne contaminants of concern inside the Search Facility. If ventilation is deemed necessary at the worksite, a nominal recommended fan size is 3,200 cubic feet per minute (CFM). The GoM shall appropriately size the fans for the work area and determine the necessity of the fans, which will depend on ambient environmental conditions, such as temperature and windspeed, during the work.

In addition to ventilation, operational controls will be implemented at the Search Facility to control the generation of airborne contaminants.

9.2 Administrative Controls and Other Precautions

Administrative controls that will be considered, as warranted, are job rotation, taking micro-breaks, instituting a windows-up / doors-closed policy for vehicles and equipment, and avoiding heavy-duty tasks of high physical demands. These minimize exposure duration and respiratory rate.

Workers must be aware of the wind direction on Site and position themselves upwind and away from the impacted areas as feasible. Workers should limit the duration of time spent in the impacted areas and the number of times the areas are entered for on-site tasks.

Any source of ignition including smoking, Cell phones or USB/PC communications must not be used in potentially hazardous locations near and within the excavation area and Search Facility because of general safety concerns and the potential for electrical sparks or static charge.

Additional information related to administrative controls is provided in the following sections.

9.3 Training

Workers will receive training on the following topics, with training documented.

- Complete a training course that informs workers of the hazards and control measures associated with the airborne contaminants of concern and document that the training has been provided to the employees.
- A general overview of the potential health effects, symptoms, and control options associated with the airborne contaminants of concern.
- Receive an orientation on the Site's rules and procedures along with the relevant emergency response and rescue/evacuation procedures.
- Requirements of the Manitoba *Workplace Safety and Health Act and Regulations* for working with chemical, physical, and biological hazards.
- Employee responsibility to follow prescribed work procedures, use personal protective equipment and decontaminate as appropriate for the level of exposure.
- Exposure controls to be utilized on-site (training, engineering controls, safe work procedures, personal hygiene and decontamination, and personal protective equipment usage).
- Respiratory protection training users, limitation, care and maintenance, user seal checks and fit-testing.



It is The GoM's responsibility to ensure training is provided to all workers involved with excavation and searching activities and First Nation members visiting the site based on this ECP and the Workplace Safety and Health Act and Regulations requirements.

9.4 Administrative Controls and Safe Work Procedures

Where contact with the airborne and dermal contaminants of concern are anticipated, work practices shall be implemented to reduce potential exposure. These include but are not limited to the following:

- Conduct pre-job hazard assessments.
- Erect conspicuous signage to inform workers of the hazard and limit access to authorized persons only.
- Use available engineering controls to minimize airborne contaminant release.
- Use job rotation where possible to minimize worker exposure to airborne contaminants.
- Avoid heavy-duty tasks of high physical demands in areas with known concentrations of airborne contaminants.
- Have an inspection and maintenance schedule for engineering controls used to reduce exposure.
- For real-time monitoring of landfill gases, record H₂S, %LEL, CO, O₂ and VOC alarm events.
- Preparation of daily Air Monitoring Reports with the results of the real-time monitoring and integrated air sampling laboratory reports.

Safe Work Procedures (SWPs) must be prepared that outline the potential hazards of the task, the tools required for the task, the personal protective equipment required for the task, the exposure controls utilized for each step in the task, and emergency response and procedures.

9.5 Respiratory Protective Equipment

Due to the known airborne contaminants of concern and odours anticipated during excavation and sorting activities, respiratory protection will be required for workers. Half-mask respirators fitted with Defender multi-gas cartridges will be the minimum respiratory protection worn by workers for the duration of the project. The Defender multi-gas cartridges with particulate filter protect against 11 different gas/vapours including: Organic Vapours, Chlorine, Hydrogen Chloride, Sulfur Dioxide, Hydrogen Sulfide, Hydrogen Fluoride, Chlorine Dioxide, Ammonia, Methylamine, Formaldehyde, and Particulates.

Respirator requirements may be reassessed by the project Occupational Hygienist upon receipt of real-time monitoring and integrated air sampling laboratory results. Workers required to wear respiratory protection will be properly trained on their use, limitations, care and maintenance and have passed a fit test conducted by a qualified individual. These half-mask respirators have a maximum protection factor of 10; thus, work must cease if concentrations exceed a value equivalent to 10 times the 15-minute short-term exposure limit (STEL) or 10 times the 8-hour ACGIH TLV-TWA.

9.6 Other Personal Protective Equipment

The following personal protective equipment must be utilized by all Search Technicians, Forensic Anthropologists, volunteers, and any First Nation visitors or family members:

- Coveralls Hooded disposable coveralls (e.g., Tyvek®, or alternative) will be worn by the Search Technicians during sorting activities; disposable coveralls must be removed and discarded before leaving the work area. These are required for two reasons: 1) to prevent skin contact with contaminants and 2) to prevent the spread of contamination from the work areas to other areas or personal property.
- Gloves Workers will use nitrile gloves under puncture resistant work gloves for all tasks in the work areas.
- CSA Approved Steel-Toed Rubber Boots Workers shall wear heavy-duty steel-toed rubber boots to protect
 their feet. To prevent the spread of contamination, workers will wash boots with soapy water when leaving the
 Search Facility work area.
- Hearing protection appropriate for noise levels at the worksite, where required.
- Hardhat.
- Safety glasses/safety glasses with side shields for workers who wear glasses or safety goggles.
- Five-head gas monitor, including sensors for H₂S, %LEL, CO, O₂ and VOCs.

9.7 Personal Hygiene and Decontamination

No eating, drinking or smoking will take place in any of the work areas. Workers are required to decontaminate prior to eating, drinking or smoking. Decontamination must include removal of disposable (e.g., Tyvek®, or alternative) and gloves and using warm water and soap to wash hands and face (including all exposed skin surfaces) and steel-toed rubber boots. Alcohol wipes must be used to clean the exterior and interior surfaces of respiratory protection. No steel-toed rubber boots used inside the Search Facility will be permitted to be worn outside of the Locker Trailer in the trailer village.

In order to minimize the spread of contamination outside of the worksite, employees will be required to decontaminate each time they leave the Search Facility. In addition to following the decontamination procedures listed above, the workers will change footwear prior to leaving the locker room, driving or accessing personal vehicles. PPE shall be stored in a container (bag or bin) and thoroughly decontaminated upon completion of the project site work. In addition to completing thorough cleaning and disinfection of PPE, practicing good hand hygiene will be imperative. Alcohol hand sanitizer rub will be used after removing nitrile gloves, however washing hands with soap and water after everything shift is mandatory.

Contingent measures for partial elimination or suppression of airborne contaminants of concern that will be implemented while working inside the Search Facility, if warranted, is to use water or a water-based surfactant to spray onto the waste piles inside of the Search Facility for dust/fibre control.

Decontamination of equipment that may come in contact with asbestos-containing materials in the excavation work areas must be addressed in the project's health, safety and environment plan. As warranted, this may include cleaning of equipment with soapy water. Wash-water must be collected and appropriately disposed of in accordance with regulatory requirements. Further discussion on equipment decontamination is beyond the scope of this document.



10.0 REPORTING

Following each day of exposure monitoring, WSP will prepare a daily Site Inspection and Air Monitoring report to summarize the observed field activities, field measurements, analytical results, and comparison to the applicable occupational exposure limits and action levels. The report will be quality-reviewed by a Certified Industrial Hygienist.

11.0 LIMITATIONS

This report has been prepared for the exclusive use of Government of Manitoba. WSP Canada Inc. has no obligation, contractually or otherwise, to any third persons using or relying upon this report for any reason and therefore takes no responsibility for damage suffered by any third party as a result of actions taken or decisions made on the basis of information or conclusions of this report.

Because of the limitations stated above, the findings, observations and conclusions expressed by WSP in this report are not, and should not be, considered an opinion concerning compliance of any past or present owner or operator of the site with any federal, provincial or local laws or regulations.

WSP will not be responsible for any real or perceived decrease in a property value, its saleability or ability to gain financing through the reporting of information in this report.

WSP's observations and/or any readings obtained will represent observed and/or measured conditions only at the date and time observed and/or measured.

WSP's assessment reports present professional opinions and findings of a scientific and technical nature. While attempts were made to relate the data and findings to applicable environmental laws, regulations, or industry standards, the report shall not be construed to offer legal opinion or representations as to the requirements of, nor compliance with, environmental laws, rules, regulations or policies of federal, provincial, or local governmental agencies. Any use of the assessment report constitutes acceptance of the limits of WSP's liability.

12.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned at 403-260-2281 or dave.ayriss@wsp.com.

WSP Canada Inc.

Dave Ayriss, B.Sc., CIH, CRSP, C-NRPP Senior Principal Occupational Hygienist

Christine Deputat, BSc., CRSP, CIH Occupational Hygienist

https://wsponlinecan.sharepoint.com/sites/ca-2025ca415789/shared documents/07. health, safety & environment/exposure control plan/ca0054372.5789_brady_exposure_control_plan.docx



APPENDIX A

Summary of Occupational Exposure Limits

October 2024 CA0039180.5749

Appendix A Summary of Occupational Exposure Limits Exposure Monitoring Plan Brady Road Resource Management Facility

Substance	ACGIH TLV (a)		Excursion Limits ^(d) (3xTWA/5xTWA)	IDLH (e)	Odour Threshold	Eye Irritation Threshold	
	8 hr TWA ^(b)	15 min. STEL (c)					
Hydrogen Sulphide	1 ppm ^(f)	5 ppm		100 ppm	0.008 ppm to 0.1 ppm	50 ppm to 100 ppm	
VOCs (as n-Hexane)	50 ppm		150 ppm/ 250 ppm	1,100 ppm	130 ppm	1,400 ppm to 1,500 ppm	
Carbon Monoxide	25 ppm		75 ppm/125 ppm	1,200 ppm	N.D	N.D	
Respirable Particulate	3 mg/m ^{3 (g)}		9 mg/m ³ / 15 mg/m ³	N.D ^(h)	N.D	N.D	
Respirable Crystalline Silica (Quartz)	0.025 mg/m ³		0.075 mg/m ³ / 0.125 mg/m ³	50 mg/m ³	N.D	N.D	
Asbestos Fibres	0.1 f/cc (i)		0.3 f/cc / 0.5 f/cc	N.D	N.D	N.D	

Note:

- (a) American Conference of Governmental Industrial Hygienists Threshold Limit Values
- (b) TWA time-weighted average
- (c) STEL short-term exposure limit
- (d) Excursion Limits for substances without a TLV-STEL, worker exposures may exceed 3 times the TLV-TWA for no more than 30 mins during a workday, and under no circumstances should they exceed 5 times the TLV-TWA, provided that the TLV-TWA is not exceeded.
- (e) IDLH immediate danger to life and health
- (f) ppm parts per million
- (g) mg/m³ milligrams per cubic metre of air
- (h) N.D not determined
- (i) f/cc fibres per cubic centimetre of air



APPENDIX B

Summary of Airborne Contaminant Action Levels and Mitigation

Appendix B Summary of Airborne Contaminant Action Levels and Mitigation Exposure Monitoring Plan Brady Road Resource Management Facility

		Monitoring					
Vapour Hazard	Action Level	Action	Frequency	Result	PPE Requirements	Additional Action	
Combustible Gases	<10% LEL	Continue to perform planned monitoring				No action required	
	>10% to 20% LEL	Repeat monitoring until %LEL < 10 %LEL			1	Take measures to mitigate landfill gas generation, where possible: During excavation activities, cover exposed excavation areas with backfill. In Search Facility, use general ventilation or fans to dilute landfill gasses.	
	>20% LEL	STOP WORK and Consult	ОН		STOP WORK	STOP WORK	
	<0.5 ppm	Continue to perform planned monitoring			Half-mask respirator with	N/A	
Hydrogen Sulphide	>1 ppm to <5 ppm	Repeat monitoring every 15-	minutes until H ₂ S <	: 0.5 ppm	Defender Multi-Purpose P100 Particulate Filter cartridge	Take measures to mitigate H_2S generation, where possible: During excavation activities, cover exposed excavation areas with backfill. In Search Facility, use general ventilation or fans to dilute H_2S gas.	
	>5 ppm	If > 5 ppm for 15 minute pe consult OH.	riod, stop work ar	nd evacuate the work area, and	STOP WORK	STOP WORK	
Carbon	<25 ppm	Continue to perform planned monitoring			N/A	Take measures to mitigate CO generation: In Search Facility, use general ventilation or fans to dilute CO.	
Monoxide	25 ppm	STOP WORK and consult OH			STOP WORK	STOP WORK	
Volatile Organic	<50 ppm	Continue to perform planned monitoring			Half-mask respirator with Defender Multi-Purpose P100 Particulate Filter cartridge	N/A	
Compounds (VOCs - as n-Hexane)	>50 ppm to <500 ppm	Repeat monitoring until VOCs < 50 ppm			Half-mask respirator with Defender Multi-Purpose P100 Particulate Filter cartridge	Take measures to mitigate VOC generation: During excavation activities, cover exposed excavation areas with backfill. In Search Facility, use general ventilation or fans to dilute VOCs.	
	>500 ppm	STOP WORK and consult (ЭН		STOP WORK	STOP WORK	
	<3 mg/m ³	Continue to perform planned integrated air monitoring			Half-mask respirator with Defender Multi-Purpose P100 Particulate Filter cartridge	N/A	
Respirable Particulate	>3 mg/m ³ to <30 mg/m ³	Repeat monitoring until Respirable Particulate < 3 mg/m ³			Half-mask respirator with Defender Multi-Purpose P100 Particulate Filter cartridge	Use water suppression to mitigate dust generation.	
	>30 mg/m ³	STOP WORK and Consult OH			STOP WORK	STOP WORK	
Respirable	<0.025 mg/m ³	Continue to perform planned integrated air monitoring			Half-mask respirator with Defender Multi-Purpose P100 Particulate Filter cartridge	N/A	
Crystalline Silica (as Quartz)	>0.025 mg/m ³ to <0.250 mg/m ³	Repeat monitoring until Respirable Silica (as Quartz) < 0.025 mg/m ³		Half-mask respirator with Defender Multi-Purpose P100 Particulate Filter cartridge	Use water suppression to mitigate dust generation.		
	>0.250 mg/m ³	STOP WORK and Consult	он		STOP WORK	STOP WORK	

Notes:

ppm - part-per-million mg/m³ - milligrams per cubic metre TVOC - total volatile organic compounds OH = Occupational Hygienist



Appendix F

Posi-Shell® Safety Data Sheet



GHS Safety Data Sheet

SDS

LSC Environmental Products, LLC Issue Date: December 14, 2021

Posi-Shell® Base Mix Page 1 of 4

1 Identification

Supplier LSC Environmental Products, LLC

2183 Pennsylvania Ave

Apalachin, NY 13732

Telephone: 607-625-3050 Fax: 607-625-2688 Web: www.lscenv.com

Product Name Posi-Shell® Base Mix

Description: Sodium Montmorillonite Clay (SMC) with Synthetic Fibers and Coloring

CAS Number: N/A

Recommended Use: Spray Applied Environmental Coatings.

2 Hazards Identification

Route of Entry: Eye Contact, Skin Contact, Inhalation Hazards: Eye: May cause mechanical irritation.

Skin: May cause drying resulting in dermatitis.

Ingestion: No known health effects.

Inhalation: Acute: Short term exposure may cause mechanical

irritation resulting in dry cough. May aggravate existing

respiratory illness.

Chronic: Repeated inhalation of respirable* crystalline silica above exposure limits can cause lung disease, including

silicosis and lung cancer.

NFPA: Not regulated, Non-hazardous

Composition / Information on Ingredients

ComponentCAS#AmountSodium Montmorillonite Clay (SMC)*N/A> 90%

4 First-Aid Measures

Eye: Flush eyes and under eye lids with plenty of water until irritation ceases. Contact

physician if irritation persists.

Skin: Wash with soap and water until clean. Contact physician if irritation develops.

Ingestion: None known.

Inhalation: Move to area free from dust. If symptoms of irritation persist, contact physician.

Inhalation may aggravate existing respiratory illness.

^{*}Typical western SMC contains 1-6% crystalline silica as quartz CAS# 14808-60-7.



GHS Safety Data Sheet

SDS

LSC Environmental Products, LLC Issue Date: December 14, 2021

Posi-Shell® Base Mix Page 2 of 4

5 Fire Fighting Measures

Flammability: Non-flammable

6 Accidental Release Measures

Personal Precaution: Avoid breathing dust; wear respirator approved for silica bearing dust.

Cleanup: Vacuum to avoid generating airborne dust. Avoid using water. Material

becomes slippery when wet.

7 Handling and Storage

Handling: Use NIOSH/MSHA respirators approved for silica bearing dust when airborne

SMC dust levels exceed PEL/TLVs. Clean up spills promptly to avoid making

dust. Storage area floors may become slippery if wetted.

Storage: Store in a dry place.

8 Exposure Controls / Personal Protection

Exposure Guidelines (Inhalation):

ComponentOSHA PEL (8 hr TWA)ACGIH TVLCrystalline Silica as Quartz0.1 mg/m³0.1 mg/m³

Particles not Otherwise Regulated

Total Dust 15 mg/m³ N/A Respirable Dust 5 mg/m³ N/A

Engineering Controls: None required for outdoor mixing and application. Use

local ventilation to maintain PELs/TLVs if handling

indoors.

Personal Protective Equipment:

Eye and Face Protection: Wear safety glasses or goggles during loading and

application to protect from dust, splashing, and spray

mist.

Skin Protection: Wear work gloves and approved work clothing. Personal

hygiene measures, such as washing hands and face after working with materials, are recommended.

Respiratory Protection: When handling generates dust wear P95 dust mask.

9 Physical and Chemical Properties

Appearance: Off-white dry powder. Small quantity of brown powder and fine

white fibers also present in package.



GHS Safety Data Sheet

SDS

LSC Environmental Products, LLC Issue Date: December 14, 2021

Posi-Shell® Base Mix Page 3 of 4

Odor: Not Determined

pH: 8-10 (5% aqueous suspension)

Relative Density (H2O=1): 2.45-2.55

Bulk Density (at 20° C): 55 lbs/cu ft as dry product

Melting Point: Approx. 1450° C
Solubility in Water: <2% soluble by weight.

Flammability: Non-flammable

10 Stability and Reactivity

Stability: Stable

Hazardous Decomposition Products: None under normal handling conditions.

Hazardous Polymerization: Will not occur.
Incompatible Materials: Hydrofluoric Acid.

11 Toxicological Information

Carcinogenicity:

- Sodium Montmorillonite Clay is not listed by ACGIH, IARC, NTP, or OSHA.
- IARC, 1997, concludes that there is sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica from occupational sources (IARC Class 1), that carcinogenicity was not detected in all industrial circumstances studied and that carcinogenicity may depend on characteristics of the crystalline silica or on external factors affecting its biological activity. NTP classifies respirable crystalline silica as "known to be a human carcinogen" (NTP 9th Report on Carcinogens 2000). ACGIH classifies crystalline silica quartz as a suspected human carcinogen (A2).

12 Ecological Information

No information available.

13 Disposal Considerations

Bury in licensed landfill according to local, state, and federal regulations.

14 Transportation Information

US DOT: Non-regulated

15 Regulatory Information

None of the components in this product are known to be regulated by national or international regulatory bodies.



GHS Safety Data Sheet

SDS

LSC Environmental Products, LLC Issue Date: December 14, 2021

Posi-Shell® Base Mix Page 4 of 4

16 Other Information

SDS Status:

Revised from MSDS format in 2015 to comply with GHS requirements.

All information presented herein is believed to be accurate; however, it is the user's responsibility to determine in advance of need that the information is current and suitable for their circumstances.

No warranty or guarantee, expressed or implied, is made by LSC Environmental Products, LLC as to this information or as to the safety, toxicity, or effect of the use of this product.

Appendix G

Bektra Odour Management System Documentation

It's Time to Upgrade Your Odour Control Products!



Fogging

Waterless Vapour



BIN BALLS Granular

Industry unique, light-weight, absorbing spheres infused with true odour neutralizing technology and a scent release formula that activates on contact with liquids.



ODOR-KEY

Odour Neutralizer Concentrates

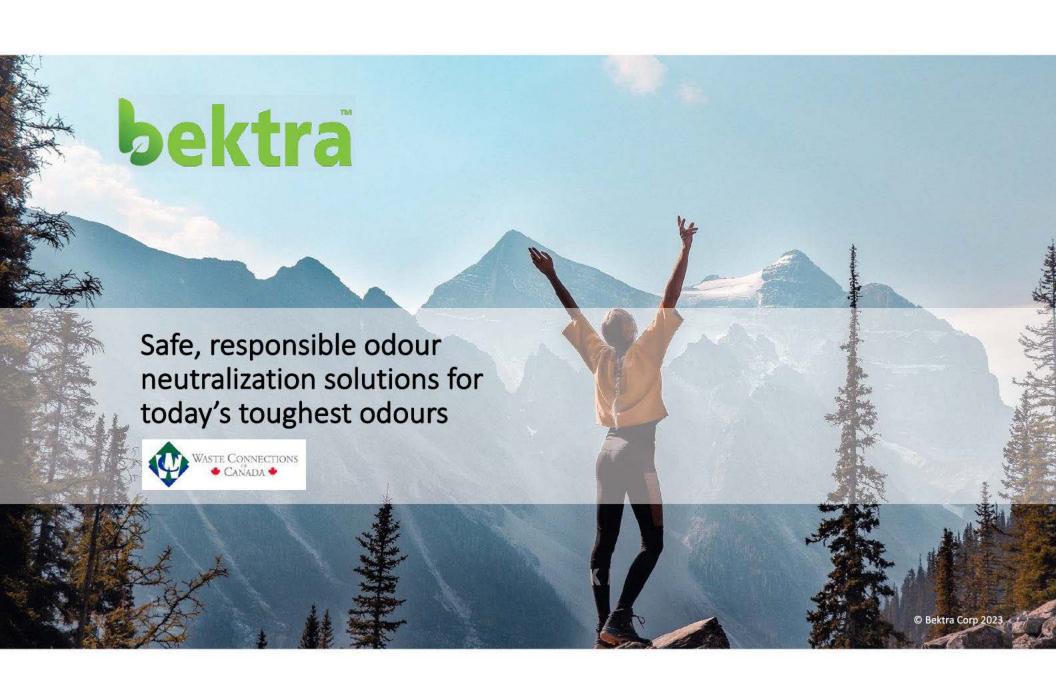
All natural multi-component odour neutralizing concentrates available in formulations for fogging and waterless vapour generators



VAPOR-TEC Air Treatment Systems

Self contained odour control generators used to deliver a waterless odour counteractant in the form of dry vapour.





bektra

- Proudly Canadian designer, manufacturer and distributor of odour neutralization products and the systems that deploy them
- Industry-leading environmental safety profiles and operational performance
- Proven experience in solid waste odour management
- Embraces the power of partnership through constructive alliances





- Preferred pricing across Canada
- Advanced portfolio in solid waste odour mitigation technology
- Easy ordering and favorable terms

Neutralize today's toughest odours with Bektra's next-generation solutions

Bektra's superior solutions for transfer stations, waste and recycling service bin services, and trash rooms

neutralize odours and help keep pests away



BIN BALLS Granular

Industry-unique light weight absorbent spheres infused with odour neutralizing technology and a scent release formula that activates on contact with liquids.



BIO-KEY

Foam

Penetrating foam odour neutralizing concentrate that cleans and prevents offensive odours in one easy step. Simply spray and walk away.



ODOR-KEY VP

Waterless

Waterless odour neutralizing concentrates for use in Bektra's Vapor-Tec ultra-dry vapor generating technology.



ODOR-KEY

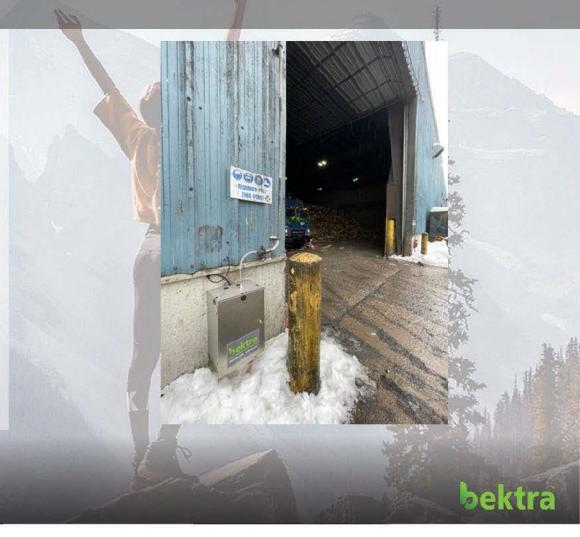
Fogging

Water-soluble odour neutralizing concentrates for use in air treatment as atomized solution through fogging nozzles.



Bektra VAPOR-TEC LVE & ODOR-KEY VP Waterless Odour Neutralizer

- Diffused. Vapor-Tec converts Odor-Key VP into sub-micron vapour
- Air-operated. No water required, vapour blown through diffuser pipe
- Powerful. Concentrated multi-component blend of natural odour neutralizing compounds
- Targeted. Industry-specific formulations
- Cost-effective. No water consumption and low solution rates (e.g. 4L/month/door)
- Year-round. No freezing or winterization
- Responsible. Environmentally sustainable
- Flexible. Rugged, easy to install



Bektra VAPOR-TEC/ODOR-KEY VP Waterless Odour Neutralizer

· How to use Vapor-Tec/Odor-Key:

- · Install Bektra Vapor-Tec stations and diffuser pipe
- · Connect to low-psi, low-flow, clean and dry compressed air
- Fill reservoir with ODOR-KEY VP

Where to use Vapor-Tec/Odor-Key:

- · Transfer station doors and floors
- · Garbage rooms and chutes
- · Material recovery processing
- · Food waste handling and disposal

Vapor-Tec vapor generator

- 2-year warranty
- · Purchase outright or lease to own
- · Vapor-Tec Flow Management Controller (FMC):
- Vapor-Tec RV5:

Odor-Key VP available in:

- 4 x 4L bottle cases at + shipping
- 20L pails at + shipping (approximately /month)



Bektra VAPOR-TEC/ODOR-KEY VP Waterless Odour Neutralizer

A complete VAPOR-TEC odour neutralization system for transfer stations



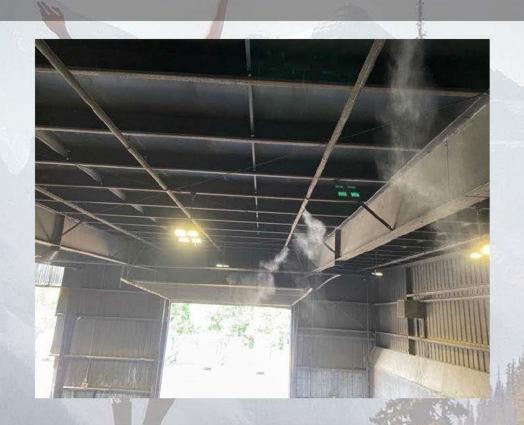






Bektra ODOR-KEY Water-Soluble Concentrated Odour Neutralization

- Powerful. Concentrated odour neutralizing compounds for treating airborne odours
- Compatible. Works with all fogging systems
- · Targeted. Industry-specific formulations
- Economical. High dilution capability for large multi-nozzle fogging applications
- Responsible. Non-toxic and biodegradable



bektra

Bektra ODOR-KEY Water-Soluble Concentrated Odour Neutralization

How to use Odor-Key:

Dilute with water and pressurize to create fine atomization at nozzles

Where to use Odor-Key:

- · Transfer station doors and floors
- Landfills

Available in:

20L pails at + shipping





Increase waste and recycling bin service revenue

Add easy odour neutralization products and services to your customer portfolio. Protect your brand, increase revenue and keep customer bins smelling clean and fresh



BIN BALLS Granular

Industry-unique light weight absorbent spheres infused with odour neutralizing technology and a scent release formula that activates on contact with liquids.





VAPOR-TEC PSE100 Waterless Vapor

Easily-installed battery or USB powered selfcontained vapour generator with Bluetooth programmability. Opportunity for monthly refill service revenue.

Bektra BIO-KEY Foaming Cleaner and Odour Neutralizer

- Powerful. Potent detergent and deodorizer that penetrates soils, oil and grease to tackle the source of odours
- Natural. Bio-stimulants breakdown organic compounds and inhibit production of nuisance odours
- Effective. Immediate results and long-lasting odour neutralization
- Easy. Easy to use spray and walk away
- · Safe. Completely bio-degradable and non-toxic



Bektra BIO-KEY Foaming Cleaner and Odour Neutralizer

How to use Bio-Key:

- Apply using a hose-end foam applicator or pumpup sprayer
- · Spray and walk away, no need to rinse

Where to use Bio-Key:

- · Trash room floors
- · Bins and chutes
- Trash tipping floors
- Landfills

· Available in:

- 4 x 4L bottle cases at + shipping
- 20L pails at + shipping
- 200L drums at + shipping





bektra



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info@bektra.com



https://www.linkedin.com/company/bektra-corp/



https://www.facebook.com/BektraCorp



https://www.instagram.com/bektra_corp



Ontario Made.

Natural odour neutralization products that make **SENSE** not just scent





Performance Advantages

The highly concentrated
Odor-Key VP 980 provides low
use rates and small solution
reservoir footprints. It is not diluted
with water and can be used in
cold weather environments.

COMMON AREAS OF USE:

- Transfer stations & landfills
- Garbage rooms & chutes
- Wastewater
- Compactors and recycling bins
- Kitchen exhaust
- · Food waste handling and disposal



The information presented in this technical data sheet is believed to be reliable. This information is provided as representative only and there are no warranties, expressed or implied, regarding its performance. Since neither distributor nor manufacturer has any control over handling, storage, use and application conditions, they are not responsible for any claims, liabilities, damages, costs or expenses of any kind arising out of or in any way connected with the handling, storage or use of the product described.

ODOR-KEY VP 980 Yukon Green

Waterless Odor Neutralizer for Vapor Applications

Odor-Key VP 980 is a concentrated, multi-component, blend of naturally occurring plant extracts and proprietary non-aldehyde odor management technology. The formula is designed to target, and permanently remove, airborne sulfur-based compounds and amines commonly associated with decomposing organics.

SPECIFICATIONS:

Appearance: Clear to slightly opaque liquid **Odor:** Slight with product specific key notes

Flash Point (CC): 60°C / 140°F Freezing Point (°C): -20°C / -4°F

DIRECTION FOR USE:

Odor-Key VP 980 is a **ready-to-use** concentrated liquid designed for use in forced air evaporators and dry vapor generating systems with particle size production not exceeding 5 microns. A Bektra Manufacturer's Representative should be consulted to review application protocol and dosage rates to maximize treatment performance.

PACKAGING:

OKV980-0016	4X4L	(4 x 1.06 gal)	17kg.	(38 lbs.)
OKV980-0020	20L	(5.3 gal pail)	22kg.	(48 lbs.)
OKV980-0200	200L	(53 gal drums)	216kg.	(476 lbs.)

STORAGE & HANDLING:

Keep out of reach of children. Product is intended for industrial use only. Keep container closed when not in use. Wear protective goggles and gloves when transferring or handling product.

Do not store in areas of high temperature or direct sunlight.







Photo 1 – Example Installation of Bektra RV5 Fans LP PR2182M System.



Photo 2 – Example Installation of Bektra LR Corridor RV5 Roof Mount Fans System.

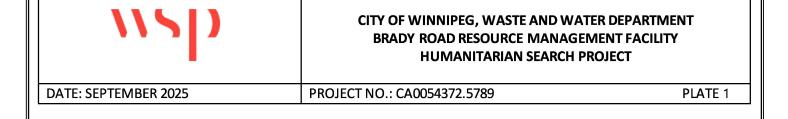




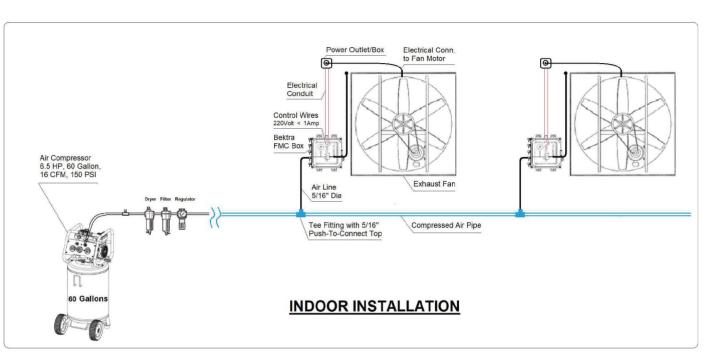
Photo 3 – Example Installation of Vapor-Tec ACU53 w RV8 PRSC2401 System.



CITY OF WINNIPEG, WASTE AND WATER DEPARTMENT BRADY ROAD RESOURCE MANAGEMENT FACILITY HUMANITARIAN SEARCH PROJECT

DATE: SEPTEMBER 2025 PROJECT NO.: CA0054372.5789 PLATE 2









Standard Limitations of Liability



STANDARD LIMITATIONS OF LIABILITY

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Overall conditions can only be extrapolated to an undefined limited area around these testing and sampling locations. The conditions that WSP interprets to exist between testing and sampling points may differ from those that actually exist. The accuracy of any extrapolation and interpretation beyond the sampling locations will depend on natural conditions, the history of Site development and changes through construction and other activities. In addition, analysis has been carried out for the identified chemical and physical parameters only, and it should not be inferred that other chemical species or physical conditions are not present. WSP cannot warrant against undiscovered environmental liabilities or adverse impacts off-Site.]

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