



**FINAL**  
**2022 Annual Monitoring Report**

Howie Road Landfill  
Ottawa, Ontario

Prepared for:

**The Corporation of the  
Municipality of Mississippi Mills**  
3131 Old Perth Road  
Almonte, Ontario K0A 1A0

SUBMITTED TO

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March 27, 2023

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March 27, 2023

The Corporation of the Municipality of Mississippi Mills  
3131 Old Perth Road  
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Re: 2022 Annual Monitoring Report  
Howie Road Landfill  
Pinchin Reference No. 275575.002

Pinchin Ltd. (Pinchin) is pleased to provide this 2022 Annual Monitoring Report for the Howie Road Landfill.

This report provides details of the monitoring program completed in 2022, an interpretation of the 2022 monitoring data, as well as our conclusions and recommendations.

Appended to this report are all the relevant technical data, as well as the Monitoring and Screening Checklist from the Ministry of the Environmental, Conservation and Parks Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water – Technical Guidance Document (November 2010), which provides certification for the Competent Environmental Practitioner (CEP).

We trust that this report satisfies your requirements. If you have any questions or comments, please contact us.

Yours truly,

Pinchin Ltd.

Tim McBride, B.Sc., P.Geo., QP<sub>ESA</sub>  
Director, Northern Ontario



## EXECUTIVE SUMMARY

The Howie Road Landfill Site (Site) is located in the west half of Lot 14, Concession VII, Huntley Ward in the former Township of West Carleton, now in the City of Ottawa, Ontario, approximately 11 kilometers (km) southwest of the Town of Almonte. The Site is owned and operated by the Municipality of Mississippi Mills (Municipality). The Site surrounding lands are designated in the City of Ottawa Official Plan as “Hazard” (south and west), “Extractive Industrial” (east and northeast), and “Residential” (north and northwest).

The Site has operated under the Ministry of the Environment, Conservation and Parks (MECP) Provisional Certificate of Approval (CofA) Number **A461001**, issued on April 15, 1980 (now referred to as an Environmental Compliance Approval (ECA)). This ECA was amended in February 2000 and October 2013. The Site has an approved waste disposal area of approximately 4.8 hectares (ha) within the total Site area of 31 ha. The Site is an active landfill with the current operations approved for and limited to the storage of brush and recyclables since April 30, 2014.

The monitoring program was completed in accordance with Section 31 of the ECA. Based on the findings of the 2022 monitoring program for the Site, the following conclusions were generated:

- No waste was imported to the Site or landfilled at the Site during 2022. In 2022, the Municipality regraded areas of cover where ponding water was present. Access roads were developed outside the fill area to facilitate maintenance on the groundwater well network;
- The overburden groundwater flow direction is inferred to be directed generally towards the northwest across the licensed landfill area. In the western portion of the Site, it is suspected that groundwater flow is influenced by the presence of the old and new ditches, as evident by the change in flow direction from northwest to west/southwest in that area. The bedrock groundwater flow direction is inferred to be directed generally towards the west/northwest, across the licensed landfill area;
- The overburden and bedrock groundwater elevations measured at the Site in 2022 were generally consistent with historical elevations and are generally stable over time with no distinctive trends in increasing or decreasing levels;
- Based on a review of the 2022 landfill gas monitoring, there is no evidence of gas migration within the Site;
- Leachate at the Site continues to be characterized by elevated concentrations of many inorganic parameters (e.g., alkalinity, barium, boron, chloride, iron, magnesium, manganese, and TDS) and by an organic load characterized by elevated DOC and BOD. Only trace levels of VOCs continue to be detected in the source zone. The leachate



plume varies in depth across the site. Higher concentrations of most leachate indicators are found within the middle portion of the overburden aquifer in proximity of the waste mound. Downgradient of the waste mound the core of the plume is generally found in the upper overburden aquifer for most of the leachate indicators. Bedrock groundwater at the site does not appear to be impacted by leachate stemming from the landfill beyond the immediate source zone area;

- To the south of the Site, the furthest downgradient monitoring well, OW-13M, is considered to be impacted by landfill leachate as elevated concentrations of alkalinity (high), calcium, conductivity, nitrate, TDS, DOC, hardness (high), manganese, and total phosphorous are significantly higher in comparison to the background conditions. It is possible that leachate impacts are migrating further south;
- To the north of the Site, a slight impact from landfill leachate may be occurring within the shallow and deep overburden aquifers; however, there is additional land available downgradient of the groundwater flow path to the west for natural attenuation to occur. Deep overburden monitoring well, OW-5D, quantified elevated concentrations of barium, a health-related parameter, at levels significantly higher in comparison to background conditions;
- To the west of the Site, landfill leachate impacts were not identified at the furthest downgradient monitoring well nests, OW-11 and OW-12;
- In 2022, the Ontario Drinking Water Quality Standard (ODWQS) exceedances quantified at one or more monitoring locations during the 2022 monitoring period include hardness (high), alkalinity (high), iron, manganese, DOC, TDS, sodium, arsenic, pH (high), and hardness (low). These parameters are all recurrent exceedances and are consistent with the historical results, the with exception of manganese at OW-4 during the spring event, which is interpreted to be anomalous and should be confirmed during the next monitoring period. With the exception of arsenic at OW-10D, all ODWQS exceedances quantified for general chemistry during the 2022 monitoring period are either aesthetic objectives or operational guidelines for drinking water systems set by the ODWQS and are not considered to be a significant human-health or environmental concern originating from the Site. Elevated levels of arsenic (a health-related parameter) are observed at the source and near-field monitoring wells; however, concentrations attenuate to acceptable levels with distance from the waste deposits, as observed in the downgradient monitoring locations. No VOC concentrations that would warrant concern or remedial action were identified in 2022;

- Groundwater quality at shallow overburden monitoring wells OW-10S and OW-11S were compared to the PWQO to assess potential discharge to surface water. PWQO exceedances for the 2022 monitoring period were quantified consistently for DOC, iron, manganese, and total phosphorous at both OW-10S and OW-11S. These concentrations are consistent with the historical monitoring record and the exceedances are consistent with those detected during previous monitoring events for OW-10S. Additionally, concentrations of boron and phenols at OW-10S exceeded the PWQO. It is not interpreted that groundwater discharge to surface water is resulting in significant impacts to the surface water quality. Additional opportunity for natural attenuation is available through the surface water works (i.e., berm and wetland) downstream of well nests OW-10 and OW-11;
- The Guideline B-7 RUL evaluation was limited to the most impacted screen intervals of the overburden and bedrock wells located furthest downgradient in each direction (north, west, and south) from the Site; this includes monitoring wells OW-5S, OW-6, OW-7, and OW-8S in the north, OW-11M and OW-12D in the west, and OW-1S, OW-2D, BR-1, and OW-13M in the south. All parameters satisfied the respective RUL criteria during the 2022 monitoring period with the exception of:
  - DOC at OW-6, OW-7, OW-11M, and OW-13M;
  - Iron at OW-6 and OW-7;
  - Manganese at OW-6, OW-2D, OW-11M, and OW-13M;
  - TDS at OW-1S, OW-2D, and OW-13M;
  - Nitrate at OW-13M; and
  - Nitrite at OW-12D.
- DOC, iron, manganese, and TDS are either operational objectives or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant human-health or environmental concern originating from the Site. Furthermore, concentrations of DOC, iron, manganese, and TDS are significantly lower at these downgradient locations in comparison to the source water quality indicating that natural attenuation is occurring with distance from the Site. Considering that additional lands are available between these wells and the property boundary and with the aid of the drainage attenuation works, it is interpreted that concentrations of these parameters are attenuated to acceptable levels prior to the property boundary. Elevated nitrate concentrations at OW-13M are not within the historical range of fluctuation at this location; however, elevated concentrations have consistently been quantified at this level since the spring of

2019. Further monitoring is therefore required to confirm the potential presence of a seasonal nitrate trend at OW-13M. Elevated nitrite concentrations at OW-12D are not within the historical range of fluctuation at this location and further monitoring is required;

- Overall, with respect to groundwater quality in 2022 groundwater leachate impacts continue to be detected immediately downgradient of the fill area in the central western portion of the site (i.e. source zone). The groundwater generally flows to the northwest and leachate attenuates along the flow path to within background levels at the western property limits. Groundwater leachate is present along the northern boundary of the site, and its migration is mitigated by the presence of the drainage works and the northwestern horizontal hydraulic gradient. Background conditions are found upgradient of the site to the east of the fill area. To the south of the site, the only available monitor is quantifying evidence of leachate;
- Concentrations of leachate indicator parameters such as ammonia, chloride, conductivity, arsenic, boron, cobalt, and iron are elevated in comparison to background conditions at surface water monitoring locations SW-2, SW-5, and SW-18 located within the collector ditch (i.e., old ditch). This is expected since the shallow groundwater and/or landfill surface water flow outlets into the old ditch, now acting as a collector ditch which was designed to mitigate impacts to the natural habitat of the new ditch and downstream wetland. Concentrations of these parameters attenuate downstream, but remain above the background level. The concentrations indicate that the water quality in the downstream wetland is influenced by leachate input from both the new ditch and the collector ditch. This suggests that leachate flows through the downstream portion of the interceptor berm and discharges to the new ditch under low water table conditions (i.e., mostly in the fall);
- Surface water monitoring location SW-3, located on the downstream property boundary, and SW-7, located off-Site, are considered the compliance points. Concentrations at these locations during the 2022 monitoring period which exceeded the PWQO, and the background concentrations at SW-1 include iron and total phosphorous. Based on the concentration distribution along the flow path of both the new ditch and the collector ditch, it is interpreted that landfill leachate is slightly contributing to the exceedances at SW-3 and SW-7. The concentrations indicate that leachate is seeping through the interceptor berm, and also that some leachate flows down from the new drainage ditch; and



- The results of the benthic monitoring indicate similar findings to the chemical surface water quality assessment which identified that slight impacts to water quality are occurring at the downstream monitoring locations SW-3 and SW-7.

Based on the findings of the 2022 monitoring program, the following recommendations are provided for consideration:

- All of the groundwater monitoring wells should be surveyed for top of casing and ground surface elevations due to repeated heave/cut adjustments made over the years;
- Landfill gas monitoring at the Site should be continued in 2022 under frozen conditions;
- Groundwater monitoring at the Site should be continued in 2023, as summarized in the section below in accordance with the MECP approved program changes. The following changes to the groundwater monitoring program have been approved:
  - Monitoring wells OW-10S and OW-11S are the PWQO evaluation monitors. Analytical methods that provide detection limits that meet the PWQO should be requested for monitoring wells OW-10S and OW-11S;
  - Water level measurements and inspections are to be completed at all groundwater monitoring wells in the spring and fall. Groundwater samples are to be collected from 18 locations (OW-1D, OW-2D, OW-4, OW-5S, OW-5D, OW-6, OW-7, OW-8S, OW-10D, OW-11S, OW-12S, OW-13M, MW-1S, MW-1M, MW-1D, BR-1, BR-2, BR-3) plus any future new wells;
  - As landfill leachate impacts have been identified at the southern downgradient well OW-13M and increasing concentrations are persisting, monitoring well OW-14 has been installed in the southern quadrant of the site and should be included in the sampling program going forward;
  - Once landowner authorization is confirmed, installation of a new bi-level well to the north of the Site should be completed to address the recurring presence of RUL exceedances of barium at OW-5D, specifically due to the use of domestic groundwater wells to the north as potable supplies;
  - Groundwater VOC samples are to be collected from monitoring locations MW-1S, OW-8S, OW-9S, MW-1D, BR-3, OW-5D, and OW-13D; and
  - A groundwater site-specific trigger level mechanism or a contingency plan should be developed for the Site.

- Surface water monitoring at the Site should be continued in 2023, as summarized in the section below in accordance with the MECP approved program changes. The following changes to the surface water program have been approved:
  - Surface water monitoring parameters are to be limited to the comprehensive list (i.e. Schedule 5, Column 3, Landfill Standards) with the addition of cobalt and hardness;
  - Surface water monitoring location SW-2 is to be removed from the sampling program given that the collector ditch is sealed off;
  - Surface water monitoring locations SW-18 and SW-19 are added to the monitoring program to monitor the effectiveness of the downstream berm between the collector ditch and wetland;
  - Surface water monitoring location SW-20 is added to the monitoring program in the interim to confirm upstream surface water quality in the residential drainage ditch prior to SW-6B. At least one more year of monitoring is required;
  - Phenolic compounds and semi-VOCs are to be removed from the surface water testing program based on their lack of detection over the historical sampling period. Testing for these parameters should resume if groundwater testing indicates a significant increase in VOCs;
  - PAHs should continue to be tested as requested by the MECP reviewer at SW-1, SW-5, and SW7. The reviewer recommended only testing for total PAHs; however, since PWQO are only available for individual PAHs, it is recommended to continue with individual PAHs and to request the lowest possible detection; and
  - The monitoring frequency is to be reduced to two surface water monitoring events per year (spring and fall, specifically during May and September).
- The previously established benthic monitoring program should continue during the spring 2022 event. A reduction in the program to a screening level benthic monitoring program has been approved; and
- It is recommended to further evaluate the collector ditch, new ditch, downstream berm, wetland, and vegetation growth at the site to determine what additional measures could be implemented to limit the flow of leachate and increase attenuation to ensure that surface water reaches background concentrations prior to migrating off-site. Improvements to the downstream berm are required to eliminate the flow of surface water under the berm during the low water level periods.





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