

Provincial Officer's Order

Order Number

1-277723794

Order Issued To

GFL ENVIRONMENTAL INC.
100 NEW PARK PL UNIT 500, VAUGHAN, ON, L4K 0H9

Site

GFL Stoney Creek Regional Facility
65 GREEN MOUNTAIN RD W, HAMILTON, ON, L8J 1X5

Refer to the Definitions section in the Provincial Officer's Report, Part B of this Order, for the meaning of all the capitalized terms that are used in this Order.

PART A - WORK ORDERED

Pursuant to my authority under **EPA | 157.1, EPA | 157**, I order you to do the following:

Item No. 1 **Compliance Due Date:** Apr-10-2024

Upon service of this Order and until cell 9A is commissioned, or June 1, 2024, whichever date comes first, do not deposit Waste higher than the current maximum Waste height of 235.75mASL.

Item No. 2 **Compliance Due Date:** Apr-17-2024

By April 17, 2024, post a copy of this Order to your website so that it is publicly accessible.

Item No. 3 **Compliance Due Date:** Apr-18-2024

By April 18, 2024, add to the weekly progress report required by the 2023 Order a report on the status of the commissioning of cells 9A and 9C.

Item No. 4 **Compliance Due Date:** Jun-01-2024

By June 1, 2024, commission Cell 9A, as outlined in the Design & Operations Report.

Item No. 5 **Compliance Due Date:** Jun-01-2024

By June 1, 2024, or upon commissioning of Cell 9A, whichever date comes first, cease depositing Waste above the approved final contours of the Site (221.75mASL) and begin to decrease the contours of the balance of the

Site.

Item No. 6 Compliance Due Date: Jun-01-2024

By June 1, 2024, or within one week of the commissioning of Cell 9A, whichever date comes first, perform a contour survey of the landfill to determine the total volume of Waste currently placed at the Site and provide the results of this survey and an isopach drawing via email to Tamara.Posadowski@ontario.ca and Environment.Hamilton@ontario.ca.

Item No. 7 Compliance Due Date: Jun-01-2024

By June 1, 2024, or upon commissioning of Cell 9A, whichever date comes first, add to the weekly progress report required by the 2023 Order, the total volume of Waste that has been relocated for the week.

Item No. 8 Compliance Due Date: Oct-01-2024

By October 1, 2024, commission Cell 9C, as outlined in the Design & Operations Report.

Item No. 9 Compliance Due Date: Dec-31-2024

By December 31, 2024, relocate and store all Waste deposited since July 1, 2023, below the approved final contours of 221.75mASL.

Item No. 10 Compliance Due Date: Dec-31-2024

By December 31, 2024, perform a contour survey of the landfill to confirm the total volume of Waste placed at the Site and provide the results of this survey and an isopach drawing via email to Tamara.Posadowski@ontario.ca and Environment.Hamilton@ontario.ca.

Item No. 11 Compliance Due Date: Dec-31-2025

By December 31, 2025, ensure that all Waste on Site is stored below the approved final contours of 221.75mASL.

Item No. 12 Compliance Due Date: Dec-31-2025

By December 31, 2025, perform a contour survey of the landfill to confirm the total volume of Waste placed at the Site and provide the results of this survey and an isopach drawing via email to Tamara.Posadowski@ontario.ca and Environment.Hamilton@ontario.ca.

PART B - PROVINCIAL OFFICER'S REPORT

This Order is being issued for the reasons set out below.

Definitions

For the purposes of this Order, the following capitalized terms shall have the meanings set out below:

"2023 Order" means the Provincial Officer's Order 1-237438590 issued to GFL on October 18, 2023.

"Design & Operations Report" means the Design & Operations Report for the Stoney Creek Regional Facility Environmental Assessment, dated July 2019, that is part of Item No. 57 in Schedule A of the ECA and must be complied with under condition 1.3 of the ECA.

"ECA" means the Environmental Compliance Approval, A181008 issued by the Ministry regarding the operations at the Site.

"EPA" means the Environmental Protection Act, R.S.O. 1990, c. E.19.

"GFL" means GFL Environmental Inc.

"Leachate Assessment Report" means the Leachate Assessment Report dated December 8, 2023, and prepared by GHD on behalf of GFL, and a copy of which is attached as part of this Order.

"Ministry" means the Ontario Ministry of the Environment, Conservation and Parks.

"Order" means this Provincial Officer's Order No. 1-277723794, as it may be amended.

"Provincial Officer" means the undersigned provincial officer or, in the event that the undersigned officer is unable to act, any other provincial officer authorized to act pursuant to the EPA.

"Site" means the property listed above in the Site section and further described below in the section entitled Description of the Site and/or System/Facility.

"Waste" means the waste type described in sections 6.1 and 6.2 of the ECA.

"Waste Relocation Plan" means the plan submitted by GFL to the Ministry on January 22, 2024 and referred to below.

Description of Person(s) Subject to the Order

GFL Environmental Inc. is an active Ontario corporation with Ontario Corporation Number 1000399619, that was amalgamated on January 1, 2023.

GFL acquired the Site on February 2, 2022 and has continued the operations at the Site as a waste disposal site (landfilling site). Many of the employees of the former owner of the Site are still involved in the operations of this Site, under the management and control of GFL.

Description of the Site and/or System/Facility

The Site includes the active filling property municipally known as 65 Green Mountain Rd. W., Hamilton, Ontario, L8J 1X5, which is legally described as all of PIN 17097-2071 (LT).

The operations regarding the Site also include the property with the leachate pond, which is located to the west of the active landfill operations, in the Heritage Green Sports Park which is legally described as all of PIN 17097-2822 (LT). The leachate pond stores treated leachate from the landfilling operations before it is discharged to municipal sanitary sewers.

Details describing the Site are included in Item 4.2 of the Leachate Assessment Report.

To the north and south of the Site there are residential neighbourhoods, and also to the west of the leachate pond. To the east of the Site, there is agricultural lands, various recreational activities and additional residences.

The Site is subject to the ECA which approves the receipt and disposal of solid, non-hazardous waste. No hazardous, liquid industrial, or putrescible wastes may be received at the Site. The Site has been operating since 1996 and in 2019 received approval under the Environmental Assessment Act for an expansion. The ECA relating to the expansion, was issued on October 31, 2019, and was amended in 2021 for construction and installation of major works and again in 2023 as required to provide an updated financial assurance plan.

Reasons for the Order

This Order is being issued to formally set out the Ministry requirements regarding the steps to be undertaken by GFL to achieve compliance with the ECA in respect of the Waste contours of the Site.

The ECA for the Site contains the following key conditions relevant to this Order:

1.3 "Except as otherwise provided for in this Approval, the Site shall be designed, developed, constructed, operated and maintained in accordance with the supporting documentation listed in Schedule "A". "

6.16 "No waste, including intermediate cover or final cover layer, shall be landfilled outside the limits of the base and final cover contours as shown in Item No. 57 in Schedule "A". No waste shall be disposed of within the buffer lands."

Item No. 57 in Schedule "A" is listed as: "Application to Amend Environmental Compliance Approval No. A181008, Terrapure Environmental Stoney Creek Regional Facility, signed by Lorenzo Alfano, dated July 11, 2019" and includes the Design & Operations Report which GFL has not amended.

The Design & Operations Report describes the final contours as a maximum elevation of about 221.75mASL, which is to include the final vegetated cover.

Condition 6.16 has appeared in previous amendments of the ECA, and the ECA provides the following reason for condition 6.16:

"The reason for Condition 6.16 is to specify restrictions on the extent of landfilling at this Site based on the Owner's application and supporting documentation. These limits define the approved volumetric capacity of the site. Approval to landfill beyond these limits would require an application with supporting documentation submitted to the Director."

Since I became the Provincial Officer assigned to the Site, I have determined that GFL is not operating in accordance with the Design & Operations Report, specifically in regard to the following:

- I. Waste contour heights;
- II. leachate head level; and
- III. final cover application.

I originally raised concerns about the Site landfill contours with GFL on September 12, 2023. In conversations with GFL, I understand that GFL believes they are in compliance with the ECA because the Waste has been placed there on an interim basis only and that the ECA only restricts elevation of the final grade. GFL also indicated that this was a standard operating practice of the Site, that a condition of a previous ECA issued in 1996 only regulated the Site's final contours, and that GFL continues to operate within the confines of its volumetric capacity restrictions.

I have responded to GFL that I enforce compliance with the existing ECA. When a new ECA is issued for a site, the older version is revoked by the signing Director, as indicated in the current ECA "Upon issuance of the environmental compliance approval, I hereby revoke Approval No (s). A181008 issued on July 23, 2021". The current ECA condition is very clear in stating that "no waste" is to be landfilled outside the final contours, so placement of Waste on an interim basis is not permitted. In order to place Waste above the approved final contours at the Site, GFL must apply for an ECA amendment.

As for operating within its volumetric capacity, GFL's current ECA has an approved capacity of 10,180,000 m³. However, this capacity takes into account the area that is to be incorporated into the landfill during its expansion. This expansion is not complete at this time, so the area required to deposit the approved volume of Waste is not available.

On November 24, 2023, I completed an inspection at the Site to assess compliance with section 6.16 of the ECA. This inspection involved the review of topographical survey information from January 2023 which showed landfill contours and volumes, along with in field measurements which I collected using a Trimble Geo 7X unit. Review of the topographical survey identified two areas of the landfill that are above the approved final contour elevation. During my Site inspection I visited these areas, determined they were inactive Waste piles, took my own measurements and confirmed these areas were still above the approved final contours

(measurements of 231.54mASL and 225.58mASL for the two areas of concern). Measurements collected on the active tipping face of the landfill at that time showed elevations ranging from 219.48mASL to 222.10mASL. So, the active tipping face at this time was already at or near the final contour elevations of the landfill.

On December 8, 2023, GFL provided the Ministry with a copy of the Leachate Assessment Report which I had requested in October 2023. Included in the report is a description of the Waste cover areas and recommendations regarding the importance of having appropriate waste cover to reduce leachate generation. Also included is a description of the historic and current levels of leachate at the Site, which has indicated that the leachate head level has been consistently above the required 0.5m, set out in the Design & Operations Report.

Information provided in the Attachment 1 section of the Leachate Assessment Report indicates that GFL has not been landfilling the Waste and applying final cover as per the approved design as outlined in the Design & Operations Report. This has most likely contributed to the generation of more leachate and has added to the already high leachate head levels. The Leachate Assessment Report also states that final cover is not keeping pace with liner construction, which is resulting in larger areas of exposed Waste which increases leachate generation.

On December 20, 2023, I issued my inspection report to GFL. The inspection report outlines that there was Waste currently placed in the landfill in excess of the approved final contours, which is in contravention of condition 6.16 of the ECA.

Also included with the inspection report was a list of actions items which included the requirement for GFL to submit a plan to reduce the heights of the Waste piles at the landfill that are currently above the approved final contours.

On January 8, 2024, which is after GFL received my inspection report which identified the non-compliance of the Waste heights; GFL moved the active tipping face of the landfill and continued to deposit Waste above the maximum permitted height. New cell construction was not completed as expected in 2023, due to GFL's focus on leachate management and odour compliance issues. GFL has indicated Waste needs to be deposited in this area until a new cell is commissioned.

On January 22, 2024, the Ministry received as requested following my inspection report, an email submission from GFL including the Waste Relocation Plan. It provided staged dates for the relocation of Waste currently stored above approved final contours and the June 2024 and October 2024 completion dates for Cells 9A and 9C. The Waste Relocation Plan lacked certain details and suggested a final resolution date of December 2025. The Ministry and GFL have since met and discussed the plan.

In GFL's Waste Relocation Plan, the plan speaks to reducing heights of interim Waste storage to pre-upset heights, and identifies pre-upset heights as pre-July 2023. Based on the plan and discussions had with GFL afterwards, pre-upset is to be interpreted as all Waste received at the Site since July 1, 2023 and up to the commissioning of the next new cell, 9A.

From July 1, 2023, to March 31, 2024, GFL has received 421,479.42 metric tonnes of Waste which is an approximate volume of 221,831.27m³. GFL is to ensure that, by December 31, 2024, this amount of Waste, and any additional Waste received at the Site until June 1, 2024, or when cell 9A is commissioned, whichever date comes first, is relocated to areas of the Site which are below the approved final contours of the Site.

The Waste relocation should be prioritized over the receipt of new Waste to ensure that the volume of Waste stored above the limit can be relocated into the new cells by the dates outlined in the Waste Relocation Plan and in the Order items above. Also, by prioritizing the Waste relocation, it will ensure that final cover can be applied to the areas where this Waste is currently being temporarily stored, so that leachate generation can be reduced, and will assist GFL in achieving the targeted leachate head level of 0.5m.

In GFL's Waste Relocation Plan, it states that "During the removal of the waste, odour will be assessed. Odour mitigation measures will be deployed as required in accordance with the odour management plan." GFL must ensure odour mitigation measures are available at the Site, prior to Waste relocation, so that if they are necessary, they are immediately available for use. The Waste must be relocated in such a manner to ensure that no nuisance odours are generated as a result, as required by condition 5.17 of the ECA. Should GFL not be able to do this, the Ministry will take additional steps and actions as required.

A draft copy of this Order was provided to GFL on March 19, 2024 for the company to provide comments and feedback on the Order requirements. Comments from GFL were received on March 25, 2024 and were considered prior to the issuance of this Order.

Conclusion

Notwithstanding the work being done by GFL regarding the 2023 Order, from January 1, 2024, to April 8, 2024, the Ministry has received 302 odour complaints from local residents regarding various odours relating to the Site, including Waste, leachate and the leachate pond. The current heights of the Waste piles are a concern as I believe they are contributing to the Waste odours currently being detected off-site. Based on my observations, odours experienced during the summer of 2023 were predominantly odours associated with the leachate. The odours that are now being experienced off-site are usually associated with Waste material at the Site.

GFL's actions of placing Waste above final contours and not keeping up with the final cover and capping, will result in an increased generation of leachate. The current leachate head level in the landfill remains above the levels outlined in the Design & Operations Report and is being addressed by the 2023 Order. These actions, I believe, have likely contributed to the odour issues experienced at the Site in the summer of 2023 and that GFL has not been operating in accordance with their Design & Operations Report and the ECA. Further, the elevated leachate levels prevented GFL from continuing its cell expansion in 2023 which has resulted in GFL placing Waste above the final contours. GFL's actions of temporary stockpiling Waste above final contours is unacceptable and a contravention of the ECA.

This Order is being issued as both a contravention order and a preventive measure order and formally sets out the Ministry's requirements following the discussions with GFL.

Authority to Issue the Order

I am issuing this Order under my authority as a Provincial Officer under the following legislation, which also includes the authority to take intermediate action and/or procedural steps:

This Order is issued pursuant to EPA s. 157 and section 157.1.

I reasonably believe that GFL Environmental Inc. has contravened or is contravening s.40 of the EPA as outlined in the Contraventions section below and described in some detail above.

I further reasonably believe that the requirements specified in this Order are necessary or advisable so as to prevent or reduce the risk of a discharge of a contaminant, namely odours, into the natural environment from the undertaking at the Site or to prevent, decrease or eliminate an adverse effect that may result from the discharge of a contaminant from the undertaking at the Site.

Contraventions

EPA 40	40. No person shall deposit, or cause, permit or arrange for the deposit of, waste upon, in, into or through any land or land covered by water or in any building that is not a waste disposal site for which an environmental compliance approval or renewable energy approval has been issued or a registration under Part II.2 is in effect and except in accordance with the terms and conditions of the approval or the regulations made for the purposes of Part II.2.
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Attachments

The attachments listed below, if any, form part of this Order:

Leachate Assessment Report (28 pages)

ISSUING OFFICER

Name: Tamara Posadowski

Job Title: Environmental Compliance Officer

Badge Number: 1861

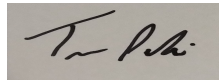
Address: 119 KING ST W, 9TH FLR, HAMILTON, ON

Officer Email: tamara.posadowski@ontario.ca

Office Email: Environment.Hamilton@ontario.ca

Date: Apr 10, 2024

Signature:



REVIEW AND APPEAL INFORMATION

REQUEST FOR REVIEW

You may request that this Order be reviewed by the Director. Your request must be made in writing or orally with written confirmation. Your written request or written confirmation of your oral request must be received by the Director within 7 days after the date this Order was served on you and must be given to the Director as indicated in the Contact Information below.

In your written request or written confirmation, you must:

- specify the portions of this Order that you wish to be reviewed;
- include any submissions to be considered by the Director with respect to issuance of this Order to you or any other person and with respect to the contents of this Order;
- apply for a stay of this Order, if necessary; and
- provide an address for service by one of the following means, in person, by mail, by commercial courier, by fax, or by email.

In response to your request, the Director may confirm, alter/amend or revoke this Order. As an intermediate step, the Director may stay this Order by providing written notice to you that additional time is required to make a decision.

The Director will serve you with a copy (written notice) of the decision to revoke this Order or of an order, a Director's Order, to confirm or alter/amend this Order, together with reasons.

DEEMED CONFIRMATION OF THIS ORDER

If within 7 days of the Director receiving your request for review you do not receive written notice of a stay, or oral or written notice of the Director's decision on your request for review, this Order is deemed (considered) to have been confirmed by Order of the Director and deemed to have been served upon you at the expiry of those 7 days.

APPEAL INFORMATION (REQUIRE A HEARING)

A. If this Order is deemed confirmed as explained above, you may require a hearing by the Ontario Land Tribunal on the deemed confirmed Order within 15 days of the deemed service date:

- you must serve as indicated in the Contact Information below, written notice of your appeal on the Ontario Land Tribunal and the Director within those 15 days of the deemed service date;

- your notice must state the portions of the deemed confirmed Order for which a hearing is required and the grounds on which you intend to rely at the hearing;
- unless you have leave (permission) of the Ontario Land Tribunal, you are not entitled to appeal a portion of the deemed confirmed Order or to rely on grounds of appeal that are not stated in your notice requiring the hearing; and
- written notice requiring a hearing must be served on the Ontario Land Tribunal and the Director as indicated in the Contact Information below.

B. If this Order is confirmed or altered/amended by the Director by a written order served upon you (as opposed to the deemed confirmation noted above), such Director's Order will include the appropriate instructions for appealing that order to the Ontario Land Tribunal.

CONTACT INFORMATION

The contact information for the Director and the Ontario Land Tribunal is the following:

Registrar
Ontario Land Tribunal
655 BAY STREET, 15th FLOOR
TORONTO, ON M5G 1E5
OLT.Registrar@ontario.ca

and Director (Provincial Officer's Orders)
Ministry of the Environment,
Conservation and Parks
Hamilton District Office
119 KING ST W, 9TH FLR
HAMILTON, ON L8P 4Y7
Office Email: Environment.
Hamilton@ontario.ca
Fax: (905) 521-7806

The contact information of the Ontario Land Tribunal and further information regarding its appeal requirements can be obtained directly from the Tribunal at:

Tel: (416) 212-6349, Toll Free: 1(866) 448-2248 or www.olt.gov.on.ca

SERVICE INFORMATION

Service of the documentation referred to above can be made personally, by mail, by fax (in the case of the Director only), by commercial courier or by email in accordance with the legislation under which this Order is made and any corresponding Service Regulation.

ADDITIONAL INFORMATION

Unless stayed by the Director or the Ontario Land Tribunal, this Order is effective from the date of service.

Failure to comply with a requirement of this Order constitutes an offence. Unless otherwise indicated, the obligation to comply with a requirement of this Order continues on each day after the specified compliance date until the obligation has been satisfied.

The requirements of this Order are minimum requirements only and do not mean that you are not required to comply with any other applicable legal requirements, including any:

- statute, regulation, or by-law;
- federal, provincial, or municipal law; or
- applicable requirements that are not addressed in this Order.

The requirements of this Order are severable. If any requirement of this Order, or the application of any requirement to any circumstance, is held invalid, such finding does not invalidate or render unenforceable the requirement in other circumstances. It also does not invalidate or render unenforceable the other requirements of this Order.

Further orders may be issued in accordance with the legislation as circumstances require.

This Order is binding upon any successors or assignees of the persons to whom this Order is issued.

The procedures to request a review by the Director or require a hearing and other information provided above are intended as a guide. The legislation should be consulted for additional details and accurate reference. Further information can be obtained from e-Laws at www.ontario.ca/laws.

Attachments

For Provincial Officer's Order 1-277723794

Leachate Assessment Report (28 pages)



Report

December 8, 2023

To	Lorenzo Alfano (GFL)	Contact No.	519-340-4192
Copy to	Brad Mullin (GFL)	Email	Brian.Dermody@ghd.com
From	Brian Dermody	Project No.	11103232
Project Name	Terrapure-Stoney Creek Landfill		
Subject	Leachate Assessment Report		

1. Introduction

This report provides an assessment of leachate management at the Stoney Creek Regional Facility (SCRF, Site) which is owned and operated by GFL Environmental Inc. (GFL). The SCRF is located at 65 Green Mountain Road West, in the City of Hamilton, immediately southwest of the intersection of Upper Centennial Parkway and Green Mountain Road West.

The SCRF is governed by Environmental Compliance Approval (ECA) No. A181008 for Waste and ECA No. 5400-7DSSHU for Industrial Sewage Works issued by the Ministry of Environment, Conservation, and Parks (MECP). The wastes that can be received at the SCRF for final disposal are restricted by the conditions of the ECA. Acceptable waste types include post-diversion, solid, non-hazardous commercial, institutional and industrial waste including petroleum contaminated soils. Only waste generated within the Province of Ontario may be received for disposal at the SCRF.

No municipal solid waste (MSW), liquid industrial wastes, hazardous wastes as defined under Ontario Regulation 347 General – Waste Management under the Environmental Protection Act, or putrescible wastes are accepted at the SCRF. This includes: hazardous industrial wastes; hazardous waste chemicals; ignitable waste; corrosive waste; leachate toxic waste; acute hazardous waste chemicals or reactive waste; hauled sewage; domestic waste; and waste from the operation of a sewage works subject to the Ontario Water Resources Act.

1.1 Purpose of this Report

This report was prepared to address questions raised by the MECP as a result of recent odours that were observed at the SCRF. Specifically, this report provides responses to a letter from the MECP to Lorenzo Alfano at GFL dated October 5, 2023 (MECP Letter), requesting a Leachate Assessment Report (Item 11) for the SCRF. This report provides an overview of the existing leachate management system at the Site; the staging of landfill development; an assessment of the leachate (including leachate generation, leachate head on the base liner system, leachate discharge, and leachate balance); potential impacts resulting from the leachate; and conclusions and recommendations for the management of leachate at the SCRF.

2. Limitations

This report: has been prepared by GHD for GFL Environmental Inc and may only be used and relied on by GFL Environmental Inc for the purpose agreed between GHD and GFL Environmental Inc as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than GFL Environmental Inc arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by GFL Environmental Inc and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

3. Assumptions

The leachate assessment presented in this report is based on the following assumptions:

- Final cover is constructed in accordance with the approved design.
- Landfill liner is constructed in accordance with the approved design.
- Monitoring data provided by GFL is accurate.

4. Leachate Assessment

4.1 Existing Leachate Management System

The SCRF includes the following main leachate controls:

- **A double liner system** that is built over a layer of granular grading fill placed on the quarry floor. The double liner system incorporates the following:
 - A composite primary liner consisting of a high-density polyethylene (HDPE) membrane directly underlain by a 1.0 m thick compacted clay liner.
 - A hydraulic control layer consisting of a 0.5 m thick layer of clear crushed stone.
 - A secondary liner consisting of a 1.0 m thick layer of compacted clay.
- **A leachate collection system (LCS)** installed on top of the primary liner across the landfill base and side slopes. This system consists of a 0.5 m thick layer of crushed stone which incorporates a network of perforated pipes conveying leachate to a leachate pumping system.

A typical cross-section through the base liner system is shown in Figure 1.

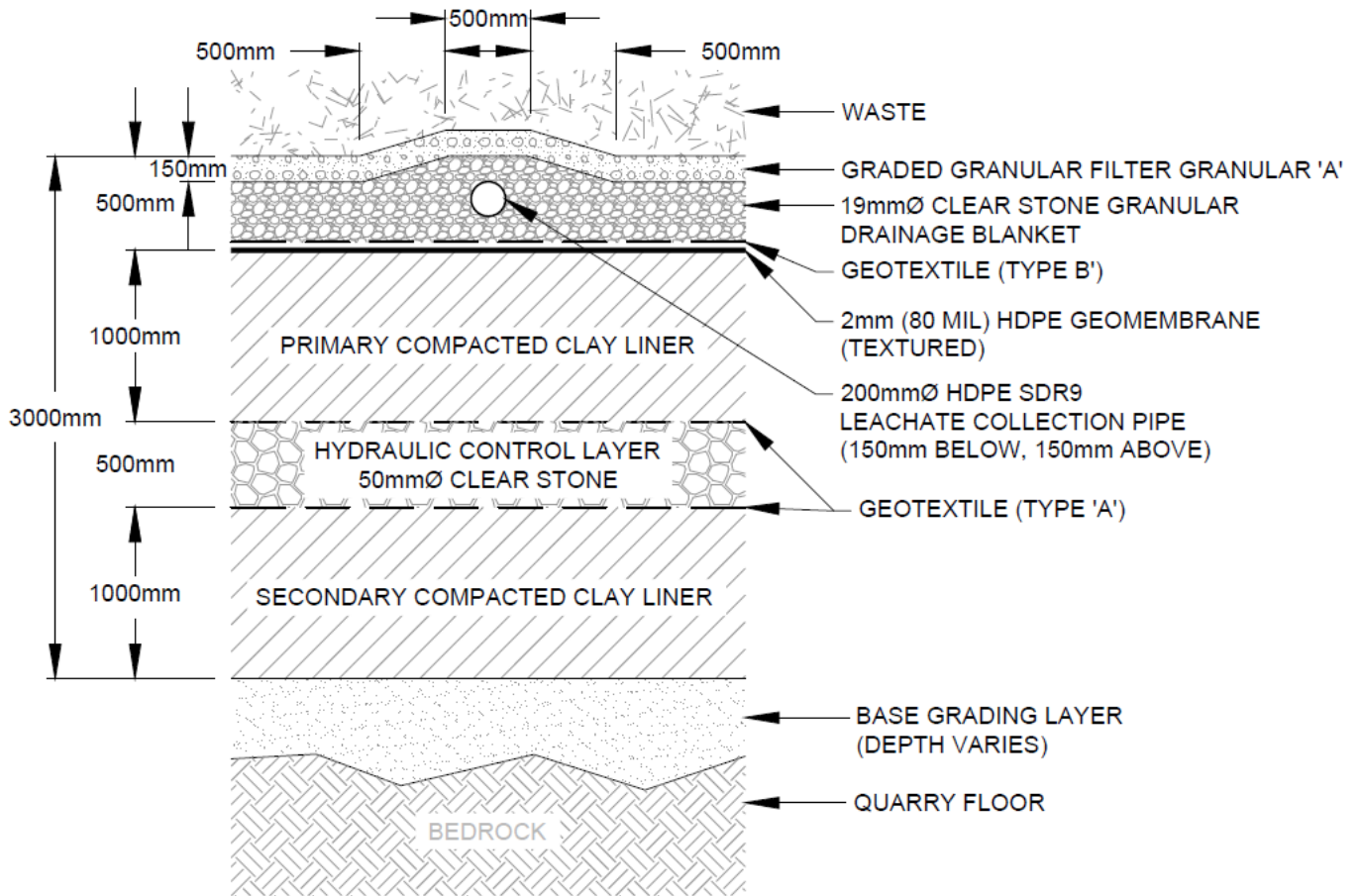


Figure 1 Typical Cross Section Through Base Liner System

Two other landfill components will also contribute to the control of leachate, as follows:

- **A groundwater collection system** is installed beneath the secondary liner. This consists of a system of trenches filled with clear crushed stone beneath the base of the landfill and around the perimeter of the landfill. The perimeter trenches also incorporate perforated pipes. This system is hydraulically connected to the base grading fill placed beneath the secondary liner.
- **A final cover** constructed over the surface of the completed landfill. This consists of a 0.60 m thick layer of compacted clay overlain by a vegetated topsoil layer 0.15 m thick.

A typical cross-section through the final cover system is shown in Figure 2.

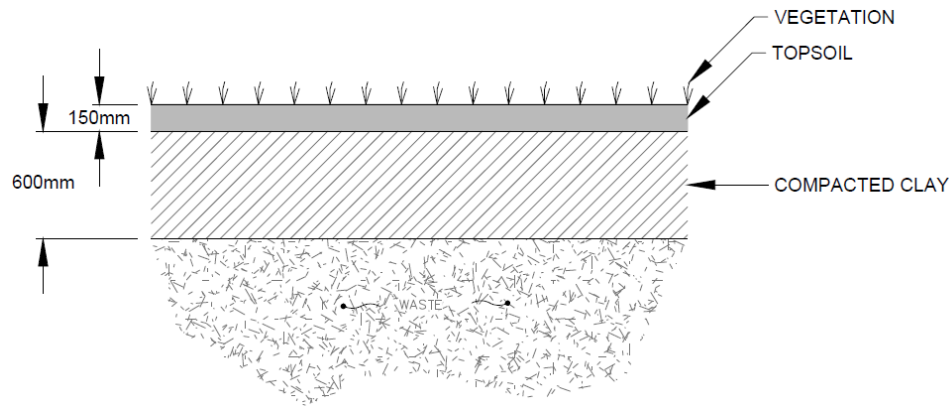


Figure 2 Typical Cross Section Through Final Cover System

Leachate is collected through the LCS and drains by gravity towards a sump at the Permanent Leachate Pumping Station (PLPS) in the southeast corner of the Site. Leachate is then recovered from the base of the landfill via pumping from either the Interim Leachate Pumping Station (ILPS) or the PLPS. The LCS for the SCRF is shown in Figure 3.

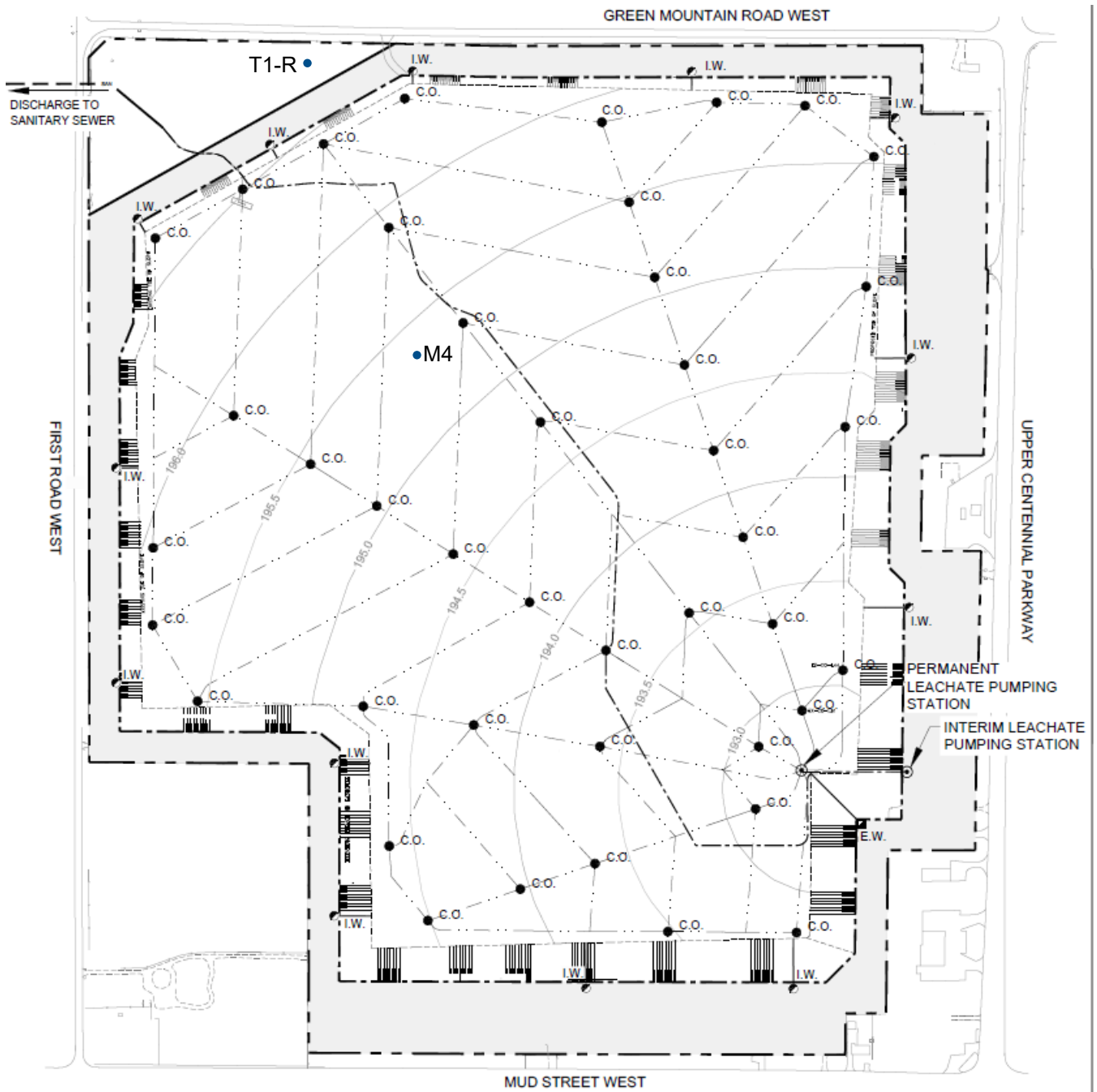


Figure 3 Top of Primary Liner Contours and Leachate Collection System Layout

Collected leachate is then treated by the Leachate Treatment System (LTS) at the ILPS through the addition of hydrogen peroxide and ferric chloride for chemical treatment. The leachate is then gravity fed into a discharge pipe buried within the landfill that conveys the leachate from the southeast corner to the northwest corner of the Active East Landfill where impacted groundwater is introduced using a wye structure prior to the leachate pipe crossing First Road West and discharging to the leachate equalization pond in the Closed West Landfill. Impacted groundwater is

collected from beneath the landfill via pumping well M4 and temporarily stored in the detention pond in the northwest corner of the Site prior to being added to the leachate discharge pipe. Leachate from the closed west landfill is passively collected, via the former quarry drain, in a sump called T1-R which is then passively drained into the leachate equalization pond. The leachate (from the east and west landfill) and impacted groundwater mixture is aerated within the leachate equalization pond and is then discharged off-Site through a connection to the City of Hamilton sanitary sewer under Mistywood Drive.

4.2 Landfill Development

The SCRF occupies a total Site area of 73.9 hectares (ha). This includes 56.8 ha for the landfill footprint, 2.3 ha for the Stormwater Management Pond (SWMP) located in the northwest corner of the Site, and 14.8 ha for buffer zones to accommodate Site infrastructure (e.g., administration office, access roads, screening berms, etc.).

The base liner system and final cover system are constructed in stages as landfilling progresses. Table 1 provides an overview of the SCRF development over the past 5 years (2018-2023), as well as the anticipated development through to Site closure. Figures depicting the development of the SCRF between 2018-2023 are provided in Attachment 1.

Table 1 Landfill Development Staging

Year	Active Landfill Area (hectares)	Capped Landfill Area (hectares)	Constructed Landfill Footprint (hectares)	Percentage of Landfill Capped (%)
2018	29.9	10.2	40.1	25.4
2019	29.9	10.2	40.1	25.4
2020	29.9	10.2	40.1	25.4
2021	26.1	14.0	40.1	34.9
2022	25.4	14.7	40.1	36.7
2023	25.3	16.9	42.2	40.0
2024-2025 ¹	15.4	32.7	48.1	68.0
2026-2027 ¹	11.3	42.7	54.0	79.1
2028-2029 ¹	7.1	49.7	56.8	87.5
Post Closure	0.0	56.8	56.8	100.0

1. Dates and values estimated based on anticipated future waste receipts and construction timing for the base liner and final cover systems.

The *Active Landfill Area* represents areas where waste is being placed or where the final cover has yet to be constructed. The *Capped Landfill Area* represents the area where final cover has been constructed. The *Constructed Landfill Footprint* represents the total area of the base liner system constructed. Presently, final cover has been constructed over approximately 40% of the constructed landfill footprint. Additional final cover will be constructed over the active landfill areas once the waste has been placed to the final approved contours.

4.3 Leachate Generation

The Hydrologic Evaluation of Landfill Performance (HELP) model version 3.07 (Schroeder, et al., 1994a and 1994b) was used to provide an assessment of leachate generation for active landfilling and site closure conditions. The HELP model was developed by the United States Army Corps of Engineers under endorsement from the United States Environmental Protection Agency (USEPA).

The HELP model uses Site-specific information for three generalized groups of input parameters as follows:

- General Design Data
- Weather/Climatic Data
- Soil & Design Data

The general design data and weather/climatic data used in this assessment were obtained from GFL from the Ambient PM₁₀ Monitoring Program, including monitoring data presented in the Annual Reports from 2018 through 2022, as prepared by Rotek Environmental Inc. Two soil profiles were used for this assessment to evaluate two conditions: Active Landfill and Capped Landfill (i.e., site closure conditions).

Precipitation that falls in the Active Landfill Area is contained within the landfill footprint where it infiltrates the waste and is ultimately collected as leachate. The majority of precipitation that falls in the Capped Landfill Area is diverted as surface runoff and directed to the stormwater management system, while some infiltrates the waste and is ultimately collected as leachate. A portion of the precipitation is subject to surface evaporation or evapotranspiration from soil under both Active and Capped Landfill conditions. This portion does not contribute to runoff or infiltration.

Active Landfill conditions were modeled with waste having minimal to no additional soil cover. The Capped Landfill conditions were modeled with the approved final cover design comprising 150 mm of topsoil overlying a 600 mm compacted clay cover with a maximum hydraulic conductivity of 1.0×10^{-5} cm/sec. Underlying layers, including waste and the landfill liner were consistent for each model.

The HELP model estimated infiltration rates for each of the described scenarios. The estimated infiltration rate for the Active Landfill was 440.12 mm/ha/year (4,401.16 m³/ha/year), while the estimated infiltration rate for the Capped Landfill was 313.85 mm/ha/year (3,138.52 m³/ha/year). These infiltration rates were applied to the areas presented in Table 1 to estimate the total leachate generated at the SCRF each year. The estimated annual leachate generation rates are presented in Table 2. Table 2 also includes projections for future leachate generation rates, based on a conceptual schedule for progressive closure of the Site through to final Site closure.

Table 2 Leachate Generation Estimate

Year	Generation in Active Landfill Areas (m ³)	Generation in Capped Landfill Areas (m ³)	Total Estimated Leachate Generation (m ³)	Total Estimated Leachate Generation (L)
2018	131,595	32,013	163,608	163,608,000
2019	131,595	32,013	163,608	163,608,000
2020	131,595	32,013	163,608	163,608,000
2021	114,870	43,939	158,810	158,810,000
2022	111,789	46,136	157,926	157,926,000
2023	111,349	53,041	164,390	164,390,000
2024-2025	67,778	102,630	170,407	170,407,000
2026-2027	49,733	134,015	183,748	183,748,000
2028-2029	31,248	155,984	187,233	187,233,000
Post Closure	0	178,268	178,268	178,268,000

The total leachate generated on an annual basis has remained relatively constant between 2018 and 2023. However, the leachate generation rate is expected to increase by about 16% in the coming years based on the anticipated development staging of the landfill, primarily due to the increase in total landfill area.

4.4 Leachate Head

The Design & Operations Report for the SCRF (GHD, July 2019) recommends that the maximum leachate head be maintained at 0.5 m above the surface of the primary liner under normal conditions.

Leachate generated in the SCRF is collected via the LCS and drains to the sump underneath the PLPS, which is the lowest point of the landfill. The LCS pipes that feed into the PLPS have an invert of 192.474 m. Maintaining a leachate head of 0.5 m in this area would equate with an elevation of approximately 192.974 m. A cross section through the PLPS is shown in Figure 4.

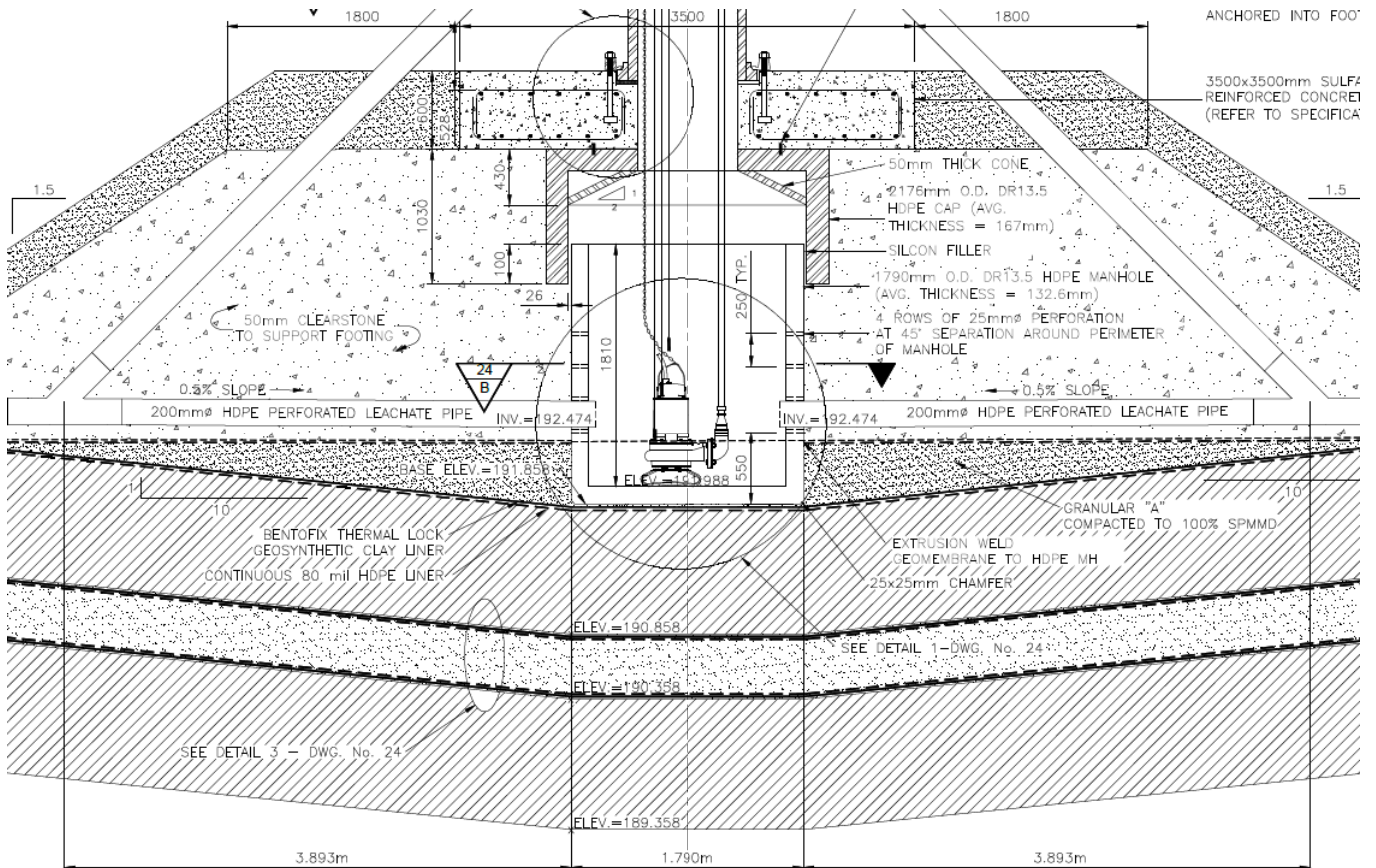


Figure 4 Cross Section Through PLPS

Leachate can also be removed from the landfill via the ILPS situated on the southeast side of the landfill. The LCS pipe that serves as the pumping location for the ILPS has an invert of 192.816 m. A cross section through the pump at the ILPS is shown in Figure 5.

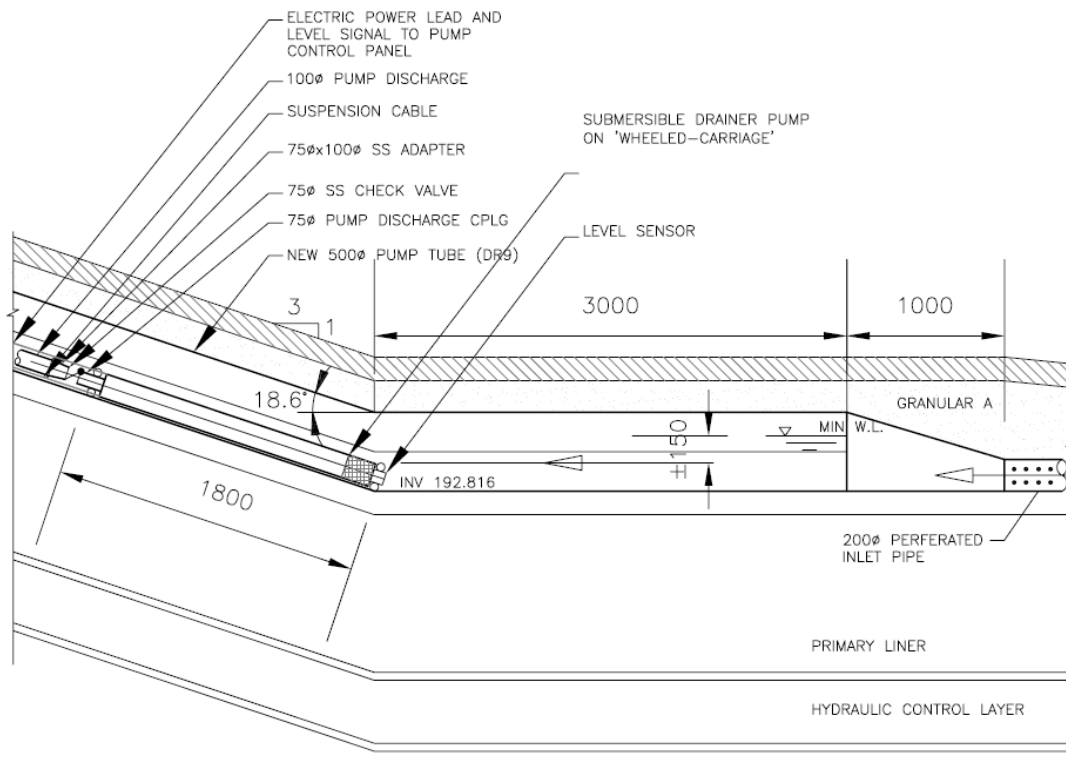


Figure 5 Cross Section Through Pump at ILPS

The PLPS structure has only been constructed up to the surface of the landfill to date. Installation of the surface cap as well as the final instrumentation and controls is expected to be completed when the final cover is constructed in this area. A temporary pump and discharge pipe have been installed to allow for discharge from the PLPS to the ILPS. Historically, most of the leachate has been recovered through the ILPS since it has a larger pump and is directly connected to the leachate treatment system. During recent months, the pumping location has been moved between the ILPS, PLPS, and the exposed leachate blanket in the northeast section of the landfill to mitigate odour impacts from the leachate. With the LTS effectively treating the odours, and recent upgrades to seal and winterize the PLPS, most of the leachate discharge should now be via the PLPS. The lowest level that the leachate can be maintained at the ILPS is 192.966 m compared to 192.474 m at the PLPS. This represents a potential reduction in leachate head on the base liner that can be realized by maintaining pumping at the PLPS.

Leachate levels in the SCRF are currently measured manually at the PLPS by GFL staff. Readings are typically collected on a weekly basis, although the frequency may be adjusted based on pumping conditions. Leachate levels are also measured at three leachate monitors located upgradient of the PLPS. The average monthly leachate depths measured at the PLPS between 2018 and 2023 are presented in Table 3. A comparison of the measured leachate depths throughout each year is presented in Figure 6.

Table 3 Average Leachate Depth Measured at PLPS (m)

	2018	2019	2020	2021	2022	2023
January	2.82	2.48	3.17	3.18	2.04	2.41
February	2.87	2.80	2.57	2.77	2.63	2.48
March	2.61	2.73	2.85	2.39	2.63	3.07
April	2.07	2.41	2.58	2.04	2.17	3.51
May	2.32	2.48	2.57	1.81	1.85	3.44

	2018	2019	2020	2021	2022	2023
June	1.98	1.84	2.55	1.76	1.28	3.57
July	2.01	1.05	2.62	2.52	0.83	3.61
August	1.12	0.57	2.41	2.68	0.56	4.04
September	0.55	0.37	2.48	3.06	0.51	3.53
October	0.48	0.76	2.12	2.99	0.58	3.16
November	1.13	1.27	2.34	2.85	1.29	-
December	1.86	1.79	2.90	1.93	1.73	-

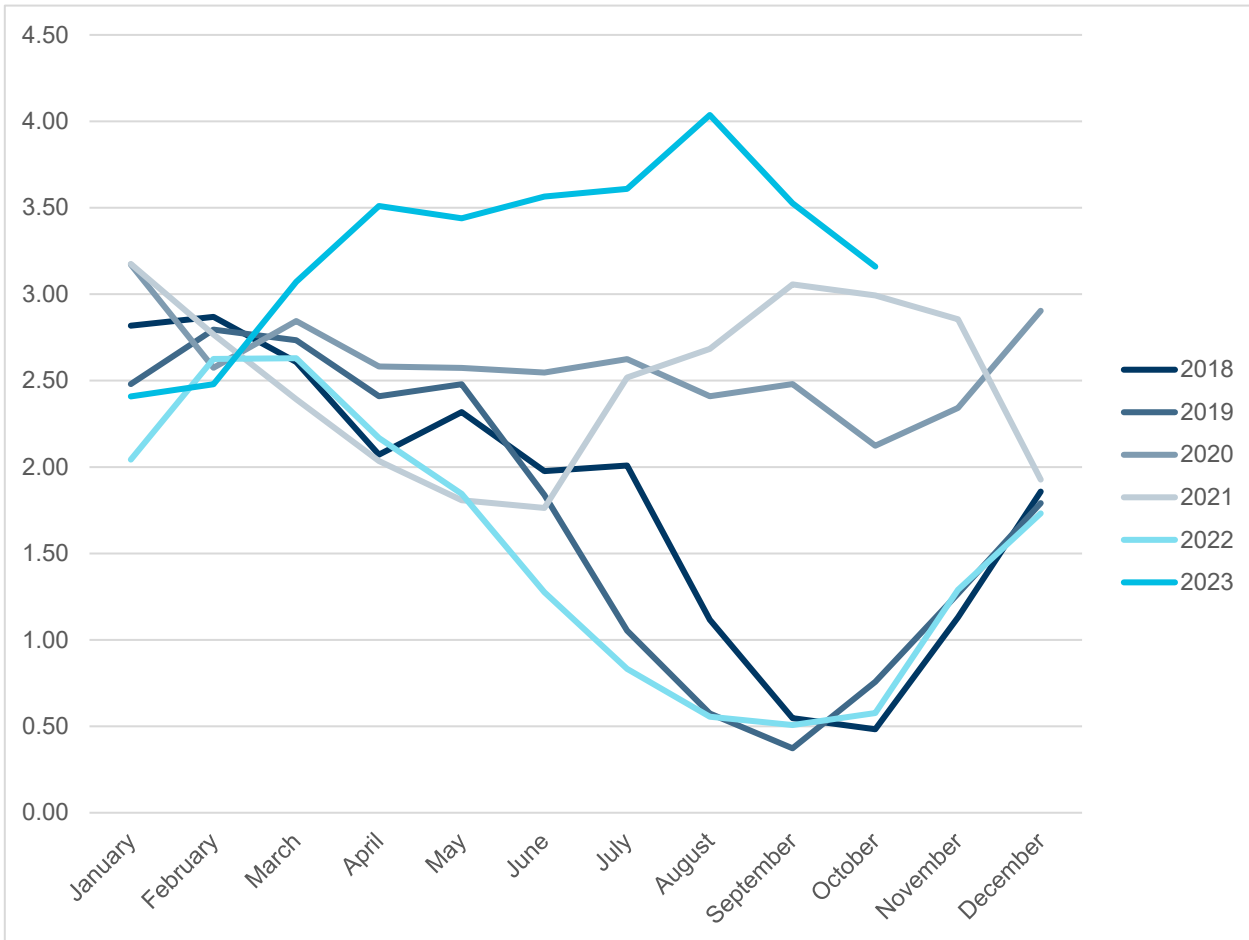


Figure 6 Leachate Depth at PLPS (m)

Leachate levels typically peak around February/March before gradually declining through September/October. A sharp increase is then observed from October through January, before the cycle repeats. Leachate levels in 2023 have been higher than previous years due to challenges arising from odour mitigation activities (e.g., multiple pumping locations, temporary shutdowns for upgrades and maintenance).

4.5 Leachate Discharge

Leachate discharge rates are measured using a flowmeter at the ILPS and are recorded daily. Historically, discharge rates in excess of 250 US gallons per minute (GPM) have been achieved. However, recent efforts to mitigate odours have necessitated a temporary reduction in the discharge rate to approximately 90 GPM. A summary of the total

volume of leachate removed from the landfill monthly between 2018 and 2023 is presented in Table 4. A comparison of the leachate volumes pumped throughout each year is presented in Figure 7.

Table 4 Leachate Volume Pumped From SCRF

Leachate Pumped From SCRF (L)						
	2018	2019	2020	2021	2022	2023
January	15,920,846	8,598,006	18,070,978	11,079,074	8,691,874	2,400,069
February	16,962,099	12,823,202	22,004,981	13,953,659	5,656,036	12,777,782
March	23,998,982	22,441,644	19,913,263	18,473,828	31,537,924	16,801,237
April	20,477,418	23,668,362	15,495,412	12,986,335	18,590,678	20,322,422
May	16,380,344	24,597,958	11,090,126	9,472,720	19,470,677	12,959,083
June	16,006,387	24,398,262	7,376,636	1,164,645	14,006,729	11,397,014
July	14,102,206	15,100,141	5,630,744	0	8,386,572	12,041,977
August	25,151,177	13,171,467	12,963,625	1,713,546	7,422,241	8,824,729
September	8,120,627	10,136,491	4,911,416	13,414,040	6,667,788	19,478,518
October	9,093,674	6,825,422	13,047,274	18,556,644	3,105,664	8,793,319
November	10,187,706	8,881,529	2,699,462	32,496,875	0	-
December	0	0	2,257,752	13,101,778	0	-
TOTAL	176,401,465	170,642,484	135,461,668	146,413,142	123,536,184	125,796,150

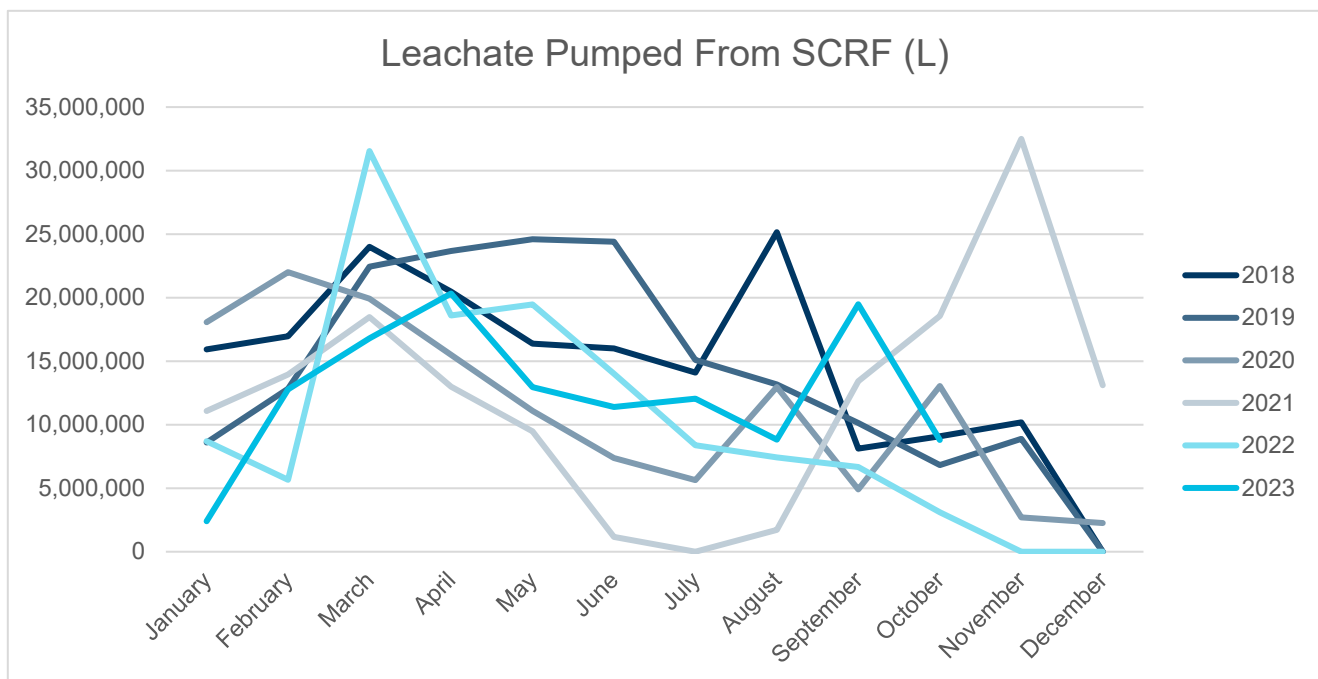


Figure 7 Leachate Pumped from SCRF (L)

The volume of leachate pumped from the landfill typically peaks around March/April, before declining through December, and increasing again in January/February. The average monthly leachate discharge achieved between 2018-2023 was approximately 12,500,000 L, with a high of approximately 32,500,000 L in November 2021. In December of 2018, 2019, and 2022 no leachate at all was pumped from the landfill.

4.6 Leachate Balance

Leachate discharge rates measured at the Site are presented in Table 4 above for comparison against the predicted leachate generation rates presented in Table 2. Figure 8 provides a comparison of the predicted leachate generation rates and measured pumping volumes between 2018 and 2023.

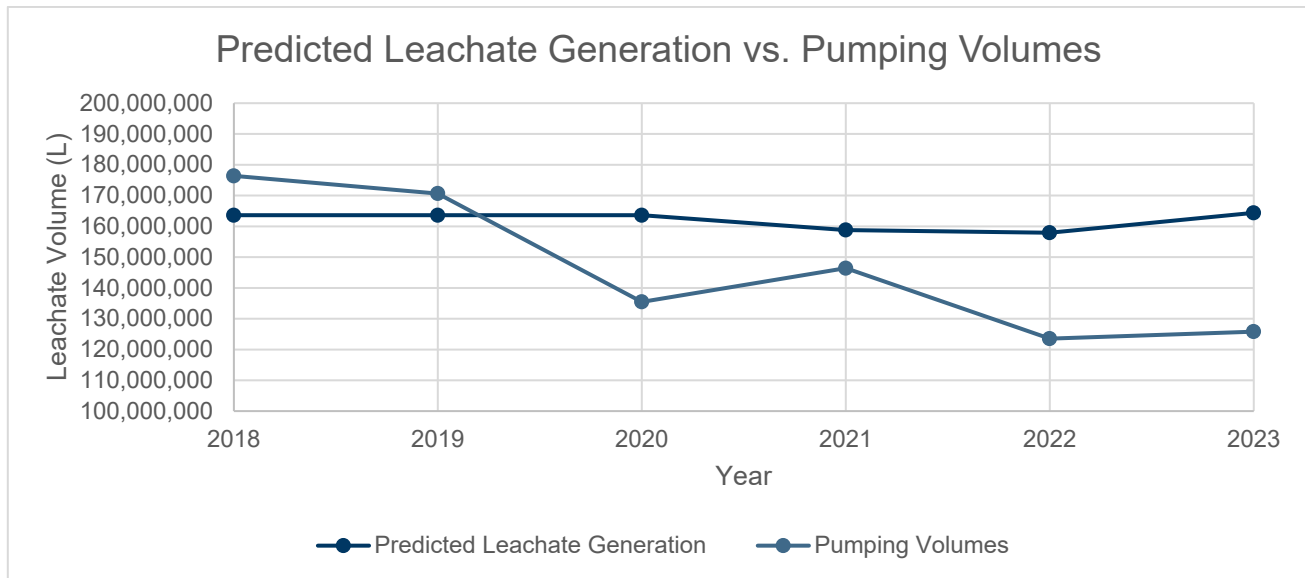


Figure 8 Predicted Leachate Generation Rate vs. Measured Pumping Volumes

As identified in Figure 8, the HELP model underestimated leachate generation in 2018 and 2019 and overestimated generation rates from 2020 to present. The HELP model simulations included modelling of landfill performance over a period of 100 years, using synthetic weather data that was based on weather data supplied by GFL. The predicted leachate generation rates are based on the average annual infiltration rate (887 mm/ha/year) and variations in landfill areas and areas that are active or capped (Table 1). As a result, predicted leachate generation rates based on the HELP model will exhibit consistent precipitation and infiltration rates, whereas actual measured leachate pumping volumes will be influenced by year-over-year variations in precipitation.

Measured precipitation in 2018 and 2019 exceeded the modelled annual average, while 2020 measured precipitation was below the modelled average. However, the magnitude of the precipitation variation relative to the modelled average and the difference in predicted vs. pumped leachate do not directly correlate. Additionally, measured precipitation in 2021 was similar to 2019, however measured pumping volumes indicate the model overestimated leachate generation.

Pumping data available for 2023 at the time of this writing is incomplete (through October 2023). The total pumping volume for 2023 will continue to increase, but is not anticipated to reach the predicted volumes, based on current pumping rates and winter trends in prior years. The overestimation in 2023 however, is partially attributed to reduced pumping rates described in Section 4.5.

4.7 Leachate Impacts

4.7.1 Odour

The odours associated with the leachate at the SCRF have been observed in three primary locations: the PLPS, the leachate equalization pond in the west landfill, and the exposed leachate blanket in the northeast section of the landfill. Upgrades to the LTS have been successful at addressing the odours from the PLPS and equalization pond, while continued pumping has drawn the leachate levels down sufficiently so that it is no longer exposed in the northeast section of the landfill. The top of the LCS in this area is at an elevation of approximately 195.5 m. After peaking in

August at over 196.5 m, leachate levels have since been reduced to under 195.2 m, eliminating the exposed leachate and resulting odours from this area as shown through ongoing monitoring activities.

4.7.2 Leachate Seeps

The final cover constructed to date along the west side of the landfill has an elevation of approximately 202.0 m at its lowest point at the limit of landfill (i.e., top of sidewall). Perimeter ditching has also been completed along the entire south and western perimeter of the landfill. Visual inspections of the final cover are completed by GFL staff on monthly basis and have shown no evidence of leachate seeps. However, water from the SWMP has not been discharged off-Site due to the water quality not meeting the trigger concentrations for some parameters (e.g., field conductivity, lab pH, and phenols). Lower concentrations of sodium, chloride, and metals were generally detected at the SWMP compared to other on-Site locations. To date, all of the water collected in the SWMP has been directed to the sanitary sewer connection through the Closed Facility.

4.7.3 Liner Service Life

Certain engineered elements of the leachate control system have a finite lifespan, which cannot be accurately estimated in a landfill setting. The leachate controls have been developed such that components can either be replaced or maintained, or alternatively, redundancy has been provided where maintenance isn't practical. The system, as a whole, is capable of controlling leachate for at least the entire contaminating lifespan which is estimated to be up to 80 years.

Table 5 summarizes the rationale behind the expectation of the service life of the liner system. Table 5 also describes the function and estimated service life of each leachate control component, identifies the potential failure modes that are considered realistic, and indicates how these failure modes have been addressed in the design. Additional details surrounding the liner service life can be found in the Design & Operations Report for the SCRF (GHD, July 2019).

Table 5 Rationale for Expected Service Life of Engineered Leachate Controls

Component	Primary function and required service life	Failure modes considered	Performance expectation and rationale
Leachate collection system granular blanket	<ul style="list-style-type: none"> – Collects leachate to maintain minimal head on liner system. – Required for about 300 years. 	Blockage of granular blanket due to siltation, bio-fouling, or chemical precipitation.	<p>EXPECTATION: Granular blanket will be capable of conveying flow for at least 300 years.</p> <p>RATIONALE:</p> <ul style="list-style-type: none"> – Siltation can be controlled because graded filter is incorporated into upper part of blanket. – Bio-fouling only possible within waste or graded filter where small pore spaces exist: bio-fouling in lower part of blanket will not be significant because of large pore spaces and minimal organic content of waste. – Precipitation will not occur because waste/granular blanket is a closed geochemical system and because of large pore spaces within blanket. – Precipitation only considered possible at pumping station where geochemical conditions change: pumping station accessible for routine maintenance. – Localized blockages will not be significant due to continuous nature of granular blanket on base and side slopes.

Component	Primary function and required service life	Failure modes considered	Performance expectation and rationale
			<ul style="list-style-type: none"> – Redundancies exist: <ul style="list-style-type: none"> • Collection through perforated pipes • Pumping from cleanout risers
Leachate Collection Piping System	<ul style="list-style-type: none"> – Provides redundancy for leachate collection. – 300 year service life desirable but not essential. 	Blockage of piping system due to siltation, bio-fouling, or chemical precipitation.	<p>EXPECTATION: Service life unquantifiable but expected to be many decades.</p> <p>RATIONALE:</p> <ul style="list-style-type: none"> – Blockage will not occur because pipes can be cleaned. – Design facilitates cleaning through close clean-out spacing and access from ground surface. – Prevention of blockage desirable but not essential.
		Collapse of piping system due to landfill-imposed stresses or chemical deterioration.	<p>EXPECTATION: Service life unquantifiable but expected to be many decades.</p> <p>RATIONALE:</p> <ul style="list-style-type: none"> – Stresses are readily calculated: piping system designed with sufficient safety factor so that collapse does not occur. – Prevention of collapse desirable but not essential. – HDPE known to be chemically resistant.
Primary Liner System	<ul style="list-style-type: none"> – Provides engineered leachate containment prior to hydraulic containment (during 40 year operating period). – Engineered containment only required for about 40 years. 	Increase in hydraulic conductivity from deterioration of HDPE geomembrane due to contact with leachate.	<p>EXPECTATION: Geomembrane will retain its low permeability properties for well in excess of 40 years.</p> <p>RATIONALE:</p> <ul style="list-style-type: none"> – Unexpected based on current knowledge of durability of HDPE and expected leachate; processes that are known to cause HDPE deterioration do not exist within landfill.
		Increase in hydraulic conductivity from deterioration of clay liner due to contact with leachate.	<p>EXPECTATION: Clay liner will retain its low permeability properties for well in excess of 40 years (see SECONDARY CLAY LINER, below).</p> <p>RATIONALE:</p> <ul style="list-style-type: none"> – Unexpected to occur; mineralogical analyses carried out indicate that clay performance not affected by leachate.

4.7.4 Groundwater

Leakage through the primary liner system was modelled as part of the impact assessment undertaken to support the landfill expansion approval. This modelling demonstrated that head on the liner system resulted in very minor amounts of leakage through the primary liner system. This result is not unexpected given the primary liner system consists of a geomembrane overlying a 1 m thick compacted clay layer.

Any leakage that passes through the primary liner system would enter the hydraulic control layer (HCL), which separates the primary liner system from the secondary liner system. In order to validate the results of modelling and measure potential leakage through the primary liner system, GFL has collected samples of water from within the HCL

since May 2018. The samples of water from the HCL are analyzed for a comprehensive list of general chemistry and metals analytes. The patterns in water quality within the HCL are evaluated to determine if significant quantities of leachate are leaking through the primary liner.

Figures 1 through 5 in Attachment 2 present the concentrations of leachate indicators (chloride, fluoride, alkalinity, ammonia and total organic carbon) in HCL water quality between May 2018 and October 2023 (the period over which data is available). As illustrated on Figures 1 through 5 (Attachment 2), water quality within the HCL has remained relatively consistent with no apparent trends of increasing concentrations over time. The variability in concentrations presented on these figures reflects natural variability in water quality and is not indicative of progressive deterioration in water quality resulting from leakage of leachate accumulating in the HCL.

It is important to note that even if significant leakage were to be detected within the HCL water, this water can be pumped out and replaced with clean water so that the protective hydraulic properties of this layer are maintained. Further, the secondary composite liner underlying the HCL provides additional leakage protection. In combination, the three principal components of the liner system provide very robust long-term protection of underlying groundwater.

Outside of the landfilled waste and liner system, groundwater quality is monitored through a comprehensive network of groundwater monitoring wells completed within the various groundwater flow zones underlying the Site. These monitoring wells are sampled regularly as part of the required routine monitoring program and the results are evaluated for the presence of landfill-related impacts as part of the annual reporting process. The results of groundwater monitoring undertaken to date continue to confirm that there is no evidence that the SCRF is impacting groundwater quality.

5. Conclusions

Final cover construction is not keeping pace with liner construction, leaving large areas of the landfill with exposed waste, which increases leachate generation. The infiltration rate for the Active Landfill was 440.12 mm/ha/year compared to 313.85 mm/ha/year for the Capped Landfill, representing a possible 29% reduction in the leachate generation rate per unit area that can be realized by capping active areas of the landfill.

The average leachate head being maintained on the liner is in excess of the recommended 0.5 m. This leads to an excess volume of leachate in the landfill that requires constant pumping over a long time period to discharge. For example, an annual leachate generation rate of 150,000,000 L would take between 3.7 to 10.2 months to remove based on recent pumping rates of 90 GPM and 250 GPM, respectively.

The lowest level that the leachate can be maintained at the ILPS is 192.966 m compared to 192.474 m at the PLPS. This represents a potential reduction in leachate head on the base liner that can be realized by maintaining pumping at the PLPS.



Pumping rates are not being adjusted as required to account for seasonal variation in the leachate generation rate. This causes fluctuations in the amount of leachate being stored in the landfill, making it difficult to maintain the leachate head on the liner below 0.5 m.

6. Recommendations

The recommendations below should be implemented to improve the management of leachate at the SCRF.

- Reduce the area of the active landfill. Construct final cover over areas with exposed waste to reduce leachate generation. Final cover construction will need to be completed in conjunction with:
 - Relocation of waste in excess of approved grades from active areas to newly constructed landfill cells.
 - Expansion of the existing SWMP and construction of drainage ditches along the east and north perimeter of the landfill to allow for shedding clean runoff.

- Reduce the leachate head on the base liner. Increasing pumping rates will expedite the discharge of leachate from the landfill and reduce the head. Adjustments to the pumping rate should be done in consideration of the existing LTS and its ability to mitigate odours from the leachate prior to discharge to the sanitary sewer.
- Increase pumping rates during the winter. This will reduce the accumulation of leachate in the landfill and facilitate the management of increased leachate generation during the spring freshet.

Project name		Terrapure-Stoney Creek Landfill					
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Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4		Brian Dermody	Victoria Shortreed		Michael Cant		12/8/2023

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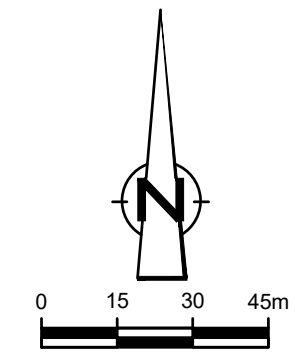
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Attachments

Attachment 1

STONEY CREEK LANDFILL VOLUMES

LINE	ITEM	QUANTITY	NOTES
1	TOTAL VOLUME OF WASTE PLACED IN 2020	290,930 m ³	LINE 2 - 6,570,455 m ³
2	TOTAL VOLUME OF WASTE PLACED TO DATE	6,861,385 m ³	COMPARISON OF JANUARY 2021 SURVEY AND APPROVED BOTTOM OF WASTE, LESS DEDUCTIONS FOR NON-WASTE MATERIALS
3	ESTIMATED REMAINING WASTE VOLUME	3,318,615 m ³	10,180,000 m ³ - LINE 2



- LEGEND:**
- EXISTING MAJOR CONTOUR (2m INTERVAL)
 - EXISTING MINOR CONTOUR (1m INTERVAL)
 - EXISTING FINAL COVER MAJOR CONTOUR (2m INTERVAL)
 - EXISTING FINAL COVER MINOR CONTOUR (1m INTERVAL)
 - FINAL COVER AREA
 - PROPERTY BOUNDARY
 - LIMIT OF LINER

SOURCE:
 TOPOGRAPHICAL SURVEY INFORMATION BASED ON AERIAL PHOTOGRAPHY DATED JANUARY 7, 2021, BY AUTOMATED ENGINEERING TECHNOLOGIES.

REGIONAL MUNICIPALITY OF HAMILTON
 WENTWORTH BENCHMARK 75U169
 (N) 813.300, (E) 999.000, ELEVATION = 204.228 mASL.

NOTE:
 PHASES '1A', '2' AND '1B' WERE DESIGNED USING BENCHMARK (ELEVATION 204.337 mASL).
 PHASES '1C', '3A', '3B', '4' AND '6A' WERE DESIGNED USING BENCHMARK AS SHOWN (ELEVATION = 204.228mASL).

REGIONAL MUNICIPALITY OF HAMILTON WENTWORTH
 BENCHMARK 75U169
 IRON PIPE WITH BRASS CAP, ALONG FIRST ROAD WEST, 0.2km NORTH OF INTERSECTION WITH MUD STREET, 1.0 Km WEST OF HWY #20, 14.3m NORTH OF CENTER LINE OF DRIVEWAY TO HOUSE, 8.2m EAST OF CENTER LINE OF ROAD, 9cm WEST OF BENCHMARK SIGN POST, 1m ABOVE ROAD LEVEL, ELEVATION 204.228mASL.

NOTES:
 TOTAL AREA= 40.1 ha
 TOTAL FINAL COVER= 10.1 ha



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Client
**TERRAPURE ENVIRONMENTAL
 STONEY CREEK, ONTARIO**

Project
**STONEY CREEK REGIONAL FACILITY
 2020 ANNUAL MONITORING REPORT**

No.	Issue	Drawn	Approved	Date

Drawn	T.WAGSTAFF	Designer	B.DERMODY
Drafting Check	D.BARTON	Design Check	B.DERMODY
Project Manager	B.DERMODY	Date	JANUARY 2021
This document shall not be used for construction unless signed and sealed for construction.	Scale	1:1500	
Original Size	Bar is 20mm on original size drawing		
ANSI D	0 20mm		

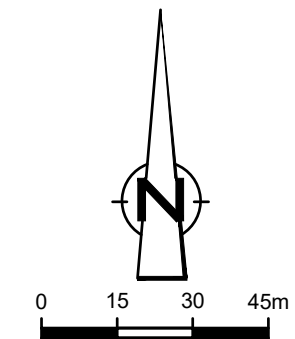
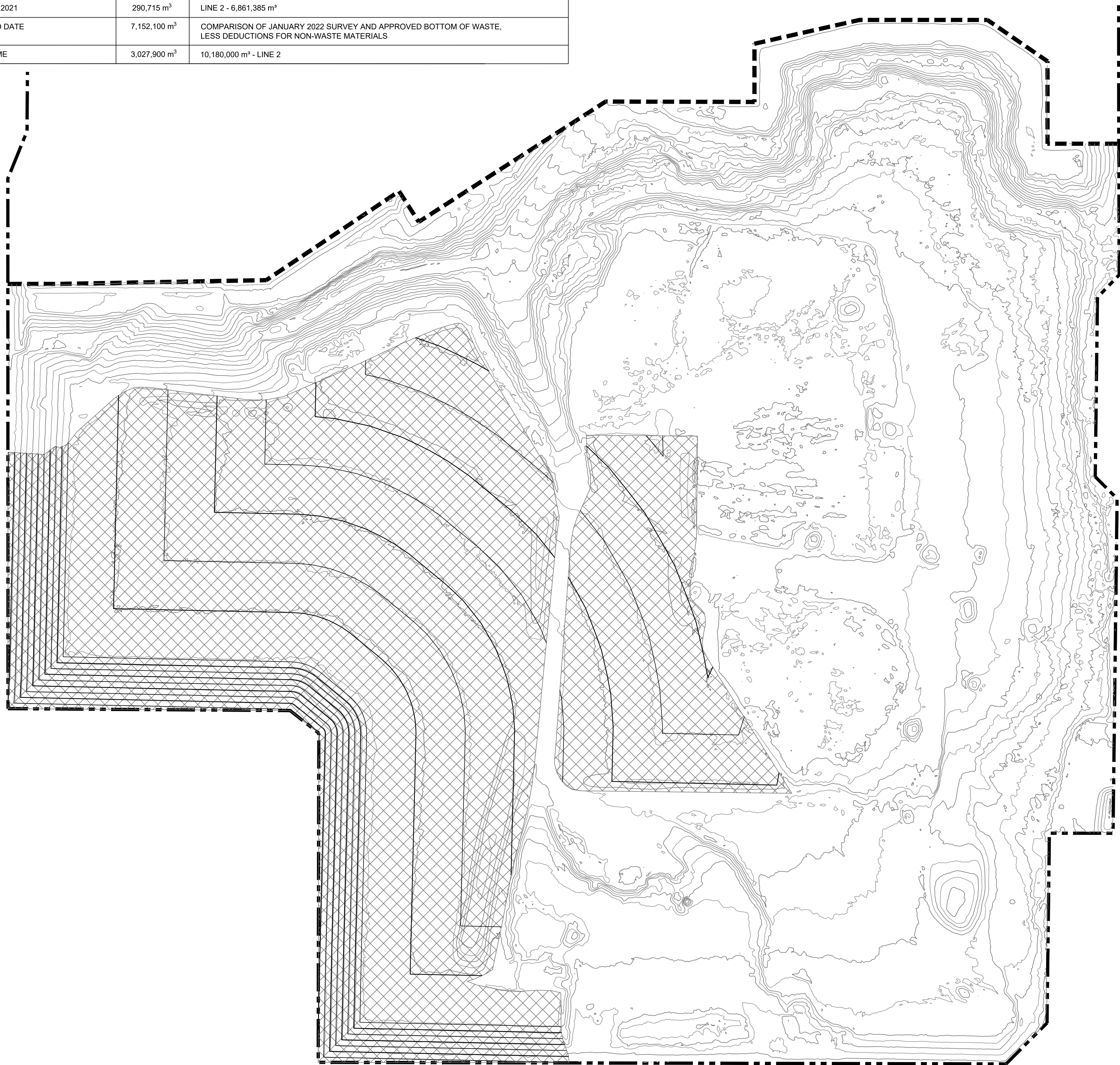
Project No. **11103232-33**

Title
**LANDFILL CONTOURS
 AND VOLUMES -
 JANUARY 2021**

Sheet No.
FIGURE 3.5

STONEY CREEK LANDFILL VOLUMES

LINE	ITEM	QUANTITY	NOTES
1	TOTAL VOLUME OF WASTE PLACED IN 2021	290,715 m ³	LINE 2 - 6,861,385 m ³
2	TOTAL VOLUME OF WASTE PLACED TO DATE	7,152,100 m ³	COMPARISON OF JANUARY 2022 SURVEY AND APPROVED BOTTOM OF WASTE, LESS DEDUCTIONS FOR NON-WASTE MATERIALS
3	ESTIMATED REMAINING WASTE VOLUME	3,027,900 m ³	10,180,000 m ³ - LINE 2



- LEGEND:**
- EXISTING MAJOR CONTOUR (2m INTERVAL)
 - EXISTING MINOR CONTOUR (1m INTERVAL)
 - EXISTING FINAL COVER MAJOR CONTOUR (2m INTERVAL)
 - EXISTING FINAL COVER MINOR CONTOUR (1m INTERVAL)
 - FINAL COVER AREA
 - PROPERTY BOUNDARY
 - LIMIT OF LINER

SOURCE:
 TOPOGRAPHICAL SURVEY INFORMATION BASED ON AERIAL PHOTOGRAPHY DATED JANUARY 14, 2022 BY AUTOMATED ENGINEERING TECHNOLOGIES.

REGIONAL MUNICIPALITY OF HAMILTON
 WENTWORTH BENCHMARK 75U169
 (N) 813.300, (E) 999.000, ELEVATION = 204.228 mASL.

NOTE:
 PHASES '1A', '2' AND '1B' WERE DESIGNED USING BENCHMARK (ELEVATION 204.337 mASL).
 PHASES '1C', '3A', '3B', '4' AND '6A' WERE DESIGNED USING BENCHMARK AS SHOWN (ELEVATION = 204.228mASL).

REGIONAL MUNICIPALITY OF HAMILTON WENTWORTH
 BENCHMARK 75U169
 IRON PIPE WITH BRASS CAP, ALONG FIRST ROAD WEST, 0.2Km NORTH OF INTERSECTION WITH MUD STREET, 1.0 Km WEST OF HWY #20, 14.3m NORTH OF CENTER LINE OF DRIVEWAY TO HOUSE, 8.2m EAST OF CENTER LINE OF ROAD, 9cm WEST OF BENCHMARK SIGN POST, 1m ABOVE ROAD LEVEL, ELEVATION 204.228mASL.



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Client
**TERRAPURE ENVIRONMENTAL
 STONEY CREEK, ONTARIO**

Project
**STONEY CREEK REGIONAL FACILITY
 2021 ANNUAL MONITORING REPORT**

No.	Issue	Drawn	Approved	Date

Drawn	T.WAGSTAFF	Designer	B.DERMODY
Drafting Check	P.LESIECZKO	Design Check	B.DERMODY
Project Manager	B.DERMODY	Date	JANUARY 2022

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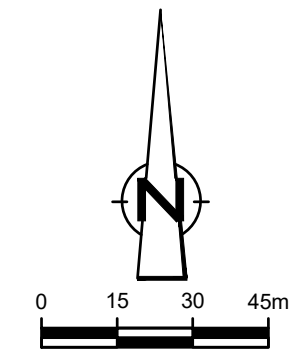
Project No. 11103232-33

Title
**LANDFILL CONTOURS
 AND VOLUMES -
 JANUARY 2022**

Sheet No.
FIGURE 3.5

STONEY CREEK LANDFILL VOLUMES

LINE	ITEM	QUANTITY	NOTES
1	TOTAL VOLUME OF WASTE PLACED IN 2022	386,565 m ³	LINE 2 - 7,152,100 m ³
2	TOTAL VOLUME OF WASTE PLACED TO DATE	7,538,665 m ³	COMPARISON OF JANUARY 2023 SURVEY AND APPROVED BOTTOM OF WASTE, LESS DEDUCTIONS FOR NON-WASTE MATERIALS
3	ESTIMATED REMAINING WASTE VOLUME	2,641,335 m ³	10,180,000 m ³ - LINE 2



- LEGEND:**
- 221 — EXISTING MAJOR CONTOUR (2m INTERVAL)
 - — — EXISTING MINOR CONTOUR (1m INTERVAL)
 - 220.0 — EXISTING TOP OF FINAL COVER CONTOUR (2m INTERVAL)
 - — — EXISTING TOP OF FINAL COVER CONTOUR (1m INTERVAL)
 - ▨ FINAL COVER AREA
 - - - - - PROPERTY BOUNDARY
 - — — — — LIMIT OF LINER

SOURCE:
 TOPOGRAPHICAL SURVEY INFORMATION BASED ON AERIAL PHOTOGRAPHY DATED JANUARY 11, 2023 BY AUTOMATED ENGINEERING TECHNOLOGIES.

REGIONAL MUNICIPALITY OF HAMILTON
 WENTWORTH BENCHMARK 75U169
 (N) 813.300, (E) 999.000, ELEVATION = 204.228 mASL.

NOTE:
 PHASES '1A', '2' AND '1B' WERE DESIGNED USING BENCHMARK (ELEVATION 204.337 mASL).
 PHASES '1C', '3A', '3B', '4' AND '6A' WERE DESIGNED USING BENCHMARK AS SHOWN (ELEVATION = 204.228mASL).

REGIONAL MUNICIPALITY OF HAMILTON WENTWORTH BENCHMARK 75U169
 IRON PIPE WITH BRASS CAP, ALONG FIRST ROAD WEST, 0.2km NORTH OF INTERSECTION WITH MUD STREET, 1.0 Km WEST OF HWY #20, 14.3m NORTH OF CENTER LINE OF DRIVEWAY TO HOUSE, 8.2m EAST OF CENTER LINE OF ROAD, 9cm WEST OF BENCHMARK SIGN POST, 1m ABOVE ROAD LEVEL, ELEVATION 204.228mASL.

NOTES:
 TOTAL AREA= 40.1 ha
 TOTAL FINAL COVER= 14.7 ha



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Client
GFL ENVIRONMENTAL
STONEY CREEK, ONTARIO

Project
STONEY CREEK REGIONAL FACILITY
2022 ANNUAL MONITORING REPORT

No.	Issue	Drawn	Approved	Date

Drawn	T.WAGSTAFF	Designer	B.DERMODY
Drafting Check	P.LESIECZKO	Design Check	B.DERMODY
Project Manager	B.DERMODY	Date	JAN 2023
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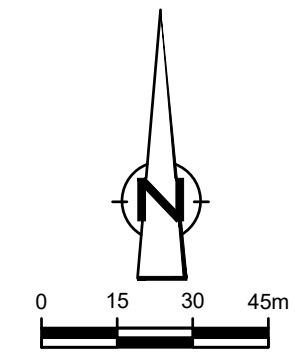
Project No. 11103232-50

Title
LANDFILL CONTOURS AND VOLUMES - JANUARY 2023

Sheet No.
FIGURE 3.5

STONEY CREEK LANDFILL VOLUMES

LINE	ITEM	QUANTITY	NOTES
1	TOTAL VOLUME OF WASTE PLACED IN 2023 (TO NOVEMBER 14th)	331,437 m ³	LINE 2 - 7,538,665 m ³
2	TOTAL VOLUME OF WASTE PLACED TO DATE	7,870,102 m ³	COMPARISON OF NOVEMBER 2023 SURVEY AND APPROVED BOTTOM OF WASTE, LESS DEDUCTIONS FOR NON-WASTE MATERIALS
3	ESTIMATED REMAINING WASTE VOLUME	2,309,898 m ³	10,180,000 m ³ - LINE 2



- LEGEND:**
- EXISTING MAJOR CONTOUR (2m INTERVAL)
 - EXISTING MINOR CONTOUR (1m INTERVAL)
 - EXISTING TOP OF FINAL COVER CONTOUR (2m INTERVAL)
 - EXISTING TOP OF FINAL COVER CONTOUR (1m INTERVAL)
 - FINAL COVER AREA
 - PROPERTY BOUNDARY
 - LIMIT OF LINER

SOURCE:
 TOPOGRAPHICAL SURVEY INFORMATION BASED ON AERIAL PHOTOGRAPHY DATED NOVEMBER 14, 2023 BY AUTOMATED ENGINEERING TECHNOLOGIES.

REGIONAL MUNICIPALITY OF HAMILTON
 WENTWORTH BENCHMARK 75U169
 (N) 813.300, (E) 999.000, ELEVATION = 204.228 mASL

NOTE:
 PHASES '1A', '2' AND '1B' WERE DESIGNED USING BENCHMARK (ELEVATION 204.337 mASL).

PHASES '1C', '3A', '3B', '4' AND '6A' WERE DESIGNED USING BENCHMARK AS SHOWN (ELEVATION = 204.228mASL).

REGIONAL MUNICIPALITY OF HAMILTON WENTWORTH BENCHMARK 75U169
 IRON PIPE WITH BRASS CAP, ALONG FIRST ROAD WEST, 0.2km NORTH OF INTERSECTION WITH MUD STREET, 1.0 Km WEST OF HWY #20, 14.3m NORTH OF CENTER LINE OF DRIVEWAY TO HOUSE, 8.2m EAST OF CENTER LINE OF ROAD, 9cm WEST OF BENCHMARK SIGN POST, 1m ABOVE ROAD LEVEL, ELEVATION 204.228mASL.

NOTES:
 TOTAL AREA= 42.2 ha
 TOTAL FINAL COVER= 16.9 ha



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Client
**GFL ENVIRONMENTAL
 STONEY CREEK, ONTARIO**

Project
STONEY CREEK REGIONAL FACILITY

No.	Issue	Drawn	Approved	Date

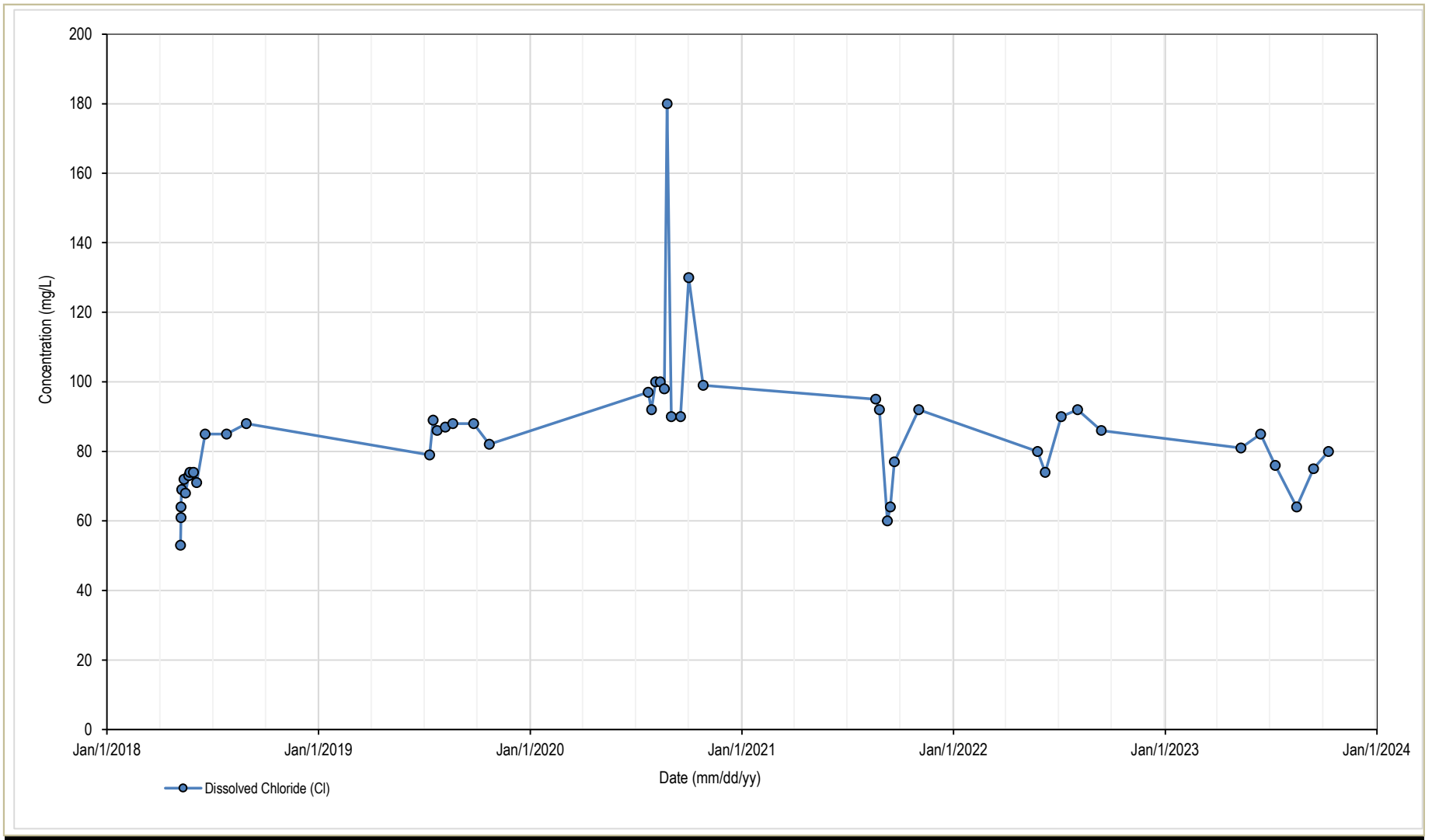
Drawn	T.WAGSTAFF	Designer	B.DERMODY
Drafting Check	P.LESIECZKO	Design Check	B.DERMODY
Project Manager	B.DERMODY	Date	JAN 2023
This document shall not be used for construction unless signed and sealed for construction.		Scale	1:1500
Original Size	Bar is 20mm on original size drawing 0 20mm		

Project No. **11103232-50**

Title
**LANDFILL CONTOURS
 AND VOLUMES -
 NOVEMBER 2023**

Sheet No.
FIGURE 3.5

Attachment 2

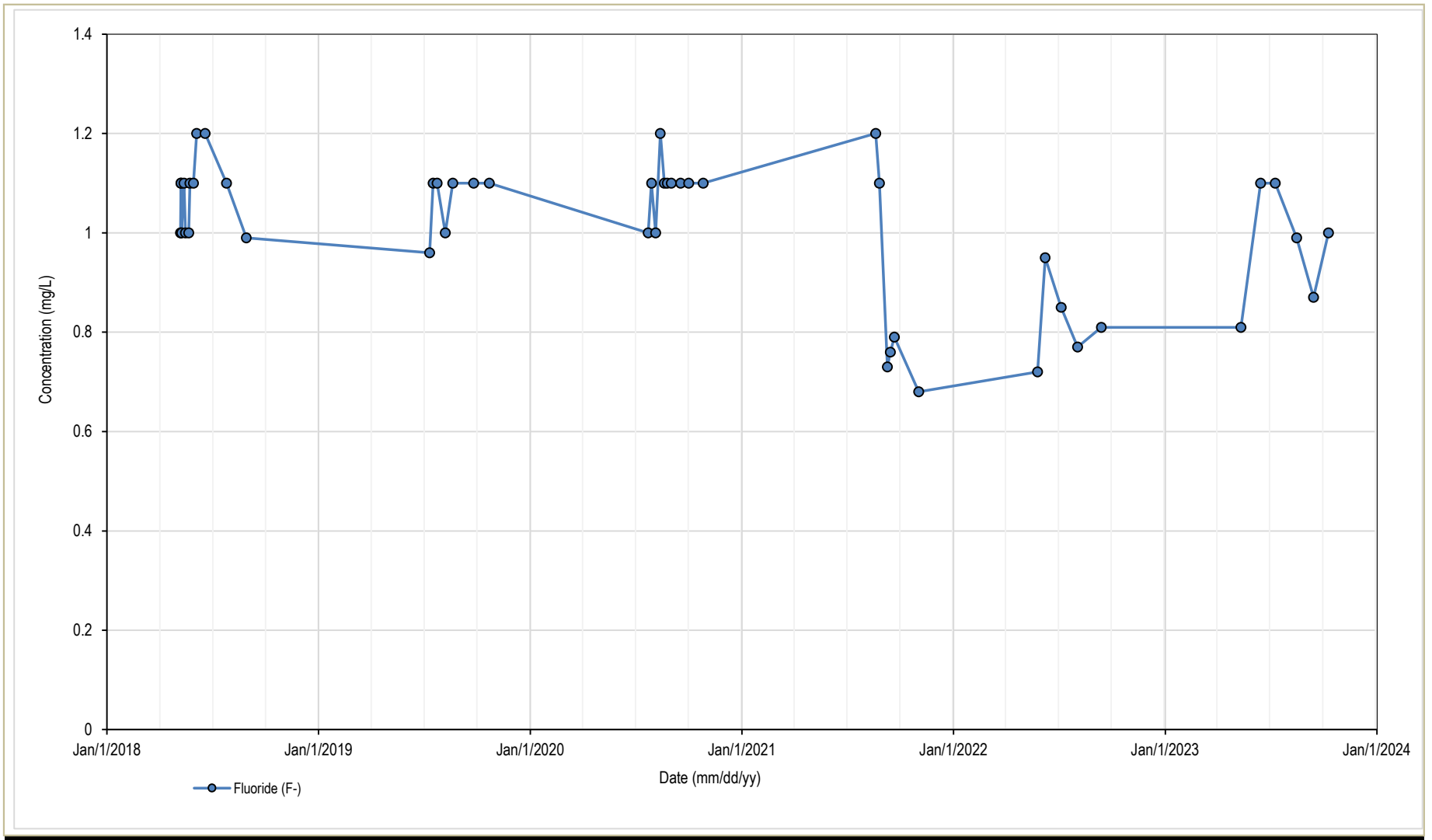


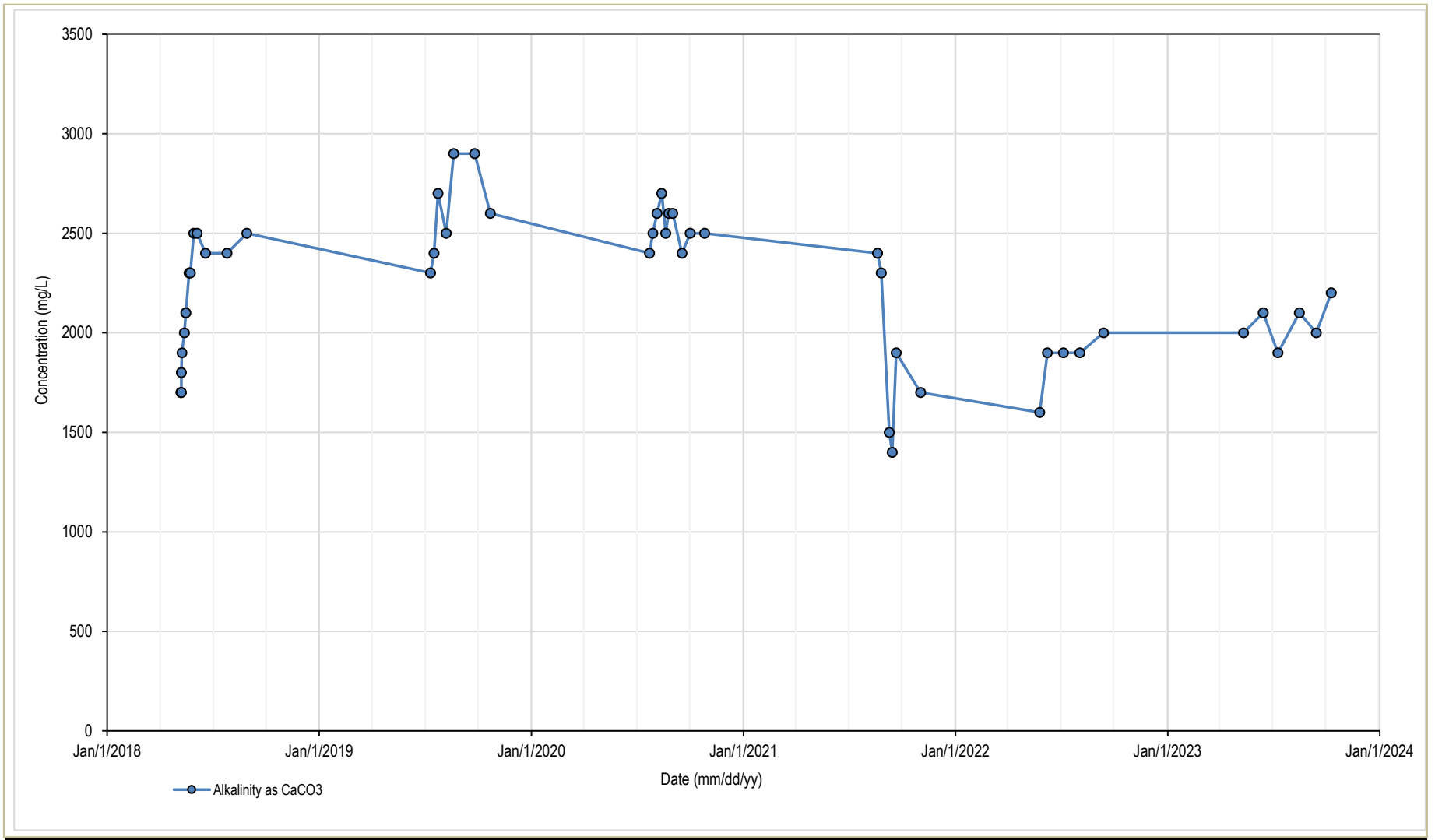
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Project No. 11103232
 Date December 2023

DISSOLVED CHLORIDE CONCENTRATION VS TIME

FIGURE 2



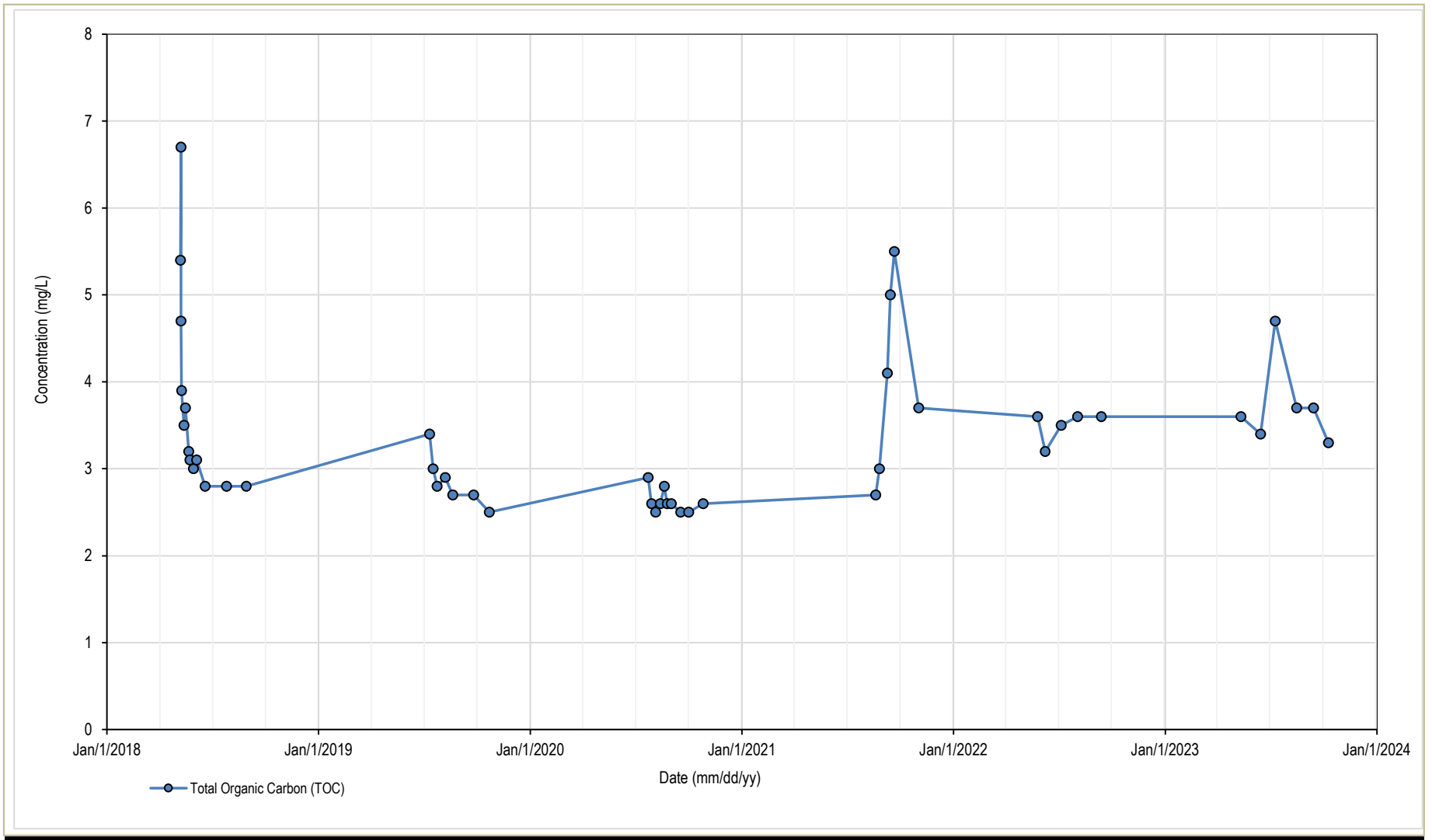


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 Date December 2023

ALKALINITY CONCENTRATION VS TIME

FIGURE 4



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Project No. 11103232
 Date December 2023

TOTAL ORGANIC CARBON CONCENTRATION VS TIME

FIGURE 5