

# Management of Wastewater Discharge and Overflow Monitoring

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March 10, 2023

**2022 Annual Report**

Auditor General of  
the Ville de Montréal



## Management of Wastewater Discharge and Overflow Monitoring

### Background

Between 2012 and 2014, both Environment and Climate Change Canada (ECCC) and Québec's Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP) adopted regulations to manage wastewater and ensure the protection of human health and the environment. These include standards applying to effluent discharges and wastewater overflows. Whereas, in Québec, the *Regulation respecting municipal wastewater treatment works* (RRMWTW) allows for untreated wastewater overflows in rainy weather or in cases of emergency, the federal *Fisheries Act* does not.

The Ville de Montréal (the City) operates two wastewater treatment plants. The Jean-R.-Marcotte wastewater treatment plant, which has been in operation since 1984, can treat the equivalent of 3,040 Olympic-size pools of wastewater per day of rain. The second plant is much smaller and is located on Île Notre-Dame. Wastewater is collected on 63% of the territory by a combined sewer system carrying both domestic wastewater and rainwater. In the event the collection system overloads, overflows of untreated wastewater can occur through the 161 overflow structures located along the collection system.

### Purpose of the audit

To ensure that the City has adequate mechanisms in place for the sound management of wastewater discharge and overflow monitoring in accordance with the regulatory requirements.

### Results

In general, the City has implemented a series of mechanisms to ensure the sound management of wastewater discharges and overflows. Nevertheless, these mechanisms are not fully compliant with regulatory requirements. Discharge concentration standards at the treatment plants are being met and all the acute toxicity tests on daphnia and rainbow trout were successfully completed. Almost all (96%) of the overflow structures are equipped with instruments that detect overflows.

However, water sampling frequencies and timeframes for retesting positive toxicity tests were not always met. On several occasions, the telemetric overflow detection instruments failed and the City was unable to identify whether wastewater had overflowed. In addition, the required visits to overflow structures are not all carried out or the frequency of visits is not respected.

Also, the City does not notify ECCC of overflows when it rains. Although it notifies the MELCCFP and ECCC of dry weather overflows, it does not always do so within the required timeframes.

Finally, we observed inaccuracies and inconsistencies in the overflow tracking and operator competency data between the information submitted by the City to the MELCCFP and the data contained in the City's internal records.

## Main Findings

### Monitoring Compliance with Wastewater Discharge Standards

- For the two wastewater treatment plants:
  - The daily flow measurement is carried out each day;
  - Discharge concentration standards are being met and all acute toxicity tests on daphnia and rainbow trout have been successfully completed.
- The accuracy of the flow measurement is verified for the Jean-R.-Marcotte wastewater treatment plant. This was not the case for Île Notre-Dame plant in 2020 and 2021.
- The discharge monitoring data posted on the MELCCFP's website is of high quality.
- However, for one or the other of the wastewater treatment plants, we observed that:
  - The ultrasonic probe used to measure flows is not calibrated annually;
  - The frequency requirement of physical and chemical test sampling was not always met;
  - For toxicity tests, the sampling frequencies, time limits for repeat tests and minimum time between samples were not respected.

### Monitoring Compliance With Wastewater Overflow Standards

- 96% of the overflow structures are equipped with instruments that detect overflows, 79% of which are equipped with an instrument that communicates in real time with the treatment plant when overflows occur.

- Following a hundred or so failures in the instruments connected by telemetry, it was not possible to identify whether or not overflows had occurred.
- 32% of weekly visits and 51% of monthly visits to overflow structures were not conducted.
- There are inaccuracies and inconsistencies between the overflow data contained in the internal database and that presented on the MELCCFP's website.

### Operation and Event Reports

- 98% of monthly and annual reports are submitted to the MELCCFP on time.
- The City does not notify ECCC of overflows when it rains.
- The City does not provide timely notifications to the MELCCFP/ECCC of overflows in dry weather, in the event of an emergency or during planned work.
- There are inaccuracies in the information regarding the qualifications of the operators presented on the MELCCFP's website.

### Operator Qualifications

- For 2019 and 2020, two staff members who performed duties related to treatment plant operations did not hold valid qualification certificates.

In addition to these results, we made various recommendations to the business units, which are presented in the following pages.



# List of Acronyms

**BVG**

Bureau du vérificateur général

**CBOD<sub>5</sub>**

carbonaceous biochemical oxygen demand

**City**

Ville de Montréal

**DEEU**

Direction de l'épuration des eaux usées

**ECCC**

Environment and Climate Change Canada

**EOR**

electronic overflow recorder

**MELCCFP**

ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs

**RRMWTW**

Regulation respecting municipal wastewater treatment works

**SE**

Service de l'eau

**SOMAEU**

Municipal wastewater treatment plant monitoring system

**SS**

suspended solids



# Glossary

## **Affluent**

Wastewater received at a treatment plant for treatment.

## **Bypass**

Any discharge of partially treated wastewater into the environment due to the bypassing of a treatment stage of the wastewater treatment plant.

## **CBOD<sub>5</sub>**

Measurement of the oxygen required, under controlled conditions, to biologically oxidize organic matter.

## **Calibrator**

Device that is used as a baseline whose value is recognized with high accuracy.

## **Calibration**

Operation which consists of ensuring that a device's measurements are similar to the results of a reference device (known as a calibrator).

## **Daphnia**

Small freshwater crustacean.

## **Dry weather**

Period beginning 24 hours after the end of a rainfall.

## **Effluent**

Wastewater released by a treatment plant.

## **Electronic overflow recorder**

Device that provides local compilation and real-time reporting of sewer overflows.

## **Grenade**

Type of local overflow recorder that looks like a grenade.

## **Hydroweb**

Technological solution used to (among other things) collect and analyze overflow structure monitoring data.

## **LIMS**

Management software used to (among other things) monitor the results of water quality analyses conducted by the DEEU's internal laboratory.

## **Municipal wastewater treatment facility**

Any structure used to collect, store, transport and treat wastewater, in whole or in part of domestic origin, prior to its discharge into the environment or into a stormwater management system and operated by an intermunicipal board, a municipality or a person acting as a grantee for a municipality.

## **Outfall**

Structure designed to discharge treated wastewater into a receiving body of water.

## **Overflow**

Any discharge of untreated wastewater into the environment or into a stormwater management system.



# Glossary

## **Overflow structure**

Site for the discharge of untreated wastewater into the environment when inflows exceed the capacity to transport the water to the treatment plant.

## **PI system**

System that stores, in real time, the operating data of different applications in order to analyze them.

## **Pumping motor unit**

Pump that is used to lift wastewater that has arrived at the wastewater treatment plant through the interceptors to the treatment facilities.

## **SICOS**

Computerized control and monitoring system used to operate and supervise sewage structures.

## **SOMAEU**

Interactive application used to transmit data related to the operation of a municipal wastewater treatment facility to the MELCCFP for regulatory control purposes.

## **Spillway**

Structure within a wastewater treatment plant through which treated wastewater passes to be discharged into the river.

## **SS**

Suspended solids – insoluble solids suspended in water that are visible to the naked eye.

## **Telemetry**

Equipment used to continuously record overflow events and transmit this information to a central station for remote viewing.

## **Totalizer**

Device that records and totals the volume.

## **Ultrasonic probe**

Device for reading a distance to measure the height of water, needed to calculate a water flow.

## **Visual feature**

Floating object (attached to a rope) installed in an overflow structure to indicate that wastewater has overflowed since the last visit.

## **Water treatment plant**

Municipal wastewater treatment facility used to treat wastewater prior to its discharge into the environment, including an associated facility used to treat sludge, waste and air.

## **XML**

File type that allows information originating from databases/data warehouses to be shared in other file types, such as text files.







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# 1. Background

Water is an important natural resource. Although it is renewable, it is not infinite. To protect and preserve it, the federal government is committed to cleaning up and decontaminating waterways so that all Canadians have access to clean water. One of the measures introduced is to ensure that wastewater (domestic, industrial and agricultural) is treated before it is discharged into lakes and rivers.

In 2009, the Canadian Council of Ministers of the Environment developed a Canada-wide strategy to guide the management of wastewater and ensure the protection of human health and the environment. However, it was only in 2012 that the federal government, in collaboration with the provinces and territories, develop a regulation<sup>1</sup> that sets out the requirements for wastewater treatment.

In 2014, the provincial government introduced the *Regulation respecting municipal wastewater treatment works* (RRMWTW),<sup>2</sup> which echoes the objectives of the federal regulation and allows for continued efforts to clean up municipal wastewater. Thus, in addition to respecting the basic standards, the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP), through municipal depollution attestations, sets specific requirements on discharge and overflow standards based on the context of municipal wastewater treatment facilities and the need to protect the environment into which the wastewater is discharged.<sup>3</sup> In addition, since the RRMWTW incorporates the federal regulation's requirements, this has allowed the Ville de Montréal (the City) to opt out of the federal regulation pursuant to an agreement reached with the federal government. However, untreated wastewater overflows, which are regulated under the *Fisheries Act* (RSC 1985, c. F-14) and enforced by Environment and Climate Change Canada (ECCC), are not covered by this agreement, and the City must therefore comply with the Act. For example, the Act prohibits the discharge of deleterious substances into waters frequented by fish.<sup>4</sup>

## Wastewater Treatment

The City has been treating wastewater on its territory since only June 1984, when the wastewater treatment plant currently known as the Jean-R.-Marcotte plant began operations. Prior to June 1984, most of the wastewater was discharged, untreated, into the waterways surrounding the island of Montréal. Furthermore, it is only since 1996 that all of the wastewater from the island of Montréal and Île Bizard has been routed to the plant.

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<sup>1</sup> *Wastewater Systems Effluent Regulations under the Fisheries Act* (SOR/2012-139).

<sup>2</sup> (CQLR, c. Q-2, r. 34.1).

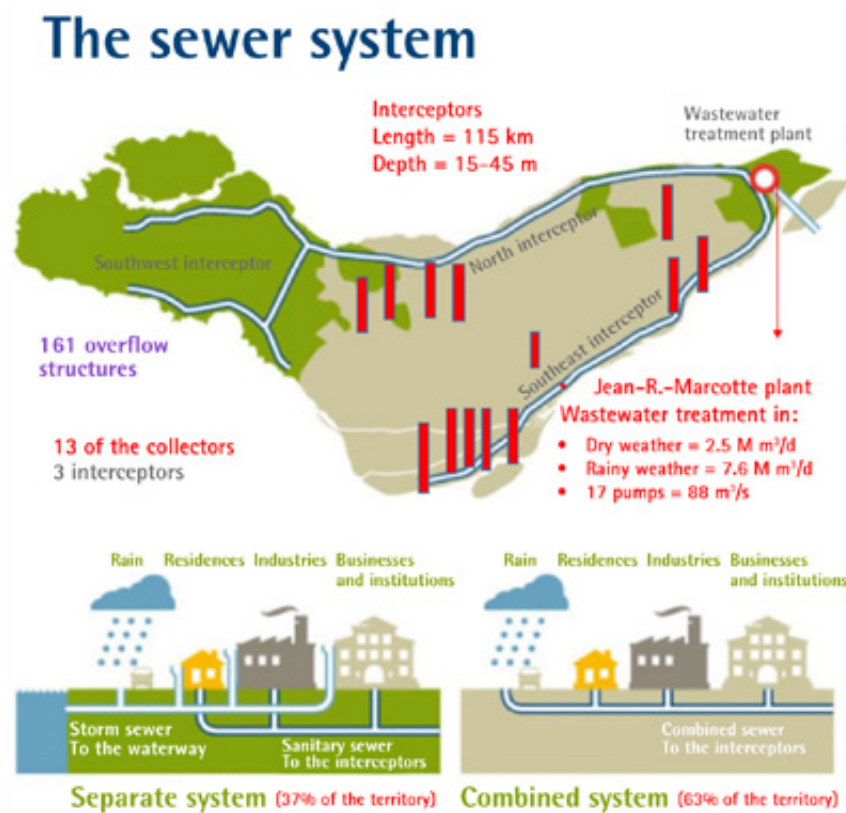
<sup>3</sup> The MELCCFP issued the first municipal depollution attestations for both of the City's treatment plants effective January 2023. These attestations include specific requirements for discharge and overflow standards that plants are obliged to meet.

<sup>4</sup> Under the *Fisheries Act*, no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.

The Jean-R.-Marcotte wastewater treatment plant is the largest in North America and the third largest in the world. It treats an average of close to 2.3 million cubic metres of wastewater per day in dry weather (and nearly 7.6 million cubic metres on rainy days [the equivalent of 920 to 3,040 Olympic-size swimming pools]). This represents 45% of the wastewater routed to wastewater treatment plants in the province. The City operates a second and considerably smaller treatment plant, Île Notre-Dame, which treats the wastewater routed from Île Notre-Dame and Île Sainte-Hélène.

Before reaching the treatment plants where it is treated, this wastewater follows a long route through domestic or industrial sewer systems that converge into larger-diameter pipes called collectors. The collectors discharge into very deep and large pipes called interceptors that carry the water to the treatment plant. The entire infrastructure that collects, stores, transports, and treats wastewater before returning it to the environment (see Figure 1) is called a municipal wastewater treatment facility, commonly referred to as a sewer system.

**FIGURE 1 | DIAGRAM OF THE AGGLOMERATION OF MONTRÉAL'S SEWER SYSTEM**



Source: Service de l'eau (SE). Image modified by the Bureau du vérificateur général (BVG) of the City.

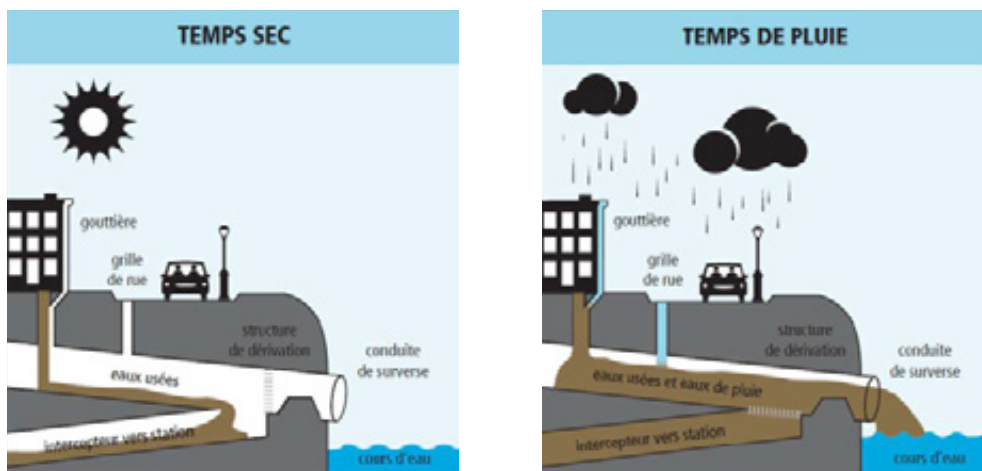
The water in the sewer system flows through pumps or through the action of gravity, i.e., the water flows from the collectors to the interceptors which are located deeper in the ground. The interceptors were dug with a west-to-east slope to allow water to be routed to the treatment plant. There are two types of domestic or industrial sewer systems found on the territory of Montréal: separate systems and combined systems.

- ◆ The **separate** system includes one pipe that collects the sanitary wastewater from homes, factories and businesses and another pipe that collects rainwater. Only sanitary wastewater is routed to the interceptors, whereas the rainwater is routed directly to the waterways via storm sewers. The separate system is present on 37% of the territory and is located mainly on Montréal's West Island.
- ◆ The **combined** system collects both sanitary wastewater and rainwater. It covers approximately 63% of the territory of the island of Montréal and is located mainly in the centre and east of the City. Most of the overflows during heavy rainfalls originate from this system.

Three interceptors surround the island of Montréal and carry wastewater to the Jean-R.-Marcotte wastewater treatment plant: the north interceptor (in operation since the 1970s), the southwest interceptor, connected to the north interceptor (in operation since 1988), and the southeast interceptor (in operation since 1992).

Along the sewer system, water inflows may sometimes exceed the system's capacity to carry wastewater to the treatment plant. This is particularly the case during heavy rainfalls or snowmelt, but other factors can also be involved, for example maintenance or emergency work (following equipment failure). This excess water results in untreated water overflowing (see Table 1) into the environment at one or more of the territory's 161 "overflow structures" (see Figure 2).

**FIGURE 2** | **DIAGRAM OF AN OVERFLOW STRUCTURE DURING DRY WEATHER VERSUS DURING WET WEATHER (COMBINED SEWER SYSTEM)**



Source: SE.

Untreated water containing certain contaminants (e.g., fecal coliforms, bacteria) is thus discharged directly into the receiving waterways (the St. Lawrence River south of the island of Montréal and the Rivière des Prairies to the north).

**TABLE 1** | **NUMBER OF UNTREATED WASTEWATER OVERFLOWS BY CATEGORY FROM JANUARY 2019 TO JUNE 2022**

YEAR	PRECIPITATION (RAIN AND SNOW, IN MILLIMETRES)	NUMBER OF OVERFLOWS THROUGH OVERFLOW STRUCTURES				TOTAL
		RAIN AND SNOWMELT	DRY WEATHER	EMERGENCY	PLANNED WORK	
2022 (6 months)	609	634	1	6	2	<b>643</b>
2021	812	547	2	12	1	<b>562</b>
2020	1,071	1,201	0	30	1	<b>1,232</b>
2019	1,196	1,295	42	115	2	<b>1,454</b>

Source: Data from the MELCCFP's SOMAEU (Municipal wastewater treatment plant monitoring system) from 2019 to 2021 and from the Hydroweb database for 2022, for overflows that lasted more than 12 minutes.

The City does not advocate restricting overflows to the environment during wet weather, as this causes backflows into residential or commercial sewer systems. To minimize overflows, the City therefore relies on a dynamic management of its wastewater infrastructure by maximizing its treatment plants' pumping and treatment capacities as well as by maximizing the conveyance or retention capacities in its collectors, interceptors and retention basins. To prevent backflows into citizens' homes, overflows at various points along the interceptors are a means to relieve the pressure on the system.

For several years now, the City has implemented a number of mechanisms to reduce the likelihood of overflows, including:

- ◆ a drinking water system leak detection and water and sewer line rehabilitation program;
- ◆ the reduction of industrial, commercial and institutional water consumption;
- ◆ the construction of retention basins;
- ◆ the implementation of an integrated interceptor control system.

Also, since 2019, as presented in Table 1, the City has experienced a decrease in the number of annual overflows, primarily in 2021, largely attributable to low rainfall during the spring snowmelt period.

In addition, the City adopted its Plan de gestion des débordements to meet the MELCCFP's regulatory framework. This plan incorporates the requirement that sewer system expansion projects for new residential developments do not result in increased wastewater overflows.

#### Roles and Responsibilities

Treatment of the City's wastewater is the responsibility of the Direction de l'épuration des eaux usées (DEEU) of the Service de l'eau (SE). Its mission is to intercept and treat wastewater generated on the Montréal territory to contribute to cleaning up waterways, in a spirit of resource preservation and waste reclamation. The DEEU is primarily responsible for this mission's regulatory aspect. In order to be able to enforce and measure regulatory compliance, particularly the RRMWTW, the DEEU decided to instrument and monitor most of the overflow structures (with the exception of a few structures that are operated and monitored by a related municipality or a borough).

The DEEU also has two teams that operate and maintain the treatment plants and their system of interceptors.

#### Regulatory Framework

Municipalities that are subject<sup>5</sup> to the RRMWTW and the *Fisheries Act* must comply with the following provisions, among others:

- ◆ Operating standards:
  - Measure the daily flow of treated wastewater using a device that measures the flow within a 15% margin of error. This device must be calibrated annually.
- ◆ Effluent discharge standards:
  - Meet standards for five-day carbonaceous biochemical oxygen demand (CBOD<sub>5</sub>),<sup>6</sup> suspended solid (SS) concentration and hydrogen potential (pH);
  - The effluent may not be acutely toxic to rainbow trout and/or daphnia.
- ◆ Standards applying to overflows:
  - Do not discharge untreated or partially treated wastewater into the environment in dry weather;
  - Identify all wastewater overflows that occur at the structure.
- ◆ Staff qualifications:
  - The staff subject to the Act must hold a valid qualification certificate or apprentice card issued by the Ministère de l'Emploi et de la Solidarité sociale.

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<sup>5</sup> Québec municipalities with wastewater facilities, except those with an annual average flow of less than 10 cubic metres/day or those located north of the 54th parallel.

<sup>6</sup> The City, like about 60 other cities, is exempt from the CBOD<sub>5</sub> standards until December 31, 2030.

- ◆ Reports and records:
  - Notify ECCC and the MELCCFP of overflows in accordance with each entity's requirements;
  - Submit monthly and annual reports electronically to the MELCCFP within the prescribed timeframes.

Administrative and monetary penalties ranging from \$250 to \$6,000,000 may be imposed for violations of the RRMWTW.

Wastewater management has become a priority for the municipalities, which must improve the quality of the water that is returned to the waterways in order to protect this collective wealth. The St. Lawrence River is the waterway into which the City discharges its treated wastewater. Untreated overflows occur at various locations on the outskirts of Montréal, in the Rivière des Prairies as well as in the St. Lawrence River. The latter is the source of drinking water for several municipalities located downstream and is an area where many citizens engage in activities such as swimming and fishing.



## 2. Purpose and Scope of the Audit and Evaluation Criteria

### 2.1. Purpose of the Audit

Under the provisions of the *Cities and Towns Act* (CTA), we conducted a performance audit mission on the management of the municipal wastewater treatment facility. We carried out this mission in accordance with the *Canadian Standard on Assurance Engagements (CSAE) 3001* of the CPA Canada Handbook – Assurance.

The purpose of this audit was to ensure that the City has adequate mechanisms in place for the sound management of wastewater discharge and overflow monitoring in accordance with regulatory requirements.

### 2.2. Evaluation Criteria

Our assessment is based on criteria we deemed valid under the circumstances, namely the following:

- ◆ Mechanisms are in place to monitor compliance with wastewater discharge standards and generate quality data;
- ◆ Mechanisms are in place to track wastewater overflow standards and generate quality data;
- ◆ Operation and event reports contain quality information and are sent in a timely manner;
- ◆ Staff members are qualified to perform duties related to wastewater treatment plant operations.

The role of the City's Auditor General is to provide a conclusion regarding the purpose of the audit. To that end, we gathered sufficient and appropriate relevant evidence on which to base our conclusion and obtain a reasonable level of assurance.

The City's Auditor General applies the Canadian Standard on Quality Management 1, *Quality Management for Firms that Perform Audits or Review of Financial Statements, or Other Assurance or Related Services Engagements*. This standard requires the City's Auditor General to design, implement and operate a quality management system that includes policies and procedures to ensure compliance with ethical rules, professional standards and applicable legal and regulatory requirements. In the performance of the work, the City's Auditor General also complied with the rules regarding independence as well as with the other ethical rules of Québec's *Code of ethics of chartered professional accountants*, which are based on the principles of integrity, professional competence and due diligence, confidentiality and professional conduct.

## 2.3. Scope of the Audit

Our audit work covered the period from January 1, 2019, to June 30, 2022. Our work consisted of conducting interviews with employees, reviewing various documents and conducting surveys that we deemed appropriate to gather the necessary evidence. Our work was mainly carried out between May and November 2022. However, we also took into account information that was sent to us up to March 2023.

We excluded from the scope of our mission the application and follow-up of *Regulations 2008-47 and 2013-57* which aim to reduce the discharge of contaminants into wastewater treatment structures by businesses and industries on the territory of the Communauté métropolitaine de Montréal. We also excluded the accreditation exercise of the internal and external analytical laboratories used to measure effluent discharge standards, activities related to wastewater infrastructure management, and the operationalization of wastewater treatment systems (e.g., wastewater and sewage sludge treatment). Finally, the impact on the environment receiving discharges of treated and untreated pollutants was not covered by our work.

This work was mainly carried out with the SE, more specifically with the Division ingénierie et procédés and the Division études et plan directeur under the Direction de l'épuration des eaux usées.

At the end of our work, a draft audit report was presented for discussion to the relevant managers of the SE. The final report was then sent to the management of this department for the purpose of obtaining an action plan and a timetable for the implementation of the recommendations laid out in this report. A copy of the final report was also sent, for information purposes, to the Direction générale and the Direction générale adjointe à l'urbanisme, la mobilité et aux infrastructures.

## 3. Audit Results

### 3.1. Effluent Discharge Tracking

#### 3.1.1. Flow Measurement

##### **Jean-R.-Marcotte Wastewater Treatment Plant**

###### Compliance with daily flow requirements

The RRMWTW requires the City to measure the daily flow of treated wastewater. It is preferable to measure the flow at the effluent (the outlet of the treatment plant) to better assess the contaminant loads that are discharged. However, flow can also be measured at the affluent (the plant's inlet).

The flow measured at the affluent is derived from the sum of the flows recorded by each of the flowmeters associated with the 17<sup>7</sup> pumping motor units. The calculation is done in the SICOS system, which adds up every second and the data is archived every 30 seconds in the PI application. In dry weather, 1 or 2 pumps per interceptor operate, whereas in wet weather or snowmelt, almost all of the pumps are in operation.

The effluent flow is measured by an ultrasonic probe located upstream of a spillway that measures the water level. A formula appropriate to the type of spillway is applied to derive the flow rate.

###### Calibration – Checking the accuracy of the flow measurement

Under the RRMWTW, the accuracy of the flow measurement must be verified annually using a calibrator or other method recognized by the MELCCFP. A margin of error of less than 15% is tolerated. The City checks the accuracy on a daily basis using the reference method. Each day, the average affluent flow is compared with the effluent flow.

From January 1, 2019, to June 30, 2022, the margin of error between the affluent and effluent flow measurements was always less than 15%, mostly below 5% (in 96.4% to 99.5% of cases) depending on the year (see Table 2).

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<sup>7</sup> There are eight pumps on the north interceptor and nine on the south interceptor.

**TABLE 2** | **DISTRIBUTION OF FLOW MEASUREMENT DEVIATIONS AT THE JEAN-R.-MARCOTTE WASTEWATER TREATMENT PLANT**

PERCENTAGE DIFFERENCE	2022 (6 MONTHS)		2021		2020		2019	
	NUMBER OF DAYS	PERCENTAGE OF DAYS	NUMBER OF DAYS	PERCENTAGE OF DAYS	NUMBER OF DAYS	PERCENTAGE OF DAYS	NUMBER OF DAYS	PERCENTAGE OF DAYS
Less than 5 %	176	97.2%	352	96.4%	363	99.2%	363	99.5%
Between 5 % and 10 %	5	2.8%	12	3.3%	3	0.8%	2	0.5%
Between 10 % and 15 %	0	0%	1	0.3%	0	0.0%	0	0.0%
<b>TOTAL</b>	<b>181</b>	<b>100%</b>	<b>365</b>	<b>100%</b>	<b>366</b>	<b>100%</b>	<b>365</b>	<b>100%</b>

Source: Table produced by the City's BVG based on data collected during our audit work.

According to Book 7 — *Flow Measurement Methods* — of the *Sampling Guide for Environmental Analysis* of the Centre d'expertise environnementale du Québec, which deals with the theoretical aspects and good practices of flow measurement, an ultrasonic probe such as the one used by the City to measure flow must:

- ◆ Have a manufacturer's accuracy of less than or equal to 2.5%;
- ◆ Be calibrated annually.

According to the manufacturer, the probe has an accuracy of 1% for daily dry weather flows and 0.4% for wet weather flows, which meets the less than or equal to 2.5% requirement. However, the ultrasonic probe is not calibrated annually by the City. A test to assess its accuracy was conducted during the winter of 2020. According to the results, the differences are below 2%. However, this test cannot be considered a calibration, as only 1 of the 3 tests required by the methodology was performed.

#### Maintenance of the flow measurement equipment

Pursuant to the RRMWTW, the City must maintain the device used to measure flows in good working order at all times. The MELCCFP recommends that routine tests be performed, in addition to the accuracy measurement calculated annually.

Flowmeters at the affluent are not routinely maintained as such. The City's recommended method to ensure that the flowmeters are functioning properly is to monitor flow measurements in real time and to use alarms to quickly detect any anomalies. The flowmeters

are ultrasonic and are secured to the outer walls of the 17 pumping motor units. Since they are not in contact with the water, there is no real wear. In addition, since the flow is measured at the affluent and effluent, if there is a significant difference in the measurement, an analysis is performed to detect the problem and adjust the flowmeters as needed.

## Île Notre-Dame Wastewater Treatment Plant

### Compliance with daily flow requirements

Pumps and a level probe are used to measure the flow on a daily basis at the affluent. There were occasional abnormal measurements (41 out of 1,277 days [3%]), especially at the beginning or end of the month when the volume totalizer was reset. Prior to July 2021, a mathematical formula was used to estimate the abnormal value. After this date, the raw data was retrieved and manually indexed in the SOMAEU. This issue was resolved in June 2022 by commissioning new pumps as part of the pump station rehabilitation work.

### Calibration – Checking the accuracy of the flow measurement

Flow measurement accuracy was not checked in 2020 and 2021 due to the pandemic, as only essential water treatment tasks were maintained, and because of the rehabilitation work at the pumping station. However, when the station was commissioned with new pumps in May 2022, the flow measurement was validated using a method recognized by the MELCCFP. To remain compliant, the City must carry out this validation process on an annual basis.

In addition, our audit revealed that only one probe is in operation for each station. Although certain anomalies in the flow calculation were identified and the values were recovered, it is questionable whether the City has an alternative in the event the probes fail. Such a situation would put the City at risk of not being able to measure the daily flow and thus not complying with this requirement.

Overall, the City has mechanisms in place to ensure that treated wastewater flows are measured daily.

#### **RECOMMENDATION** **3.1.1.A.**

We recommend that the Service de l'eau implement a calibration plan for the ultrasonic probe at the effluent of the Jean-R.-Marcotte wastewater treatment plant to ensure the accuracy of the probe measurements.

#### **RECOMMENDATION** **3.1.1.B.**

We recommend that the Service de l'eau develop and implement an affluent flow measurement accuracy verification plan for the Île Notre-Dame wastewater treatment plant to ensure the accuracy of the flow measurement on an annual basis.

#### **RECOMMENDATION** **3.1.1.C.**

We recommend that the Service de l'eau evaluate the need for a second device to provide redundancy in the event of probe failure at both wastewater treatment plants, to enable the Ville de Montréal to continue to measure flows.

### 3.1.2. Effluent Discharge Standards

Pursuant to the RRMWTW, the City's effluent must meet discharge standards. Samples for concentration standards are analyzed by the SE's in-house laboratory, and acute toxicity testing on rainbow trout and daphnia is performed by an external laboratory. For the years covered by our audit, the internal and external laboratories had a valid accreditation issued by the Centre d'expertise en analyse environnementale du Québec for their field and area of activity.

#### 3.1.2.1. Concentration Standards

To protect the receiving environment, the effluent must meet the concentration standards set out in the RRMWTW:

- ◆ The CBOD<sub>5</sub> must be less than or equal to 25 mg/L;
- ◆ SS concentrations must be less than or equal to 25 mg/L, unless it is demonstrated that the excess is caused by algal blooms in sewage lagoons;
- ◆ The hydrogen potential (pH) value should be between 6.0 and 9.5.

For CBOD<sub>5</sub> and SS measures, the sample analysis results are compiled to establish an average according to the category of the plant. For example, in the case of the very large Jean-R.-Marcotte wastewater treatment plant, samples must be taken five days per week and the averaging period must be monthly. For the Île Notre-Dame wastewater treatment plant, which is of medium size, samples are required once every two weeks and the averaging period is quarterly.

### Jean-R.-Marcotte Wastewater Treatment Plant

Pursuant to the RRMWTW, the Jean-R.-Marcotte wastewater treatment plant is exempted from complying with the CBOD<sub>5</sub> and SS requirements until December 31, 2030. However, it is exempt only from the CBOD<sub>5</sub> requirement, as its municipal depollution attestation prescribes a discharge standard for SS. As required, on December 15, 2022, it filed its action plan with the MELCCFP on the measures it would be taking to comply with the CBOD<sub>5</sub> standard as well as a timetable establishing the implementation of the measures.

As Table 3 shows, the SS and pH test results are within acceptable ranges. Although the City is required to measure SS and pH at a rate of 5 days per week, it does so daily. Between January 1, 2019, and June 30, 2022, there were only 4 days (0.31%) when no sample was collected. Despite this, the required sampling frequency of 5 days per week was always met.

Although it is not required to meet the CBOD<sub>5</sub> standard before January 2031, the City is analyzing discharges for this parameter to validate where it currently stands. As illustrated below, the requirement concerning CBOD<sub>5</sub> is not met. Secondary treatment will be required to enable the City to comply with the requirement.

**TABLE 3** | **RESULTS OF CHEMICAL AND PHYSICAL ANALYSES OF EFFLUENT DISCHARGES AT THE JEAN-R.-MARCOTTE WASTEWATER TREATMENT PLANT**

PARAMETERS ANALYZED AND REQUIREMENTS TO BE MET		2022 (6 MONTHS)	2021	2020	2019
CBOD <sub>5</sub> (as of 2031)	less than or equal to 25 mg/L	min: 54.1 max: 83.4	min: 63.0 max: 80.9	min: 46.3 max: 74.0	min: 39.6 max: 70.5
SS	less than or equal to 25 mg/L	min: 15.8 max: 18.9	min: 16.0 max: 18.8	min: 16.5 max: 19.7	min: 14.8 max: 19.2
pH <sup>[a]</sup>	between 6.0 and 9.5	min: 6.9 max: 7.9	min: 6.7 max: 8.1	min: 6.2 max: 8.3	min: 6.8 max: 8.3

[a] pH results are evaluated on an ad hoc basis.

Source: Table produced by the City's BVG based on data collected during our audit work.

## Île Notre-Dame Wastewater Treatment Plant

Unlike the Jean-R.-Marcotte wastewater treatment plant, the Île Notre-Dame wastewater treatment plant, given its category, must comply with the aforementioned CBOD<sub>5</sub>, SS and pH requirements. However, samples must be collected every two weeks. For CBOD<sub>5</sub> and SS, the averaging period is quarterly, whereas pH results are assessed on an ad hoc basis. Although regulations require testing every two weeks, the City carries out tests on a weekly basis.<sup>8</sup>

As Table 4 shows, all of the CBOD<sub>5</sub>, SS and pH test results are within acceptable ranges.

**TABLE 4** RESULTS OF CHEMICAL AND PHYSICAL ANALYSES OF EFFLUENT DISCHARGES AT THE ÎLE NOTRE-DAME WASTEWATER TREATMENT PLANT

PARAMETERS ANALYZED AND REQUIREMENTS TO BE MET		2022 (6 MONTHS)	2021	2020	2019	COMPLIANT YES/NO
CBOD <sub>5</sub>	less than or equal to 25 mg/L	min: 2.4 max: 5.1	min: 1.0 max: 1.8	min: 1.0 max: 13.9	min: 6.5 max: 13.7	<b>yes</b>
SS	less than or equal to 25 mg/L	min: 4.8 max: 7.9	min: 4.1 max: 6.5	min: 4.2 max: 21.8	min: 11.4 max: 18.5	<b>yes</b>
pH	between 6.0 and 9.5	min: 7.1 max: 8.3	min: 7.1 max: 8.4	min: 6.5 max: 8.0	min: 6.7 max: 7.6	<b>yes</b>

Source: Table produced by the City's BVG based on data collected during our audit work.

However, tests were not conducted every two weeks as required. A total of 3 tests were not performed, as presented in Table 5. For 1 case in 2019, pH values were not available because the sample conservation times had been exceeded. The other 2 cases occurred in February 2021 and March 2021. CBOD<sub>5</sub>, SS and pH were not measured because it was not possible to collect effluent samples. The pandemic (less traffic on Île Notre-Dame) and the rehabilitation work that took place at the pumping station resulted in extremely low effluent flows during these periods. With the cold weather in February and early March, the effluent froze, preventing the DEEU from collecting samples.

<sup>8</sup> Corresponds to the value obtained during the test.



TABLE 5

**RATE OF COMPLIANCE WITH EFFLUENT SAMPLING FREQUENCIES AT THE ÎLE NOTRE-DAME WASTEWATER TREATMENT PLANT**

	2022 (6 MONTHS)	2021	2020	2019
CBOD <sub>5</sub> , SS et pH	100% (13/13)	92% (24/26)	100% (26/26)	96% (25/26)

Source: Table produced by the City's BVG based on data collected during our audit work.

**3.1.2.2. Acute Toxicity Testing**

To protect aquatic organisms, a wastewater treatment plant's effluent cannot be acutely toxic to rainbow trout or daphnia.<sup>9</sup> To comply with the RRMWTW, both toxicity tests must be performed, and both must be negative. An acute toxicity test result is considered positive if the mortality rate of organisms exposed to the undiluted effluent is greater than 50%. If a positive result is obtained for an acute toxicity test, the operator must conduct a second test on the same species using a new sample within 7 days of the positive result. If the result of this second test is negative, the operator must conduct a third test on the same species, within 7 days, to determine the final test result.

The City contracts with accredited private laboratories to have these acute toxicity tests performed. The agreements between the City and these laboratories contain various clauses that stipulate the number of tests to be analyzed, the timeframe for reporting results and the need to establish a regular sample collection schedule. Nonetheless, the MELCCFP made a point of reminding municipal wastewater treatment facilities in late 2021 that, while some laboratories were having difficulty meeting testing deadlines due to labour shortages, it is the responsibility of the latter to make every effort to ensure they meet their obligations.

**Jean-R.-Marcotte Wastewater Treatment Plant**

In the case of the Jean-R.-Marcotte wastewater treatment plant, toxicity tests must be conducted monthly and at least three weeks apart.

Over the period covered by our audit, 5 toxicity tests showed positive results (see Table 6), namely 1 for rainbow trout and 4 for daphnia. However, toxicity is only confirmed following another positive result for the second or third test. The 5 positive tests were each followed by 2 negative tests. Toxicity was therefore never confirmed.

<sup>9</sup> Rainbow trout and daphnia have been identified as the standard coldwater fish and crustacean for freshwater pollution studies and aquatic toxicology research.

**TABLE 6** | ACUTE TOXICITY TEST RESULTS

Rainbow trout				
YEAR	PERCENTAGE OF SUCCESS BEFORE THE 2 ADDITIONAL TESTS		PERCENTAGE OF SUCCESS AFTER ADDITIONAL TESTS	
2019	100%	(12/12)	100%	(12/12)
2020	100%	(12/12)	100%	(12/12)
2021	92%	(11/12)	100%	(12/12)
2022	100%	(5/5)	100%	(5/5)

Daphnia				
YEAR	PERCENTAGE OF SUCCESS BEFORE THE ADDITIONAL TEST		PERCENTAGE OF SUCCESS AFTER ADDITIONAL TESTS	
2019	92%	(11/12)	100%	(12/12)
2020	83%	(10/12)	100%	(12/12)
2021	92%	(11/12)	100%	(12/12)
2022	100%	(5/5)	100%	(5/5)

Source: Table produced by the City's BVG based on data collected during our audit work.

However, in 2 cases, the second and third tests following a first positive result were not performed within the required timeframe. In one case in 2019 concerning daphnia, the second test was performed 8 days after the first test result. In another case, in 2021 for rainbow trout, the third test was performed 10 days after a negative result.

The required monthly sampling frequency was not met on 3 occasions. The May 2020 daphnia test was not performed because the City did not receive the necessary container in the collection kit. This happened when the City changed laboratories. In addition, the March 2022 tests were not conducted for rainbow trout and daphnia because the water sample container spilled during transport to the external laboratory. The remaining volume of water was

insufficient to conduct the tests. The City was notified late and was unable to collect new samples in a timely manner, resulting in regulatory non-compliance.

Also, the minimum period of at least 3 weeks (21 days) between 2 samples was not respected on 2 occasions. In 1 case, in 2019, 18 days separated the collection of the 2 samples for both rainbow trout and daphnia. A sample was taken but was cancelled due to a problem at the external laboratory. Sampling was repeated 5 days later, thus reducing the time separating it from the next sample. In another case, in 2021, 19 days separated the 2 samples for both rainbow trout and daphnia. This was due to a scheduling error.

#### **Île Notre-Dame Wastewater Treatment Plant**

In the case of this wastewater treatment plant, acute toxicity tests must be conducted on a quarterly basis and at least 2 months apart. All first-trial toxicity tests were successful, and the sampling frequency was respected. However, the two-month minimum period between tests was not respected in 1 instance in 2020. A first test was performed on February 6 and a second one on April 2. The reason given was a lack of coordination with the external laboratory.

Generally, as evidenced by the limited number of cases of non-compliance found, the City is in substantial compliance with wastewater discharge monitoring requirements.

#### **RECOMMENDATION 3.1.2.2.A.**

We recommend that the Service de l'eau establish a sample collection schedule that takes into account the requirements of the *Regulation respecting municipal wastewater treatment works* and update it following any sample that was not collected to ensure that the minimum time between sample collections is met.

## **3.2. Overflow Monitoring**

The *Fisheries Act* and the RRMWTW require the City to identify all wastewater overflows that occur on its territory.

### **3.2.1. Inventory of Overflow Structures**

In order to identify all wastewater overflows that occur on its territory, the City must first inventory all of the overflow structures on its sewer system. To date, the City accounts for 161 overflow structures that it monitors. Since the construction of the first sewer systems on the island of Montreal, the sewer systems of the different cities and boroughs have been modified and the modifications have been documented in a variety of ways over the decades. As a result, the DEEU is informed of or discovers new overflow sites during inspections or work performed on the system. These sites are verified to confirm that they are indeed overflow structures. Thereafter, they must be instrumented and monitored. Since 2016, a total of 37 potential overflow structures have been identified. Of these, 9 have been confirmed as overflow structures, 24 are under review, and 4 have been classified as non-overflow structures following analysis. Of the 9 confirmed, 3 were instrumented as a result of a project and now figure among the 161. There are plans to instrument the remaining 6 in order of priority of the

SE's projects. Instrumentation requires a construction project, and it is one of hundreds of the SE's pending projects.

### 3.2.2. Devices Used to Measure Overflows

To detect overflows (section 9 of the RRMWTW), the City has installed devices at overflow structures where feasible.<sup>10</sup> Some devices record the frequency of overflows, when they occur, and a cumulative daily total of how long they last (e.g., electronic overflow recorder [EOR]). For others, a weekly visit needs to be made to note whether the visual feature has been displaced. This feature makes it possible to determine whether there has been an overflow between 2 visits, but it gives no indication as to the duration or frequency of a possible overflow. The different devices used are listed in an inventory as presented in Table 7. Currently, of the 161 overflow structures, 127 (79%) have overflow data transmitted to the treatment plant via telemetry.

**TABLE 7** | CATEGORIES OF DEVICES USED TO MEASURE OVERFLOWS

DEVICE FEATURES	DEVICE CATEGORY (NUMBER OF OVERFLOW STRUCTURES EQUIPPED WITH SUCH A DEVICE)	NUMBER AND PERCENTAGE
With telemetry	<ul style="list-style-type: none"> <li>• HWM sensor (43)</li> <li>• Inclinator (15)</li> <li>• Level (32)</li> <li>• Pump (2)</li> <li>• Regulator (35)</li> </ul>	127 (79%)
Without telemetry	<ul style="list-style-type: none"> <li>• Local recorder (grenade) (4)</li> <li>• Manual [a] (9)</li> <li>• Visual feature (6)</li> <li>• Boroughs (14)</li> <li>• Unmonitored (1)</li> </ul>	34 (21%)
<b>TOTAL</b>		<b>161 (100%)</b>

[a] Human intervention is required to trigger the overflow.

Source: Table produced by the City's BVG based on data received by the SE.

Of the 161 overflow structures, only 1 is considered "unmonitored" because no device has yet been installed to monitor overflows. According to the DEEU, this overflow structure, along with the other 6 structures confirmed above, as well as those not connected by telemetry (visual feature) are on an instrumentation project list prepared by the SE. The reason given for this site is that the structure is difficult to access, as it is located in the middle of Notre-Dame

<sup>10</sup> Some sites do not require a device, as human intervention is required for an overflow to occur (e.g., the use of a portable pump to discharge water outside the sanitary system during heavy rain or snowmelt).

street, i.e., on the territory of the Ministère des Transports du Québec. Gaining access to it involves teams from the Ministère des Transports du Québec and the City and requires closing a section of the street.

### 3.2.3. Overflow Survey

For devices equipped with telemetry, overflows are usually identified when an alarm is triggered in the SICOS system. For devices that do not communicate via telemetry, overflows are recorded during visits. The DEEU has implemented an administrative guideline in the form of a decision-making logic diagram.<sup>11</sup> This guides the internal teams through the different steps that need to be followed in order to confirm whether or not there has been an overflow when an overflow is detected or the displacement of a float is observed. The logic diagram also outlines the steps to be taken to notify the MELCCFP/ECCC as soon as possible in the event of a dry weather overflow. Also, on a daily basis, the DEEU analyzes the report of overflows occurring at devices that communicate through telemetry to detect any anomalies, such as an overflow that did not actually occur.

#### 3.2.3.1. Visit

As stipulated in the RRMWTW, the City must visit overflow measuring devices at specified frequencies depending on the type of device<sup>12</sup> to detect overflows or to ensure that they are in good working condition. As part of our audit, we selected sample visits to test whether the required visits had been made.

##### Weekly Visits

For these visits, we selected 6 weeks per year, for a total of 21 weeks from January 2019 to June 2022.<sup>13</sup>

The devices covered are visual features, local recorders (e.g., grenades) and manually operated devices. Based on the audit work conducted, the City visited 68% of the overflow structures on a weekly basis, including the 6 structures equipped with visual features. We nevertheless made the following discoveries:

- ◆ The 4 structures equipped with local recorders were visited on a monthly basis rather than weekly as required, since they are local;
- ◆ Of the 9 structures equipped with manually operated devices, 2 were not listed on the visit forms and were therefore not visited. Among the 7 others:
  - 1 site was not visited because it is operated by the borough and the borough was not aware of the visit requirement;
  - For the other 6, 3 visits (1%) were not made (1 case) or cannot be demonstrated (2 cases, the forms were not found).

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<sup>11</sup> A diagram that describes the steps in a process.

<sup>12</sup> Required visits are dictated in the RRMWTW for visual features and in the SOMAEU program for other devices.

<sup>13</sup> 21 weeks x 19 structures = 399 audited visits.

## Monthly Visits

For these visits, we selected 2 months for the years 2019 to 2021 and 1 month for 2022, for a total of 7 months.<sup>14</sup>

### a) Device connected by telemetry

The 127 overflow structures equipped with a device that communicates by telemetry must be visited monthly to ensure that the device is functioning properly. The targeted devices are HWM sensors, inclinometers, levels and pumps.

We observed that 49% of the visits were made during the periods we sampled:

- ◆ The 43 structures equipped with an HWM device were indeed visited monthly. Of these structures, 4% of the visits were not completed;
- ◆ 21 structures were visited weekly even though the requirement is monthly, meaning that the requirement is met;
- ◆ There is no evidence that the remaining 63 structures were visited. According to the DEEU, some of these structures are visited, either frequently or only when there is a breakdown, but these visits are not documented.

### b) Manual or automated pump

Overflow structures equipped with manual or automated pumps and operated and monitored by the related municipality of Beaconsfield (11 sites) and the boroughs of Pierrefonds-Roxboro (1 site) and Lachine (2 sites) must be visited monthly. However, the DEEU receives overflow data only from the boroughs and related municipalities.

Furthermore, as mentioned above, the main purpose of the visits is to determine whether an overflow has occurred and to verify whether the equipment is operating properly. However, when the paper forms for visits were reviewed, only those used for visual feature visits indicated whether or not there had been an overflow. Also, it was found that there is no clear indication of what needs to be checked to ensure that the equipment is functioning properly. In addition, certain devices are difficult to access, and it is not possible to identify the overflows during the visit, which is why these devices have been equipped with telemetry.

## RECOMMENDATION 3.2.3.1.A.

We recommend that the Service de l'eau conduct overflow facility visits at the scheduled frequencies, document them properly and specify what needs to be checked for each type of device, so as to identify wastewater overflows and ensure that the devices are functioning properly.

<sup>14</sup> 7 weeks x 127 structures = 889 audited visits.

**RECOMMENDATION**

**3.2.3.1.B.**

We recommend that the Service de l'eau, in collaboration with the related municipality of Beaconsfield and the boroughs of Pierrefonds-Roxboro and Lachine, ensure that it receives information concerning visits that are followed up by either a related municipality or a borough, such that the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs is provided with complete information.

**3.2.3.2. Electronic Overflow Recorders**

Periodically, the EORs experience failures or problems with data transmission via telemetry, which result in some occasions where no overflow data was available for certain overflow structures. When this situation occurs, there is an “unmonitored” note in the monthly report. Based on the analysis of reports for the period from January 2020 to June 2022, there were 127 of these “unmonitored” events (see Table 8). These involved 44 separate overflow structures for which either the devices did not record data locally or, for certain devices without local recording capabilities, telemetry transmission did not work. The duration of the events varies between 1 and 30 days with an average duration of 11 to 23 days for the two and a half years analyzed. Of the 44 structures, 6 recorded a total of 39 events (31%) during this period. Of these, 2 structures recorded recurring events for the months of February through May 2022. When there is an equipment failure and overflow data is not collected, other temporary equipment must be installed and visited according to the requirements that apply to the replacement equipment. However, from the tests performed on the visits as well as information received by the DEEU it is unclear if visits were made when the equipment did not collect the overflow data or whether redundancy equipment was installed.

**TABLE 8 | BREAKDOWN OF “UNMONITORED” EVENTS BY YEAR**

YEAR	NUMBER OF “UNMONITORED” EVENTS	NUMBER OF OVERFLOW STRUCTURES CONCERNED	AVERAGE DURATION (IN DAYS) OF THE EVENTS
2022 (up to June)	21	15	11
2021	33	20	23
2020	73	29	18
<b>TOTAL</b>	<b>127</b>	<b>64</b>	<b>17</b>

Source: Table produced by the City's BVG based on data collected during our audit work.

In the absence of evidence that a mechanism has been put in place to collect overflow data when EORs fail, the DEEU is unable to demonstrate that it is identifying all overflows as required.

### Dry Weather Overflows

Since the RRMWTW does not allow dry weather overflows, an analysis of Hydroweb data for the period from January 2019 to June 2022 was performed as part of our work to identify whether there were any other dry weather overflows that were not identified by the DEEU and of which the MELCCFP was not informed.

Based on the results, out of approximately 50 overflows examined during this period, only 6 occurred in late 2019 and should have been reported to the MELCCFP because there had been no rain or snowmelt in the preceding days.

Although these cases were also identified by the DEEU during this period, no justification was documented to explain the fact that they had not been reported.

Despite these cases, for those overflows that the City is able to identify in dry weather, i.e., where the EORs have not failed, the City adequately identifies them as dry weather cases.

#### RECOMMENDATION 3.2.3.2.A.

We recommend that the Service de l'eau implement redundancy mechanisms when overflow data cannot be collected due to equipment, recording, or telemetry failure, so as to ensure that all overflows occurring on its territory are inventoried in a timely manner as required.

### 3.2.4. Transmission of Notices

In the event of a wastewater overflow that is not permitted by the regulation, the City must immediately notify an ECCC fisheries officer (section 38(5) of the *Fisheries Act*) as well as the Minister of the Environment, the Fight Against Climate Change, Wildlife and Parks (section 15). To this end, the SE has developed an administrative guideline that outlines the steps to be taken to produce these notices, particularly in the event of dry weather overflows. To date, it is the DEEU that transmits the notices when overflows occur.

#### Notice to the Environment and Climate Change Canada Fisheries Officer

As provided in the *Fisheries Act* (s. 38 [7]), as soon as feasible after the occurrence of a deposit of a deleterious substance in water frequented by fish, a fisheries officer must be informed thereof and provided with a written report on the occurrence. To date, the City has only notified fisheries officers of dry weather overflows, emergencies or planned work through notices sent to the Minister of the Environment, the Fight Against Climate Change, Wildlife and Parks. As part of our audit work, we found that the City was unable to demonstrate that it had notified a fisheries officer for 4 of the 16 notices analyzed (25%).

The City does not notify ECCC of wet weather overflows, contrary to its obligation to do so pursuant to the *Fisheries Act*. In October 2019, the City received a warning from ECCC's enforcement branch regarding discharges that occurred in August 2018 and April 2019.



The warning alleged a violation for discharging a deleterious substance in water frequented by fish and failing to notify a fisheries officer promptly. The warning informed the City to “take the necessary steps to comply with the Fisheries Act.” Although no administrative or criminal sanctions were levied against the City:

*“...this warning and the circumstances to which it refers are part of ECCC’s records and will be taken into consideration in the event of a repeat offence, another violation, and in making internal decisions such as those regarding inspection frequency.” According to ECCC, it “may consider taking further action if the city does not take the necessary steps to comply with the law”.*

Three years after this warning was issued, the City has yet to implement any measures to correct the situation.

#### **Notice Sent to the Minister of the Environment, the Fight Against Climate Change, Wildlife and Parks**

According to the RRMWTW (s. 15), unlike the federal government, there is no need to notify the Minister of the Environment, the Fight Against Climate Change, Wildlife and Parks when an overflow occurs during rainy weather or snowmelt. Only dry weather overflows or overflows that occur during an emergency or planned work at an overflow structure must be reported.

#### Notice in Dry Weather or in the Event of an Emergency

Notice must be given promptly when any of the following events occur:

- ◆ Discharge of the effluent elsewhere than at the final point of discharge of the outfall;
- ◆ A bypass or an overflow from an overflow structure or bypass structure in the event of an emergency or in dry weather;
- ◆ Equipment shutdown or failure having an impact on the quality of discharges or on the frequency or volume of overflows or bypasses;
- ◆ A bypass or an overflow elsewhere than from an overflow structure or a bypass structure.

The notice may be provided to the Minister of the Environment, the Fight Against Climate Change, Wildlife and Parks verbally or in writing. If the notice is provided verbally, the City has 48 hours to send an electronic copy. If it is provided in writing, it has 24 hours to do so.

For the period running from January 2019 to June 2022, the DEEU issued 9 verbal notices, including 2 (22%) for which the written notice was not provided within 48 hours. In those 2 cases, the notices were sent in 8 and 12 days respectively.

With respect to the written notices (see Table 9), for this same audit period, the DEEU issued 75 notices specifically for dry weather or emergency overflows. Of these notices, 18 out of 64 (28%) for the Jean-R.-Marcotte wastewater treatment plant and 3 out of 11 (27%) for the Île Notre-Dame wastewater treatment plant were not provided within the prescribed timeline. Overruns ranged from 2 to 190 days, the majority being less than 10 days.

TABLE 9

**NUMBER OF WRITTEN NOTICES SENT TO THE MINISTER OF THE ENVIRONMENT, THE FIGHT AGAINST CLIMATE CHANGE, WILDLIFE AND PARKS FOR THE PERIOD FROM JANUARY 2019 TO JUNE 2022 (JEAN-R.-MARCOTTE AND ÎLE NOTRE-DAME WASTEWATER TREATMENT PLANTS)**

YEAR	NOTICES CONCERNING DRY WEATHER OVERFLOWS		NOTICE CONCERNING OVERFLOWS IN THE EVENT OF EMERGENCIES	
	JEAN-R.-MARCOTTE WASTEWATER TREATMENT PLANT	ÎLE NOTRE-DAME WASTEWATER TREATMENT PLANT	JEAN-R.-MARCOTTE WASTEWATER TREATMENT PLANT	ÎLE NOTRE-DAME WASTEWATER TREATMENT PLANT
2022	2	0	8	0
2021	3	1	4	1
2020	2	0	30 <sup>[a]</sup>	0
2019	0	5	15	4
<b>TOTAL</b>	<b>7</b>	<b>6</b>	<b>57</b>	<b>5</b>

<sup>[a]</sup> A total of 23 notices were issued on October 8, 2020, for the same reason following a bitumen spill in the system the day before. The decision was taken to proceed with overflows to protect the wastewater treatment plant's equipment.

Source: Table produced by the City's BVG based on data collected during our audit work.

In addition, certain overflow structures are monitored by the City of Beaconsfield and the Pierrefonds-Roxboro borough. The DEEU consults them monthly to obtain overflow information. This does not allow the DEEU to notify the MELCCFP within 24 hours in the event of an overflow.

Also, in the case of the 2 structures monitored by the Lachine borough, the City has set up an operating procedure to be informed if overflows occur. This came about after 7 dry weather overflows occurred in 2021 for which notices were sent nearly 2 months later because the borough did not notify them within the required timeframe. It should be noted that an IT problem prevents the DEEU from accessing the data remotely. Until the problem is corrected (which is planned in 2023), the DEEU has decided to collect the information directly on a weekly basis in order to avoid further situations of non-compliance. However, this operating mode does not guarantee that the reporting deadlines will be met; for example, we observed that an overflow had occurred on September 29, 2022, and that the DEEU had sent the notice concerning it on October 10, 2022.

While each of these events may seem insignificant, taken together, they demonstrate that current operations must be improved in order to meet the timelines set by the RRMWTW.

### Notice of Planned Work

Notice must be given at least 45 days prior to any bypass or overflow that is required as part of planned work to modify, repair or maintain the structure.

Various mechanisms have been put in place over the years to enable the DEEU to identify this work (e.g., meetings with the DEEU's maintenance team, training for DEEU project managers and reminders to boroughs, related municipalities and central departments). In addition, a decision-making logic diagram was produced to allow stakeholders to know whether or not a notice must be issued for the planned work.

Despite these mechanisms, the DEEU is not always informed of all upcoming work or is not informed in a timely manner to be able to meet the reporting deadline. For example, in the case of work scheduled for January 17, 2022, at an overflow structure, the DEEU sent the notice on January 7, 2022, i.e., only 10 days before the work was scheduled. In addition, in the case of sewer line rehabilitation work where a bypass was required in October 2019, the DEEU was notified by the Service des infrastructures du réseau routier only once the bypass had occurred. The notice was therefore never sent.

Also, during the analysis of the 14 notices sent for work planned during the period from January 2019 to June 2022, at both the Jean-R.-Marcotte and Île Notre-Dame wastewater treatment plants, the reporting deadline had not been met for 3 notices, i.e., in 21% of cases. The transmission times ranged from 1 to 22 days before the start of the work.

The analyses thus show that, despite the mechanisms in place, the DEEU does not have a formal process to identify all upcoming planned work to ensure that notices can be issued in a timely manner.

**RECOMMENDATION**  
**3.2.4.A.**

We recommend that the Service de l'eau establish a mechanism to immediately notify Environment and Climate Change Canada of any wastewater overflows from overflow structures and wastewater treatment plants.

**RECOMMENDATION**  
**3.2.4.B.**

We recommend that the Service de l'eau review the mechanism for providing notices to the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs, including notices for structures that are monitored by a borough or related municipality, so as to ensure that they are sent within the required timeframe.

**RECOMMENDATION**  
**3.2.4.C.**

We recommend that the Service de l'eau establish a mechanism to identify all upcoming work on the wastewater treatment facility and communicate it to the various stakeholders in order to notify the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs within the required timeframe.

### 3.3. Annual and Monthly Reports

#### 3.3.1. Transmission of Reports

The City is required to report monthly and annually to the MELCCFP on the monitoring of its municipal wastewater treatment facilities by operating segment. The 7 segments were determined based on the location of the wastewater treatment facilities or overflow structures and whether they are local or agglomeration jurisdiction under the criteria used in the RCG 11-017.<sup>15</sup> For segments with facilities that are local jurisdiction, the DEEU has been mandated by the related municipalities of Beaconsfield, Dollard-des-Ormeaux, Sainte-Anne-de-Bellevue, Kirkland and Pointe-Claire to produce monthly and annual reports. The City must submit a monthly report electronically no later than 42 days following the end of each month. The annual report must be submitted by April 1 of the year following the end of the calendar year. These reports include wastewater flow measurements and analytical results,<sup>16</sup> meteorological data as well as overflow records (e.g., overflow structure visits, duration and volume of overflows).

Based on a review of the various reports submitted during the period running from January 2019 to June 2022, it is apparent that the City has been largely compliant with respect to the submission deadlines. The reporting deadline was not met for only 4 of the 294 monthly reports the City produced (1%) and 1 of the 21 annual reports produced (5%). Two late monthly reports were due to problems with the SOMAEU platform, and one delay in 2020 happened because no one had been identified to take over when the person in charge was absent. At the time of our audit, a minimum of 3 people were identified as resource persons in the SOMAEU platform, thus allowing for backup in cases of absence.

#### 3.3.2. Data Quality for Annual and Monthly Reports

Pursuant to the RRMWTW, the information provided in the annual report is public information. This report includes information on the monitoring of the wastewater treatment plant and of the overflow structures. It consists of the compilation of information provided by the City in the monthly reports. Since it is public information, it must be of high quality (i.e., it must be accurate and complete).

The information required for monthly reporting is stored in two internal City databases/warehouses. They are fed either directly from operational data provided by software<sup>17</sup> or from various files (e.g., visits to overflow structures, overflow data received by telemetry). These are transmitted to the SOMAEU in the form of two XML files. The use of XML files avoids having to manually enter the information in the SOMAEU. However, it is possible to enter information directly into the file or to make modifications as needed.

<sup>15</sup> RCG 11-017 is the regulation of the agglomeration council that identifies the water and sewer system pipes that are under the agglomeration's jurisdiction.

<sup>16</sup> (SS, CBOD<sub>5</sub>, pH, toxicity test results).

<sup>17</sup> The LIMS for laboratory test data and the PI application for flow measurements.

### 3.3.2.1. Wastewater Treatment Plant Monitoring Data

#### Jean-R.-Marcotte Wastewater Treatment Plant

To ensure that the daily flow measurement data and discharge analysis results (excluding toxicity test results) reported in the SOMAEU match the operational data from the software applications, the DEEU implemented a documented monthly control as of January 2021. As part of our audit work, an analysis of this control for 5 months between January 2021 and May 2022 demonstrated that it is effective, as no deviations were identified. For the 2019 and 2020 data, only 6 discrepancies on all daily flow measurements for those years were identified, whereas none were identified for the discharge analysis results.

With regard to the toxicity test results presented in the SOMAEU, our audit work identified only one deviation out of the 23 tests performed (4%). For example, a result was submitted in January 2019 for the Jean-R.-Marcotte wastewater treatment plant without it being possible for the DEEU to find evidence of the external laboratory's test results.

#### Île Notre-Dame Wastewater Treatment Plant

Up to June 2022, an issue during the reset of the flow volume totalizer caused an abnormal daily flow rate approximately once a month that needed to be corrected. The totalizer issue was resolved with the commissioning of the new pumping station in June 2022. In addition to these deviations, which were always corrected, an analysis of the results of the discharge analysis and toxicity tests did not identify any deviations in the tests performed.

Thus, the mechanisms in place ensure that the information in the software applications' operational data is consistent with that in the SOMAEU.

### 3.3.2.2. Overflow Structure Monitoring Data

To monitor the overflow structures, the DEEU uses the Hydroweb database. Several steps are taken and various sources of information<sup>18</sup> are used to populate the database used to produce the monthly report. Although there is a procedure in place and a monthly checklist is used to verify that all of the steps have been completed, there is no evidence of a peer review being conducted to ensure the integrity and completeness of the data processed. For example, in the case of an overflow that occurred in January 2022 during planned work at an overflow structure, no data had been reported in Hydroweb. It was not until the notice to the Minister of the Environment, the Fight Against Climate Change, Wildlife and Parks was closed in August that the error was detected and the correction made.

Also, in order to verify that the SOMAEU data is consistent with the data in the database, a comparison was carried out for the period from January 2020 to June 2022.

Several discrepancies were identified, primarily in relation to the data from the Jean-R.-Marcotte wastewater treatment plant. They are presented in Table 10.

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<sup>18</sup> For example: File of weekly and monthly visits, follow-up email concerning certain overflow structures.

**TABLE 10****DISCREPANCIES BETWEEN THE INFORMATION IN THE HYDROWEB DATABASE AND THE INFORMATION IN THE MUNICIPAL WASTEWATER TREATMENT PLANT MONITORING SYSTEM**

YEAR	DISCREPANCIES
2022 (6 months)	<ul style="list-style-type: none"> <li>• 3 visits presented in the SOMAEU and not in Hydroweb.</li> <li>• 4 cases where a volume was reported in Hydroweb, but these were reported in the comment section of the SOMAEU instead of in the section provided for that purpose.</li> <li>• 9 overflows that occurred during emergency/dry weather/planned work were not reported in the column provided for this purpose in Hydroweb but rather in the comment column. However, the information is well documented in the SOMAEU. According to the DEEU, some changes are made directly in the SOMAEU, but they are not reflected in the Hydroweb database.</li> </ul>
2021	<ul style="list-style-type: none"> <li>• 2 cases where an overflow duration and volume are indicated in Hydroweb and not in the SOMAEU.</li> <li>• 1 overflow classified as “dry weather” was reclassified as “emergency” in the SOMAEU, but the correction was not made in Hydroweb.</li> <li>• 18 cases where the reason for the displacement of a visual feature was not specified in Hydroweb (e.g., rainy weather, snowmelt).</li> </ul>
2020	<ul style="list-style-type: none"> <li>• 9 visits presented in Hydroweb and not in the SOMAEU.</li> <li>• 8 visits presented in the SOMAEU and not in Hydroweb.</li> <li>• 4 visits where the date was offset by one day between the SOMAEU and Hydroweb for the same sites.</li> <li>• 6 cases where there is a discrepancy in the duration of overflow between Hydroweb and the SOMAEU.</li> <li>• 5 cases where an overflow duration is indicated in Hydroweb and not in the SOMAEU.</li> <li>• 4 cases where there is a discrepancy in the overflow volume between Hydroweb and the SOMAEU.</li> <li>• 10 cases where the reason for the displacement of a visual feature was not specified in Hydroweb (e.g., rainy weather, snowmelt).</li> </ul>

Source: Table produced by the City’s BVG based on data collected during our audit work.

In addition, the DEEU exports the Hydroweb data to an Excel spreadsheet in which it has programmed formulas that return information for analysis and internal reporting purposes. Anomalies were identified in the 2022 spreadsheet, such as missing values<sup>19</sup> or formulas in certain cells or inconsistent formatting. To ensure accountability, the DEEU should review how this spreadsheet was programmed to detect and correct any errors.

The lack of peer review of the data during the production of the monthly report in Hydroweb as well as the various discrepancies identified between the internal database and the SOMAEU’s database do not ensure the quality of the data. This creates a situation that could mislead different users.

<sup>19</sup> For example: File of weekly and monthly visits, follow-up email concerning certain overflow structures.

**RECOMMENDATION**

**3.3.2.2.A.**

We recommend that the Service de l'eau, in order to maintain traceability of the reporting process to the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs, implement controls to ensure that:

- ◆ the overflow data contained in the internal database and the data disclosed in the Municipal wastewater treatment plant monitoring system are complete, accurate and consistent;
- ◆ any changes made to the data directly in the Municipal wastewater treatment plant monitoring system are documented.

### 3.4. Qualifications of the Operators Performing Duties at the Wastewater Treatment Facilities

#### 3.4.1. Qualification Certificates

Pursuant to section 10 of the RRMWTW, the operations and monitoring of a wastewater treatment plant, including the control and supervision of operations related to the collection and treatment of wastewater, must be carried out by a person holding a valid qualification certificate or apprenticeship card issued by the Ministère de l'Emploi et de la Solidarité sociale.

Nearly sixty staff members annually perform duties subject to qualification requirements and it is their responsibility to hold a valid certificate at all times. However, the Division des opérations of the DEEU monitors these on a regular basis to ensure compliance, especially when the certificate expires. Yet, the monitoring process does not ensure that staff members have their certificate at the time of operation, as two of the staff members (3%) who performed duties in 2019 and 2020 did not hold a valid certificate. In one of the cases, a staff member worked for 11 months prior to retiring without renewing his expired certificate; in the other, 2 years elapsed before a staff member applied for their certificate despite the DEEU's follow-up in 2020.

#### 3.4.2. Declaration of Operators' Qualifications in the Annual report

The City must declare in the annual report all qualified operators who have performed at least one day of work during the year in connection with the operation or monitoring of the wastewater treatment plant. However, an analysis of the information reported in the 2019 to 2021 reports revealed several inaccuracies, primarily regarding the Jean-R.-Marcotte wastewater treatment plant (see Table 11). Staff members subject to the regulation who worked at least 1 day were not declared or staff members not subject to the regulation were declared. In the Île Notre-Dame wastewater treatment plant, only 2 inaccuracies were identified, i.e., 2 staff members who worked in 2021 were not declared in the annual report.

TABLE 11

**INACCURACIES IN STAFF QUALIFICATIONS IDENTIFIED IN THE ANNUAL REPORTS FOR THE JEAN-R.-MARCOTTE WASTEWATER TREATMENT PLANT**

YEAR	STAFF MEMBERS WHO WORKED AT LEAST ONE DAY AND WERE NOT DECLARED IN THE REPORT (PROPORTION OF TOTAL STAFF MEMBERS)	STAFF MEMBERS WHO WERE DECLARED IN THE REPORT BUT ARE NOT SUBJECT TO THE REGULATION (PROPORTION OF TOTAL STAFF MEMBERS)	INCOMPLETE INFORMATION TO JUSTIFY WHETHER OR NOT THE STAFF MEMBER SHOULD BE DECLARED IN THE ANNUAL REPORT (PROPORTION OF TOTAL STAFF MEMBERS)
2021	9 (14%)	7 (11%)	0
2020	4 (6%)	3 (5%)	6 (10%)
2019	1 (2%)	2 (3%)	1 (2%)

Source: Table produced by the City's BVG based on data collected during our audit work.

This situation resulted in false cases of non-compliance being declared in the 2019 and 2021 annual reports. Thus, for 5 of the 6 qualification certificates expired in 2021 (4) and in 2019 (2), 4 were for staff members who should not have been declared because they were not subject to the regulation. In another case, the staff member was on maternity leave and had not worked during the reporting year.

**RECOMMENDATION  
3.4.2.A.**

We recommend that the Service de l'eau review the mechanism for tracking operators' qualification certificates to ensure that staff subject to the *Regulation respecting municipal wastewater treatment works* hold a valid certificate at all times and that accurate and complete qualification information is provided in the annual report.



## 4. Conclusion

In general, we conclude that the Ville de Montréal (the City) has implemented a series of mechanisms to ensure sound management of wastewater discharge and overflow monitoring. Nevertheless, these mechanisms are not fully compliant with regulatory requirements.

That being said, the City is doing well in monitoring treated wastewater discharges, with the majority of discharges meeting expected requirements. For example, the Jean-R.-Marcotte and Île Notre-Dame wastewater treatment plants measure their flows on a daily basis and comply with the discharge concentration standards they are required to meet. Also, all toxicity tests conducted on rainbow trout and daphnia produced satisfactory results. However, depending on the wastewater treatment plant, for certain toxicity tests, the sampling frequencies, the time limits for repeat tests and the minimum time between samples were not respected. In addition, neither the accuracy of the affluent flow measurement of the Île Notre-Dame wastewater treatment plant, nor the calibration of the ultrasonic probe used to measure effluent flow at the Jean-R.-Marcotte wastewater treatment plant were verified yearly as required.

With respect to overflow monitoring, although 96% of overflow structures are equipped with an instrument to detect overflows, the mechanisms in place do not ensure that all overflows are recorded. Of the instrumented structures, nearly 79% are equipped with a device that communicates with the plant during an overflow. However, on more than a hundred occasions, the device failed, and the City was unable to identify whether an overflow had occurred, as there was no evidence that a redundancy had been put in place. Also, not all visits requirements are being met, as not all weekly (32%) and monthly (51%) visits are being conducted or their frequency is not being met. Also, the City does not notify Environment and Climate Change Canada (ECCC) of any wet weather overflows. Although it notifies the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP) and ECCC of dry weather overflows, it does not always do so within the required timeframes.

In addition, although the operational data on discharge tracking was consistent with that presented on the MELCCFP's website, inaccuracies and inconsistencies were identified for the data on overflow monitoring and operator qualifications.

More specifically, the major findings that we note in relation to the evaluation criteria are as follows:

### **Criterion 1: Mechanisms are in place to monitor compliance with wastewater discharge standards and to generate quality data.**

- ◆ For both wastewater treatment plants:
  - The daily flow measurement is carried out each day;
  - The concentration standards with which the plants are required to comply (SS and pH for the Jean-R.-Marcotte wastewater treatment plant and CBOD<sub>5</sub>, SS and pH for the Île Notre-Dame wastewater treatment plant) are met;
  - All toxicity tests performed on daphnia and rainbow trout were successful, although five tests failed in the first trial;
  - The discharge monitoring data posted on the MELCCFP's website are of high quality.

- ◆ For the Jean-R.-Marcotte wastewater treatment plant:
  - Flow measurement accuracy is verified daily and differences between affluent and effluent measurements are below 15% as required;
  - The sampling frequencies for concentration tests are always met.
- ◆ Nevertheless, for one or the other of the plants:
  - The ultrasonic probe used to measure effluent flows is not calibrated annually;
  - The annual verification of the accuracy of the flow measurement has not been performed for the years 2020 and 2021;
  - The samples for concentration test did not always meet frequency requirements;
  - For toxicity tests, in a few cases, the sampling frequencies, the time limits for repeat tests and the minimum time between two samples for toxicity tests were not respected.

**Criterion 2: Mechanisms are in place to track wastewater overflow standards and generate quality data.**

- ◆ 96% of overflow structures are equipped with an overflow recording device.
- ◆ 79% of the overflow structures are equipped with an instrument that communicates overflows in real time to the wastewater treatment plant.
- ◆ The 6 overflow structures equipped with a visual feature are visited as required to identify any overflows.
- ◆ However, we found in our tests that:
  - 32% of weekly visits and 51% of monthly visits to overflow structures were not conducted. Due to non-compliant visit frequencies, some sites are visited monthly rather than weekly;
  - After about 100 failures of electronic overflow recorders over a period of two and a half years, it was not possible to identify whether or not overflows had occurred, as there was no evidence of any redundancy device having been installed on a temporary basis;
  - There are inaccuracies and inconsistencies between the overflow monitoring data contained in the internal database and that presented on the MELCCFP's website.

**Criterion 3: Operation and event reports contain reliable information and are sent in a timely manner.**

- ◆ Monthly and annual reports for all 7 segments are submitted to the MELCCFP by the deadline, with the exception of 4 reports over the reporting period (3 monthly reports and 1 annual report).
- ◆ The City does not have a process in place to notify ECCC of wet weather overflows as required by the *Fisheries Act*.

### 3.2. Management of Wastewater Discharge and Overflow Monitoring

- ◆ The City is not able to provide timely notifications to the MELCCFP/ECCC of overflows in dry weather, in the event of emergencies or during planned work on these wastewater treatment facilities.
- ◆ The information on operators' qualifications presented on the MELCCFP's website contains inaccuracies in that some staff who worked at least 1 day were not declared and some staff who were not subject to the regulation were declared.

#### **Criterion 4: Staff members are qualified to perform duties related to wastewater treatment plant operations.**

- ◆ Overall, only 2 of the approximately 60 staff members assigned to duties related to wastewater treatment plant operations did not hold a valid qualification certificate when they performed work in 2019 and 2020.

