

## Chapter 11

# Environment—Regulating Industrial Wastewater Systems

### 1.0 MAIN POINTS

Industrial activities (e.g., mining) generate wastewater. Industrial wastewater can contain various contaminants that are harmful to human health and ecosystems. To limit risks posed by these contaminants, industrial site owners are required to have wastewater systems that reduce the negative impacts of industrial wastewater.

The Ministry of Environment (Ministry) is responsible for regulating industrial wastewater. For the period of January 1, 2014 to December 31, 2014, the Ministry had effective processes to regulate industrial wastewater, except it needs to:

- › Keep up-to-date records on the frequency of industrial wastewater system inspections
- › Clearly document the results of each inspection and prepare annual environmental compliance reports for each higher-risk industrial wastewater system
- › Provide the public with information on enforcement actions related to its industrial wastewater system regulation

### 2.0 INTRODUCTION

Industrial activities in Saskatchewan place pressure on the province's natural resources, including water. Industrial activities such as mining, manufacturing, and power production generate wastewater that is harmful to human health and ecosystems. For example, wastewater can be contaminated with high concentrations of metals, sulphide minerals, dissolved solids, or salts that negatively affect surface water quality, aquatic ecosystems, and groundwater quality.

Industrial site owners are responsible for having wastewater systems that limit the impact of wastewater on the environment. Most often, wastewater is contained in tailings<sup>1</sup> ponds or lagoons, or treated prior to being discharged into surface water. Regulating industrial wastewater systems helps limit risks to human health and ecosystems.

The Ministry regulates industrial wastewater by issuing permits (for constructions/expansions and operations), inspecting wastewater systems at industrial sites, reviewing environmental monitoring results (e.g., water sampling results), and enforcing permit requirements. This chapter sets out the results of our audit of the Ministry's processes to regulate industrial wastewater.

<sup>1</sup> Tailings are fine ground rock and mineral waste products from mineral processing operations. Tailings are usually deposited in the form of water-based slurry into tailing ponds, which are sedimentation lagoons enclosed by dams built to capture and store tailings.



## 3.0 BACKGROUND

### 3.1 Industrial Wastewater Systems

Industrial activities generate wastewater that can contain a variety of contaminants that pose a risk to human health and the environment. The goal of industrial wastewater treatment is to reduce or remove organic matter, solids, nutrients, metals, and other pollutants before discharging the wastewater into the environment. Therefore, wastewater treatment must be designed and operated in a way that it reduces the negative impacts on ecosystems and human health.

Wastewater treatment is a multi-stage process to help remove contaminants before wastewater re-enters a body of water, is applied to the land, or is reused. The methods used and degree of treatment vary depending on the type of pollution and the sensitivity of the receiving environment.<sup>2</sup> In general, options to treat wastewater consist “of a combination of physical, chemical, and biological processes and operations”<sup>3</sup> designed to settle out suspended particles in the wastewater and eliminate toxic biological and chemical contaminants.

### 3.2 The Ministry’s Responsibility for Regulating Industrial Wastewater

Under *The Environmental Management and Protection Act, 2002*,<sup>4</sup> the Ministry is responsible for inspecting and regulating wastewater treatment at 165 operating industrial sites as shown in **Figure 1**.

**Figure 1—Industrial Sites by Operation, Discharge into Surface Water, and Risk Rating, at March 2015**

Category of Industrial Operation	Total Number of Operating Sites	Number of Sites that Discharge into Surface Water	Number of Extreme or High Risk Sites
Potash Mining	16	-	12
Uranium Mining	8	5	7
Coal Mining	3	3	3
Gold Mining	5	3	4
Sodium Sulfate and Potassium Sulfate Mining	8	2	1
Other Mining (e.g., diamond, salt, metal)	18	3	9
Power Generation	10	4	3
Petroleum Refineries	3	-	3
Ethanol/Biofuels	8	1	1

<sup>2</sup> The receiving environment is where treated wastewater is released.

<sup>3</sup> [www.fao.org/docrep/t0551e/t0551e05.htm#3.2.5](http://www.fao.org/docrep/t0551e/t0551e05.htm#3.2.5) (21 July 2014).

<sup>4</sup> *The Environmental Management and Protection Act, 2010* comes into effect in June 2015. Significant changes to the regulation of industrial sites as a result of this new Act are not expected.

Category of Industrial Operation	Total Number of Operating Sites	Number of Sites that Discharge into Surface Water	Number of Extreme or High Risk Sites
Agriculture – Grain Processing	11	1	-
Animal/Animal Byproduct Processing	10	1	-
Forestry/Wood Treatment	14	1	6
Industrial Landfills/Landfarms	21	3	1
Other Industrial (e.g., railcar repair, manufacturing)	30	2	7
<b>Total</b>	<b>165</b>	<b>29</b>	<b>51</b>

Source: Ministry of Environment information.

The Ministry evaluates the extent of risks that regulated industrial sites pose to the environment. Risk factors include site proximity to environmentally-sensitive areas, public concern, and history of compliance issues. **Figure 1** shows the Ministry has identified 51 industrial sites as posing extreme or high risks to the environment. Also, **Figure 1** shows that 29 of the 165 industrial sites are designed to discharge treated wastewater into surface water. Direct discharges into surface water can have an immediate effect on water quality, with surface water contamination negatively impacting human health and ecosystems.

As part of its regulatory activities of industrial sites, the Ministry issues two types of permits:

- 】 Construction and expansion permits – These permits include requirements for site owners to design and build or expand industrial wastewater systems to properly contain or treat wastewater.
- 】 Operational permits – These permits include requirements for site owners to monitor and report on the containment and/or discharge of wastewater. The Ministry may include wastewater quality standards in operational permits that the owner must meet given the specific nature of contaminants and treatment process.

Where contamination occurs because of industrial site operations, the Ministry requires site owners to submit remediation action plans to mitigate the damage. In addition, prior to beginning operations, the Ministry requires<sup>5</sup> mining site owners to submit reclamation plans along with associated financial assurances.<sup>6</sup> It requires the reclamation plan to show how the owner plans to remediate (i.e., clean up) the site once operations have stopped. It also requires mining site owners to update their reclamation plans and associated financial assurances every five years.

Also, certain industrial sites, including uranium mines and petroleum refineries, are subject to federal regulations for industrial wastewater. Although the Ministry also regulates these industrial sites, it is not responsible for monitoring their compliance with federal laws.

The Ministry carries out its regulatory responsibility through its Environmental Protection Branch. At December 2014, this Branch had 14 Environmental Protection Officers

<sup>5</sup> Under *The Mineral Industrial Environmental Protection Regulations, 1996*.

<sup>6</sup> A financial assurance can be provided in various forms including cash, a letter of credit from the bank, or a bond issued by a guarantee (insurance) company.



(EPOs). The primary responsibility of the EPOs is to carry out industrial-site regulation duties. In addition, the EPOs carry out other duties such as overseeing the containment and cleanup of hazardous spills. In 2014-15, the Ministry spent about \$1.7 million on its industrial regulatory activities (2013-14: \$1.7 million).

Ineffective industrial wastewater regulation increases the risk of discharging inadequately treated wastewater into surface water, or its infiltration into groundwater. Saskatchewan residents depend on both surface and groundwater. Water that is contaminated by industrial wastewater may be unsuitable for drinking, recreation, agriculture, and industry. Cleaning up contamination is expensive. For example, the estimated cost to clean up the Mount Polley copper and gold mine tailings pond spill in British Columbia was estimated to be between \$50 million to \$500 million.<sup>7</sup>

## 4.0 AUDIT OBJECTIVE, SCOPE, CRITERIA, AND CONCLUSION

The objective of this audit was to assess whether the Ministry had effective processes to regulate industrial wastewater systems. We assessed the Ministry's processes for the 12-month period of January 1, 2014 to December 31, 2014.

We examined the Ministry's policies, procedures, processes, permits, and inspection reports. We tested a sample of permit applications and approvals, interviewed Ministry staff, and attended industrial wastewater system inspections along with Ministry staff.

To conduct this audit, we followed the standards for assurance engagements published in the *CPA Canada Handbook – Assurance*. To evaluate the Ministry's processes, we used criteria based on our related work, literature including reports of other auditors, and consultations with management. The Ministry's management agreed with the criteria (see **Figure 2**).

**Figure 2—Audit Criteria**

Effective regulation of industrial wastewater systems should include processes to:

- 1. Permit industrial wastewater system construction/expansions**
  - 1.1 Set and communicate appropriate requirements for industrial wastewater system constructions/expansions
  - 1.2 Issue appropriate construction/expansion permits
  - 1.3 Confirm owners meet construction/expansion requirements
- 2. Monitor compliance with wastewater system operational permits**
  - 2.1 Set and communicate appropriate requirements for operating industrial wastewater systems
  - 2.2 Issue appropriate operational permits
  - 2.3 Regularly assess compliance with operational permit terms and conditions
- 3. Address and report identified non-compliance**
  - 3.1 Identify non-compliance
  - 3.2 Require action on non-compliance
  - 3.3 Report non-compliance to industrial wastewater system owners, senior management, and the public

**We concluded that, for the period of January 1, 2014 to December 31, 2014, the Ministry of Environment had effective processes to regulate industrial wastewater systems except that it needs to:**

<sup>7</sup> [www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/imperial-metals-raising-100-million-to-clean-up-bc-spill/article20074754](http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/imperial-metals-raising-100-million-to-clean-up-bc-spill/article20074754) (30 January 2015).

- › Keep up-to-date records on the frequency of industrial wastewater system inspections
- › Clearly document the results of each inspection of industrial wastewater systems and prepare annual environmental compliance reports for each higher-risk industrial wastewater system
- › Provide the public with information on enforcement actions related to its regulation of industrial wastewater systems

## 5.0 KEY FINDINGS AND RECOMMENDATIONS

In this section, we describe our key findings and recommendations related to the audit criteria in **Figure 2**.

### 5.1 Industrial Wastewater System Constructions and Expansions are Appropriately Permitted

#### 5.1.1 Requirements for Constructing/Expanding Industrial Wastewater Systems Set and Communicated through Permits

*The Environmental Management and Protection Act, 2002* (EMPA 2002) and *The Mineral Industry Environmental Protection Regulations, 1996* (MIEPR) make the Ministry responsible for issuing permits for constructing, expanding, or altering industrial sites including industrial wastewater systems. MIEPR applies to mining operations, whereas EMPA 2002 applies to non-mining operations.

By law, companies must apply to the Ministry for permits to construct, expand, or alter industrial wastewater systems. The Ministry's *Industrial Works Construction Application Standards* posted on its website outline application submission requirements consistent with the law. For example, application submissions include: construction or expansion plans and descriptions of the treatment process, industrial runoff drainage information, and the expected concentration of substances being released into the environment. Companies often have an engineer verify the construction or expansion plan and include their report in the submission to the Ministry.

The Ministry has determined that detailed guidance on design standards is not practical given the wide range of industries that generate industrial wastewater in Saskatchewan and the varying environmental risks these industries pose. Rather, we found the Ministry requires industrial site owners to conduct an Environment Impact Assessment (EIA) for new industrial sites (i.e., prior to being built) or sites where substantial expansions are planned.

EIAs require industrial site owners to identify numerous types of environmental risks associated with their future operation, including risks to surface water and groundwater from industrial wastewater. EIAs also require site owners to set out, in writing, how they plan to mitigate the environmental risks through construction design and site operation.



Site owners use engineers to verify that the proposed construction design addresses environmental risks outlined in the EIA.

During 2014, the Ministry received about 45 industrial wastewater construction/expansion application submissions. For each of the five construction/expansion application submissions we examined, we found the submission contained the information required. One application submission we examined was for a new construction; this application included an EIA as expected.

Ministry staff (i.e., Environmental Protection Officers – EPOs) review construction/expansion application submissions to determine whether the proposed design mitigates identified risks. We found the EPOs have post-secondary education in Environmental Science, Natural Science, Engineering or Environmental Studies, and/or have several years of directly-related experience.

When assessing the adequacy of a proposed construction/expansion, EPOs consult applicable guidelines and standards issued by other agencies. For example, when reviewing a design that includes a basic lagoon, the Ministry consults with Water Security Agency staff and their guidelines to determine the adequacy of the design. In the case of plans for potash mine tailings management areas, the Ministry reviews standards set by the Canadian Centre for Mineral and Energy Technology (a research and development arm of Natural Resources Canada).

The Ministry has a policy that gives EPOs authority to approve permits for more standard constructions/expansions and requires management to approve permits for more complex systems. For the five application submissions we examined, EPOs reviewed the submissions and recommended construction/expansions permits in a timely manner (i.e., within three months or less); these permits were appropriately approved.

## 5.1.2 Constructions/Expansions Built as Planned

If industrial wastewater systems are not built according to the approved plan, there is a risk that inadequately treated wastewater will be released into the environment. To confirm that wastewater systems were built according to the approved plan, the Ministry inspects the new construction, or requires owners to submit “as-built drawings” prepared by engineers after completion of construction/expansion.

We found that, for the five construction/expansion permits we examined, the EPO either received and reviewed an “as-built” drawing, or inspected the new construction on-site. Also, as noted in **Section 5.2**, the Ministry conducts ongoing inspections once industrial sites begin operations.

## 5.2 Need to Maintain Current Records on Inspection Frequency

### 5.2.1 Requirements for Operating Industrial Wastewater Systems Set and Communicated through Permits

Similar to municipal wastewater system construction, EMPA 2002 and MIEPR require industrial wastewater system owners to obtain permits from the Ministry to operate industrial wastewater systems and comply with Ministry-issued permits in their operations (operational permits). The Ministry uses operational permits as its main vehicle to communicate its requirements for operating industrial wastewater systems. The Ministry bases operational permit requirements for industrial wastewater on contamination standards (e.g., maximum concentrations of contaminants such as arsenic and uranium) set out in *The Water Regulations, 2002* and MIEPR. In addition, the Ministry may refer to contamination standards developed by the Canadian Council of Ministers of the Environment<sup>8</sup> and the Water Security Agency (*Saskatchewan Surface Water Quality Objectives*) to establish permit requirements.

The Ministry issues operational permits that are generally in force for a five-year period. Because of the variety of industries under regulation in the province, the Ministry determines operating requirements on a site-by-site basis, considering risks outlined in the EIA. Operational permits include clauses that detail how industrial wastewater is to be dealt with (e.g., by using lagoons or treating and discharging to surface water once it meets certain quality standards).

Operational permits also include clauses that detail industrial wastewater monitoring requirements such as monitoring the structural integrity of tailings ponds and contaminant levels in water. They also list detailed reporting requirements (both contents and frequency of reports). Reports typically must include monitoring results, trends and summaries; summaries of any spills or upset conditions<sup>9</sup> during the year; and proposed changes or upgrades to operations. All permits require owners to report at least annually. As further described in **Section 5.3.1**, as the Ministry develops environmental compliance reports, it may need to change permit requirements to place additional monitoring and reporting requirements on industrial site owners.

For each of the 30 operational permits we examined, we found permit requirements were similar within the same industry. All permits we examined described the manner in which to treat the wastewater, included maximum concentration levels for sites discharging into surface water, and required, at minimum, reporting against permit requirements annually. We also found that permits for larger, higher-risk sites required more frequent reporting (e.g., up to quarterly reporting).

The Ministry gives EPOs the authority to recommend, and in limited cases, approve operational permits for industrial wastewater systems; it requires management to approve most operational permits. Requiring a manager's level of approval helps ensure appropriate and consistent operational permit requirements between sites where

<sup>8</sup> The Canadian Council of Ministers of the Environment is an inter-governmental organization in Canada with members from the federal government, 10 provincial governments, and three territorial governments. Membership is at the ministerial level and meetings typically occur at least annually to discuss national environmental issues.

<sup>9</sup> An upset condition is any abnormal condition, anomaly, or interruption in the treatment process that may have an adverse effect on the quality of water.



merited. For each of the 30 operational permits we examined, we found the permits were appropriately approved by an EPO or manager.

## 5.2.2 Up-to-Date Site Inspection Tracking Needed

EPOs are responsible for assessing compliance with operational permit requirements. The Ministry uses EPOs as its main contact between the industrial site owner and the Ministry. We found that all regulated industrial sites were assigned to a specific EPO. EPOs assessed compliance with operational permit requirements by inspecting industrial sites and reviewing reports required under operational permits.

The Ministry uses a risk-based policy to determine the frequency of site inspections. It annually ranks sites as being a low, medium, high, or extreme risk, depending on factors such as site proximity to environmentally-sensitive areas, public concern, and history of compliance issues. The Ministry plans to inspect:

- › Extreme-risk sites at least twice per fiscal year
- › Higher-risk sites at least once per fiscal year
- › Medium- and low-risk sites once every two to three years

We observed the annual site risk ranking, with mining sites generally ranking higher as they generate more contaminants that can be harmful to ecosystems and human health (see **Figure 1** for the number of extreme- and high-risk sites among industrial operation categories).

For the 30 operational permits we examined, we found the Ministry undertook timely site inspections consistent with its policy. However, for 10 of the permits, Ministry documents that track inspections did not always include the latest inspection dates as compared to the most recent inspection reports. For example, for one permit, the latest inspection date recorded was December 2013, even though the most recent inspection was conducted in November 2014. Without keeping up-to-date records on the frequency of site inspections, management is unable to determine if it conducts industrial wastewater system inspections in a timely manner.

**1. We recommend that the Ministry of Environment keep up-to-date records on the frequency of its inspections of industrial wastewater systems.**

As noted previously, industrial sites are required, at minimum, to submit reports annually. We found that for the 30 operational permits we examined, site owners submitted reports consistent with reporting deadlines set out in their permit.



## 5.3 Improved Identification of Non-Compliance and Reporting of Enforcement Action Needed

### 5.3.1 Better Identification of Non-Compliance Needed

The Ministry identifies non-compliance for each industrial site by reviewing reports provided by industrial site owners against permit requirements, and conducting on-site inspections to verify permit requirements. EPOs provide inspection reports to industrial site owners including required actions.

For the 30 inspection reports we examined, we found instances of identified non-compliance ranged from wastewater samples that exceeded permit requirements, inadequate reports (e.g., report did not contain trends of monitoring results), to insufficiently-maintained wastewater infrastructure.

The Ministry does not use a standard inspection checklist for industrial sites because of the unique permit requirements developed for the wide range of industrial sites. The Ministry has a field inspection process policy that requires an EPO to determine the objective of the inspection prior to the inspection. The policy outlines common inspection areas (e.g., tailing management areas) regulated through permit requirements. The Ministry indicated it does not always cover all permit requirements at each on-site inspection due to the size and complexity of sites.

In our review of 30 inspection reports, we found the reports did not always clearly set out what EPOs examined (e.g., what inspection areas were covered) or how industrial site owners performed with respect to each area inspected. For example, in some inspection reports, instead of describing what they examined and found in their inspections (i.e., compliance and non-compliance with permit requirements), EPOs only summarized the actions they required the industrial site owner to take (e.g., undertake a groundwater assessment).

Clearly documented inspections would show what an EPO concentrated on and when each area was last inspected, improve communication of inspection results, and help direct future inspection activities. Without such documentation, the Ministry risks inconsistent system inspections. Also, the Ministry does not know if inspections are covering all permit requirements and sufficiently identifying non-compliance. This is a particular concern for higher-risk sites where potentially undetected permit non-compliance could result in substantial negative impacts to the environment.

- 2. We recommend that the Ministry of Environment require its staff to clearly document, for each industrial wastewater system inspected, the results of inspections as compared to the Ministry's permit requirements.**

Rather than requiring interpretation of narrow, specific data trends in reports from industrial site owners, the Ministry has begun to consider broader risk implications of those trends. For example, EPOs are expected to determine whether an industrial site owner has reported sufficient information on whether an industrial site contained



impacts to surface water within site boundaries. The Ministry has begun using the development of environmental compliance reports to help determine the impacts of broader issues and trends.

In 2013, EPOs started to complete an environmental compliance report for each higher-risk industrial site in the potash sector. EPOs complete compliance reports based on their reviews of reports received from industrial sites owners. By December 2014, the Ministry had completed compliance reports for 10 higher-risk sites in the potash sector, and shared them with the owners of the respective industrial site(s). Management indicated that it plans to prepare similar reports for other higher-risk industrial sites and to update the completed compliance reports annually.

These reports highlighted areas where site owners need to strengthen their sampling and/or analysis of treated wastewater, and possible changes needed in permit requirements. For example, in our review of the 10 compliance reports for the potash sector, we noted 5 out of 10 potash industrial sites did not provide sufficient sampling results and analysis for the Ministry to know whether the industrial site owner sufficiently contained impacts to surface water within site boundaries. We further noted that the Ministry had started to work with the site owners to have them include this information in the reports they must submit to the Ministry.

At December 2014, although the Ministry indicated that it expects EPOs to prepare environmental compliance reports for each higher-risk industrial site, it had not made this a formal requirement (i.e., it did not have a policy on this matter). Not having such a policy increases the risk that the Ministry may not identify non-compliance with its requirements for sites posing higher risks to the environment. This, combined with inspection reports that do not always clearly document what was inspected and found, increases the risk that the Ministry may not be sufficiently regulating higher-risk industrial sites.

**3. We recommend that the Ministry of Environment require the annual preparation of environmental compliance reports for all higher-risk industrial wastewater systems.**

### 5.3.2 Action Items Enforced

The Ministry sets out action items in inspection reports to enforce compliance with permit requirements. In certain instances, EPOs set specific deadlines for site owners to complete the action items. In addition to setting action items, the Ministry sometimes includes recommendations to improve operating practices in the inspection reports.

None of the inspection reports we examined indicated ongoing instances of inadequately treated wastewater being released into surface water. We found that for each of the seven inspection reports with action items that we examined, industrial site owners complied with action items by the stated deadlines or the next inspection, or Ministry documentation showed that the owners were actively working towards compliance.

Also, the Ministry has a policy that describes a variety of escalating enforcement tools that it can use to bring industrial site owners into compliance with permit requirements, such as notices of violation, administrative penalties, and court orders. The policy requires senior management to approve notices of violation, administrative penalties, and the decision to seek court orders.

The Ministry maintains a summary list of escalated non-compliance issues. During the year, the Ministry sent one notice of violation for an industrial wastewater site. We found senior management properly approved the notice, and the site owner complied with it.

### 5.3.3 Public Reporting of Enforcement Action Needed

As previously described, the Ministry did not always explicitly identify non-compliance with permit requirements in its reports to site owners. As explained in **Section 5.3.1**, its inspection reports do not always describe what that the Ministry inspected or found; rather, they set out actions the owner is expected to take. More clearly documenting inspection results against permit requirements and preparing environmental compliance reports for all higher-risk industrial sites (see **Recommendations 2 and 3**) would help ensure the Ministry consistently identifies and reports non-compliance.

As previously noted, where non-compliance is escalated to a notice of violation or administrative penalties, senior management is involved in the process. The Ministry also indicated that it holds informal meetings between managers in the Environmental Protection Branch to discuss regulatory issues and the status of regulatory work. Also, the Ministry produces an annual compliance report for senior management that contains information on hazardous spills at industrial sites.

We found the Ministry's annual reports, for recent years, included information on its regulatory activities – that is, the number of industrial site reports that it reviewed in the year and the total number of inspections completed. It does not include the number and nature of enforcement tools it used (e.g., number of notice of violations issued, administrative penalties levied, or court orders sought). This type of information would give the public insight into the results of the Ministry's regulatory activities.

**4. We recommend that the Ministry of Environment provide the public with information on its enforcement actions (e.g., number of notices of violation, administrative penalties levied, court orders sought) related to its regulation of industrial wastewater systems.**

Also, the Water Security Agency periodically publishes the *State of the Watershed Report*. This report provides the public with information on the current health of Saskatchewan's watersheds and activities (e.g., mining) that impact the watersheds. The most recent report was published in 2010.



## 6.0 SELECTED REFERENCES

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