

# FACTS ON STORMWATER



## Part II: STORMWATER MANAGEMENT AT EXISTING SITES Options for Improvement

Existing greenhouse storm water management (SWM) systems are working systems. They get old and tired. Even new systems can be over-worked when they have to deal with a series of storms or a massive storm event that might exceed the design 1 in 100 year storm or drought conditions. Yes, extremely dry conditions can cause soil cracking and hardening, and can lead to vegetation loss, which can be contributing factors to SWM system problems. SWM systems require attention to ensure they can do their job effectively. Each system, from surface collection to transport to containment and discharge, will have its own unique features. They require site specific optimization/retrofitting in order to meet the intended purpose. The “one size fits all” approach does not apply to these systems.

How can you tell if your system needs improvement or repair? What should you look for? You can identify possible opportunities for improvement by observing the functionality of the existing storm water system. This factsheet provides a list of some of the critical things to look for and their possible causes. The tips presented assume the storm water system has been properly designed.

### **Observation 1:** *Rainwater cascading down from the roof during a heavy rainfall*

Possible causes:

- i) Obstructions along rainwater pathway (debris accumulation in gutters or kinked pipe);
- ii) Roof layout changes affecting rainwater distribution;
- iii) Greater than the design 1 in 100 year storm.

### **Observation 2:** *Rainwater pooling on roads and/or parking lot during heavy rainfall*

Possible causes:

- i) Excessive sediment accumulation inside catch basins;
- ii) Obstructed catch basin grate;
- lii) Changes in soil grading;
- iv) Recent site expansion and layout changes;
- v) Rainwater pathway obstructions.



***Observation 3: Rainwater causing soil erosion along open conveyance systems***

Possible causes:

- i) Excessive rainwater surface flow and speed;
- ii) Poor vegetative protection (coverage and maintenance including mowing) of conveyance system berms;
- iii) Increased flows due to site layout changes;
- iv) Uneven rainwater distribution inside conveyance system.

***Observation: Poor vegetation growth or localized discolouration in open conveyance channels***

Possible causes:

- i) Upstream rainwater contamination;
- ii) Excessive rainwater speed over surface;
- iii) Soil erosion onset;
- iv) Extraneous water source (boiler blowdown, chemicals, etc.)

***Observation: Localized corrosion of storm water sewer pipes***

Possible causes:

- i) Upstream rainwater contamination;
- ii) Extraneous water source (boiler blowdown, chemicals, etc.).

***Observation: Rainwater collection pond showing signs of berm deterioration***

Possible causes:

- i) Poor berm stability due to improper construction materials, or slope;
- ii) Excessive surface water speed;
- iii) Berm deterioration by nearby environment; e.g., vegetation removal;
- iv) Unsettled crossing and/or inlet-outlet pipes;
- v) Nearby heavy equipment traffic;
- vi) Poor protective vegetation layer;
- vii) Excessively dry soils;
- vii) Possible mechanical damage;
- ix) Poor vegetation maintenance; e.g., not mowing;
- x) Unprotected inlet pipe discharge.

***Observation: Rainwater collection pond showing signs of excessive vegetation and/or wild life***

Possible causes:

- i) Pond contamination by nutrient laden rainwater;
- ii) Process and storm water cross connections;
- iii) Disposal of empty chemical containers, organics, or food waste in the pond's vicinity.

**Observation:** *Rainwater collection pond showing excessive bottom solids accumulation*

Possible causes:

- i) Upstream soil erosion;
- ii) Upstream broken storm water sewer lines;
- iii) Berm deterioration;
- iv) Disposal of extraneous soil materials inside pond or on berms;
- v) Excessive runoff.

**Observation:** *Rainwater collection pond contents showing signs of water contamination*

Possible causes:

- i) Pond contamination by nutrient laden rainwater;
- ii) Process and storm water cross connections;
- iii) Disposal of empty chemical containers, organics, or food waste in the pond's vicinity;
- iv) Deterioration of storm water conveyance system-civil structure metal parts;
- v) Rainwater from other sites (shared ponds).

**Observation:** *Trash and debris found inside storm water collection ponds*

Possible causes:

- i) Excessive surface runoff into pond;
- ii) Upstream broken conveyance system;
- iii) Upstream catch basins missing grating cover;
- iii) Disposal of extraneous material inside/ or in the vicinity of pond;
- iv) Unprotected pond location;
- v) Shared ponds.

**Observation:** *Floating oil sheen on pond water surface or pond inlet/outlet*

Possible causes:

- i) Parking lot motor oil leaks;
- ii) Inadvertent discharge of oily substances into floor drains and water conveyance system.

**Note:** Consider installing an oil-grit interceptor upstream from the catch basin as needed.

**Observation:** *Storm water rushes quickly into catch basins*

Possible cause:

- i) Steep slopes of impervious areas (roofs, paved areas, etc.) reducing rainwater retention and flow-buffering upstream from catch basins.

**Observation:** *Localized soil cave-in along storm water sewer lines*

Possible causes:

- i) Broken storm water lines;
- ii) Heavy traffic along storm water conveyance system;
- iii) Poor vegetation;
- iv) Excessive runoff in the vicinity;
- v) Mechanical damage.

***Observation: Localized wet spots along storm water conveyance system***

Possible causes:

- i) Broken storm water lines;
- ii) Surface runoff accumulation in area.

***Observation: Storm sewer outlet pipe requires adjustment***

Possible causes:

- i) Berm or pipe base poor stability allowing the pipe to shift;
- ii) Excessive rainwater flow;
- iii) Obstructed inlet;
- iv) Nearby heavy traffic;
- v) Recent layout changes;
- vi) Unprotected discharge.

***Observation: Overall poor storm water evacuation into final receiver***

Possible causes:

- i) Upstream broken/obstructed conveyance system;
- ii) Final outlet obstruction by debris/vegetation/kinked outlet walls;
- iii) Downstream flooded conditions;
- iv) Undersized piping/pond.

***Observation: Site infrastructure expansions negatively affecting an existing storm water management system***

As the site expands, the storm water management system must expand accordingly. Contact a qualified engineering firm with experience in storm water management system design to address this concern.

***Observation: Storm water management system expansions implemented without following proper design/construction criteria.***

All storm water management system retrofits and modifications must adhere to pertinent regulations, following accepted engineering practices, and be implemented by certified professionals.

***Observation: Improvised retrofits of existing storm water management facilities and thus uneven flow distribution inside the conveyance system.***

Retrofitting of existing storm water management systems must be performed under professional supervision and following applicable regulations. Retrofitted systems must effectively meet new peak flow demand management.

**Observation: MOECC final effluent sampling exceeds allowable discharge levels into the environment (single and multiple user ponds)**

Possible causes:

- i) Pond contamination by nutrient laden rainwater;
- ii) Process and storm water cross connections;
- iii) Disposal of empty chemical containers or miscellaneous waste in the pond's vicinity;
- iv) Deterioration of storm water conveyance system metal parts;
- v) Rainwater from other sites (shared ponds).

**Note: Take duplicate water samples for verification analysis by a certified laboratory.**

**Observation: Storm water management system operating without MOECC required permits**

**Storm water is classified as sewage. Thus, all site discharges into the environment require an Environmental Compliance Approval (ECA) from the MOECC per:**

- Environmental Compliance Approval (ECA) Application under section 20.2 of part 11.1 of the Environmental Protection Act. R.S.O.,1990.
- Section 53 of the Ontario Resources Act. R.S.O. 1990, ECA for Sewage Works.

Remember, the effectiveness of a properly designed storm water management system dwells in its ability to effectively handle rainwater peak flows. Routine maintenance of the system, establishment and implementation of a monitoring program, and periodic inspections along with sampling at selected locations after a heavy rainfall will ensure continued operability and environmental compliance.

All of these observations should be incorporated into your SWM Operation and Maintenance Manual and Monitoring Protocol. Do you have a manual? Do you have a monitoring program that you follow? Both are necessary to ensure the SWM system is functioning properly and is in peak condition.

