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TRCA AT A GLANCE

• One of 36 CAs in Ontario

• Provincially legislated under the CA Act of 1946

• Watershed boundaries (crosses multiple municipalities)

• Largest landowner in the GTA

The TRCA’s area of jurisdiction includes:
• 3,467 sq. km: 2,506 on land and 961 water-based.

This area is comprised of nine watersheds including:
• Etobicoke Creek
• Mimico Creek
• Humber River
• Don River
• Highland Creek
• Rouge River
• Petticoat Creek
• Duffins Creek
• Carruthers Creek

The TRCA’s jurisdiction also extends into Lake Ontario to a point defined by the Territorial Divisions Act, R.S.O. 1980

The population in 2004 within TRCA’s jurisdiction is approximately 4,300,000 (37% of Ontario’s population).
Conservation Authorities Act (1946)

- created in 1946 in response to flooding and erosion concerns
- basis for TRCA's mandate to prevent, eliminate or reduce the risk to life and property from flooding and erosion

- Ont. Reg. 166/06 (permits)
- Programs like Erosion Management and Habitat Restoration
EROSION HAZARD MANAGEMENT @ TRCA
IN-STREAM ESC CONTROL PRACTICES

Necessary when:

• The work itself is located in the water:
  – to control stream erosion
  – to install new infrastructure (bridges with piers)
  – to realign a section of watercourse
  – to protect buried infrastructure (pipelines, sewers)
WHAT IS IN-STREAM ISOLATION?

- A sediment control practice in flowing water
- To isolate sediment in the work area from the rest of the watercourse
WHY IN-STREAM CONTROLS ARE REQUIRED

- Comply with legislative requirements
- Protect terrestrial and aquatic organisms from excess sediment
- Reduce turbidity and water quality concerns
- Protect of downstream infrastructure from sediment and debris accumulation

http://www.irv-software.at/kunden/sifim/images/region/ImpoundmentFig4.jpg
CURRENT RESOURCES FOR IN-STREAM CONTROL PRACTICES

- OPSS / OPSD
  - Turbidity Curtains (219.260/261)
  - Temporary bypass / Full Diversion (221.030)
- Erosion and Sediment Control Guidelines for Urban Construction (GGHA, 2006)
- Sustainable Technologies Evaluation Program (STEP)
- Supplier websites
  - Application
  - Design considerations
  - Installation & maintenance
There are many variables that affect performance & suitability:

- Water levels
- Ice
- Debris
- Soil type
- Uneven bed surface
- Thalweg position

Choosing the wrong method can be time consuming and costly to repair and maintain.
TIPS AND TECHNIQUES FOR COMMON IN-STREAM CONTROL PRACTICES
COMMON IN-STREAM CONTROL PRACTICES

- Polypropylene Bag (‘Meter bag’) Cofferdam
- Floating Silt / Turbidity Curtain
- Flume
- Water-filled dam
- By-pass pumping
WOVEN POLYPROPYLENE BAG COFFERDAM

- Typically 36”x36”x36”
- 1 cubic metre capacity (commonly known as meter bags)
- Typically filled with pea gravel
- 4 point straps for lifting/placing
WOVEN POLYPROPYLENE BAG COFFERDAM

• Provides a structural barrier adjacent to or in the watercourse
• Constricts flow to the remainder of the channel
• Can be utilized with unwatering to provide a dry work area
WOVEN POLYPREPROPYLENE BAG COFFERDAM

- Used perpendicular to flow for bypassing; or
- Parallel to flow for temporary diversion

Diagram:
- Flow arrows indicating direction.
- Metre bags and discharge pump and hose.
- Work area marked as NTS.
- Gravel filled yard bags wrap around poly sheeting to create impervious barrier.
- Extend poly sheeting upstream to reduce seepage through substrate.
- Min. 1.0m high to prevent base flows from overtopping the dam while providing a freeboard of 0.30m at all times.
- Extend poly sheeting 1.0m downstream to reduce bed scour during overflow.
WOVEN POLYPROPYLENE BAG COFFERDAM

**Pros**

- Flexible configurations
- Reusable (typically can be moved 2-3 times*)
- Small-moderate footprint
- Good for winter construction projects
- Adjustable when floods are forecasted
WOVEN POLYPROPYLENE BAG COFFERDAM

Cons

- Typically needs a liner for an effective seal → installation in depths > 1 bag high is challenging
- Reusability requires operator TLC
- Can have a big footprint in deep watercourses
- Eventual landfill disposal
Lifting and seepage at bed/liner interface

Think about duration and time of year
• Use a sling to lift the bags
  ➢ Directly with teeth when no staff are in the water
  ➢ With a clevice hook if staff are in the water (for safety)

• Don’t fill the bags to capacity
  ➢ ~80% optimal
  ➢ Advise your estimator!
  ➢ Use clean pea gravel – never sand or any deleterious materials in the event of a break
• When installing perpendicular to flow (e.g. for bypassing) pump first to lower water levels and make liner installation easier

• Consider a bentonite liner and/or bentonite bags at toe of liner for gabion-lined channels and other watercourses with highly permeable beds

• Remove from d/s to u/s
WATER-FILLED DAMS

- Water filled tubes to provide a structural barrier between the work area and the receiving watercourse.
- Can be installed perpendicular or parallel to flowing water.
WATER-FILLED DAMS

Pros

- Very portable
- Uses on-site water to fill
- Adjustable lengths
- Work ‘in the wet’ but isolated
- Or in the dry in conjunction with pumping
WATER-FILLED DAMS

Cons

- Big footprint when inflated; problematic for small streams (parallel to flow)
- Rolling (extreme conditions)
  - Hard to re-position if it rolls
  - Not as adaptable for storm events
  - Bacterial growth
- Thermal impacts (short-term)
WATER-FILLED DAM

**General Tips**

- Best for lower flow streams and lakes
- **Reinforce with meter bags** if using in higher flow systems
- **Release** captured water *slowly* or onto a splash pad
  - can cause erosion if released in an uncontrolled manner
- Consider discharging water into filter bag or in settling basin
  - temperature & bacteria

FLOATING SILT (TURBIDITY) CURTAIN

- OPSD219.260/61
- Geotextile vertically suspended in water to enclose work area
- Curtain acts as a sediment barrier to protect the rest of the watercourse from disturbance by construction activities
- **Parallel** to flow only
FLOATING SILT (TURBIDITY) CURTAIN

- Made of Woven geotextile ≤300 μm; or
- Geomembrane of low-permeability synthetic material
- Float, adjustment lines and ballast
- 50mm freeboard
FLOATING SILT (TURBIDITY) CURTAIN

Pros

- Height adapts to fluctuating water levels*
- Easy to install
- East to move and adjust as work progresses
- Small footprint
  - good for narrow streams
- For work ‘in the wet’
FLOATING SILT (TURBIDITY) CURTAIN

Cons

• Damaged easily by ice
• Vulnerable to failure on bends*
• Does not perform well in fast flowing streams
• Not for work that needs to be ‘in the dry’ (obviously)

*without additional measures in place
• May need to add pea gravel bags for additional ballast
• If maintaining in colder temperatures, minimize movement and break ice proactively
• If located along a bend, use additional measures upstream to deflect flow (e.g. meter bags)
• Consider adding T-bars and paige wire fencing for structural support*

*Not appropriate for shale beds
FLUME

- CSP or HDPE pipe conveys flows through work area to allow work in the dry
- Can be used in conjunction with pumping to assist in conveying flow
FLUME

Pros

- Allows in-stream works to be constructed in the dry
- Good when construction activity spans entire watercourse
  - e.g., grade control work
- Typically more cost effective than full bypass pumping*
FLUME

Cons

• May not be suitable for highly sensitive streams
  – Installation/removal disturbs bed
• Should be sized to convey the 2 year event
  – may be cost-prohibitive depending on flow rates
• Requires sufficient elevation change to work passively (may need pumping \(\rightarrow\) additional $)
May need to add supports to get required slope
- Splash pad at outlet for erosion protection
- Work should still be phased in the event of a major storm event
BY-PASS PUMPING

• Uptream and downstream limits of work area are blocked with a cofferdam
  ➢ rock, meter bags, water-filled dam, pea gravel bags, jersey barriers, etc.

• Flows are bypassed with a pump and hose(s) or into a temporary channel to isolate the desired length of watercourse
BY-PASS PUMPING

Pros

- Allows in-stream works to be constructed in the dry
- Good when construction activity spans entire watercourse
  - e.g., grade control work
BY-PASS PUMPING

Cons

• Pumps can use ~1200 L/day in fuel
  – $7,000 - $10,000 / week (fuel only)
  – GHG emissions
• Submersible pumps clog easily in sandy streams
  – Daily maintenance
• Generator and pump system are at risk of vandalism when left running overnight
• Can be noisy
• Pump and hose requirements are frequently underestimated
BY-PASS PUMPING

General Tips

- Stabilize work area daily so pumps can be shut off overnight and allow water to flow through site
  - Easiest with meter bag cofferdams
- Supplier flow rates typically do not take fish and self-cleaning screens into account
  - Additional restriction to flow
- Trash pumps with self-cleaning screens are better for sandy bottoms
- Dig a small sump for the pump or place in pool section for best performance
BY-PASS PUMPING

General Tips

- Clear leaf litter and debris proactively before pumping to reduce clogging and cleaning
- For sandy bottoms where trash pumps are not desired; elevate submersible pump on a skid and strap upright
- Consider an additional cage around intake in streams with a lot of woody debris
- Pay more for a self-cleaning fish screen to save on maintenance
IN-STREAM CONTROLS – LESSONS LEARNED

REMEMBER FIRST PRINCIPLES

• **Avoid** in-stream works to the fullest extent possible – back to planning stage
• **Phase work** to minimize downstream risk in the event of failure
• **Adhere to timing windows** to reduce risk to aquatic life and habitat

STORM EVENTS ARE BECOMING MORE INTENSE

• Don’t pray it won’t rain – **plan for it to rain** and know what to do
IN-STREAM CONTROLS – LESSONS LEARNED

KNOW YOUR FLOW

• When you price your job and when you actually do the job may be very different
• Velocity, depth and discharge should be understood at different times of year
• Measures should be designed to withstand the 2 year event where possible

SHORT TERM GAIN = LONG TERM PAIN (USUALLY)

• Don’t choose the cheapest method to buy and install – choose the method that can perform under the site conditions
• Wrong selection = increased maintenance = $$ $$
Questions?
Thank You

Moranne McDonnell, B.E.S., C.E.T., CISEC
Associate Director, Engineering Projects
Restoration & Infrastructure Division
TRCA
(416) 392-9725
mmcdonnell@trca.on.ca