Sustainable Technologies
EVALUATION PROGRAM

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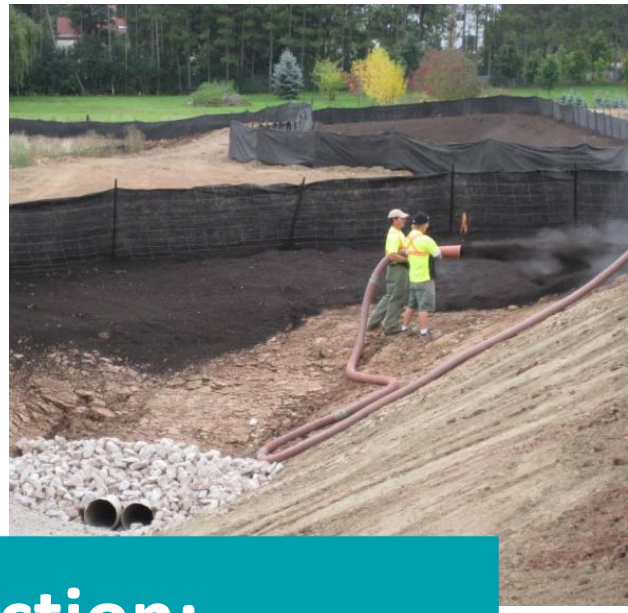

New ESC Guide for Urban Construction: Erosion risk assessment and turbidity targets

Presented by: Lisa Rocha
Terrafix Summit 2020
March 4, 2020

The water component of STEP is a collaborative of:

Lake Simcoe Region conservation authority
Credit Valley Conservation inspired by nature
Toronto and Region Conservation Authority

About STEP

The Sustainable Technologies Evaluation Program (STEP) is a conservation authority led initiative developed to support broader implementation of sustainable technologies and practices within a Canadian context.

Current partners:

Lake Simcoe Region conservation authority

Credit Valley Conservation inspired by nature

Toronto and Region Conservation Authority

Program objectives:

- Carrying out research, monitoring and evaluation of clean water technologies
- Develop strategies to overcome implementation barriers
- Develop tools, guidelines and policies
- Education, advocacy, and knowledge transfer

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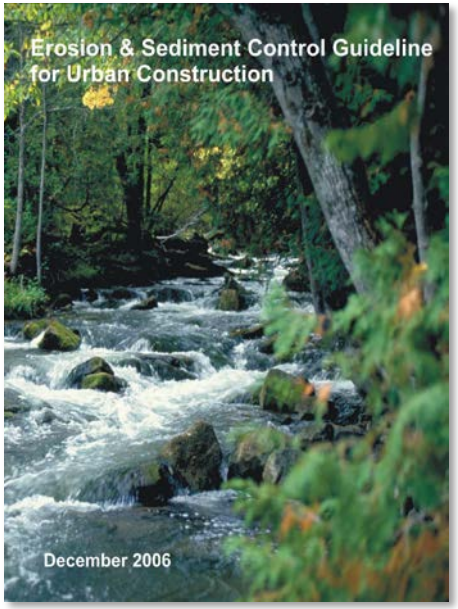
About the ESC Guideline update

Why was the update needed?

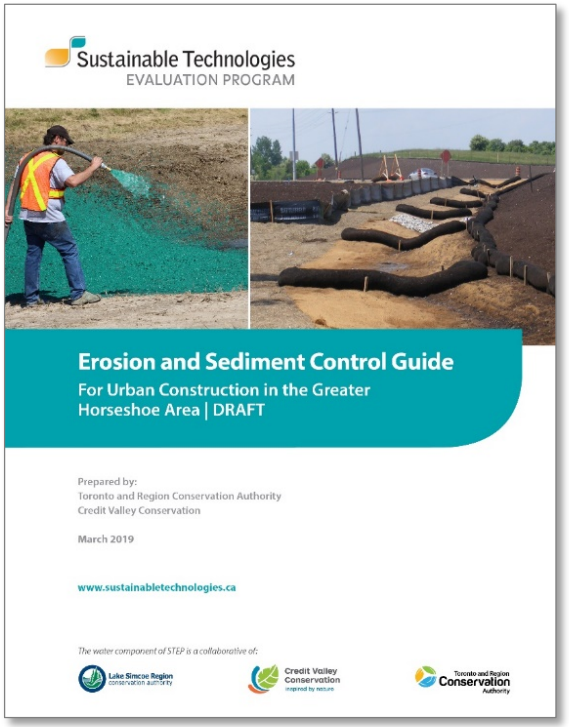
- GGHA Conservation Authorities ESC Guideline for Urban Construction published over 12 years ago
- ESC knowledge has expanded & practice has evolved



Key changes this past decade:

- Availability of professional training (e.g. CISEC)
- Legislative changes
- Changes to BMPs
- Expanded knowledge & understanding of ESC issues
- Turbidity monitoring requirements for SAR habitat (e.g. Silt Smart Protocol)
- New CSA ESC standards

New Guide - Highlights



- ***Qualitative erosion risk assessment methodology***
- Clarification of ESC approvals process, including flowcharts and checklists
- Inclusion of new BMPs with an emphasis on erosion prevention, and elimination of reference to proprietary BMP names
- Updated guidance on in-water isolation BMPs and protecting LID features during construction
- ***Guidance on ESC effectiveness monitoring, including turbidity targets based on continuous monitoring and consideration of both concentration and duration of exposure.***

Erosion Risk Assessment (ERA)

- Assessing erosion risk is fundamental to effective ESC planning on any project
- The ***qualitative erosion risk assessment methodology*** outlined in the guide is recommended for projects where:
  - Extent of land disturbance is > 10 ha ***and*** duration > 30 days;
  - Construction activities are planned in or near natural water features; ***or***
  - The site is within the catchment of a water feature that is known or potential habitat for species at risk (listed on SARO).
- Part of preliminary site assessment – done ***prior*** to the start of construction

Why is ERA necessary?

- Demonstrates due diligence
- Helps flag high risk areas early in the planning process
- Helps with optimal selection and placement of BMPs
- Provides regulatory agencies with more context, i.e. showing your work
- Encourages application of enhanced controls in high risk areas.

Qualitative ERA approach

- Guide sets out a qualitative ERA approach that represents a hybrid of:
  - MTO's risk assessment methodology outlined in *Environmental Guide for ESC During Construction of Highway Projects (2015)* **and**
  - *RUSLE For Application in Canada (2002)*
- RUSLE – **R**evised **U**niversal **S**oil **L**oss **E**quation – calculates the specific amount of annual soil loss for a defined area
- MTO qualitative approach – high, moderate or low erosion risk classifications and consideration of the sensitivity of the receiver

Hybrid ERA approach

- Qualitative assessment of erosion risk based on the following factors:
  - Soil erodibility
  - Topography
  - Ground cover
- Larger development sites divided into polygons of like erosion potential

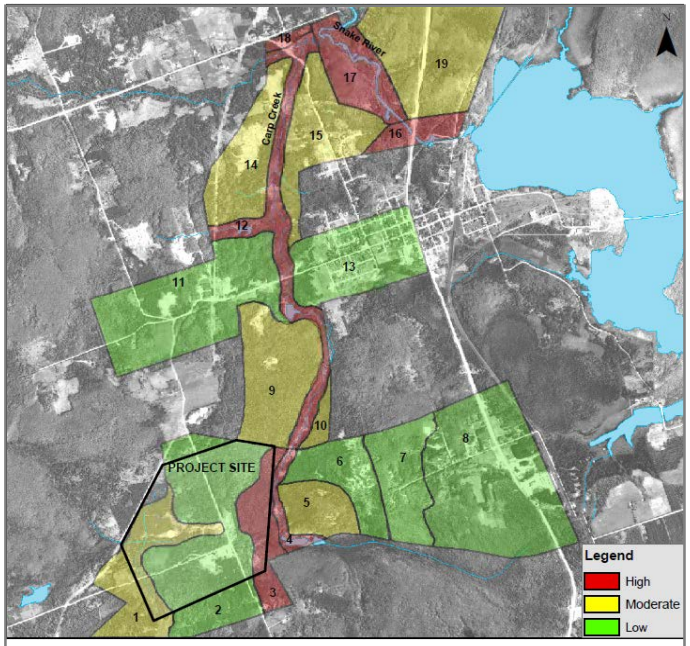


Photo credit: MTO's *Environmental Guide for ESC during the Construction of Hwy Projects (2015)*

- Erosion risk is classified (low, moderate or high) for all factors and for each polygon
- ERA outcome informs the selection and placement of BMPs

Selecting best practices based on ERA

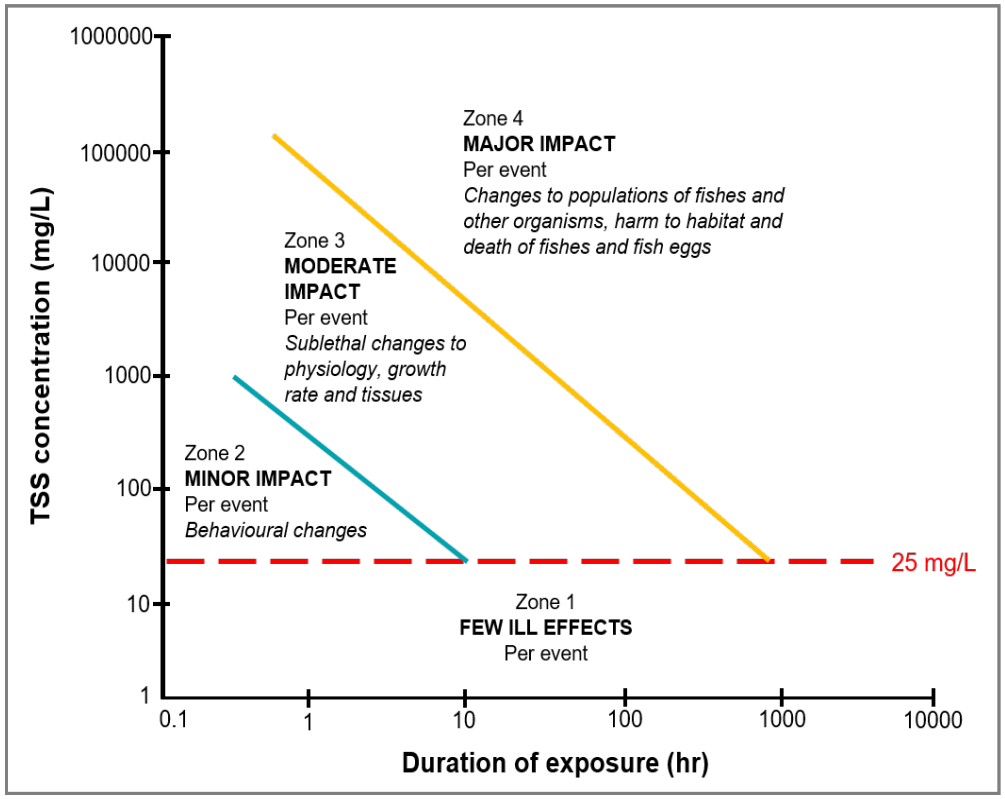
Minimum best practices recommended	Low risk	Moderate risk	high risk
Procedural ESC Measures	yes	yes	yes
ESC Plan	yes	yes	yes
Routine inspection of ESC effectiveness	yes	yes	yes
Flow/Runoff Diversion	optional	where possible	yes
Phased Construction and Progressive Rehabilitation	optional	where possible	yes
More intensive ESC measures	optional	optional	yes
Turbidity monitoring	optional	Recommended after significant rainfall / snowmelt	Continuous recommended

New performance based targets and turbidity monitoring on construction projects

Context – how did we get here?

1986 - Fisheries and the Problem of Turbidity and Inert Sediment in Water: A Synthesis for Environmental Impact Assessment

- Research by Charles P. Newcombe (1986) assessed the extent to which fish were impacted by exposure to SS at varying concentrations and durations.
- Chart categorizes suspended sediment exposures as having ***few ill effects***, or a ***minor***, ***moderate*** or ***major impact***.
- Considers both ***concentration*** and ***duration of exposure***

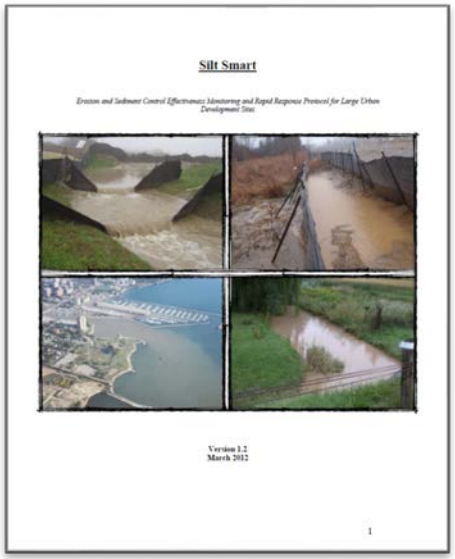


Context – How did we get here?

More recently…

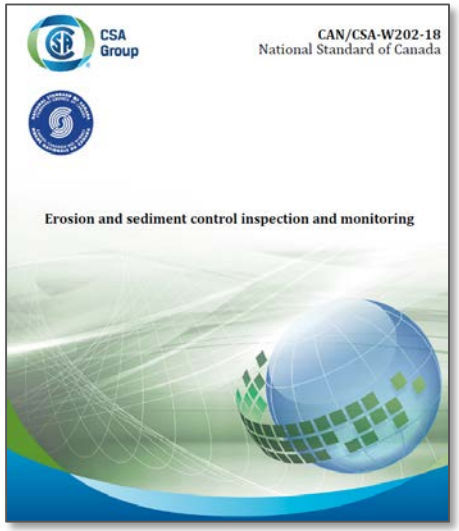
2012 - *Silt Smart ESC Effectiveness Monitoring and Rapid Response Protocol for Large Urban Development Sites*

- Continuous turbidity monitoring downstream of large construction sites that drain to sensitive streams
- First local performance based turbidity requirement
- Automated alerts to key stakeholders during exceedance



2018 - *CSA ESC Inspection and Monitoring Standard*

- Canada-wide standard developed by a balanced public & private sector technical committee
- Performance based TSS and turbidity targets for receiving water (D/S of construction) and effluent
- Regulatory agencies must determine how to apply the standard to assess compliance with targets



Performance based target

What is it?

- Turbidity (or suspended sediment) targets for construction site runoff are established
- Targets are ecological – based on keeping levels below thresholds at which ecosystems experience adverse effects
- Water quality monitoring is carried out to assess compliance with targets
- Extent of compliance determines if and when corrective actions are required on the site

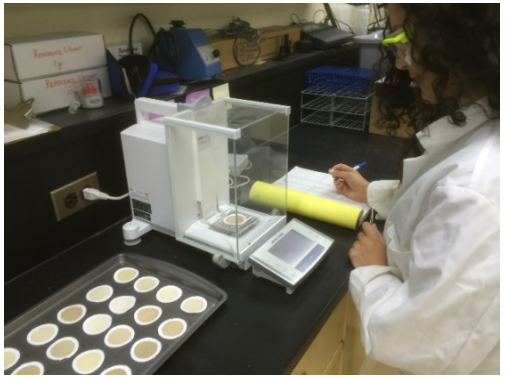
Why performance targets are needed

- No definitive and widely applicable targets within Ontario to date
- Provides context - monitoring efforts are not meaningful without a target against which they are measured.
- Clarifies expectations and makes regulatory requirements more consistent across all sites

- Focused on outcome → less sediment in the stream
- Promotes more rigorous and frequent inspection and monitoring of the site
- More appropriate to the dynamic nature of construction projects

Turbidity vs. TSS Targets

Turbidity: a measure of the degree to which light is scattered by substances that are dissolved or suspended within a liquid



Total suspended solids: a measure of the amount (weight) of solids suspended in a liquid

- Turbidity and suspended sediment concentration are ***positively correlated***, but the relationship can vary significantly from one water source to another
- Turbidity can be measured instantaneously and continuously on site, allowing for assessment of duration of elevated sediment events
- Duration is a key factor in assessing impacts to aquatic organisms
- As a result, ***targets described here are based on turbidity***

Receiving water vs. effluent targets

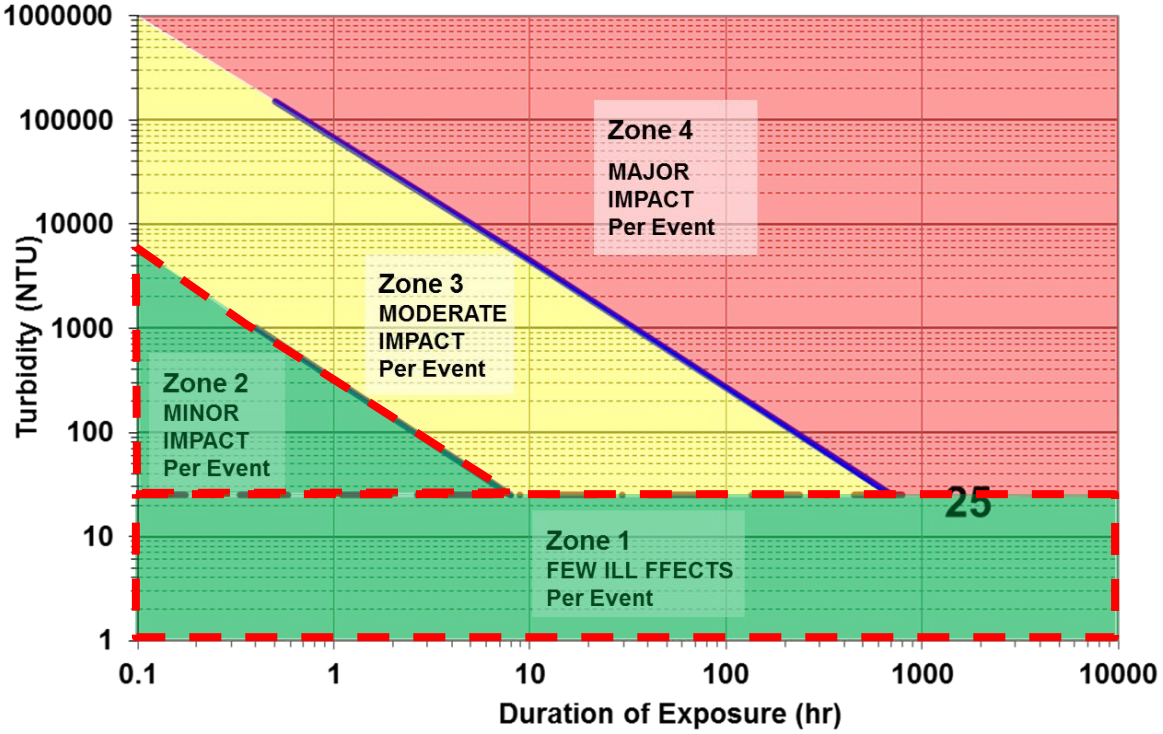
- ***Receiving water target*** applies downstream of the site, in the water body to which the site drains
- Only exceedances above typical (pre-construction) values are assessed
- Upstream levels must be considered
- **Advantage:** most direct assessment of the condition of the receiving water

- ***Effluent target*** applies to direct runoff/discharge from the construction site, before it is subject to any dilution in a receiving water feature.
- **Advantage:** most direct assessment of sediment release from the site

The type of target and monitoring carried out (receiving water or effluent) depends on site specific circumstances

New ESC Guide Turbidity Targets for Receiving Water

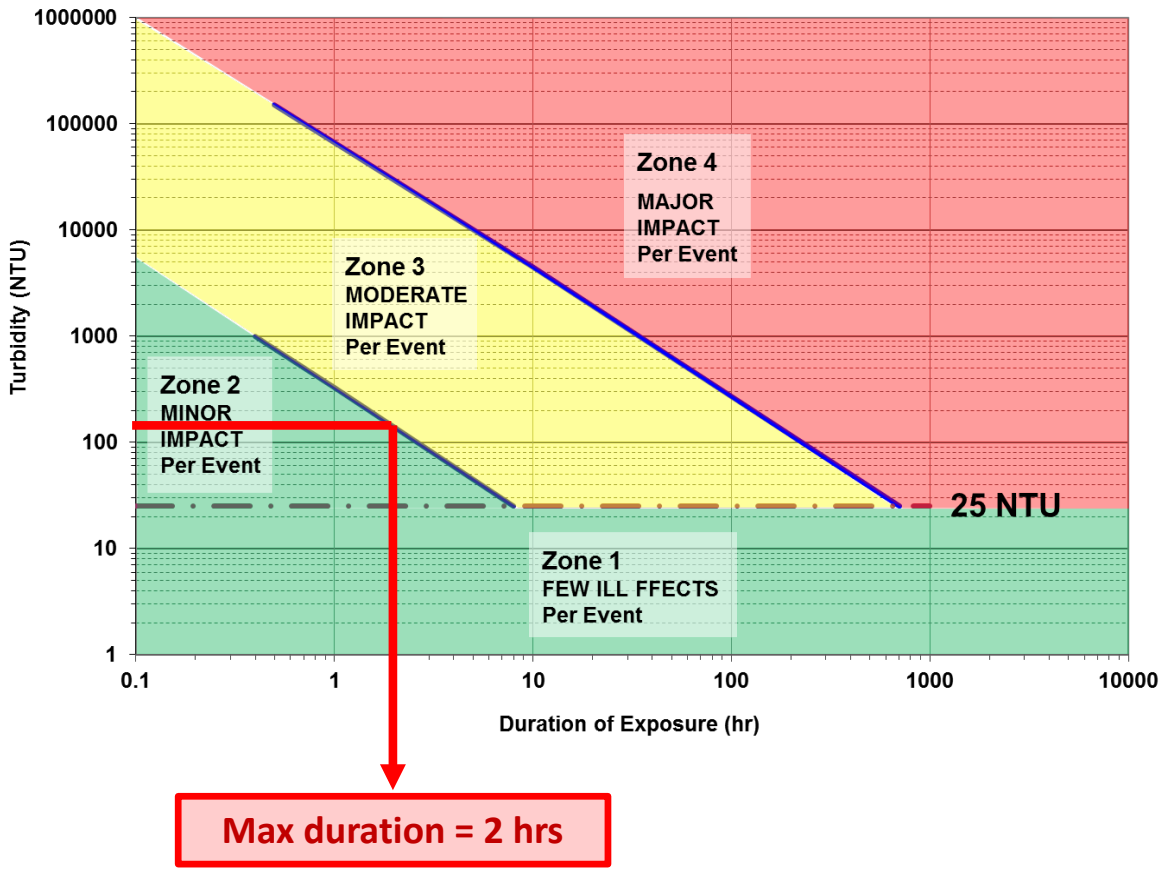
- Uses turbidity as a proxy for suspended sediment
- Assumes TSS-turbidity ratio of 1:1 based on past monitoring studies (TRCA & U of Guelph 2006; SWAMP, 2005)
- ***Goal:*** receiving water features D/S of construction projects maintain turbidity within the "few ill effects" or "minor impact" zones



- Exceedance of the target is based on the extent of ***increase above typical (pre-construction) turbidity levels*** in the stream
- Ensures construction project is not held accountable for natural stream sediment fluctuations

Defining the few ill effects and minor impact zones

Construction-based turbidity increase (NTU)	Duration (h)
≤ 25	Any duration
761	0.5
324	1
138	2
84	3
59	4
45	5
36	6
29	7



New ESC Guide Turbidity Targets for Effluent

- Applies to any water leaving the site (i.e. both active and passive discharge)
- Target depends on receiver:
  - Discharges to storm or sanitary sewer are subject to municipality-specific contaminant limits
  - For natural water features effluent should be in the ***"few ill effects"*** or ***"minor impact"*** zones based on turbidity and duration
- Does not require consideration of typical (pre-construction) turbidity levels in the receiver
- Can be assessed at any discharge areas that are permanently wet, like sediment pond outlets

APPLYING PERFORMANCE BASED TARGETS ON SITE

Site specific considerations for establishing a turbidity monitoring approach

Erosion risk

- Qualitative ERA described in ESC Guide, more intensive monitoring should be considered for higher erosion risk sites

Receiving water

- Natural feature vs. sewer system
- Is the low water level deep enough to keep the turbidimeter submerged?
- Is the receiver inaccessible or too far from the construction site?

Presence of species at risk

- More intensive (continuous) monitoring recommended on sites draining to SAR habitat
- Determined by regulatory body administering *Endangered Species Act* (now MECP)

Type and location of discharge points

- Ease of access for equipment installation and safety considerations
- Cost considerations for effluent monitoring on multi-pond sites

Turbidity monitoring approaches

Method	Where can it be applied?	Advantages	Disadvantages
Handheld turbidity measurement	Anywhere you can collect a water sample	• Straightforward • Low equipment cost • Greater capacity to pinpoint sources • Can be carried out in the winter	• Staff costs for site visits and sampling • Duration is not assessed
Continuous online turbidity measurement	Anywhere with constant water flow, for example: - At pond outlets - In receiving water	• Concentration & duration = more accurate assessment • Convenience - data logged constantly • Set location means higher precision and comparability • Readily comparable to concentration/duration targets	• Higher equipment costs • More data = higher staff costs for data QA/QC • Staff costs for equipment cleaning and maintenance • Not typically operational during winter
Continuous online turbidity measurement with remote access	Anywhere with cellular service and constant water flow, for example: - At pond outlets - In receiving water	In addition to those listed above: • Convenience of remote access • Opportunity for fast response	• Same as above • Additional cost for cellular service and related equipment

Assessing compliance with targets through continuous turbidity monitoring

- Where receiving water targets will apply:
  - Two continuous in stream turbidity monitoring stations (U/S and D/S of site) with remote data access
- Where effluent targets will apply:
  - Continuous turbidity monitoring stations at all permanently wet discharge locations (e.g. ponds) with remote data access
- Continuous turbidity monitoring throughout construction period until 80% ***effective*** permanent stabilization
- Regular maintenance and calibration of equipment
- Emphasizes more timely response to elevated sediment releases

Example: Assessing compliance with receiving water target

Calculate the turbidity increase attributable to the construction site…

Construction based turbidity increase = (measured DS turbidity) – (measured US turbidity + ISG)

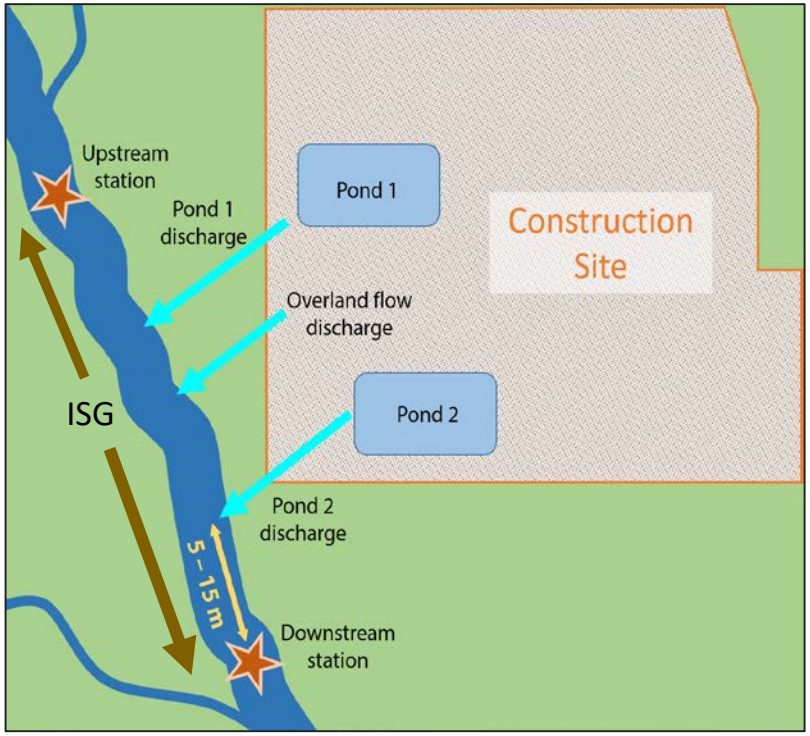
Where **ISG** = natural in-stream generation of sediment between the US and DS sites

Assuming:

Measured US turbidity = 40 NTU

ISG = 10 NTU

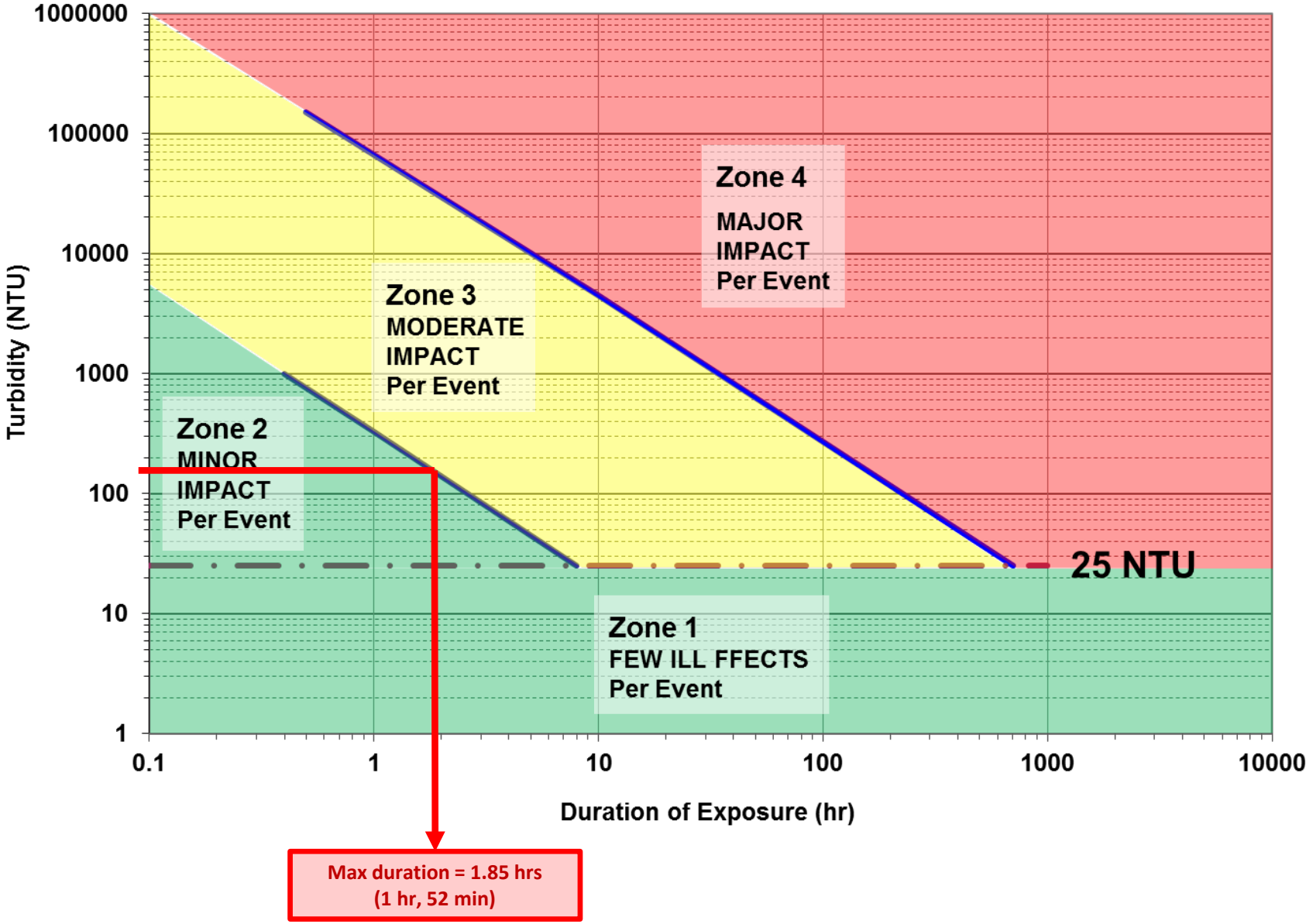
Measured DS turbidity = 200 NTU



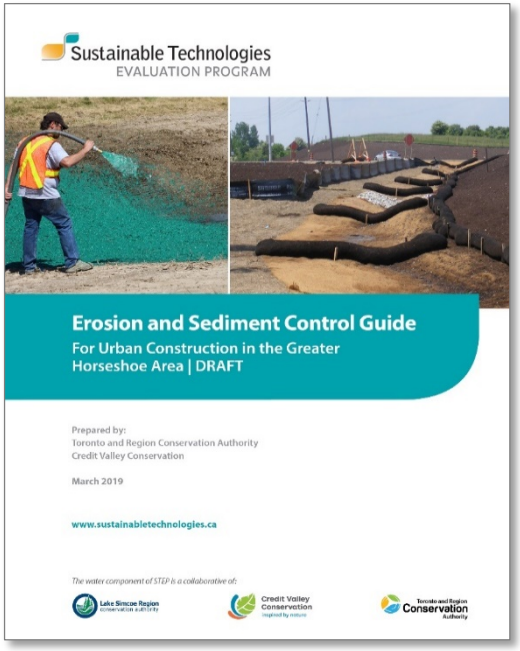
What turbidity increase can be attributed to the construction site?

Answer: 150 NTU

At what duration does this turbidity level (150 NTU) constitute an exceedance (i.e. "moderate impact" zone)? Using interpolation…



Next steps



- Official adoption in TRCA jurisdiction in Sept. 2020
- During roll out period TRCA will:
  - offer training;
  - develop a voluntary initiative to offer streamlined reviews on continuously monitored sites; and
  - Encourage adoption in other CA jurisdictions
- MECP's forthcoming system wide ECA initiative to reference new ESC Guide as a requirement
- TRCA partnering on two construction site turbidity monitoring pilots
  - Implementation of continuous monitoring with remote data access
  - Subject to expedited approvals processes
  - Objective: assess extent of compliance with targets, investigate innovate solutions to reduce turbidity levels in site runoff
- Pilot outcomes to inform updated guidance on turbidity reduction best practices

Thank You

Where to find the Guide:
sustainabletechnologies.ca/esc-guide

Questions? Comments? Ideas?

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