Standard Operating Procedures for Structural Stormwater Treatment and Municipal Roads

August 4th, 2020

Background

- The Clean Water Service Delivery Act (Act 76 of 2019) requires that DEC publish phosphorus reduction methods. Lake Champlain and Memphremagog by November 1, 2021.
  - A public comment period of at minimum 30 days.
- Two standard operating procedure (SOP) documents were circulated to MS4s to aid in the development of the phosphorus control plans.
- SOPs will also be used for the tracking of funded projects and overall TMDL accounting such in the Clean Water Performance Report.

Operational and MS4 SOPs

- Located here: https://dec.vermont.gov/sites/dec/files/FINAL%20DRAFT%20Stormwater%20SOP%206-1-20.pdf
- Includes methods for:
  - Structural Treatment Practices (gravel wetlands, infiltration basins, etc.)
  - Non-Structural Practices (street sweeping, catch basin cleaning, etc.)
- These methods have already been presented to the MS4s and are implemented in tools such as the STP Calculator and the BMP Tracking table.
- Largely based on EPA methods

Municipal Road SOPs

- SOPs located here: https://dec.vermont.gov/sites/dec/files/FINAL%20DRAFT%20MRGP%20SOP%206-1-20.pdf
- Includes methods for:
  - Paved or unpaved roads with ditches
  - Paved roads with curbs and catch basins

Ditched Road Loading Rates

- The Problem:
  - Lake Champlain TMDL modeling road loading rates did not consider connectivity or compliance with municipal roads standards.
  - The TMDL scenario assumed that 65%-100% of municipal roads would be treated. Roughly 50% are hydrologically connected and of those ~50% already meet MRGP standards.
- The Solution:
  - Redistribute the municipal road load based on connectivity, slope, and compliance with MRGP Standards.

Setting Loading Rates

- Municipal road miles for each drainage area were divided up based on a combination of factors.

Loading Factor	Possible Values
Surface Type	Paved, Unpaved
Connectivity	Connected, Unconnected
Road Slope	<5%, 5-10%, >10%
Compliance Status	Does Not Meet, Partially Meets, Fully Meets
Road Class	Class 1-3, Class 4

- GIS and REI data was used to tag road segments with the factors.
- Compliance status was assigned proportionally based on available REIs

Setting Loading Rates

- A loading rate for group is calculated from the product of the average loading rate for the surface type and multipliers for slope, compliance score, and connectivity.

$$Average\ Loading\ Rate\ \times Slope\ Multiplier\ \times Compliance\ Multiplier \times Connectivity\ Multiplier = Group\ Loading\ Rate$$

Loading Rate Multipliers

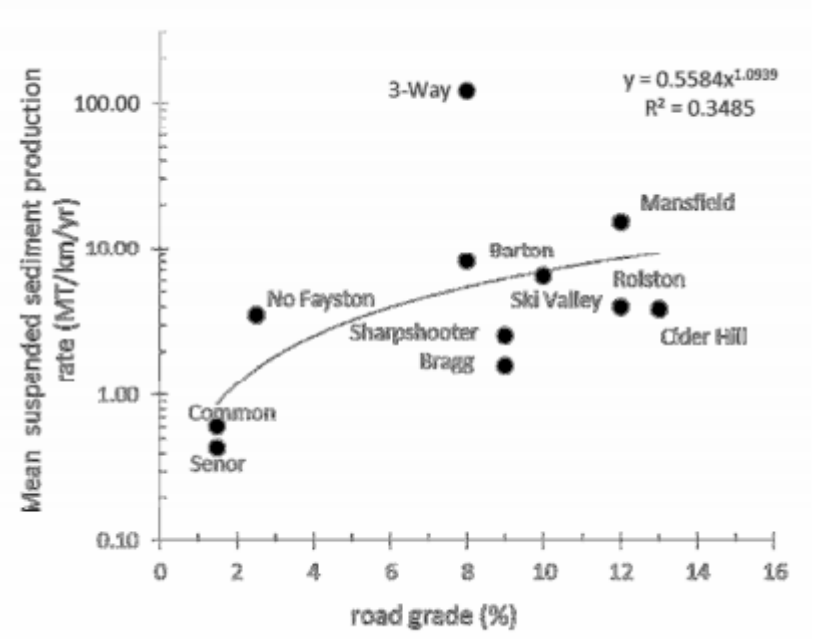
- **Compliance with MRGP Standards**
  - 80% reduction for taking a road segment from Does Not Meet to Fully Meets is based on testing by Beverly Wemple's group.
  - 40% for a partial improvement of compliance score is based on best professional judgement.

To \ From		Initial Compliance Status: Partially Meets	Initial Compliance Status: Does Not Meet
Post Project Compliance Status	Partially Meets	0%	40%
	Fully Meets	40%	80%

Erosion Volume	Reduction
< 3 cubic yards	20%
≥ 3 cubic yards	40%

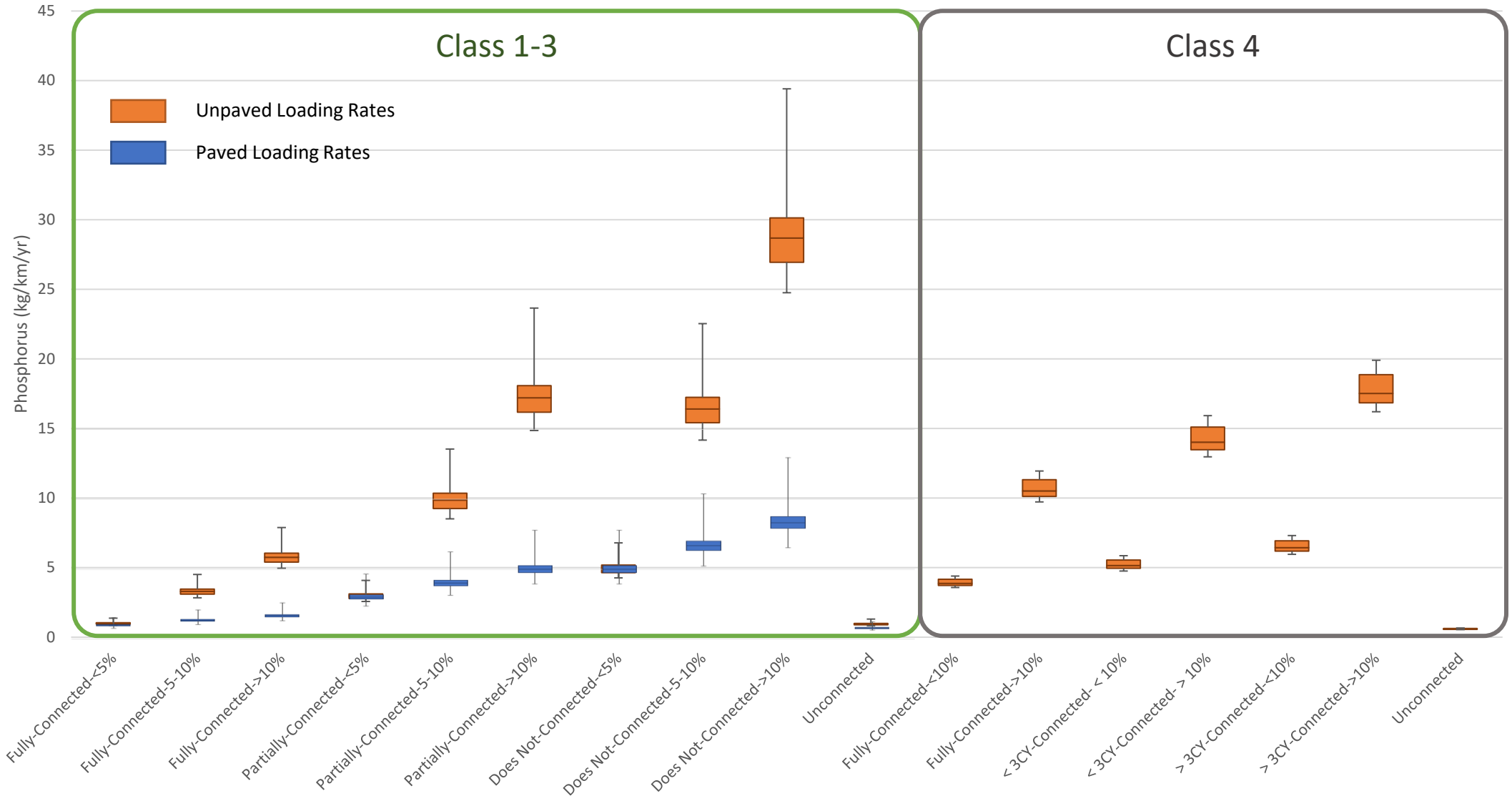
Loading Rate Multipliers (cont'd)

- **Road Slope** – higher slopes have higher load
  - Slope modifiers for unpaved roads were based on work by Beverley Wemple.
  - Slope modifiers for paved roads based on other models.



Loading Rate Multipliers (cont'd)

- **Connectivity** - "Connected" segments have higher load than "unconnected" segments
  - There will be some load for "unconnected" segments.
- Excel Solver add-in was used to determine the connectivity multiplier such that the total starting load was preserved when each loading rate was multiplied by the total length of road in that group.


Class 1-3
Class 4
Unpaved Loading Rates
Paved Loading Rates
Phosphorus (kg/km/yr)
45
40
35
30
25
20
15
10
5
0
Fully-Connected-<5%
Fully-Connected-5-10%
Fully-Connected->10%
Partially-Connected-<5%
Partially-Connected-5-10%
Partially-Connected->10%
Does Not-Connected-<5%
Does Not-Connected-5-10%
Does Not-Connected->10%
Unconnected
Fully-Connected-<10%
Fully-Connected->10%
< 3CY-Connected- < 10%
< 3CY-Connected- > 10%
> 3CY-Connected-<10%
> 3CY-Connected->10%
Unconnected

Paved Roads with Curbs and Catch Basins

- Based on NRCS method for gully erosion

$$Erosion\ Rate = \frac{(Volume\ of\ Erosion\ \times Soil\ Bulk\ Density)}{Time\ since\ Gully\ Started\ Forming} \times Sediment\ to\ P\ conversion$$

  - Soil Bulk Density = 43.38 kg/ft^3
  - Age of Erosion: 30 years or known time span
  - Sediment to P conversion: 0.000396 kg P/kg Sediment
- Ongoing research project with VTrans and Wemple looking at gully erosion