P. O. Box 512
Montpelier, Vermont 05601
April 14, 2021

House Committee on Natural Resources, Fish and Wildlife
meeting remotely

Subject: S.101 - promoting housing opportunity and choice in smart growth areas

Dear Committee:

I am Thomas Weiss, a civil engineer. My experience relevant to this letter includes the hydraulics of sewers and of wastewater treatment facilities: measuring infiltration and inflow in sewers; sizing of sewers; planning for sewer separation projects; sizing of pipes, weirs, and pumps in wastewater treatment facilities.

As you are aware, Sections 7 and 8 propose to give municipalities sole responsibility for issuing permits for connections to their water and wastewater systems. Currently the State is required to issue permits for those connections. Municipalities also issue permits for connections.

I ask that the State have a meaningful role in issuing connections to municipal systems. State oversight is needed. To that end, sections 7 and 8 need to be removed from the bill.

Many of our wastewater treatment systems discharge to impaired or stressed waters. Many of them have unauthorized discharges. Many of the discharge permits have expired.

Adding more sewage to these systems will not improve the quality of the receiving waters. More sewage into a wastewater treatment facility means more total amounts of nutrients and of bacteria in the effluent.

Yes, those increases in the effluent might be within the limits of a discharge permit. Yet there is a gap between the water quality hoped to be achieved when a permit is issued and the water quality that actually exists. I am focusing on the water quality. If the water quality is impaired or stressed, then additional connections need carefully to be evaluated.

Numbers of systems with combined sewer overflows and sanitary sewer overflows
You had some discussion yesterday with Michael O'Grady on the number of municipal wastewater treatment systems. My data come from several ANR internet sites. There are 180 NPDES (National Pollutant Discharge Elimination System) Permits. 114 of them have been issued to municipalities. 89 of them have been issued to municipal wastewater treatment facilities. The other 25 municipal permits are for discharges from water treatment plants (filter backwash); for emptying municipal swimming pools twice a year, and for a few others.

Vermont has 89 municipal wastewater treatment facilities which treat sewage and discharge the resulting effluent into Vermont's rivers and lakes.

I believe that a dozen still have combined sewer systems. These systems discharge combined sewage (a mixture of runoff and untreated sewage) at discharge locations (CSO outfalls) before the wastewater treatment facility. In 2019 and 2020 these systems discharged a total of 49,000,000 gallons of untreated combined sewage in a total of 330 reported CSO events.

Many wastewater collection and treatment systems experience dry weather discharges, also known as sanitary sewer overflows. These discharges can be raw sewage, partially treated sewage, or partially disinfected sewage, depending on where the discharge happened. Dry weather discharges are caused by various problems, including pump failure, clogged sewer, broken sewer, malfunctioning disinfection system. In 2019 and 2020, 45 of these systems, just over half of all such systems, had a dry weather discharge. Combined, they discharged a total of 19,000,000 gallons in 106 reported dry weather discharges.

Many of these dry weather discharges go into rivers or lakes that are impaired or stressed because of nutrients, bacteria, or dissolved oxygen levels. Other systems that have not had dry weather discharges also discharge into such impaired or stressed waters. The impaired waters go by a variety of names: impaired, priority waters, 303d lists. Twenty-one of the systems with dry weather discharges discharge into such impaired or stressed waters. Seventeen more, with neither dry weather discharges nor combined sewer overflows also discharge into such impaired or stressed waters.

How additional connections increase the amount of pollutant being discharged under normal operation
Even if a wastewater system is operating well, adding more connections will mean more pollutants entering the receiving water. Here I use "operating well" to mean it meets its discharge concentrations, has no combined sewer overflows, and has no dry weather discharges.

Discharge permits often provide two limits for a discharge: total amount (pounds per day) and concentration (milligrams per liter). Few plants discharge near the total amount because they do not operate near capacity. My argument again, is about how additional connections will change existing conditions. The relevant limit in this testimony is the concentration. With more sewage coming into the system from additional connections, there will be more effluent going out, discharging more pounds of pollutants. So when a system is discharging into an impaired or stressed water, then the additional pollutant will add to the impairment or the stress.

How additional connections increase the amount of pollutant being discharge during combined sewer overflows.
A sewer pipe has a certain capacity for sewage flow. That capacity is determined by factors including the diameter, roughness, and slope of the pipe. Additional connections add more flow, increasing the depth of sewage in the pipe. This means that it takes less runoff to cause a combined sewer overflow. Combined sewer overflows will thus occur more frequently, last longer, and overflow more combined sewage.

I have provided an illustration showing this. The top pair shows flow in a sewer pipe. The pipe on the left shows current conditions: sewage flow in the pipe (dark grey) and a given amount of runoff flow (light grey) Of course, in the pipe, the two are thoroughly mixed. The uncolored portion inside the top of the pipe shows the air in the pipe. The pipe on the right shows the future condition: the same present amount of sewage flow (dark grey), the sewage flow from added connections (medium grey), and the same amount of runoff flow (light grey). Under future conditions, there is less air inside the pipe.

The middle portion of the illustration shows a plan view (looking down) of one type of combined sewer overflow structure. I chose to use this type in the illustration because it is easier to visualize. Combined sewage flows from a pipe on the left into a channel inside the structure. Combined sewage flows to the wastewater treatment facility through a pipe to the right. Inside the structure is a second channel, separated from the first by a weir. When there is enough flow, combined sewage flows over the weir into the second channel, then flows to the river through a different pipe.

The lower portion of the illustration shows two cross sections through the overflow structure. The section on the left shows current conditions. The depth of combined sewage (medium grey) in the channel is the same as in the pipe at the upper left of the illustration. I have set the weir height so it is just above the depth of sewage. Because the weir is higher than the depth of combined sewage, their is no overflow and the channel that goes to the river has no sewage. The section on the right shows future conditions. The depth of sewage in the channel is the same as in the pipe at the upper right of the illustration. The weir is at the same elevation in both of the sections. In the future condition, the depth of combined sewage is higher than the weir, so some of it is diverted into the overflow channel and goes to the river.

Remember, the rate of runoff is the same in both pipes at the top of the illustration. The difference in depth is due to the sewage from the additional connections. It is the sewage from the additional connections plus the runoff that causes the overflow in the future condition. What this means is that overflows start with smaller amounts of runoff. Also that each overflow occurs over a longer time: starting earlier in the storm and ending later in the storm. Also, during a given storm, there will be more combined sewage overflow in the future than

the same storm would provide under current conditions. The same holds true with runoff from melting snow.

How additional connections increase the amount of pollutant being discharged during dry weather overflows.
As I pointed out above, dry weather overflows have many causes. These causes include pump failures, clogged sewers, broken sewers, malfunctioning disinfection systems. In all of them the more sewage that is flowing through the pipe, the more that discharges.

How expired discharge permits do not lead to improvements in water quality
There are 37 municipal wastewater treatment facilities which lack a current permit. Eighteen of the permits expired between 8 and 13 years ago. The failure of DEC to renew the permits has deprived the public its right to comment on draft permits and how well those permits and wastewater systems might be protecting (or failing to protect) our rivers and lakes. Those permits might require lower discharge limits when discharging to an impaired or stressed water. According to the 2016 TMDL (total maximum daily loads) report, 22 municipal wastewater treatment facilities will need to discharge less phosphorus. Until those limits are determined, we should be cautious about allowing additional connections.

Conclusion
One can argue (in the sense of offering reasons for or against) the significance of the additional connections on the water quality of the receiving waters. The effects of course will be site specific: how much flow is added to a sewer, how close the sewer is to capacity. Again, I am talking about changes from current water quality. When these discharges are to impaired or stressed waters, then the level of impairment or stress will increase. That effect goes far beyond the municipality adding the connections. The effects of additional connections are incremental in terms of time and of space. In space: using the southern Black River as an example: there are discharges from Ludlow, Cavendish, and Springfield. The State has a better ability to determine the cumulative effects on water quality in the entire Black River due to additional connections than do the individual municipalities.

For these reasons, I believe that the State must remain involved in the issuing of permits for additional connections.

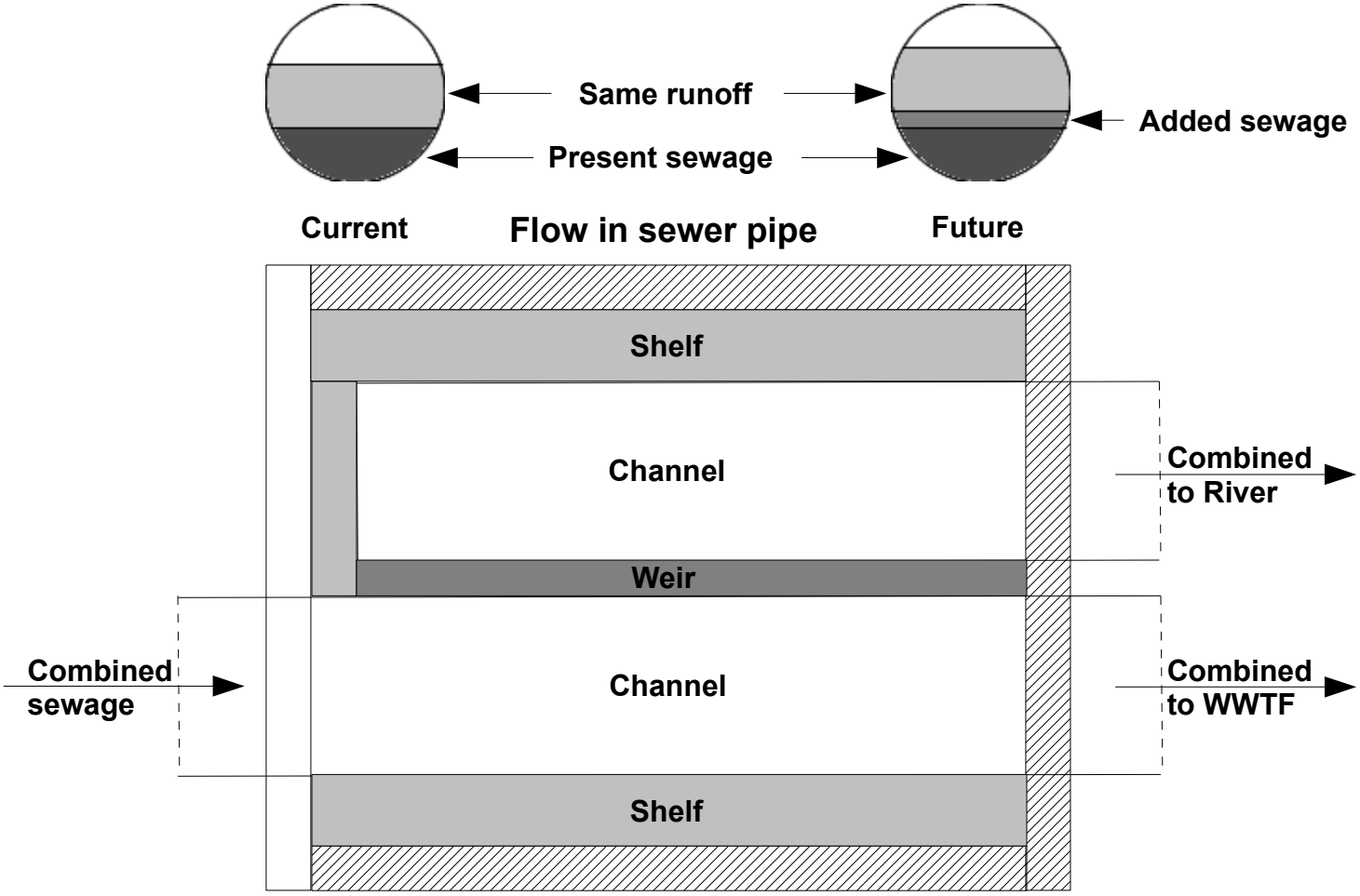
We need meaningful State oversight. Removing State oversight is not in the best interest of the people of Vermont nor is it in the best interest of the State's trusteeship over the waters of Vermont.

Please remove sections 7 and 8 from the bill.

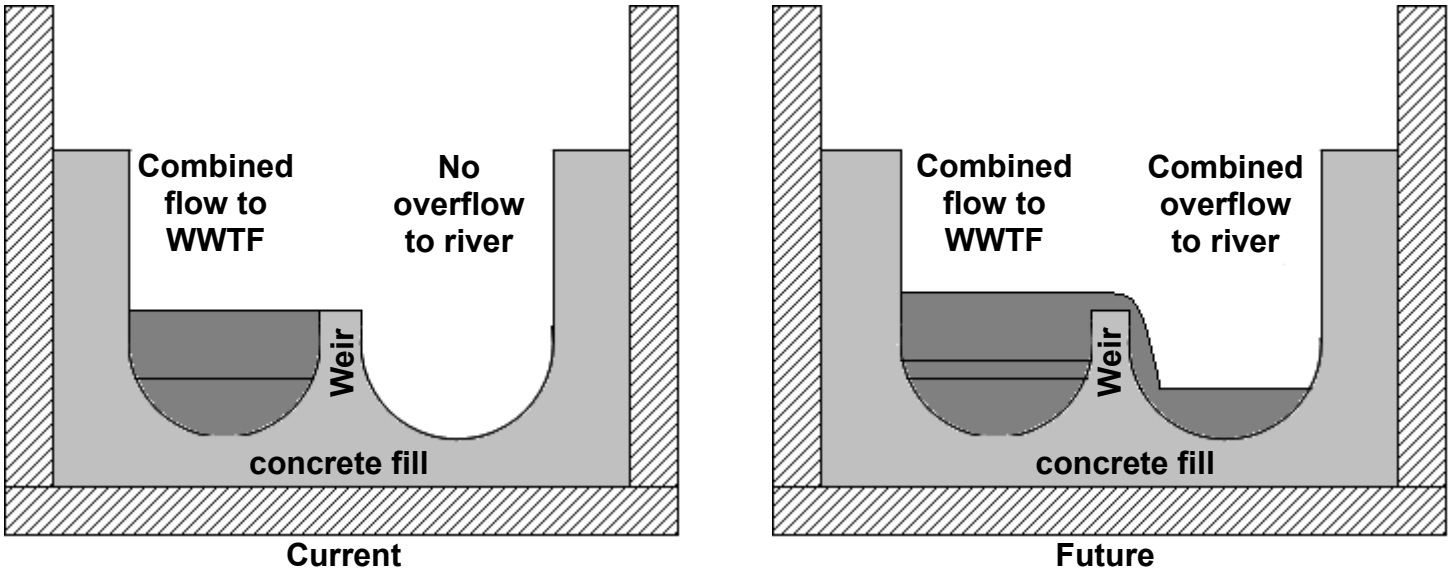
Thank you for taking time to read this testimony.

Sincerely,
Thomas Weiss, P.E.

Combined Sewer Overflow



One type of overflow structure
(plan view)



Weir height is set so there is no overflow under current connections with the same flows as at the top of this page.

(section view)

Prepared April 11, 2021, Thomas Weiss, P. E.