Congestion Levels at intersections along the VT-100 and VT-108 Corridor: 2017 and 2037

An analysis was composed at the various intersections along VT-100 and VT-108 for both present volumes as well as volume growth over the next 20 years. The purpose of this analysis was not only to find which intersections are at a congested level at present and identify what if any mitigation has been proposed but to also analyze intersection volumes along the corridor 20 years into the future to see if any new congestion hot spots occur. This analysis was composed with traffic simulation software evaluating intersection congestion using a value known as Level of Service.

Intersection Level of Service is a measure of the operational conditions within a traffic stream as well as the perception of delay by motorists and passengers. Level of Service is influenced by a variety of factors, including intersection controls, intersection geometry, traffic levels, and incidents that impede traffic flow. There are six levels of service, characterized by letter designations A through F with A symbolizing the lowest level of congestion with minimal traffic delay and F symbolizing the highest level of congestion with potentially long traffic delays.

For Vermont state roads, VTrans has adopted a Level of Service Policy for the state highway system. Level of Service (LOS) C is designated as the desired design target for signalized intersections and LOS D is designated as acceptable for side street approaches on stop-controlled intersections. Reduced LOS may be acceptable on a case-by-case basis, particularly within densely settled areas where further intersection improvements that are required to achieve LOS C would create negative cultural and environmental impacts. In cases where the existing LOS is less than desired and where the necessary intersections improvements are not feasible, a lower LOS may be acceptable, provided that the impact of future traffic can be effectively mitigated by implementing other congestion management strategies.

Table 1 - **Signalized Intersection Level of Service Criteria**

LOS	Avg. Delay (sec/veh)	Quality of Service
A	≤10	Free flow with little or no queuing
B	≤20	Low delays with short queues – reasonably unimpeded operation
C	≤35	Moderate delays and queues with occasional cycle failures*
D	≤55	Moderate delays and queues with noticeable cycle failures
E	≤80	Long delays and queues with frequent cycle failures
F	>80	Very long delays and queues with continued cycle failures

* *a cycle failure occurs when a vehicle has to wait more than one traffic signal cycle to pass through the intersection*

Table 2 – **Stop Controlled Intersection Level of Service Criteria**

LOS	Avg. Delay (sec/veh)	Quality of Service
A	≤10	Free flow with little or no queuing
B	≤15	Low delays with short queues – reasonably unimpeded operation
C	≤25	Moderate delays and queues but stable operation
D	≤35	Less stable condition -delays and queues are noticeable
E	≤50	Longer traffic queues and delay is more significant
F	>50	Very long delays and extensive queuing

Should an individual lane group or approach experience LOS F or a volume/capacity ratio greater than 1.0, the intersection is considered to have failed. In cases where an intersection fails, mitigation may be required, if reasonably possible, in order to mitigate a future traffic impact. Mitigation could include but is not limited to improvements such as extra left turn lanes, right turn lanes, through lanes, new traffic signals, existing traffic signal improvements, or roundabouts.

VT-100 and VT-108 corridor: Congestion Hot Spots 2017 and 2037

I-89 Exit 10 Interchange intersections, VT-100 and Stowe St./Blush Hill intersection, VT-100 and Shaws intersection:

- **2017:** Each of these currently signalized intersections has a 2017 LOS in the acceptable B or C range. Even with this acceptable level of service, the close proximity of these traffic signals can cause notable delays at times during the AM and PM peak hours as well as during special events that are held in the Stowe/Waterbury area. The mitigation to this issue is being addressed in the 2018 and 2019 roadway reclamation and repaving project on VT-100 between Waterbury and Stowe. One aspect of the reclamation project seeks to upgrade and improve the traffic signal coordination, timing, and detection at these locations for better traffic progression during these busier times.

- **2037:** Each of these currently signalized intersections has a 2037 LOS in the acceptable B or C range with the exception of the VT-100 and Stowe St./Blush Hill intersection. The 2037 projected Level of Service at that location is D. It is conceivable that the 2018/2019 traffic signal upgrades and timing improvements will help this intersection have a better level of service by 2037, but this particular intersection should be noted as a potential future congestion hot spot.

VT-100 and Guptil Road:

- **2017:** Guptil Road currently has a Level of Service value of F at its approach to VT-100. The mitigation to this issue is being addressed in the 2018 and 2019 roadway reclamation and repaving project on VT-100 between Waterbury and Stowe. Mitigation will consist of a new traffic signal that will be installed at this intersection as well as the addition of a left turn lane on VT-100.

- **2037:** The new traffic signal and left turn lane will have been installed and in operation for some time by 2037. Future 2037 traffic projections have this intersection operating at a Level of Service value of C which is an acceptable level.

VT-100 and Howard Avenue:

- **2017:** The Howard Avenue stop-controlled approach to VT-100 currently has a Level of Service value of D. This is an acceptable Level of Service for a stop-controlled intersection. However, Howard Avenue also has less than 100 vehicles per hour on its approach during the AM or PM peak hour. According to the VTrans Level of Service Policy, this is not a high enough volume for the Level of Service criteria to be in effect.

- **2037:** The Howard Avenue stop-controlled approach to VT-100 will have a projected Level of Service value of F in 2037. However, Howard Avenue will continue to have less than 100 vehicles per hour on its stop-controlled approach during the AM and PM peak hours. According to the VTrans Level of Service Policy, this is not a high enough volume for the Level of Service criteria to be in effect.

VT-100 and Moscow Road:

- **2017:** The Moscow Road stop-controlled approach to VT-100 currently has a Level of Service value of D. This is an acceptable Level of Service for a stop-controlled intersection. However, Moscow Road serves as a bypass for traffic travelling to VT-108 without having to go through the center of Stowe. Projections show this Level of Service will diminish over time due to the increased traffic using this bypass. A feasibility study was completed in 2016 for this intersection analyzing possible traffic control solutions such as a traffic signal or roundabout. VTrans and Stowe will continue to discuss the future of this intersection regarding which traffic control solution is feasible and the funding of that solution.

- **2037:** The Moscow Road stop-controlled approach to VT-100 will have a projected Level of Service value of F in 2037. A feasibility study was done for this intersection in 2016 analyzing possible traffic control solutions such as a traffic signal or roundabout. This could be a future congestion hot spot for Moscow Road, so an agreed upon and funded mitigation or traffic control solution should be in place if possible.

VT-100 and Mountain Rd (VT-108):

- **2017:** The intersection of VT-100 with Mountain Road is currently a three way stop. This configuration offers a high degree of safety due to the nature of the multi-way stop. However, it comes at the cost of intersection delay. Currently this intersection has a Level of Service value of F. There are bypass options available for drivers to get to VT-108 that avoid using this intersection but there are currently no plans in place for other improvements. Stowe would like to retain the three way stop control at this intersection for the time being. VT-100 at this location is a Class 1 town highway so it is considered a Stowe town road. The VTrans Level Service policy only applies to state roads.

- **2037:** The intersection of VT-100 with Mountain Road is currently a three way stop. This configuration offers a high degree of safety due to the nature of the multi-way stop. However, it comes at the cost of intersection delay. Currently this intersection has a Level of Service value of F and will continue to have a Level of Service value of F in 2037 if the configuration remains the same. VT-100 at this location is a Class 1 town highway so it is considered a Stowe town road. The VTrans Level Service policy only applies to state roads.

VT-100 and West Hill Road:

- **2017:** West Hill Road currently has a Level of Service value of F at its approach to VT-100. The mitigation to this issue is being addressed with a future project in the VTrans capital program. Mitigation will consist of a new traffic signal that will be installed at this intersection as well as the addition of a left turn lane on VT-100. The projected construction of this project is fall of 2021.

- **2037:** The new traffic signal and left turn lane will have been installed and in operation for some time by 2037. Future 2037 traffic projections have this intersection operating at a Level of Service value of C which is an acceptable level.

VT-108 and Luce Hill Road:

- **2017:** Although the Luce Hill Road stop-controlled approach to VT-108 currently has a Level of Service value of C, the intersection has met warrants for a traffic signal. A roadway master plan was completed for Mountain Road Village in 2018 that included analyzing the intersections in this area including Luce Hill Rd. It was concluded in the roadway master plan that a traffic signal would be the best solution based on intersection geometrics as well as pedestrian connectivity and safety. VTrans and Stowe will continue to discuss the funding options for the traffic signal solution.

- **2037:** Although the Luce Hill Road approach to VT-108 will have a Level of Service value of D in 2037, the intersection met warrants for a traffic signal in 2018. A roadway master plan was completed for Mountain Road Village in 2018 that included analyzing the intersections in this area including Luce Hill Rd. It was concluded that a traffic signal would be the best solution based on intersection geometrics as well as pedestrian connectivity and safety.

VT-108 and Cottage Club Road:

- **2017:** The Cottage Club stop-controlled approach to VT-108 has a Level of Service value of C. This is an acceptable Level of Service for a stop-controlled intersection.

- **2037:** The Cottage Club stop-controlled approach to VT-108 will have a projected Level of Service value of D in 2037. This is an acceptable Level of Service for a stop-controlled intersection.

VT-100 and Randolph Road:

- **2017:** The Randolph Road stop-controlled approach to VT-100 has a Level of Service value of C. This is an acceptable Level of Service for a stop-controlled intersection.

- **2037:** The Randolph Road stop-controlled approach to VT-100 will have a projected Level of Service value of E in 2037. This is a potential future congestion hot spot and should be analyzed in the future for possible safety and mitigation measures.

VT-100 and Bishop Marshall Road:

- **2017:** The signalized intersection of VT-100 and Bishop-Marshall Road has a Level of Service value of C. This is an acceptable Level of Service for a stop-controlled intersection.

- **2037:** The signalized intersection of VT-100 and Bishop-Marshall Road will have a projected Level of Service value of D in 2037. This is a potential future congestion hot spot and should be analyzed in the future for possible safety and mitigation measures.