

# Mason, New Hampshire

## Road sight-lines for cars

### LEGEND:

Stopping distances for passenger car at 35 MPH per AASHTO formulas:  
 210 - 235' on dry pavement, estimated  
 250' standard on wet or dry pavement  
 450-600'+ on snow covered road

Color code for sight-line distance:  
 Black: < 210' unsafe at 35 MPH under any conditions.  
 Red: 210 - 249' safe for dry conditions but questionable when wet.  
 Tan: 250 - 600 safe for wet but questionable for snow covered roads.  
 Green: > 600' safe for all conditions

Color strips correspond to direction (lane) of travel, right hand strip as seen by driver applies to direction traveled.

### AASHTO standard test conditions for CARS

Driver Eye Height: 3.5 (41") feet above the road.  
 Object Height: 2.0 feet (24") (representative of a vehicle's taillights).

### Stopping distances on paved roads from 35 MPH

210-235' estimated, dry  
 250' standard, dry or wet pavement  
 450-600'+ snow or ice

AASHTO recommends a 20% increase for sustained downgrades steeper than 3%.

Grade	Description	SSD	Change
0%	Level Road	250 ft	
3%	Gentle Slope	257 ft	+7 ft
6%	Moderate Hill	271 ft	+21 ft
9%	Steep Grade	289 ft	+39 ft

### The "Snow Factor" on Downgrades:

On a 9% downgrade covered in snow or ice, the physics change drastically:  
 \* Reduced Friction: The friction coefficient drops from ~0.35 (wet) to as low as 0.05 (ice).  
 \* Runaway Risk: On steep grades with ice, the force of gravity can exceed the available braking friction, making it physically impossible to stop regardless of sight distance.  
 \* Design Response: Engineers often use "Generous Design," choosing the SSD for a speed 5-10 mph higher than the posted limit (e.g., using 45 mph standards for a 35 mph hill) to provide a buffer for winter conditions.

### Stopping distances on gravel roads from 35 MPH

280-310 dry gravel  
 330-380+ wet/loose gravel  
 400+ 9% downgrade

The combination of a steep downgrade and gravel is a high-risk design scenario. On a 9% gravel downgrade, the required stopping distance can easily exceed 400 feet at 35 mph. "washboard" ripples on gravel roads can cause tires to lose contact with the ground, effectively doubling braking distances

### The following are NOT TAKEN INTO ACCOUNT in assessing "visibility":

Buildings or other structures  
 Trees, foliage or snow banks  
 any of which can further reduce sight lines.  
 So these calculated sight-lines distances are maximum values which can be greatly reduced in "real world" circumstance.

### Sight-line calculation process:

Based on:  
 Road centerline map (NH DOT)  
 DEM raster (elevation from 2019 LIDAR QL1, 1.5' pixels)

### Create points every 10 feet along road centerline

For each observation point along road:  
 \* using eye level 42" above pavement (AASHTO standard for cars)  
 \* create sight line to following target point, 24" above pavement (AASHTO standard)  
 \* evaluate visibility by checking for blocking by ground elevation along sight line.  
 \* if the point is visible, move target 10' down road to next point, repeat visibility evaluation  
 \* stop if target is not visible (or at end of road)  
 \* record sight-line distance to farthest visible point in-a-row, in other words, never blocked by terrain (DEM)

Then move observation point 10' down the road and repeat the process, resulting a a forward sight-line distance for each point.

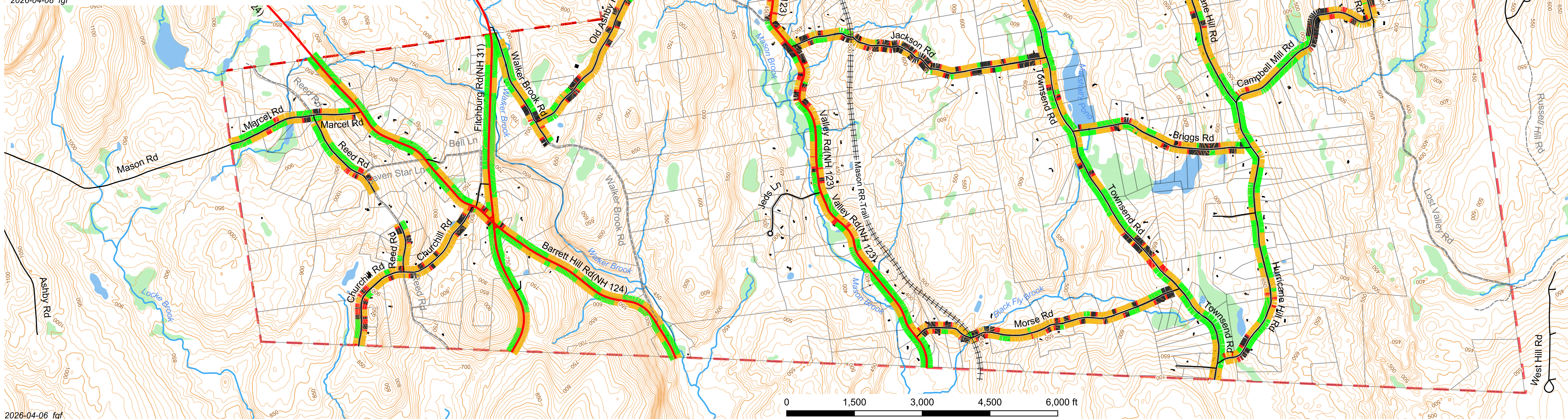
Then repeat the process from the other end in the reverse direction of travel, resulting in a backward sight line distance for each point

Finally, display the forward and reverse direction sight-line distances as parallel color stripes offset sideways from the road centerline so as to fall into the appropriate travel lanes

The sight line calculations only take into account the bare ground topology as reported in the LIDAR base DEMs. They do NOT detect sight-line blockages due to trees, foliage, structures or snow banks.

NOTE: I developed the analytical procedure used, which I believe to be correct, but it has not been independently validated and should be considered "experimental".

2026-04-08 fgr



2026-04-06 fgr