

MEMO

TO: Rita Seto, Two Rivers Ottauquechee Planning Commission

FROM: Corey Mack, RSG Transportation Engineer

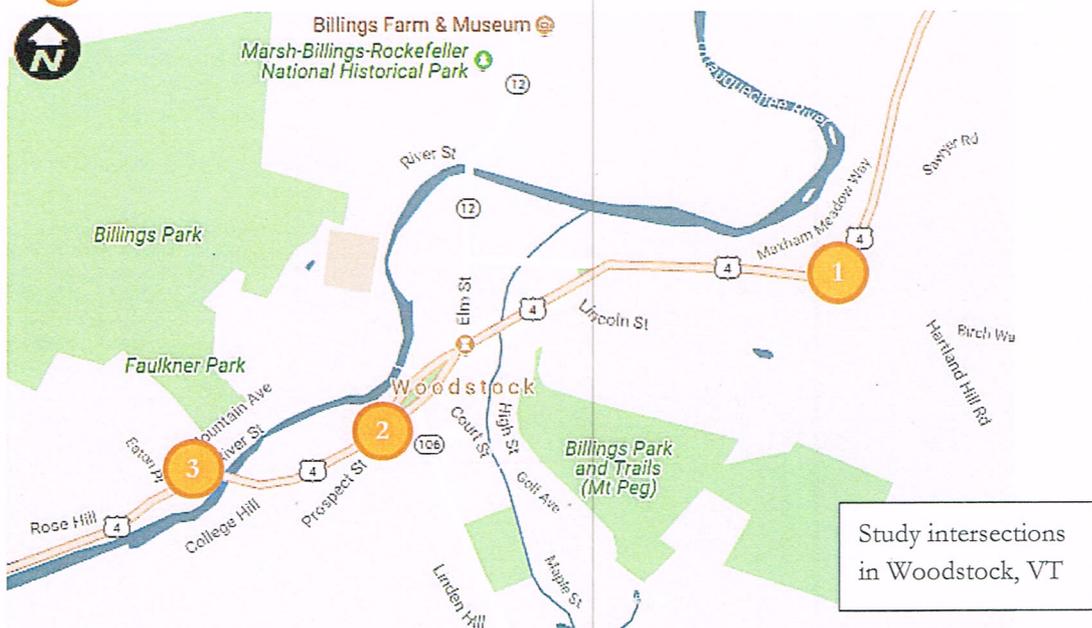
CC:

DATE: January 4, 2018

SUBJECT: Woodstock Truck Tracking Analysis

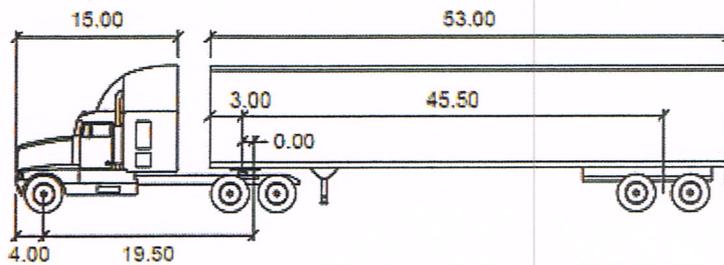
This technical memorandum summarizes the results of the large vehicle westbound tracking analysis performed at three intersections in Woodstock, Vermont. The study intersections are noted for the horizontal curvature which may require operators of the large vehicles to maneuver into the opposing lane of travel to navigate without tracking off the roadway and onto adjacent features. The three study intersections are:

1. US Route 4 and Hartland Hill Road,
2. US Route 4 at the West End of The Green, and
3. US Route 4 and River Street.



RSG recorded video of traffic movements at the three study intersections on November 28, 2017. The video was compiled to highlight typical truck movements and can be viewed online here: <https://vimeo.com/249099573>. This technical memorandum includes screen shots from the original video materials. The technical memorandum also includes westbound vehicle tracking paths through each intersection, using an AASHTO WB-67 design vehicle over a scaled orthophotograph in AutoTurn design software. The AASHTO WB-67 represents a typical long-distance freight truck found in the region.

FIGURE 1: AASHTO WB-67 DESIGN VEHICLE.



WB-67

	feet	
Tractor Width	: 8.00	Lock to Lock Time : 6.0
Trailer Width	: 8.50	Steering Angle : 28.4
Tractor Track	: 8.00	Articulating Angle : 75.0
Trailer Track	: 8.50	

INTERSECTION 1: US-4 AND HARTLAND HILL ROAD

The westbound vehicle travel lane follows along the inside of a horizontal curve. The curve radius and central angle is approximately 50-feet and 83-degrees, respectively. The inside curb is approximately 20-feet offset from the double yellow centerline.

When the design vehicle follows the double yellow centerline, the trailer track is modeled to track outside of the pavement limits, over the curb and near the adjacent sidewalk (refer to sheet 1 of 6 in Attachment A). The operator of the truck with similar characteristics to the design vehicle must cross the double yellow centerline to avoid tracking over the existing curb (sheet 2 of Attachment A).

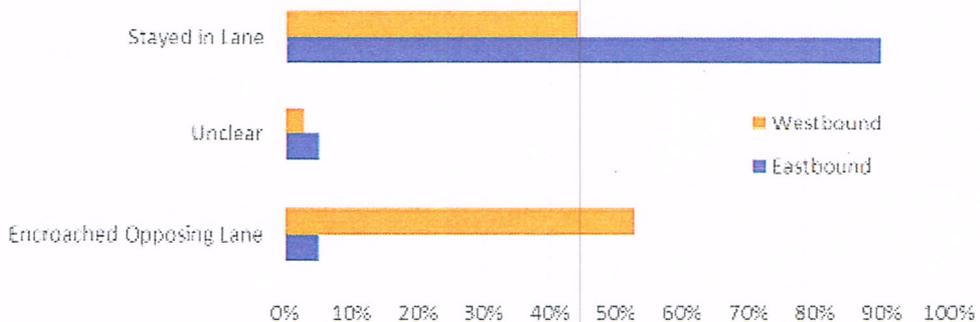
The vehicle tracking model is confirmed in the operator videos and following screen shots. This operator encroachment into opposing vehicle lanes is further documented in videos provided by the Woodstock Police Department. All following still images illustrate a westbound large vehicle navigating the intersection.





Not all large vehicles meet the design characteristics of the AASHTO WB-67; shorter trailers and vehicles with shorter wheelbases and different steering angles can maneuver through the intersection without entering the opposing lane. Of the 34 westbound trucks observed traveling through the intersection, 18 (53%) were noted to encroach into the opposing lane.

Truck Tracking at US-4 / Hartland Hill





INTERSECTION 2: US-4 AT THE WEST END OF THE GREEN

The westbound vehicle travel lane follows along the inside of a horizontal curve. The curve radius and central angle is approximately 100-feet and 24-degrees, respectively. The inside curb is approximately 18-feet offset from the double yellow centerline.

When the design vehicle follows the double yellow centerline, the trailer track stays within the paved limits of the roadway. However, the trailer track is modeled to encroach into the adjacent on-street parallel parking aisle (refer to sheet 3 of 6 in Attachment A). The operator of the truck must cross the double yellow centerline to avoid tracking into the parallel parking aisle (sheet 4 of Attachment A). When vehicles are present in the parking aisle, the effect may be more pronounced in an effort to minimize a potential crash into stationary vehicles, door swing, and potential pedestrians.

The vehicle tracking model is confirmed in the operator videos and following screen shots. All images illustrate a westbound large vehicle navigating the intersection.

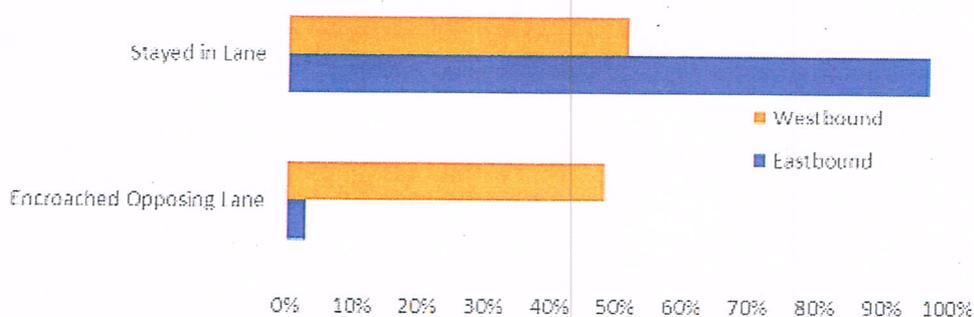




Of the 29 westbound trucks observed traveling through the intersection, 14 (48%) were noted to encroach into the opposing lane.



Truck Tracking at US-4 / West End of The Green



INTERSECTION 3: US-4 AT RIVER STREET

The westbound vehicle travel lane follows along the outside of a horizontal curve. The curve radius and central angle is approximately 100-feet and 47-degrees, respectively. The outside curb is approximately 18-feet offset from the double yellow centerline.

When the design vehicle follows the double yellow centerline, the trailer track is modeled to encroach into the opposing left turn lane (refer to sheet 5 of 6 in Attachment A). The operator of the truck must swing as wide as possible to the outside curb to minimize trailer tracking over the double yellow (sheet 6 of Attachment A). When vehicles are not present in the left turn lane, operators may be less likely to maneuver appropriately to minimize off-tracking.

The vehicle tracking model is confirmed in the operator videos and following screen shots. All images illustrate a westbound large vehicle navigating the intersection.

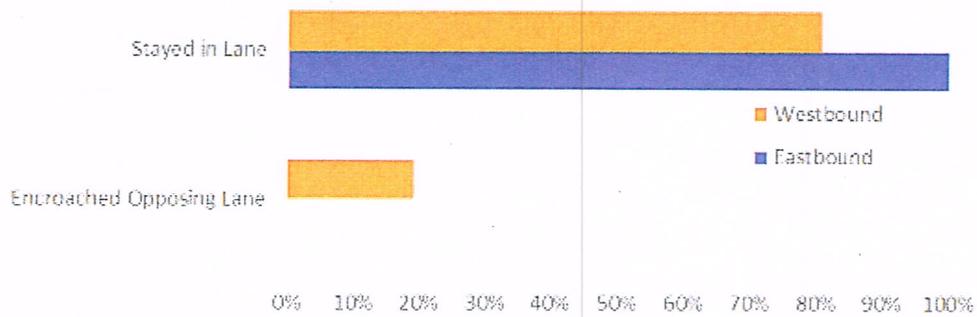






Of the 26 westbound trucks observed traveling through the intersection, 5 (19%) were noted to encroach into the opposing lane.

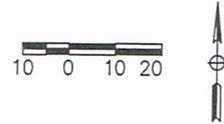
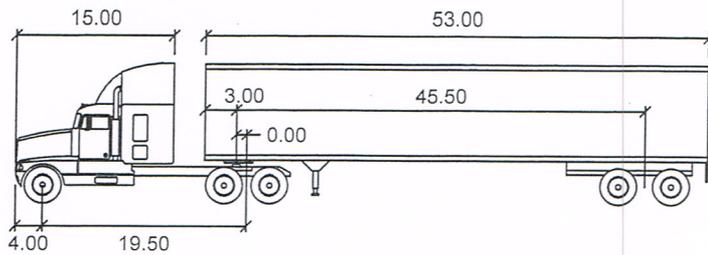
Truck Tracking at US-4 / River Street



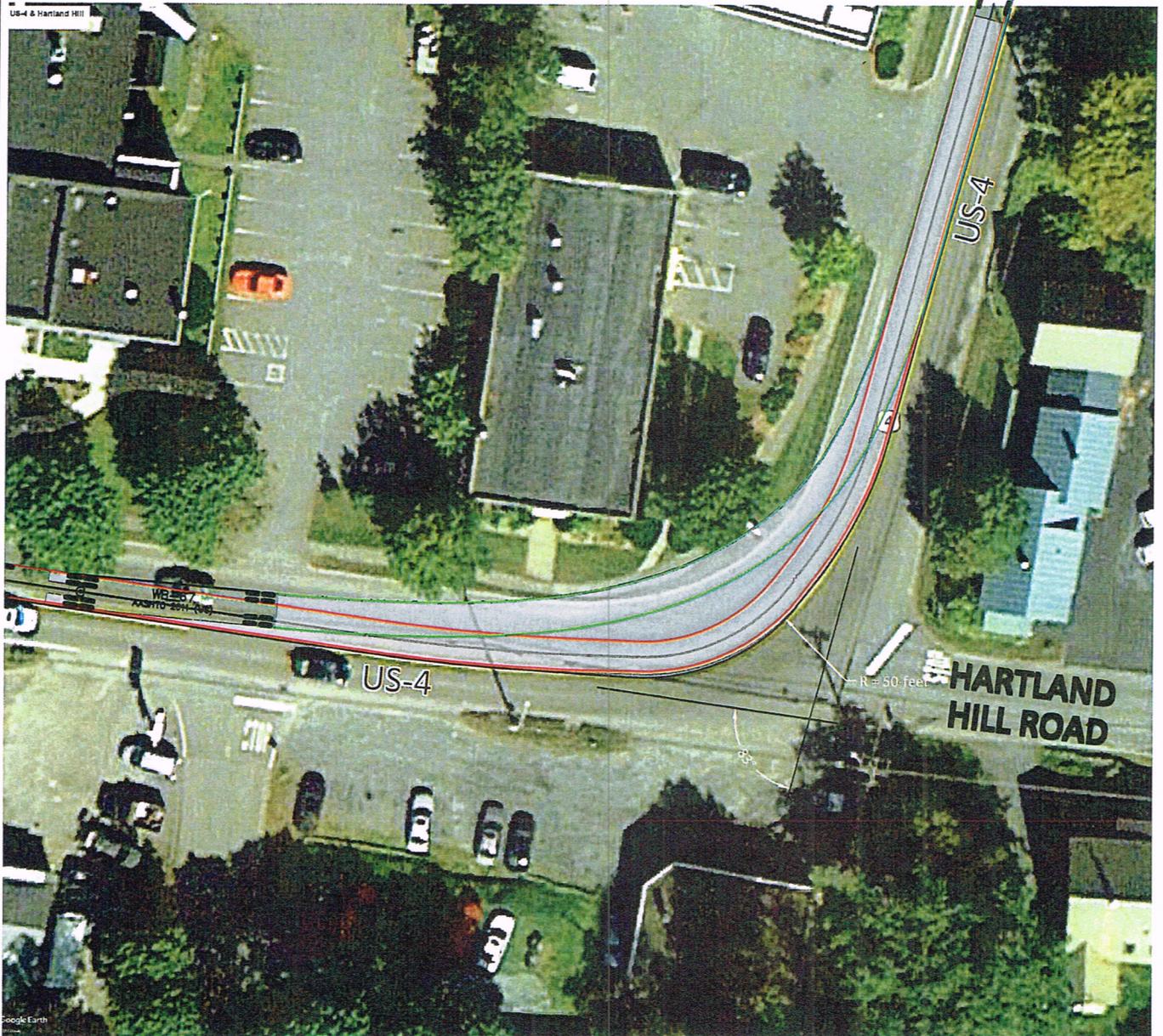
COREY MACK, PE
Transportation Engineer

Attachments:

Attachment A: AutoTurn WB-67 Tracking Models



WB-67	feet		
Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 28.4
Tractor Track	: 8.00	Articulating Angle	: 75.0
Trailer Track	: 8.50		



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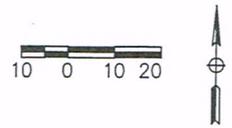
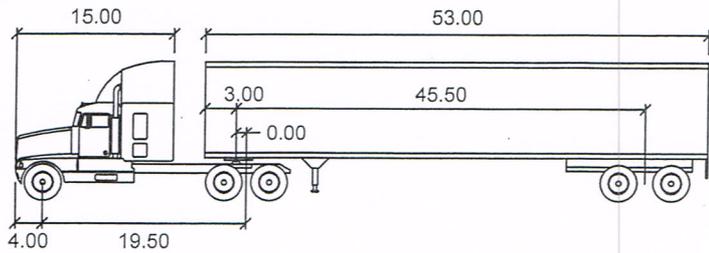


Woodstock Truck Tracking

Woodstock, VT

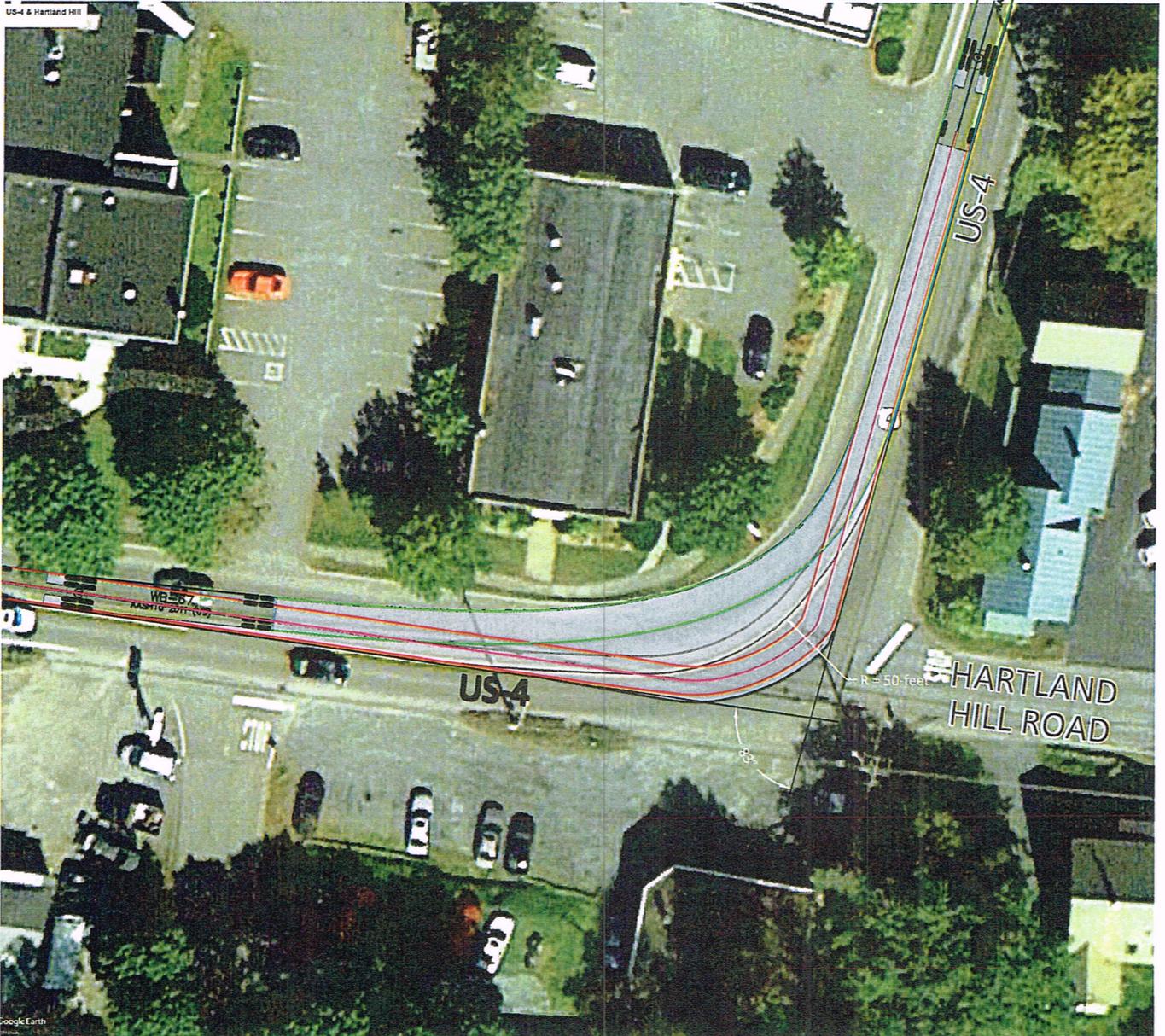
Westbound US-4 WB-67 at Hartland Hill Road
Truck Follows Centerline

SHEET 1 OF 6	
SCALE:	NTS
DES'D BY:	CDM
CHK'D BY:	---
DATE:	12/29/17
PROJ. #:	17302



WB-67

	feet		
Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 28.4
Tractor Track	: 8.00	Articulating Angle	: 75.0
Trailer Track	: 8.50		



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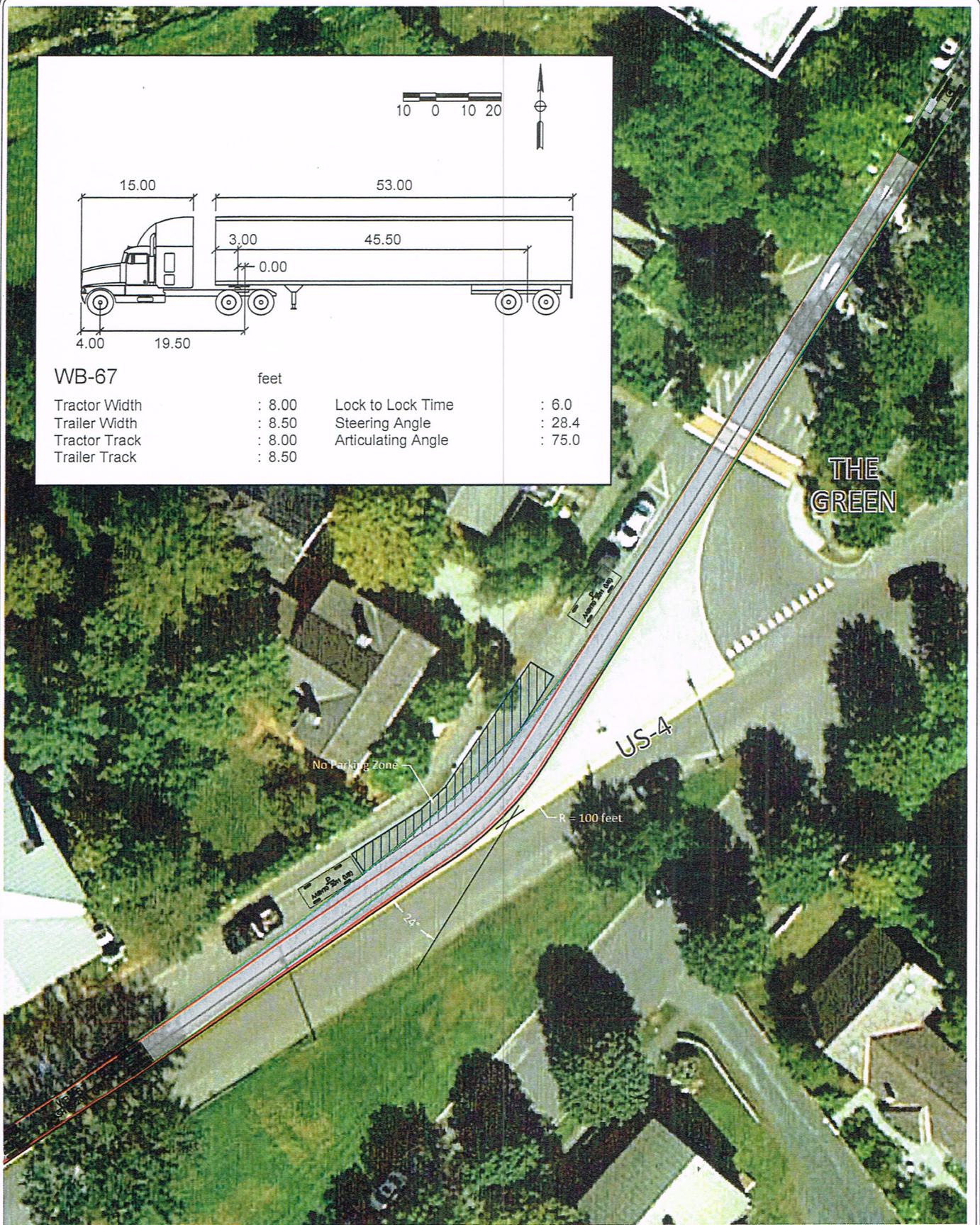
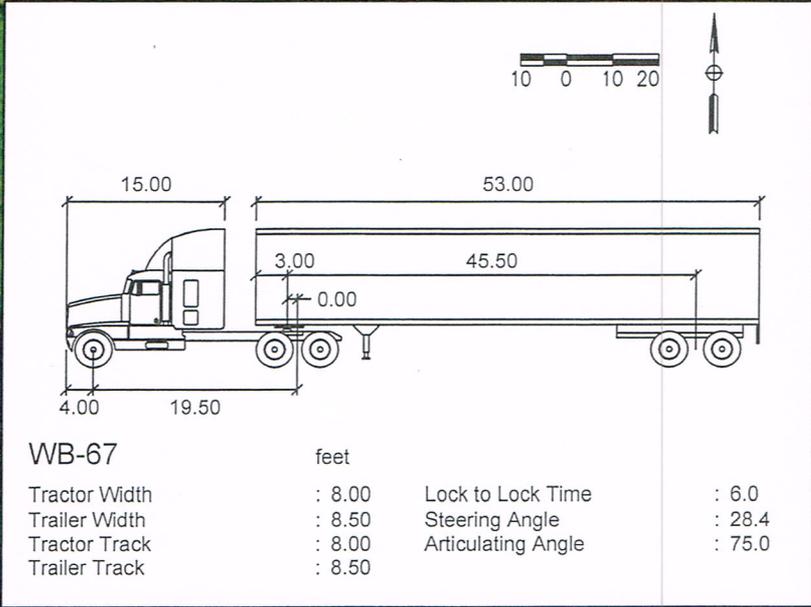
Woodstock Truck Tracking

Woodstock, VT

Westbound US-4 WB-67 at Hartland Hill Road
Truck Enters Opposing Lane

SHEET 2 OF 6	
SCALE:	NTS
DES'D BY:	CDM
CHK'D BY:	---
DATE:	12/29/17
PROJ. #:	17302

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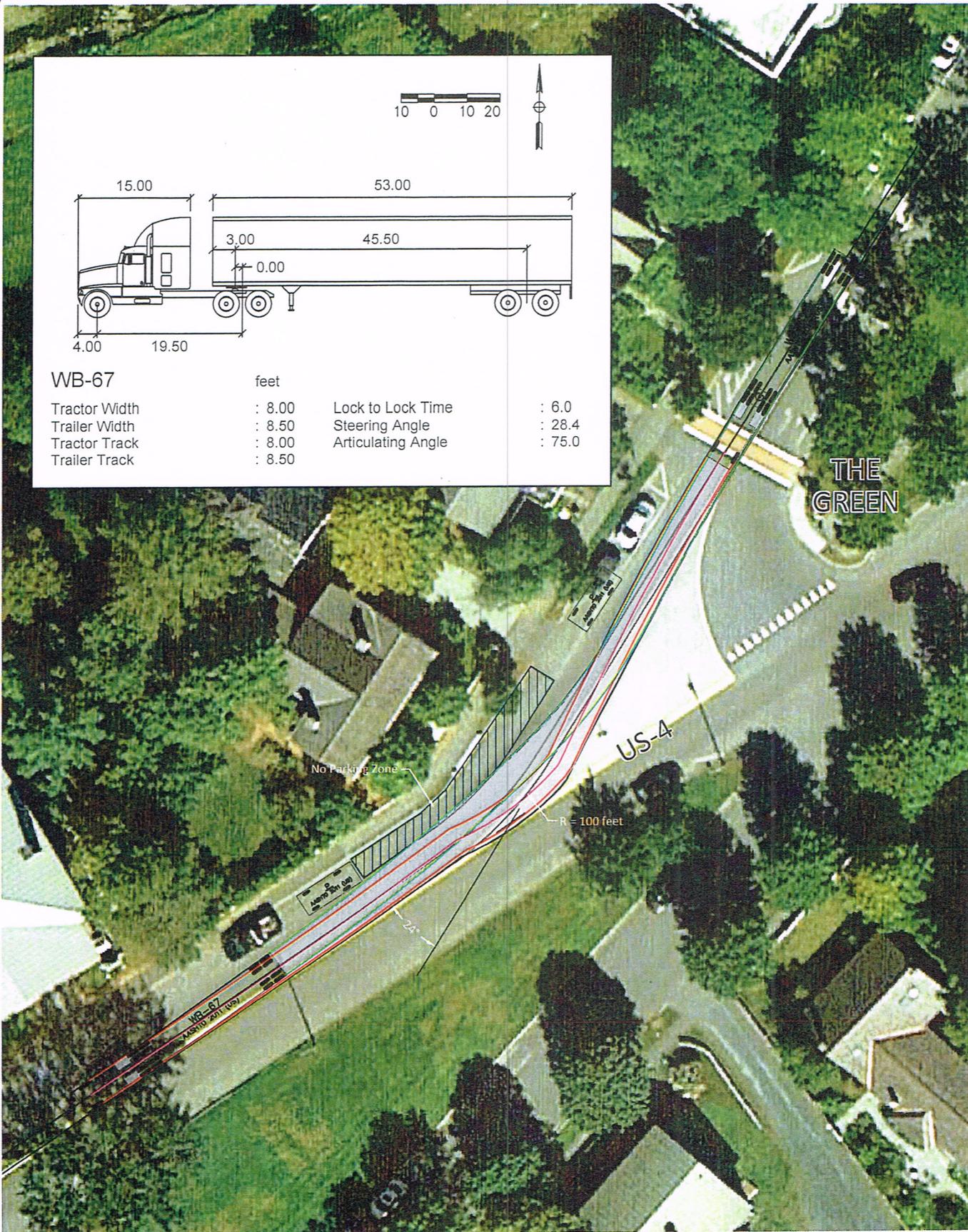
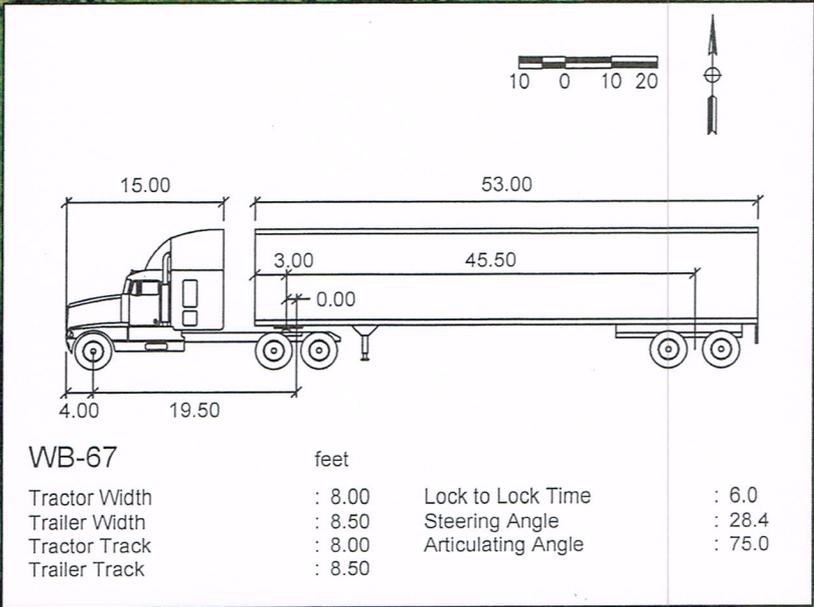
Woodstock Truck Tracking

Woodstock, VT

Westbound US-4 WB-67 at West End of The Green
Truck Follows Centerline

SHEET	3	OF	6
SCALE:	NTS		
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CHK'D BY:	---		
DATE:	12/29/17		
PROJ. #:	17302		

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Woodstock Truck Tracking

Woodstock, VT

Westbound US-4 WB-67 at West End of The Green
Truck Enters Opposing Lane

SHEET 4 OF 6

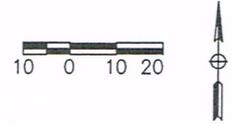
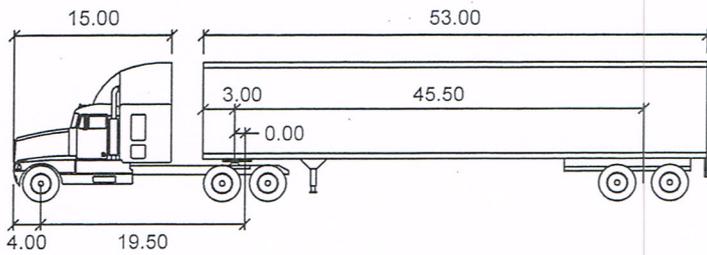
SCALE: NTS

DES'D BY: CDM

CHK'D BY: ---

DATE: 12/29/17

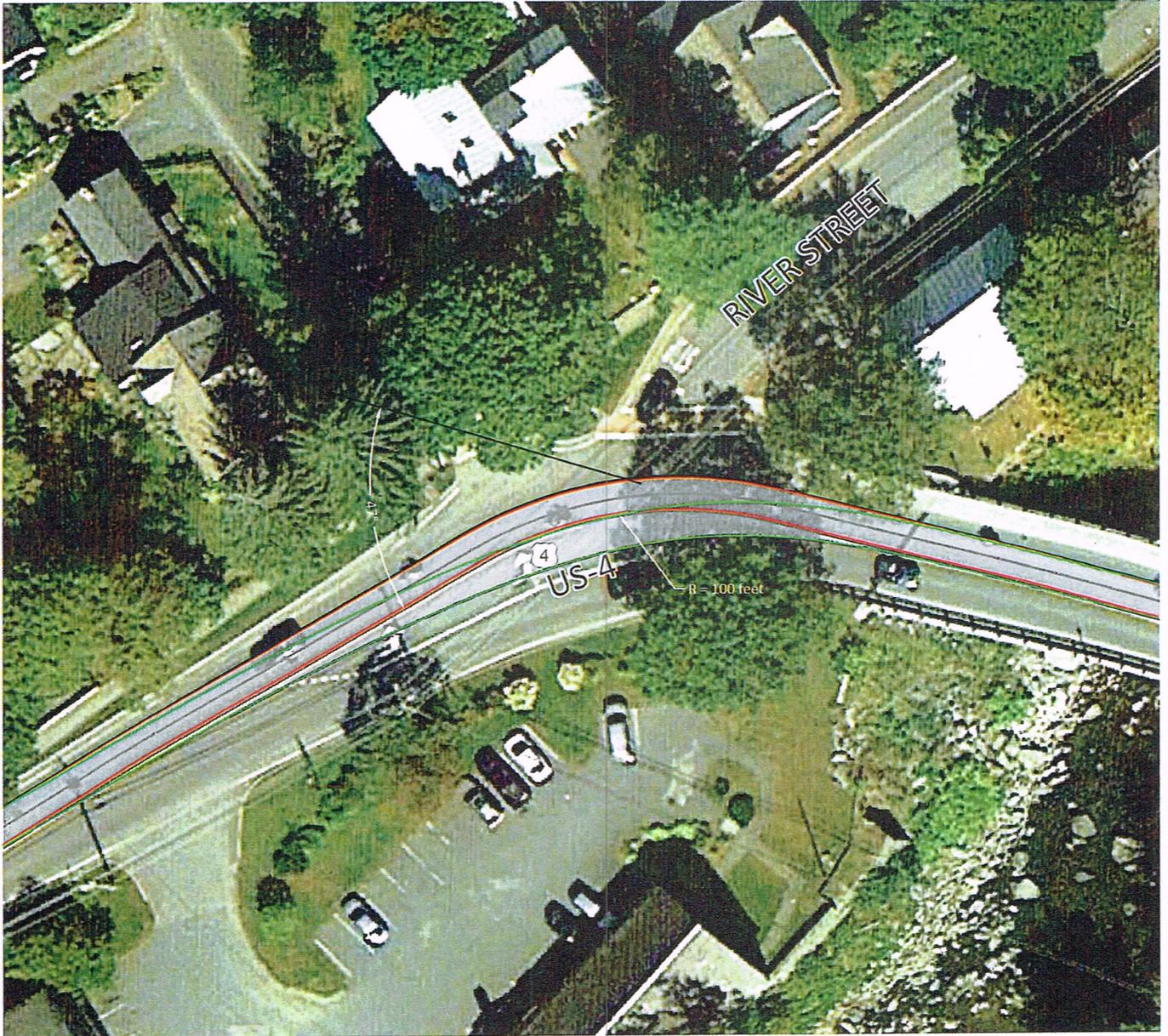
PROJ. #: 17302



WB-67

feet

Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 28.4
Tractor Track	: 8.00	Articulating Angle	: 75.0
Trailer Track	: 8.50		



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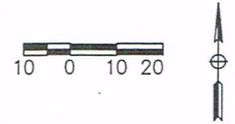
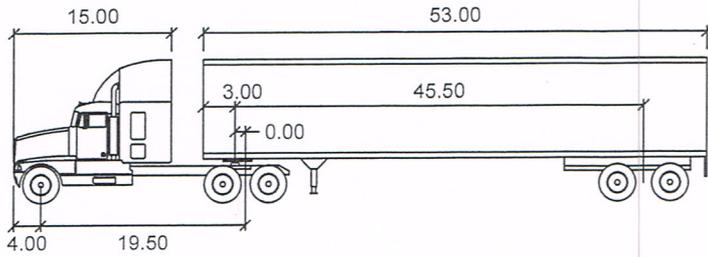
Woodstock Truck Tracking

Woodstock, VT

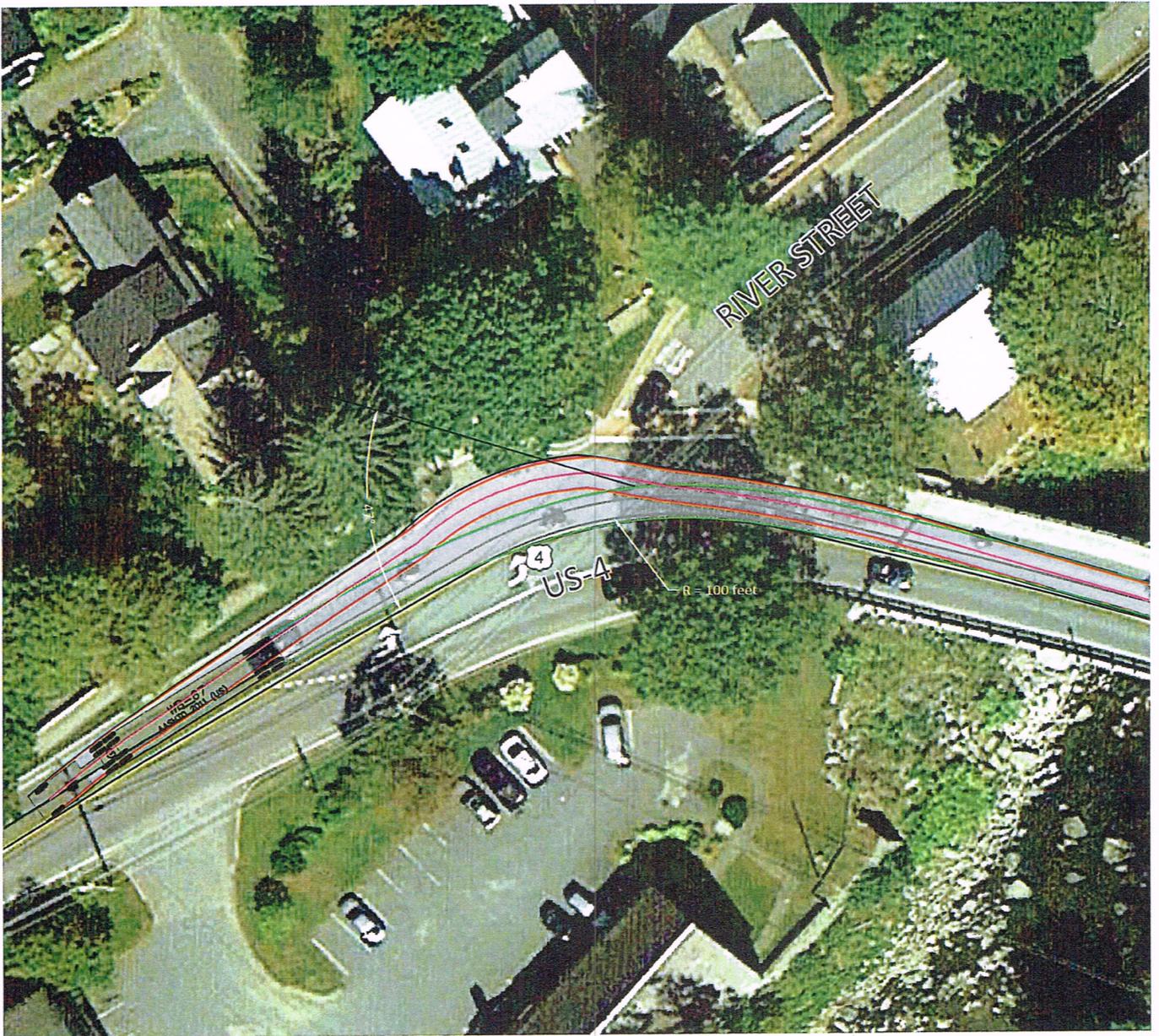
Westbound US-4 WB-67 at River Street
Truck Follows Centerline

SHEET 5 OF 6

SCALE:	NTS
DES'D BY:	CDM
CHK'D BY:	---
DATE:	12/29/17
PROJ. #:	17302



WB-67	feet		
Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 28.4
Tractor Track	: 8.00	Articulating Angle	: 75.0
Trailer Track	: 8.50		



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Woodstock Truck Tracking

Woodstock, VT

Westbound US-4 WB-67 at River Street
Truck Swings Wide

SHEET 6 OF 6	
SCALE:	NTS
DES'D BY:	CDM
CHK'D BY:	---
DATE:	12/29/17
PROJ. #:	17302