P.O. Box 82899, Fairbanks, Alaska 99708 www.insight-forensics.com 907.388.0484

[redacted]

Mr. [redacted]
[redacted] Law Office, P.C.
[redacted]
Fairbanks, AK 99707

RE: Report of Collision Investigation and Reconstruction
Case: [redacted]

Pursuant to your request, Insight-Forensics has investigated a motor vehicle-bicycle collision that resulted in the death of [redacted], on August 21, [redacted]. The accident occurred in [redacted] Alaska, in the driveway of [redacted] gas station/convenience store ([redacted]) addressed at [redacted] Road, just north of a roundabout and the [redacted] Highway. Our understanding is that on the afternoon of August 21, [redacted], bicyclist [redacted] was riding home from school on the sidewalk adjacent to [redacted] Road. At the same time, [redacted] was driving a commercial flatbed work truck along [redacted] Road in the same direction as the bicyclist. The two collided at the sidewalk crossing of the driveway to the [redacted] at 2:52 pm. [redacted] was reportedly killed when he rolled under the truck and rear double axles of the flatbed. The purpose of this report is to present a detailed accident reconstruction and analysis, and provide an expert opinion as to the cause(s) of the collision. Dr. Dennis Filler, Professional Engineer, and Dr. Mike Donaldson, Senior Scientist performed the investigation, collision reconstruction, and cause analysis. This report documents our findings and conclusions.

INVESTIGATION

Our investigation included review of [redacted] Law Office file information, including police reports and transcripts of eyewitness statements, accident scene photographs, and the [redacted] surveillance video of the accident. We also performed site reconnaissance, photo-documentation, and an inspection of the [redacted] truck involved in the accident.

EVIDENCE CONSIDERED

A surveillance camera located above the entrance to the [redacted] convenience store captured the collision event with time-date stamped videography. We analyzed this video to determine truck and bicycle speeds and to assess conditions leading up to the collision. We also performed truck-bicycle approach reconnaissance, a bicycle sidewalk approach simulation, and collected informal traffic data to assess bicycle and vehicle speeds and traffic patterns in the vicinity of the accident scene. This data provided insight about approach and turn speeds, traffic patterns, and driver and bicyclist behaviors. Finally, we collected detailed measurements of the truck involved in the accident at the [redacted] Yard. These measurements included quantification of passenger-side mirror fields of view, and determination of pedestrian visibility via bicycle approach simulations.

COLLISION RECONSTRUCTION and ANALYSIS

The following narrative makes reference to figures and tables attached to this report. Figures comprise accident scene and reconnaissance photographs, surveillance video images (or stills), and collision reconstruction graphics. Figure 1 depicts the accident scene from aerial and ground-level perspectives. The [redacted] trucks'

final stopped position and truck features at the collision scene are shown in figures 2 and 3. Figure 4 is an example of a surveillance video *still* used to determine truck and bicycle speeds. Figures 5 and 6 depict the field simulation setup for truck mirror analysis, and the determined mirror fields of view. Reconstruction graphics of the approach sequence leading to collision are shown in figures 7a and 7b. Figure 8 shows the visibility of a bicyclist on the sidewalk upon approach to the [redacted] driveway. Possible truck and bicycle approaches to the [redacted] driveway, signage and crosswalk features related to these approaches, and the truck-bicycle approach hypothesis are depicted in figures 9, 10 and 11. Figure 12 is an accident scene photograph showing the [redacted] truck fuel gage at the time of accident. Table 1 sequences the real-time speed-distance relationship between the truck and bicycle as determined from the [redacted] surveillance video. Informal assessment data of traffic and bicycle approach speeds and patterns are summarized in table 2 and 3.

General Accident Information

The collision scene was the driveway entrance to a small commercial plaza (Fig. 1). [redacted] gas station and convenience store and a [redacted] Company outlet are the primary tenants of the plaza. According to the [redacted] surveillance video of the accident, both the [redacted] truck and bicyclist were traveling northbound along [redacted] Road. The truck was in the outer (or easternmost) lane and the bicyclist was traveling on the adjacent sidewalk. Eighteen inches of concrete curb and gutter separate the road from the sidewalk, and the sidewalk is 7.5 feet wide. Mr. [redacted] was riding a black multi-speed bike, and was wearing his helmet and small backpack at the time of collision. According to the police survey and accident scene photographs, the truck, which was turning into the [redacted] driveway, came to a stop in the middle of the driveway (Fig. 2) approximately 25 feet beyond the point of impact with the bicyclist (Fig. 1).

According to accident scene photographs, the commercial flatbed was a red 1993 GMC [redacted] Company truck with identification number 35402 (USDOT #[redacted]), VIN number [redacted], Tab #[redacted], and license plate [redacted]. The truck had three axles, one in the front and a dual-axle, dual-wheel configuration under the rear of the flatbed. This 10-wheel truck was equipped with vertical and convex round, over-and-under, vehicle and truck mirror sets on both sides of the cab (Fig. 3). The mirrors were later identified as Prutsman 7”x 16” West Coast Style mirrors above Mirrex convex round mirrors; the driver’s side round was 8.25 inches in diameter and the passenger-side round was 7.5 inches across. At the time of the accident, a push broom was strapped across the flatbed grate behind the cab rear window, and metal frames were strapped to the flatbed (Fig. 3).

We found the initial Alaska Motor Vehicle Collision Report #[redacted] (form 12-200) for the subject incident replete with errors and unreliable. According to a [redacted] Police Department Case Supplement Report statement dated May 28, [redacted], form 12-200 was revised by the federal government and a subsequent ‘data dump’ from old-to-new forms did not populate information correctly, which caused the errors. The corrected collision report was issued new number [redacted]. We found this collision report reliable with only two minor errors. According to the police report, weather at the time of the accident was clear, sunny, and 65˚F, the road condition was dry, and the posted speed limit was 25 miles per hour (mph).

Video Surveillance Analysis

Surveillance video obtained from the [redacted] station was analyzed to provide accurate estimates of the speeds of the truck and bicycle. In order to analyze vehicle speeds, still frames (or *stills*) were extracted from the surveillance video. We analyzed a total of ten frames representing real time of 2:52:15.828 to 2:52:19.578, the 3.75 second time span just prior to the bicycle leaving the sidewalk. We then marked and took detailed measurements of the locations of vehicle reference points (front passenger side wheel hub of the truck, and center of torso of the bicyclist), and measured change in distance in the images for each. In order to calculate actual change in distance, we had to account for distortion in the images due to perspective.

Perspective distortion is an artifact of all two-dimensional images that represent three-dimensional space. We determined extent of perspective distortion by creating a perspective recreation photograph that matched the surveillance camera field of view, distance from sidewalk and angle of the sidewalk in relation to the centerline of the surveillance camera. The perspective recreation photograph provided the basis for the scale correction utilized in calculating actual change in distance in each of the surveillance frames in which the vehicles traveled in a straight line distance. Truck turn speed was calculated separately, based on a 35-foot arc distance of travel as measured in the field using fixed landmarks (speed limit sign and gas pump which obscured view of vehicles entering the driveway after that point (Fig. 4).

Figure 4 represents the relative positions of the truck and bicycle in sequential time steps. The dot-spacing in Figure 4 provides accurate correlation of change in position of the two vehicles through the approach sequence. Utilizing time stamps from the surveillance video, it was then possible to determine real-time truck and bicycle speeds and distances from the driveway with confidence. Table 1 summarizes the speeds and time-distance relationship for the converging truck and bicycle.

From speed sequencing (Table 1) we know that both truck and bicycle were traveling below the posted speed limit, that the truck did not begin to slow for the turn until it was approximately 34.7 feet (about one truck length) away from the [redacted] driveway, and the bicyclist began to decelerate at about 33.7 feet from the driveway, when he was parallel to the truck's flatbed double-axle wheels. It is apparent that both driver and bicyclist were preparing for the approaching driveway at about the same time.

In summary, the truck and bicycle ended up in the middle of the [redacted] driveway entrance at the same time, resulting in a collision. Though bicyclist [redacted] had the right of way, the truck driver ([redacted]) failed to yield to [redacted] and in so doing, turned his truck directly into the path of the bicyclist in such a way that [redacted] had no way to avoid the collision. The bicyclist collided with the truck just behind the cab, before going down and under the truck. We conclude that by that point, no amount of evasive maneuvering on the part of [redacted] would have significantly changed the outcome.

CAUSE ANALYSIS

We tested multiple hypotheses to determine the most likely proximal cause(s) for [redacted] failure to yield to the bicyclist. Hypotheses considered included: biker in a blind spot, biker unsafe travel behavior, truck driver inattention, and truck driver unsafe driving behavior.

<u>Blind Spot and Driver Inattention Hypothesis</u>

We considered the possibility that [redacted] failure to yield was due to the biker being obscured from his view in some way. The alternative was that [redacted] was visible, but [redacted] failed to notice him. To test this hypothesis we accessed the truck at the [redacted] Yard on September 30, [redacted]. We took measurements and photographs of the [redacted] truck, noting that although the truck had been repainted white and renumbered (36225), its USDOT and VIN identification numbers confirmed it was the same truck. We also confirmed that the cab side mirrors matched those that were on the truck at the time of collision (Fig.3).

Fields of view of the passenger side west coast vertical and convex (spot) mirrors were measured by laying out a pattern of traffic dividers spaced evenly apart in four rows of four cones each to form a 12 x75 foot grid along the passenger side of the truck (Fig. 5). The first row of the grid was placed at the most forward point visible in the spot mirror field of view. We quantified fields of view by positioning the camera at eye level in the driver's position, and determined which traffic dividers were visible in each mirror. We also observed the effect of varying the position of the camera on the resulting field of view in each mirror. We found that the view in the spot mirror is insensitive to driver position, whereas the narrow west coast field of view will shift left or right by approximately 5 degrees, depending on driver head position. Spot and west coast mirror fields of view are depicted in Figure 6.

We then performed a bicycle approach simulation through the traffic divider array, and videotaped the bicyclist through the passenger side spot mirror from the vantage point of the driver in the cab. The lateral spacing of the traffic dividers was such that the centerline corresponded to approximately the center of the sidewalk from the actual accident scene. In the simulation a bicyclist pedaled up the centerline while the video camera was aimed at the spot mirror from the driver's vantage point. From this experiment, it was determined that a pedestrian would be clearly visible in the spot mirror at distances of 5 to 80 feet behind the mirror.

We combined the results from the mirror analysis with reconstruction analysis based on the real-time positions of the truck and bicycle in the surveillance video to produce the two-dimensional (2D) reconstruction sequence shown in Figures 7a and 7b. Frames 2 through 4 are accurate depictions of relative positions of the truck and bicycle transposed from the surveillance video measurements. Mirror views collected from the approach simulation experiment show bicyclist visibility through the approach sequence. Frame 1, which correlates the surveillance video with 2D reconstruction at the point the truck entered the camera field of view, shows the most likely position of the bicyclist at about 20 feet away.

We also tested the hypothesis that obstructions or other complicating factors at the scene in some way may have obscured [redacted] from [redacted] view. The sidewalk bicycle simulation verified the openness of the sidewalk approach, free of obstructions to visibility, such that a pedestrian or bicyclist would be clearly visible along the 168 foot stretch of sidewalk leading up to the driveway entrance (Fig. 8).

To summarize, all evidence indicates that the bicyclist was never in a blind spot as the truck approached the driveway turn. In fact, the evidence from spot-mirror analysis and bicycle sidewalk simulation indicates that the bicycle would have been clearly visible in the spot mirror the entire time the truck was in the field of view of the [redacted] surveillance camera. This time frame coincides with when the driver would normally have been looking for pedestrians or bicyclists on the sidewalk in preparation for the turn. Further, reconstruction analysis indicates that the bicyclist would be visible in the spot mirror to at least 75 feet behind the truck's spot mirror at any time on the straightaway, and the only time the bicyclist would have left the spot mirror field of view is when he was even with the front of the flatbed of the truck, when the truck was fully committed to the turn. This evidence suggests driver inattention was a factor in the collision.

Unsafe Driving/Bicycling Behavior Hypothesis

Speeds determined from the surveillance video and the fact that the truck turned through the middle of the [redacted] driveway suggest unsafe driving. To test this hypothesis, we measured traffic speeds and behavior patterns of bicyclists and motorists at the scene of the accident. Measurements included determination of bicyclist and motorist speeds in the straightaway section leading up to the driveway using a Sports Radar Tracer SRA3000 speed radar gun. We also noted and recorded driving behaviors of motorists as they either drove past or entered the [redacted] driveway. In addition we measured speeds of vehicles turning into the driveway by positioning an observer at the same vantage point as the surveillance camera and timing vehicles completing the same 35-foot turn segment as the truck in the surveillance video. Motor vehicle data was collected on May 21 and 22, [redacted] during peak travel times over the two day period. Bicycle data was collected during peak school travel times on the last two days of the [redacted] school year, and again over the first two days of the [redacted] school year. Speeds were recorded and behavior patterns are inferred from the informal data.

Referring to Figure 11 (point C vicinity), road traffic approach speeds ranged from 12 to 23 mph (Table 2). Of the 31 vehicles observed over an hour that turned into the [redacted] driveway, nearly all had accelerated through the roundabout-to- straightaway transition, and it was apparent that drivers who planned or made early decisions to turn into the [redacted] driveway began to slow down and used their turn signals before point C (~75 feet before the driveway). There were six 'late-decision turns', whereby vehicles abruptly slowed and turn signals came on within about 35 feet of the turn. There were four drivers that did not use a turn signal for turning into the driveway.

The [redacted] truck does not fit well within this data set in that it appeared to 'coast' from 15 down to 11 mph over the last 35 feet of road before the driveway turn. However, we can conclude that the truck driver did not slow down significantly (from 15 to 11 mph) for the turn. It is also apparent that the truck began to decelerate at about the same position as 'late-decision turners' in our informal survey. Additionally, the truck took the turn at a higher speed than most of the other traffic we measured. Of the 54 vehicles timed, 47 of them (or 87%) took the turn slower than the [redacted] truck, and 7 took the turn faster (Table 2).

Observations of bicycle travel patterns and speeds were recorded on May 21 and 22, [redacted], the last two days of school, and again on August 21 and 22, [redacted], the first two days of the new school year. We measured bike speeds for both directions, over 'to school' and afternoon 'from school' travel periods. Evaluation of the data (Table 3) indicates that bike speeds ranged from 8 to 24 mph, 8 of 42 (or 19%) bicyclists wore helmets, and the typical bicyclist peddled hard immediately after the [redacted] off-ramp crosswalk (Fig. 11, point A), sometimes by standing up to peddle, to gain speed before coasting and moderate peddling to maintain speed on the sidewalk between points B and C. In no instance did a bicyclist jump the curb to use the road. If Mr. [redacted] were in this survey, his recorded speed and behavior would not be considered exceptional, and he would have been one of the minority who wore their bike helmet.

There are two gas station/convenience stores in the vicinity of the accident location: the [redacted] and [redacted] Fuel. They are located about a tenth-of-a-mile apart and within view of each other. We performed traffic counts by vehicle type on July 25, [redacted], from 7:30 to 8:30 am and 5 to 6 pm, to see if there was preference for fueling between the two stations during peak traffic times. Results indicated a preference by all types of vehicle (commercial trucks inclusive) for the [redacted], except for long vehicles (e.g., tractor-trailers, 18 wheelers, and cars/trucks towing boats) – [redacted] Fuel offers more turn-around room. The price of unleaded fuel was the same at both stations on July 25, but diesel was two cents per gallon cheaper at [redacted]. We surmised that location, [redacted] being closest to the [redacted] Highway, was a dominate factor for overall preference. Further, it is common practice for a company to be contracted with a particular fuel vendor for fueling of their fleet vehicles. We noted one accident scene photograph (Fig. 12) that showed the [redacted] truck fuel gage at nearly three-quarters full at the time of the accident. The driver was likely turning into the [redacted] plaza for reason other than refueling.

We conclude the truck driver did not sufficiently slow down for the driveway turn, and that he took the turn at a constant speed of 11 mph to the point of collision, which is two miles per hour faster than the average of all commercial and non-commercial vehicles we observed making the turn. Compared to measurements of other drivers at the same location and based on the wide arc the truck traveled in the turn, we characterize Mr. [redacted] driving behavior faster and less safe than the average driver.

Approach Hypothesis (Additional Opportunity to See Bicyclist)

We believe that in addition to the final approach to the driveway, the truck driver had earlier opportunity to notice the bicyclist heading towards the [redacted] plaza. In fact, regardless of approach direction, the driver must have passed the bicyclist in the north roundabout somewhere in the vicinity of the [redacted] Highway off-ramp crosswalk.

Since both truck and bicycle approached the [redacted] driveway from [redacted] Road at south, only approaches from that direction need to be considered. Bicyclist [redacted] was on the east sidewalk of [redacted] Road, and was coming from school according to eyewitness accounts. Therefore, his approach was from the [redacted] Road roundabouts under the [redacted] Highway (Fig. 9d). The [redacted] truck had two possible approaches: (1) the [redacted] off-ramp or (2) the same [redacted] Road roundabouts approach as the bicyclist. These approaches are depicted in Figure 9a and 9c.

The roundabouts are well marked for pedestrians at multiple crosswalks with yield signs, pedestrian crossing signs, and the 25 mph speed limit is posted at the [redacted] driveway entrance (Fig. 10). The sidewalk distance from the [redacted] off-ramp crosswalk to the [redacted] driveway was measured at 268 feet (Fig. 11). Bicycles traveling through this crosswalk must negotiate the approximate 110-degree turn to the left (Fig. 10d) at slow speeds to stay on the sidewalk. We determined through bike-travel simulation that speeds in excess of about 8 mph would send a bicyclist off of the sidewalk and down a steep grassed slope with fence below (Fig. 10d).

If the [redacted] truck approached from the roundabouts (Fig. 9a, [redacted] Approach 2) then driver [redacted] should have seen the bicyclist in his front window before reaching the north roundabout. We know this because had the bicyclist been behind the truck as it approached the north roundabout, he could not have caught the truck as traffic ahead of the truck was light and not slowing according to the [redacted] surveillance video. Further, the bicyclist would have had to slow down through the off-ramp crosswalk to negotiate the sharp 110-degree turn-to-sidewalk transition (Fig. 10d) while the truck accelerated through the north roundabout and into the straightaway.

Now consider a truck approach from the [redacted] Highway off-ramp (Fig 9c). With the truck approaching the crosswalk, there are three possible bicycle positions: either the bicyclist was coming from the left and not yet into the crosswalk ahead, or he was in the crosswalk, or he was through the crosswalk and on the sidewalk to the driver's right. If the first, and the bicyclist not yet in view (i.e., under or before the [redacted] overpass), then the bicyclist could not have caught the truck before the [redacted] driveway as vehicular traffic was not congested. With the bicyclist through the underpass, and the truck driver looking left for oncoming traffic (roundabout traffic only comes from the left), he would have seen the bicyclist approaching the crosswalk. For the bicyclist in the crosswalk scenario, Mr. [redacted] would have first seen Mr. [redacted] there through the truck's front windshield. This leaves the third and most likely scenario, the bicyclist having already cleared the off-ramp crosswalk. Referring to Figure 11, with the bicyclist slowed by the crosswalk-to-sidewalk sharp-turn transition (point A), the truck would have passed the bicycle as it drove through the roundabout and accelerated upon entering the [redacted] Road straightaway (point B). As the bicyclist also accelerated from the crosswalk and increased his speed from 8 mph (at point A) to 21 mph (at point C), he caught the truck (traveling at 13 mph) as the two entered into the [redacted] surveillance camera field of view, approximately 75 feet before the driveway. Regardless of truck approach, the truck driver should have first seen the bicyclist at the roundabout.

CONCLUSIONS

Based on the evidence from the accident scene and collision reconstruction and cause analysis we conclude that:

- Weather at the time of the accident was not a factor in this collision.
- Traffic and road design were not factors in this collision. Traffic was light and not congested, and the traffic ways were well signed. The roundabouts are well marked for pedestrians at multiple crosswalks with yield signs and pedestrian crossing signs. These signs were visible to drivers and pedestrians alike from all approaches to the roundabouts.
- Both the [redacted] truck and bicyclist were traveling north in their respective travel ways (road and sidewalk) at speeds below the posted speed limit upon approach to the [redacted] driveway.
- Bicyclist [redacted] speed and behavior were not exceptional or reckless, and he was wearing his bike helmet.
- Bicyclist visibility was not a factor in this collision. The truck driver had ample opportunity to see the bicyclist and respond by yielding; bicyclist [redacted] had the right of way. Analysis of spot mirror field of view verified clear visibility of pedestrians or bicyclists 5 to 80 feet behind the mirror. Inspection of the

sidewalk at the scene of the accident and review of accident scene photographs verified it was free of anything that would have obscured the view of the bicyclist in the 168 feet before the driveway.

- [redacted] failure to yield to [redacted] despite ample opportunity to see the bicyclist indicates that driver inattention was a primary cause in the accident.
- [redacted] driving behavior suggests that unsafe driving may have also been a factor in the collision. The truck entered the [redacted] driveway faster than 87% of the traffic measured. [redacted] also swung wide into the driveway, rather than staying in his lane. These factors indicate that unsafe driving on the part of [redacted] may have been an additional factor in causing the accident.
- Regardless of truck approach, that is from the [redacted] Highway off-ramp or [redacted] Road roundabouts, the driver should have first seen bicyclist [redacted] at the north roundabout, at least 168 feet before the driveway. [redacted] failure to notice the biker further suggests that driver inattention was a factor in causing the accident.

LIMITATIONS

This report is intended for [redacted] Law Office and its assigns only**.** The information contained herein relates to investigation of a motor vehicle collision involving a fatality. Great care was exercised to ensure accuracy through investigation and reporting. Conclusions made are based on thorough review of the evidence and conditions at the time of the accident, and professional reconstruction and cause analysis. No expressed warranty is made or implied that others will come to the same conclusions. We reserve the right to amend this report should additional information come to light in the future. Please do not hesitate to call with questions or concerns you may have.

Sincerely,

Insight-Forensics

Dennis Filler, Ph.D., P.E.
Principal

Mike Donaldson, Ph.D.
Senior Scientist

Attachments: Figures 1 through 12
Tables 1 through 3

ATTACHMENTS

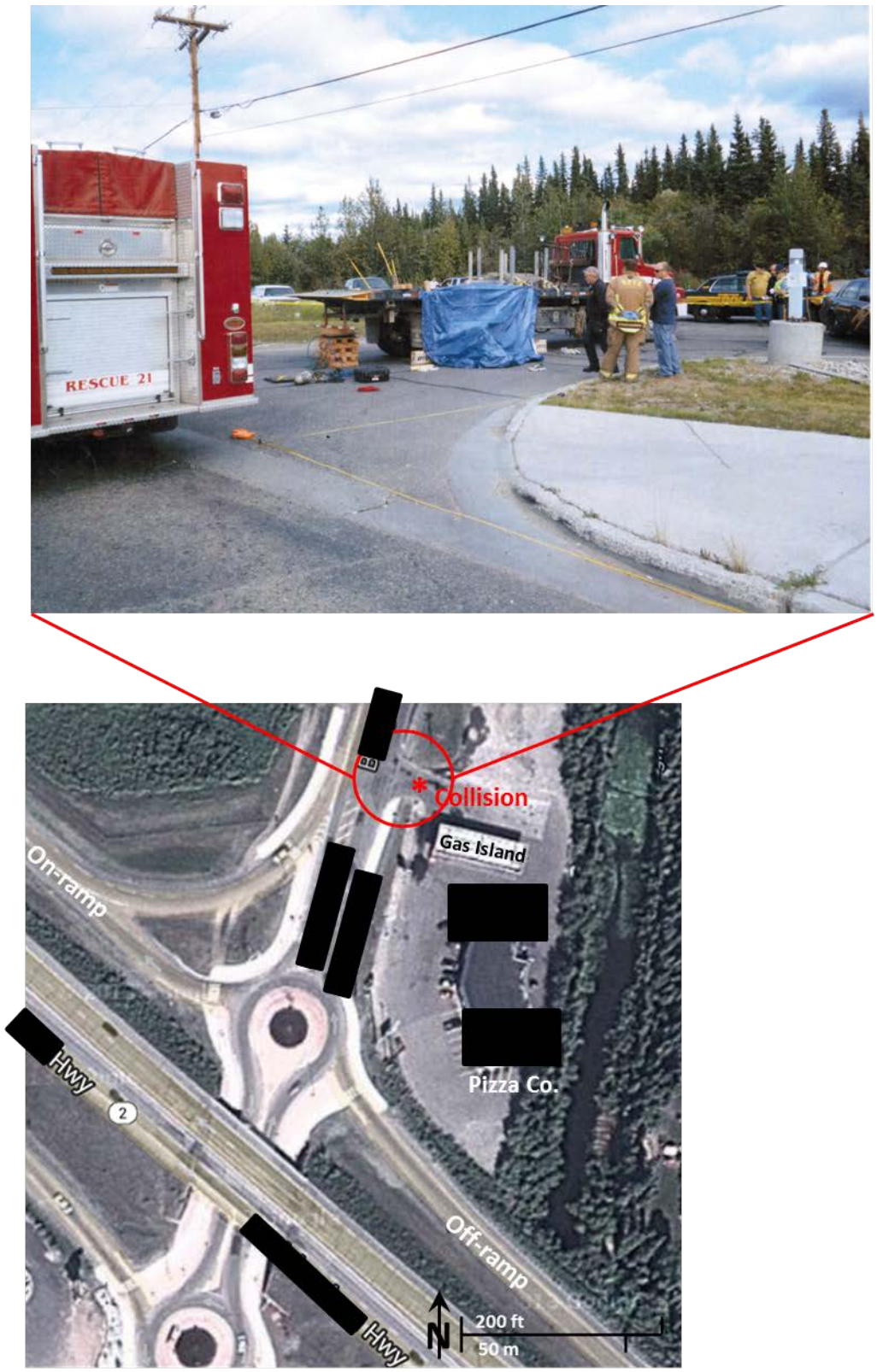

Figure 1. Accident scene. The bottom image is a Google base map depicting the collision location at the intersection of [redacted] Road and [redacted] driveway. The top accident-scene photograph shows the final resting position of the [redacted] truck after collision.

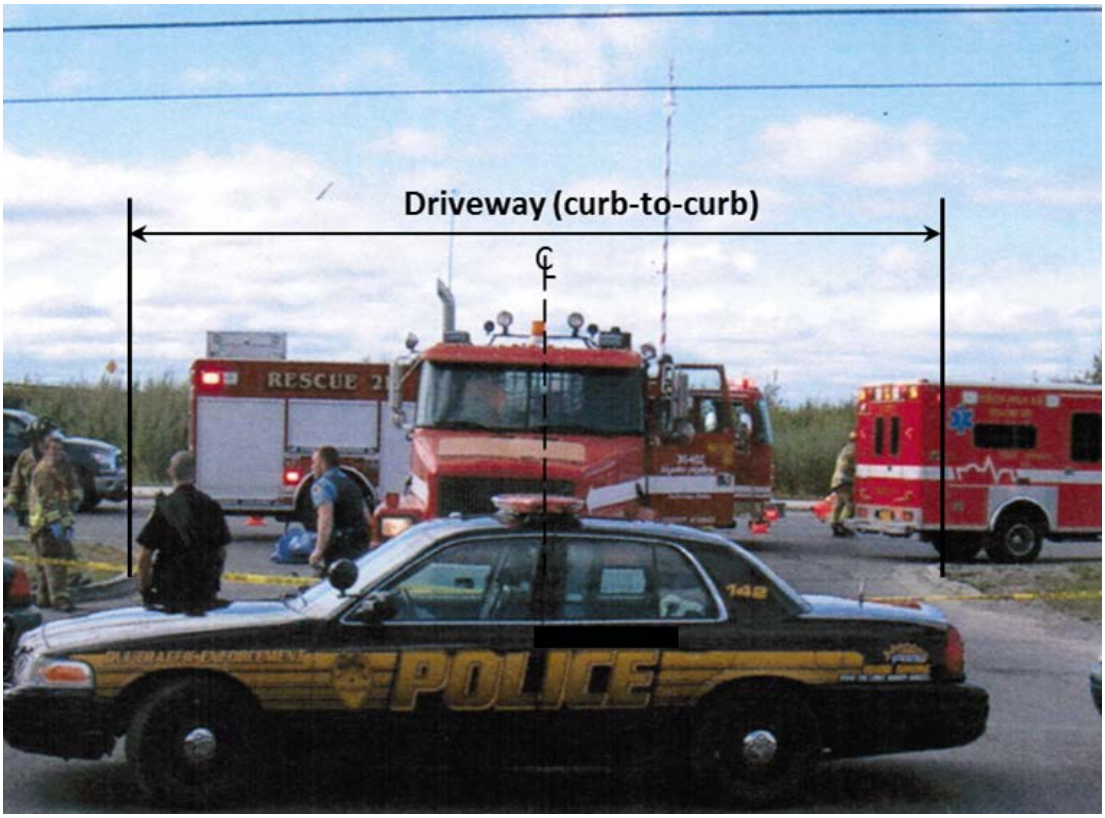

Figure 2. The final resting position of the [redacted] truck at the accident scene on August 21, [redacted]; truck is centered in the [redacted] driveway.

Figure 3. [redacted] truck features at the time of accident.

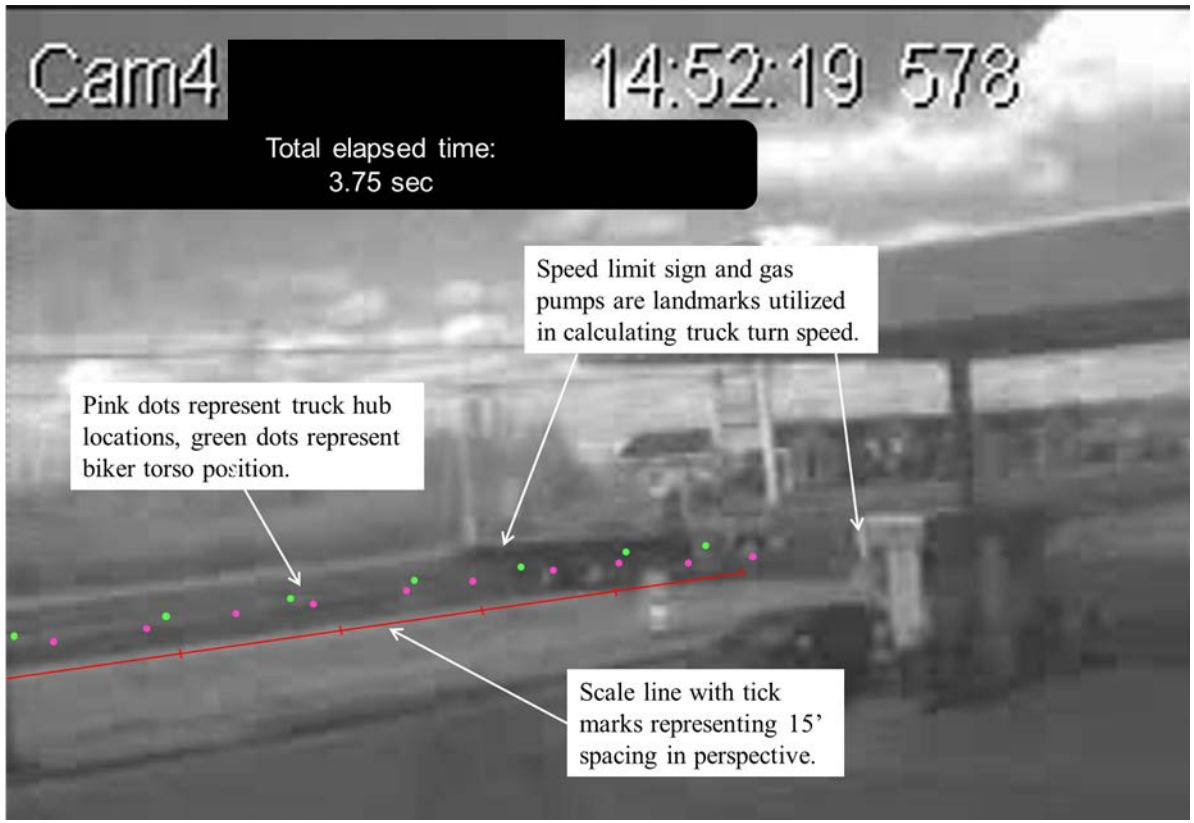

Figure 4. Speed and time-distance sequencing using surveillance video *still* of [redacted] truck and bicycle positions at [redacted] driveway. The image is superimposed with red perspective-adjusted scale line and pink and green dots, the relative positions of the trucks' front wheel hub and bicyclist torso through the 3.75-second approach sequence to the [redacted] driveway. Dots are interpreted from right to left, with each successive green dot paired with the associated successive pink dot. There are three more pink dots than green because the truck was in full view when the bicyclist appeared at left (i.e., fourth pink dot from left is front wheel hub location when bicyclist appeared as first green dot at left). The video date and time stamp are across the top.

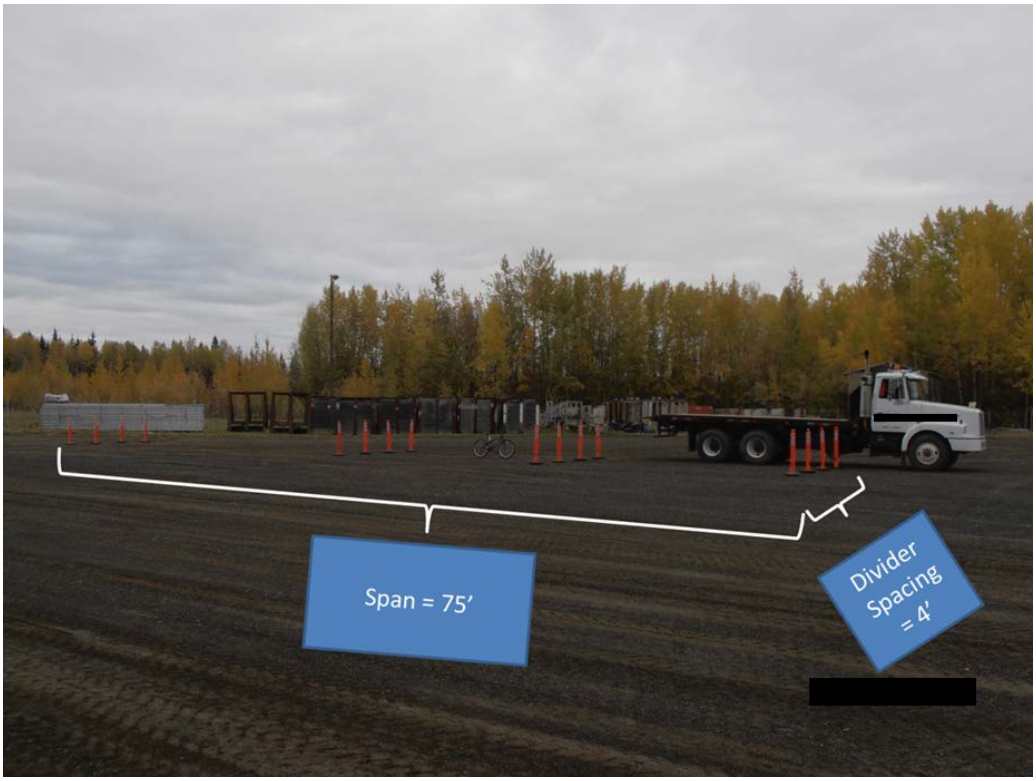

Figure 5. Mirror analysis: field simulation setup to determine mirror fields of view.

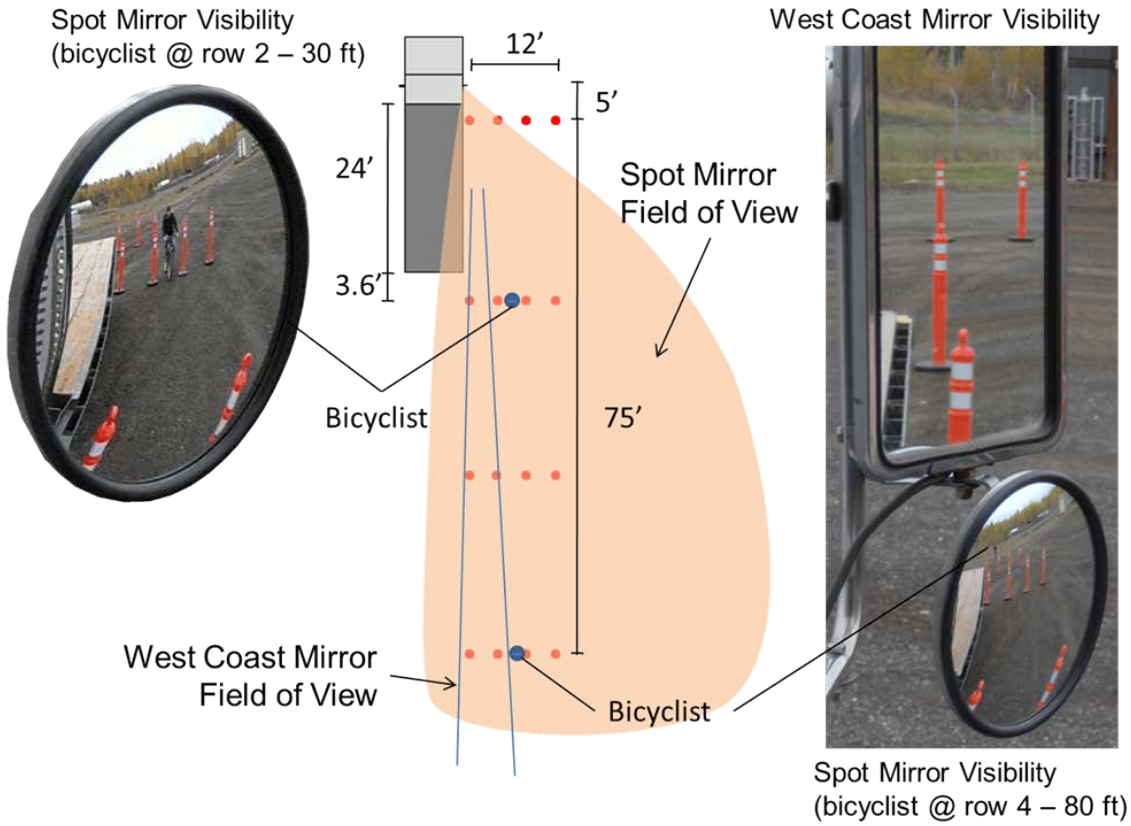

Figure 6. Mirror visibility analysis: mirror perspectives and determination of fields of view.

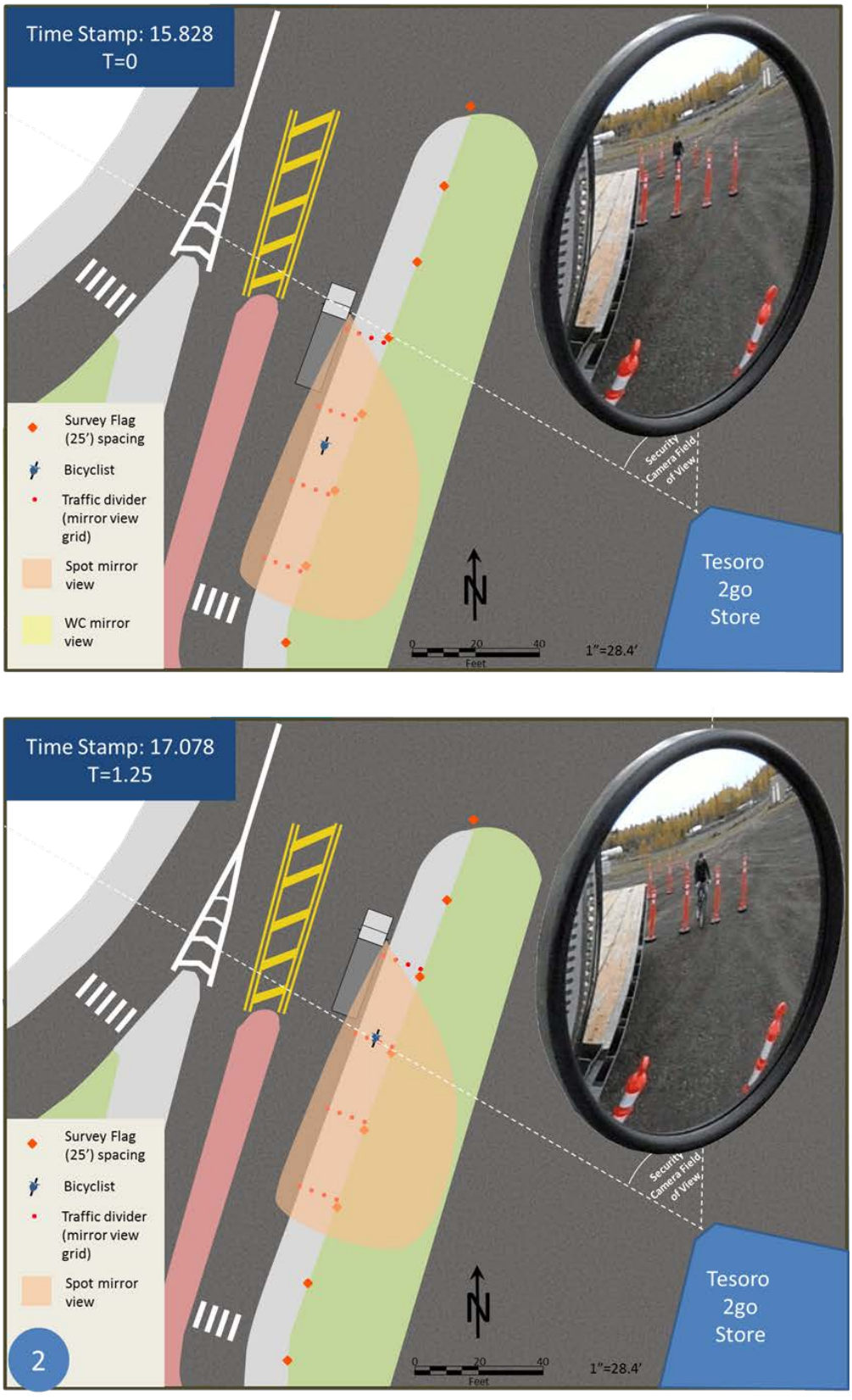

Figure 7a. Reconstruction sequence correlated with truck spot mirror visibility simulation. Frame 1: truck entering surveillance camera field of view as bicyclist is approaching from behind at about 20 feet away. Frame 2: bicyclist is parallel with back of truck as he enters surveillance camera field of view.

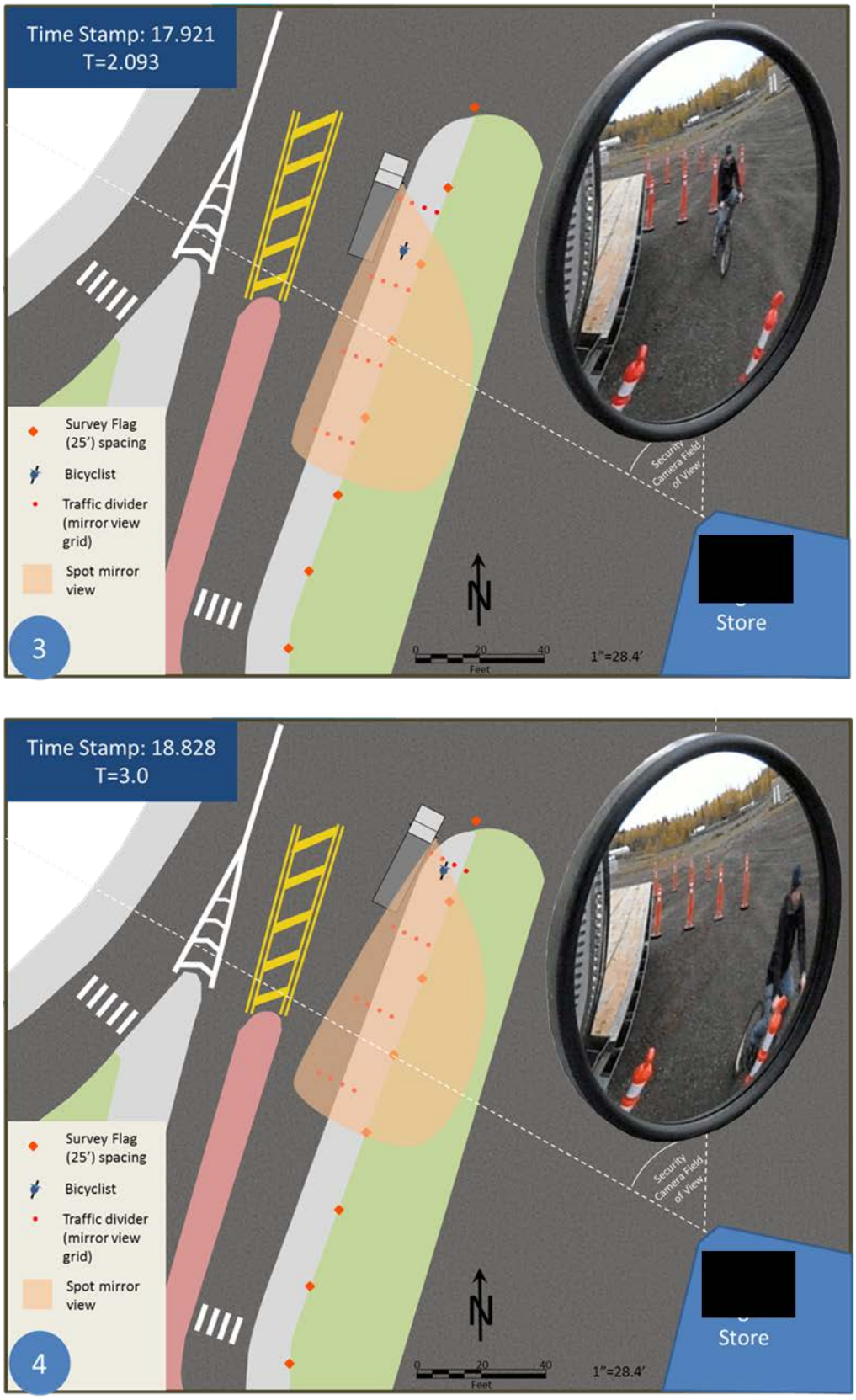

Figure 7b. Reconstruction sequence correlated with truck spot mirror visibility simulation. Frame 3: Truck and bicyclist approaching driveway; bicyclist approximately 35 feet from driveway. Frame 4: Truck turning at driveway as bicyclist about to leave sidewalk. Note bicyclist is visible in truck mirror through entire sequence.

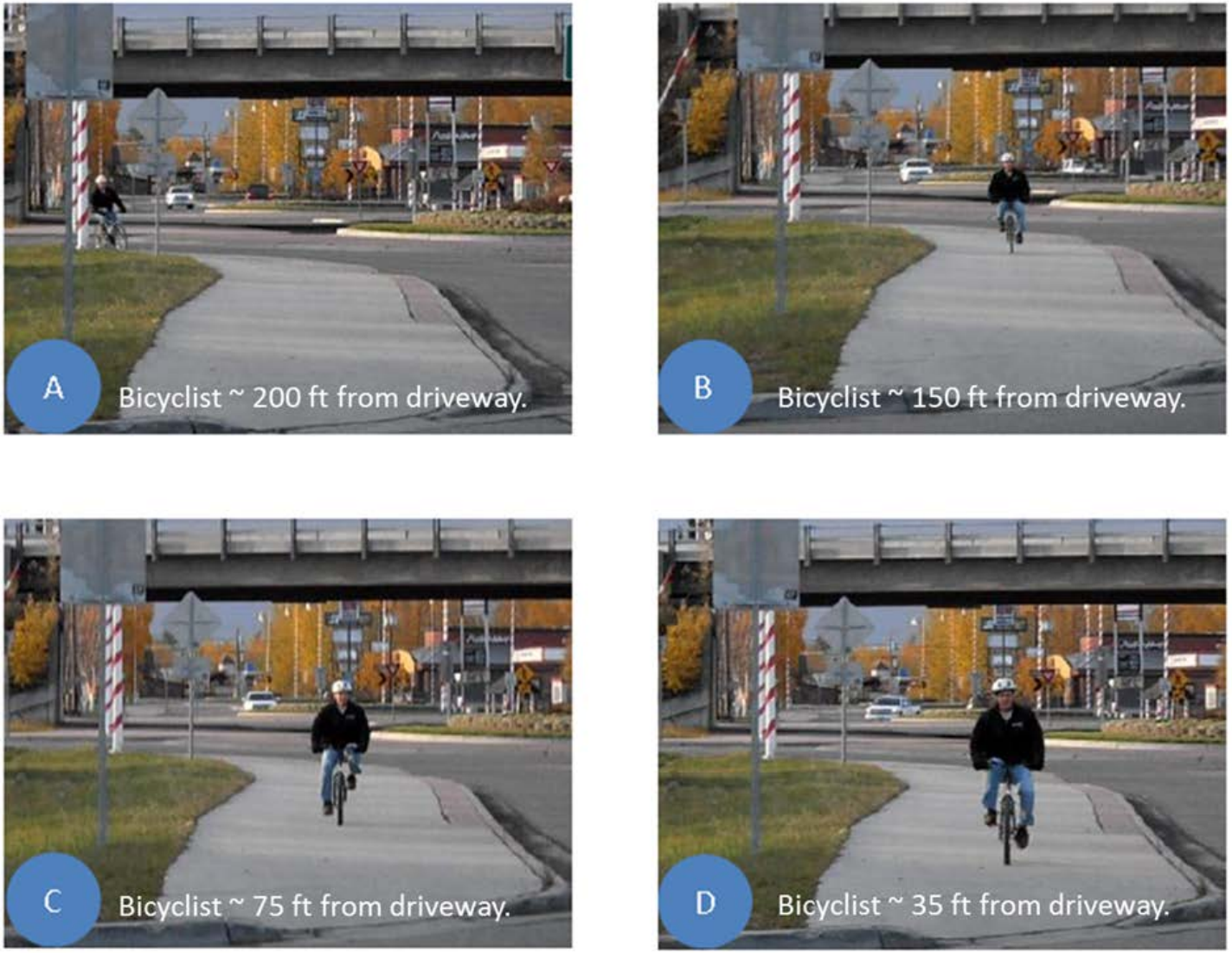

Figure 8. Bicycle simulation illustrating the visibility of a bicyclist on the [redacted] Road east sidewalk upon approach to the [redacted] driveway on a clear day.

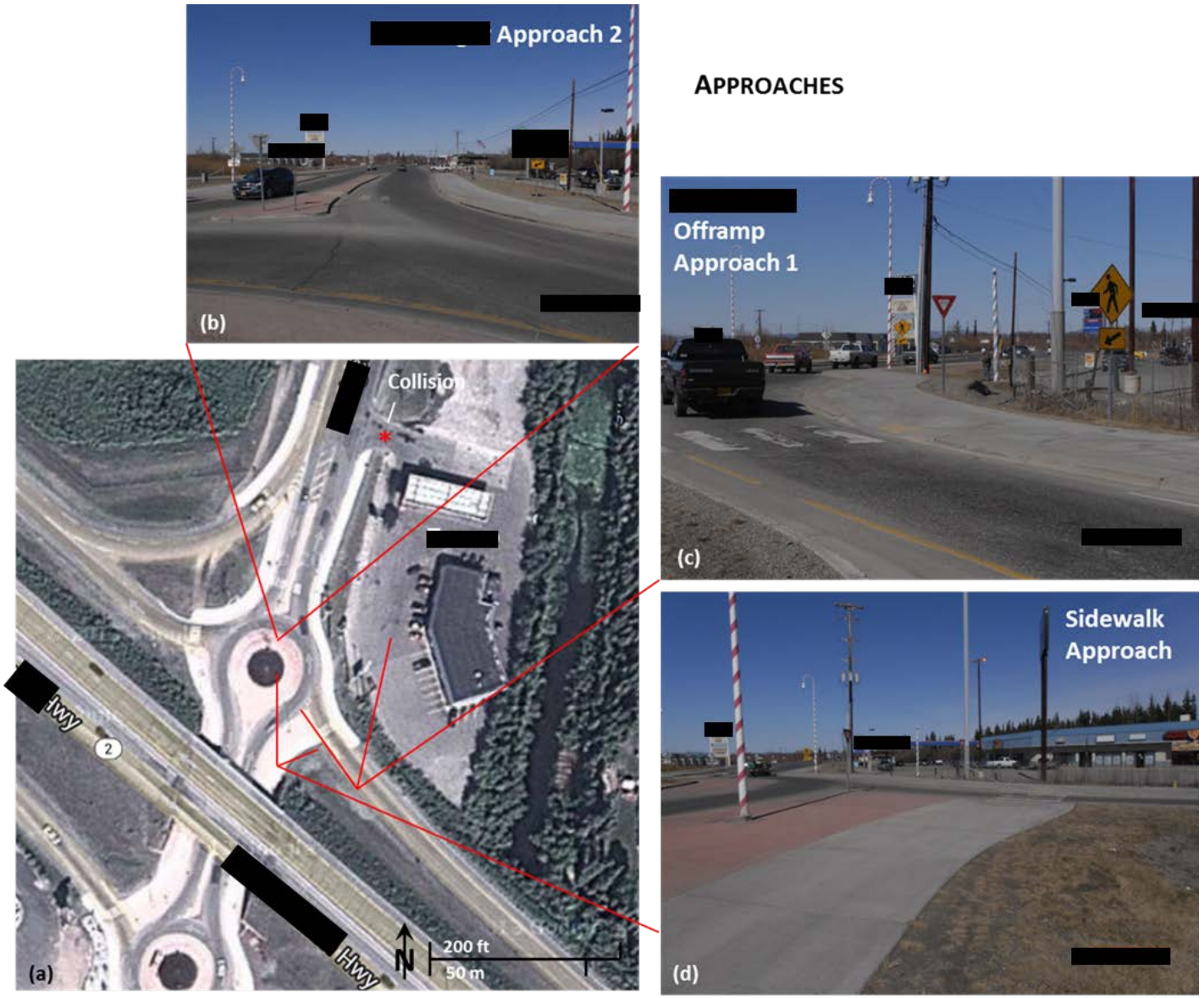

Figure 9. (a) Google base map depicting approaches to the north [redacted] Road roundabout and [redacted]; (b) and (c) depict the two possible truck approaches, and (d) the bicycle approach.

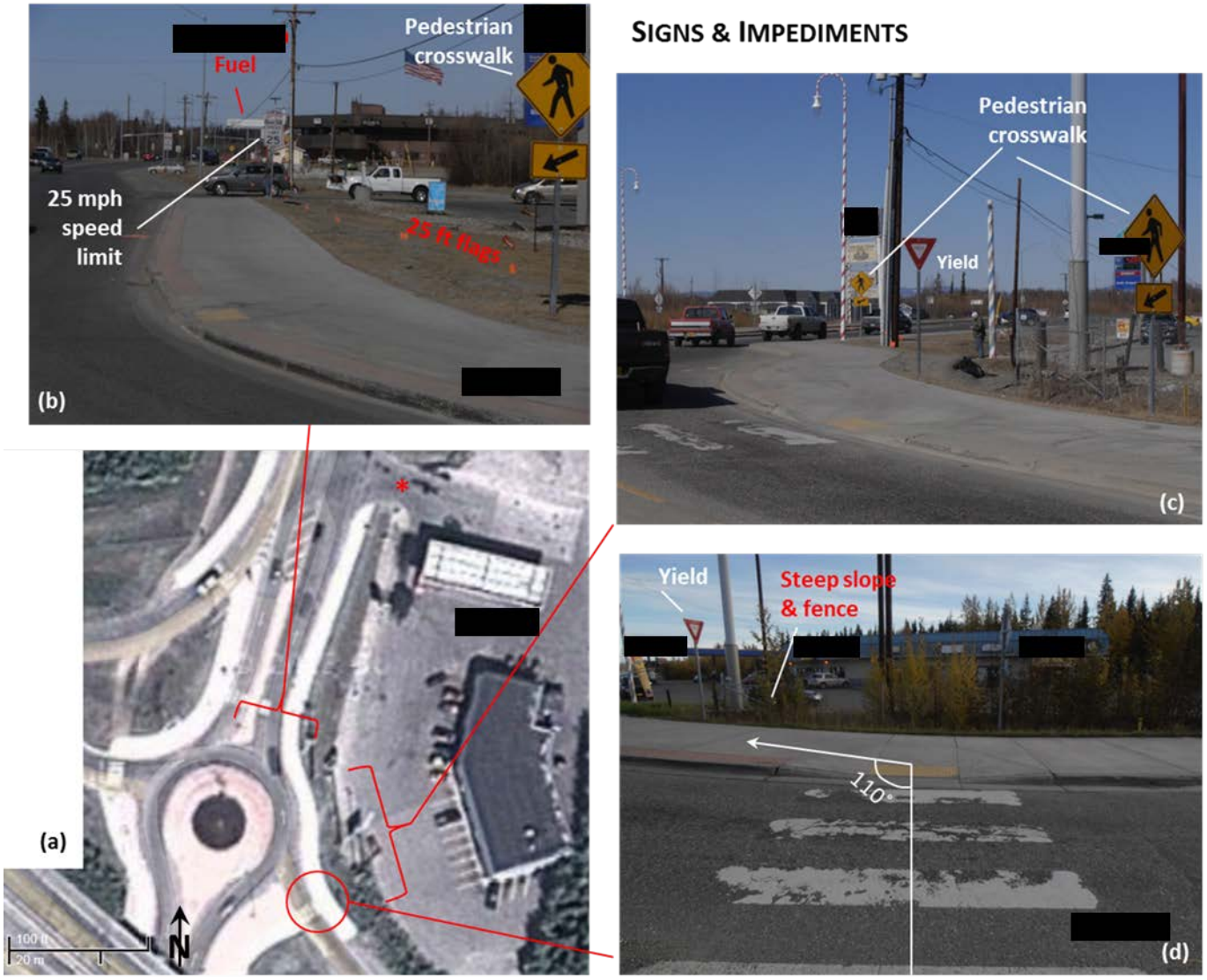

Figure 10. (a) Google base map depicting all approaches to the [redacted] Road roundabout; (b) 25 mph speed limit sign posted at [redacted] driveway; (c) pedestrian and yield signs at crosswalks; and (d) sharp turn at Bicycle Approach crosswalk ([redacted] Hwy off-ramp at right).

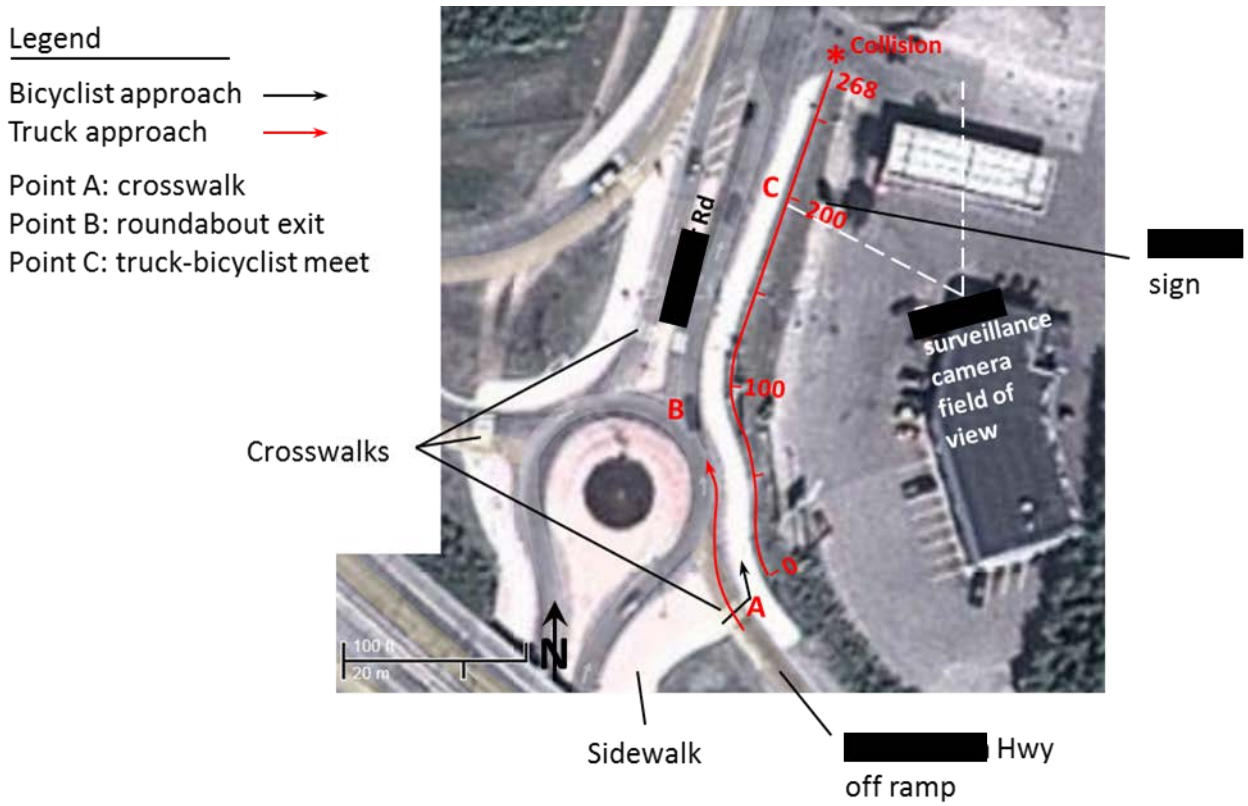

Figure 11. Approach hypothesis: Point A bicycle speed < 8 mph, truck accelerating; Point B, both bicycle and truck accelerating, bicycle catching up to truck; Point C bicycle parallel to truck flatbed rear end.

Figure 12. [redacted] truck fuel gage at the time of collision.

Table 1. Real-time truck and bicycle speeds for collision approach sequence.

Surveillance Video Frames	Cumulative Time[1] (sec)	Approx. Truck Distance to [redacted] driveway[2] (ft)	Relative Speeds (mph) Truck	Bicycle	Comments
1-2	0.422	67.1	13	NIV	Truck entered surveillance camera field of view.
2-3	0.843	58.8	13	NIV	
3-4	1.250	51.3	12	NIV	
4-5	1.672	41.9	15	21	Truck accelerated. Bicyclist enters surveillance camera field of view, and is parallel to back end of truck flatbed.
5-6	2.093	34.7	12	19	Truck decelerated. Bicyclist is parallel to double wheel axles of truck flatbed.
6-7	2.500	21.7	11	22	Front of truck ~ 22 feet from driveway.
7-8	2.922	33.5[3]	11	20	Bicyclist decelerated. Truck initiated turn at 11 mph.
8-9	3.343	21.4[3]	11	19	Bicyclist decelerated. Truck turned at constant speed.
9-10	3.750	0	11	16	Bicyclist about to leave the sidewalk. Truck turned at constant speed.

Notes: [1]Time based on [redacted] surveillance video time stamps. [2]Front-of-truck distances based on ground-level measurements adjusted to surveillance camera perspective. [3]Bicyclist distance from driveway. NIV – not in video.

Table 2. Vehicle approach turn speeds on May 22, [redacted].

Veh#	Speed (mph)	Veh#	Speed (mph)	Veh#	Speed (mph)	Veh#	Speed (mph)	Veh#	Speed (mph)	Veh#	Speed (mph)
1	18'	6	15	11	23'	16	15'	21	15	26	22'
2	17'	7	20''	12	15	17	12	22	14	27	20
3	12	8	16	13	18	18	16	23	16	28	21'
4	15	9	16	14	17	19	14	24	15''	29	19
5	14''	10	12	15	13	20	16	25	14''	30	21
										31	15''

Notes: 'Late turn signal; '' No turn signal.

Table 3. Summary of bicycle travel patterns and speeds.

Date	Time	# Bikers	Speed (mph)	H/NH	Direction of Travel
May 21, 2013	1 - 2:45 pm	1	16	NH	E-W
May 22, 2013	12- 2 pm	15	15 - 24	NH	9 E-W/8 W-E
		2 (together)	14	H (both)	
Aug 21, 2013	7:25 - 9 am	1	20	NH	E-W
	2 - 3:30 pm	11	8 - 23	NH	12 W-E/1 E-W
		2	13 and 18	H	
Aug 22, 2013	7:20 - 8:20 am	2	14 - 22	NH	4 W-E
		2		H	
	2 - 3:15 pm	4	14 - 22	NH	5 W-E/1 E-W
		2		H	

Notes: H – helmet on; NH – no helmet.