



# Stodola Engineering Limited

August 6, 2024

Stuart D. Mann, Esq.  
Law Office of Stuart Mann, LLC  
885 Arapahoe Avenue  
Boulder, Colorado 80302

Re: Siegrist  
SEL File No. 24-104  
Date of Incident: 09/14/2023

Dear Mr. Mann,

As you requested, Stodola Engineering Limited (SEL) has evaluated a collision involving pedestrian Katie Siegrist who was walking with her dog northbound on Animas View Drive in Durango, Colorado on September 14, 2023, at approximately 7:46 p.m. Reportedly, she was on her phone. A 1987 Jeep Wrangler (Jeep), driven by Olivia Burkhart was also northbound at the same time. The right front fender struck the back of Ms. Siegrist, causing her to rotate and land to the right of the road. The Jeep came to rest approximately 105 feet north of the area of impact identified by the police. At the time of the incident, wet, unlit night conditions existed.

Ms. Siegrist was fatally injured.

Purpose:

The purpose of this report is to summarize the accident reconstruction to date.

Qualifications:

The basis for the opinions in this report includes the material reviewed, inspection of the scene, the basic principles of engineering and physics and my general education, experience, and training. The methodology applied in the analysis is consistent with that followed by all Accident Reconstructionists.

My formal training includes a B.S. degree in Mechanical Engineering from Rice University (1982) and a M.S. degree in Mechanical Engineering from the University of Colorado (1994). I am a licensed Professional Engineer in the State of Colorado. I completed the Texas A&M System Advanced

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Accident Reconstruction course in 1996. I have extensive experience in motor vehicle accident reconstruction. This experience includes the investigation and reconstruction of more than 2000 motor vehicle crashes over the past 29 years.

Recent seminars and conferences include the EDR Summit 2017, ARC-CSI Crash Conference 2016 and the University of Michigan Human Factors Engineering Short Course 2016

Documents Provided:

Relative to this incident, SEL has reviewed the following:

- Durango Police Report and Photographs
- Animas View Drive Neighborhood Meeting Notes, November 1, 2023
- Article by Janet Jones, Prioritize ‘
- Medical Records
  - Durango Fire- Ambulance
  - Mercy Medical Center
  - St. Mary’s Hospital

In addition to the materials provided to SEL for review, the following materials served as background references:

- Gillespie, Thomas D. Fundamentals of Vehicle Dynamics, Society of Automotive Engineers, Inc., 1992.
- Limpert R. Motor Vehicle Accident Reconstruction and Cause Analysis, Third Ed. The Michie Company, 1989.
- Fricke, L. Traffic Accident Reconstruction – Volume 2 of The Traffic Accident Investigation Manual, Northwestern University Traffic Institute.
- Olson, Paul L. and Eugene Farber, Forensic Aspects of Driver Perception and Response, 2nd Edition, Lawyers and Judges Publishing Company, 2003.
- Daily, J. et al. Fundamentals of Traffic Crash Reconstruction. Institute of Police Technology and Management. 5th Printing. January 2013.
- Olson, Paul L. and Eugene Farber, Forensic Aspects of Driver Perception and Response, 2nd Edition, Lawyers and Judges Publishing Company, 2003.

Accident Site:

The scene was inspected and photographed on January 30, 2024. At the location of the incident, Animas View Drive is a two way, north/south roadway with one lane in each direction separated by painted double yellow lines. Fog lines are present with minimal paved shoulders outboard of the fog lines. There is a double fog line on the northbound lanes that is approximately 11 feet wide. The road curves to the left approaching the area of impact. There is a driveway to United Campgrounds of Durango north of the area of impact. Photograph A. The reported speed limit is 25 mph.



Photograph A. Google Earth Image from 9/11/2019

1987 Jeep Wrangler:

The Jeep was also inspected on January 30, 2024. The Jeep is a 2-door 4x4 utility vehicle with Vehicle Identification Number (VIN) 2BC CL81K 7

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HB 503765. It has a reported curb weight of 2,914 lbs. The published width of the Jeep is 5.5 feet which corresponds to the measurement from the scan of the vehicle.

The Jeep exhibits damage and wear consistent with its age and milage (443,756 miles at the time of the SEL inspection). Relative to the incident, the right fender and wheel well cover are deformed, and the side light broken out in that location. The fender was previously damaged with rust showing through the Bondo. Photograph A.



Photograph A. Impact damage

The license plate is folded under the bumper. However, the post impact movement of Ms. Siegrist and her documented injuries are not consistent with an impact with the bumper. Pedestrians who are struck in the rear are likely to sustain bumper injuries such as fractures to the legs and

whiplash-type neck injuries.<sup>1</sup> Nor are the fractures to the right front headlight bezel and the bumper valence consistent with the subject impact.

The windshield is fractured. There is no evidence of body contact with it. There are localized chips in the windshield in which the cracks run through. Photograph B, C.



Photograph B. Chips and cracks on Passenger side

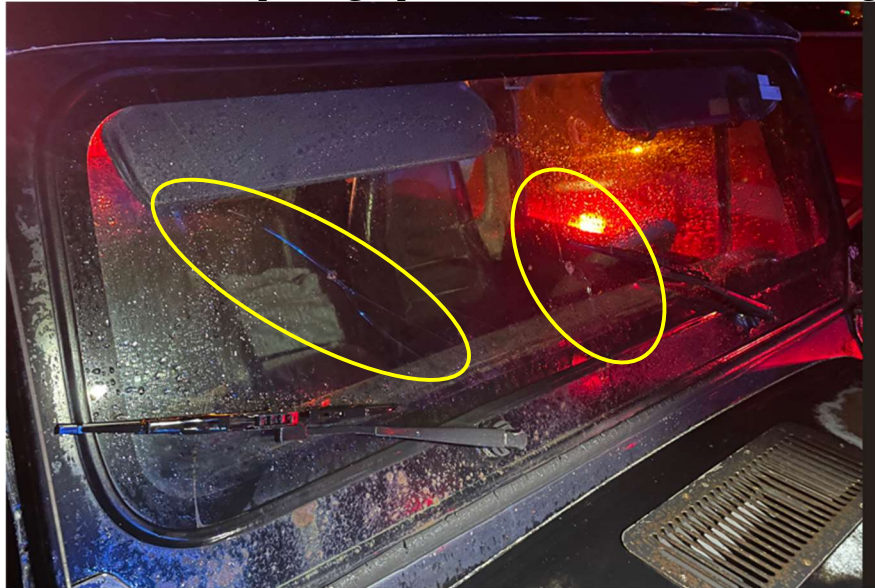
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<sup>1</sup> Fundamentals of Pedestrian/Cyclist Traffic Crash Reconstruction, 1<sup>st</sup> edition-2016, M. Reade and T. Becker



Photograph C. Chips and cracks on Driver side

The cracks are visible in photographs taken at the scene. Photograph D.

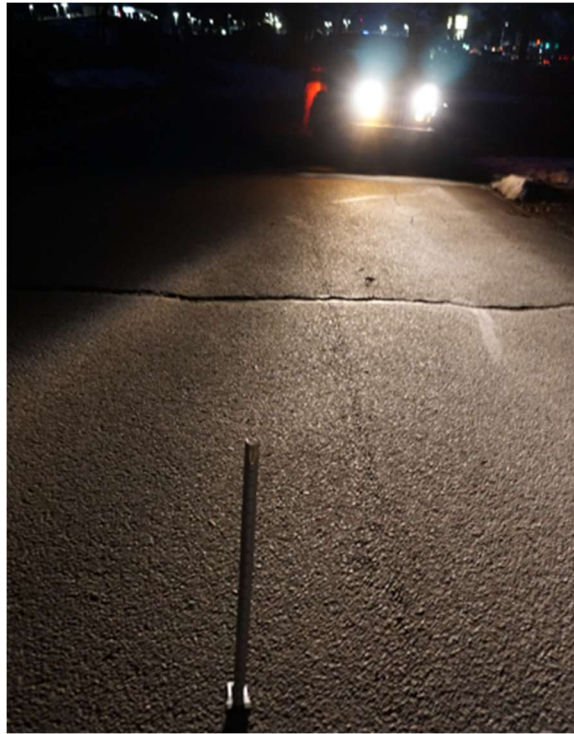


Photograph D.

The vehicle's lights were observed at night. Light measurements taken 25 feet in front of the Jeep at a height of 26.5 inches were between 3.84 lux to the right of the Jeep and 37 lux in the center, between the rails.



Photograph E. This equates to 223 candelas on the right and 2148 candela between the rails.



Photograph E. Headlight pattern

Statements:

In her interaction with the police, Ms. Burkhart stated that she did not see the female walking on the road because it was too dark. She was not able to use her brakes to slow down. She stated that she was going 30 mph.

Engineering Analysis and Discussion:

Jeep Impact Speed:

The Jeep stopped approximately 106 north of the location of the shoe on the roadway as documented by the police. There are no tire marks observed on the roadway leading to the Jeep's rest location. If a vehicle is traveling at 30 mph (44 fps), and braked at a deceleration rate of 0.5 g's, it will stop in 60 feet. Applying a 1 second perception-reaction time, a time in response to an impact, the Jeep would have traveled 44 feet post impact before being braked and coming to a stop. The adoption of a traveling speed of 30 mph is consistent with the documented evidence. If the area of impact was further to the south, Ms. Burkhart likely would have been traveling faster than 30 mph.

Windshield Analysis:

As noted above, the Jeep had numerous chips and cracks. Cracks can obstruct a driver's vision, especially if they're on the driver's side. Chips and cracks can be especially hazardous in wet conditions when visibility is needed to avoid accidents. Colorado law states that "No vehicle shall be operated upon any highway unless the driver's vision through any required glass equipment is normal and unobstructed." (CO Code §42-4-201) Ms. Burkhart's Jeep was defective due to the cracks and chip present on the night of the incident.

Impact Location:

Medical records from St. Mary's Hospital indicate that "stranding of the fat in the left paracolic gutter likely represented a focal contusion in this location" (pg. 28/744). This corresponds to an impact on the left side of Ms. Siegrist consistent with the damage to the right front fender. There is no physical evidence of her body going onto the hood of the vehicle or into the windshield. The trajectory of Ms. Siegrist and available physical evidence are indicative of a fender vault and Ms. Siegrist would not achieve a common velocity with the Jeep. Ms. Siegrist likely rotated in the air before coming to rest northeast of the area of impact as observed in the videos. The location of the right shoe on the right side of the right fog line and its pointing to the south indicates that she was walking on or to the right of the right fog line and out of the travel lane. The impact rotated her clockwise before she came out of her shoe.

The lane width is approximately 11 feet between the left fog line and the center of the road. The Jeep is only 5.5 feet wide, which should have given a buffer of another 5.5 feet. Ms. Burkhart was navigating a left curve. The impact location is consistent with Ms. Burkhart taking the left curve wide.

Headlight Analysis

Federal Code 49 CFR § 238.443 – Headlights states, in part:

- (a) Each power car shall be equipped with at least two headlights. Each headlight shall produce no less than 200,000 candelas. One headlight shall be arranged to illuminate a person standing between the rails 800 feet ahead of the power car under clear weather conditions. The other headlight shall be arranged to illuminate a person standing between the rails 1,500 feet ahead of the power car under clear weather conditions.



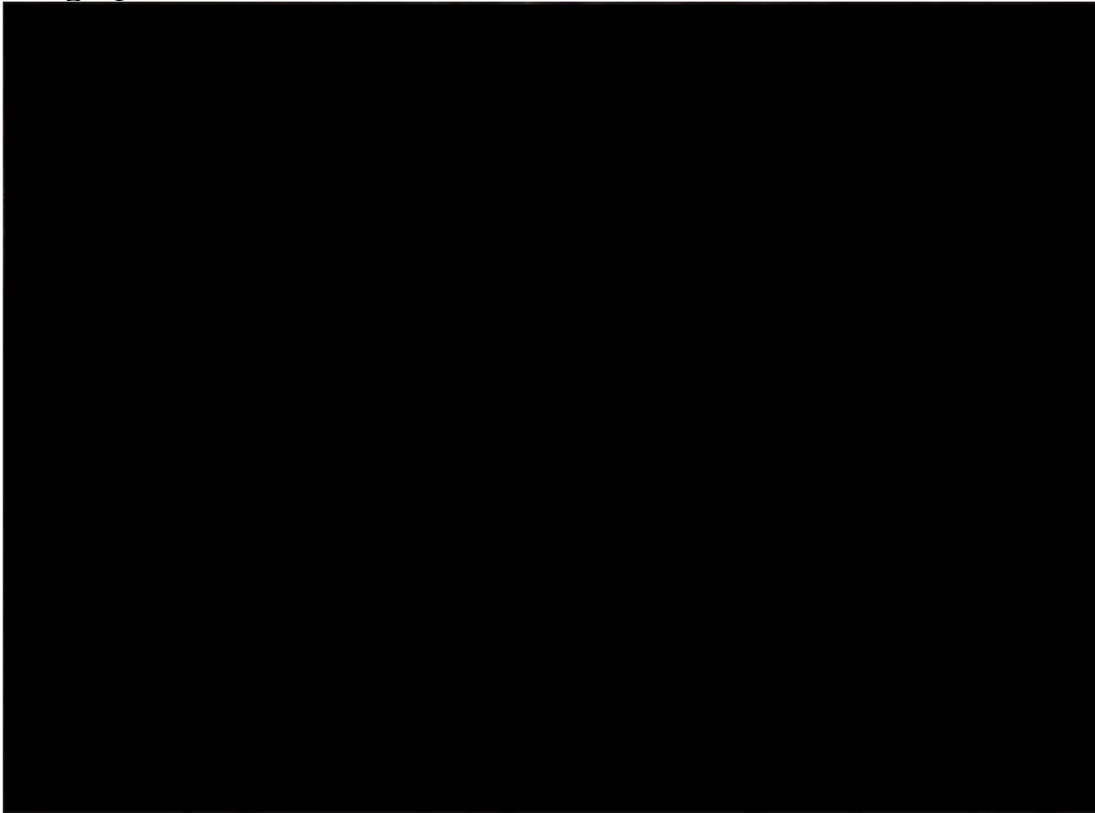
(b) A power car with a headlight not in compliance with the requirements of paragraph (a) of this section shall be moved in accordance with the following:

(1) If one of the headlights is defective, the defect shall be considered a non-running gear defect subject to the provisions contained in § 238.17 of this part.

The testing conducted on January 30, 2024, showed that values between the rails only resulted in 2,148 candela 25 feet in front of the vehicle, far below the requirements of the Federal Code. Ms. Burkhart was driving a defective vehicle that was not properly maintained.

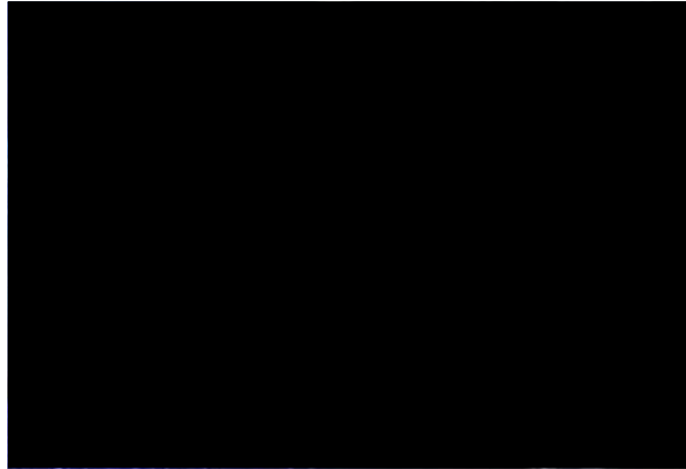
Clothing:

The police state that Ms. Siegrist was not observed to be wearing any type of reflective or light-colored clothing, it appears that only her shoe was collected. However, dash cam video shows the pedestrian on the ground being attended to by two people with Ms. Siegrist in a light top. The reflective back of her Hoka running shoe next to the fog line is also visible. Photograph G.



Photograph G. Clip from video 2023-09-15\_1951 (6.28/30.00)

Blankets were placed on Ms. Siegrist but another dashcam shows the blankets illuminated by headlights without the same reflective quality. Photograph H. Ms. Siegrist's top was likely reflective.



Photograph H. Blankets

The police report was not accurate and any conclusions regarding Ms. Siegrist's visibility is without merit. Based on the SEL nighttime inspection of the subject location, there were no visibility limitations of pedestrians on the right with similar Hoka running shoes when illuminated by properly functioning headlights. Had Ms. Burkhart not been driving a vehicle with defective headlights and a chip and cracked windshield, she could have seen Ms. Siegrist.

SEL recognizes a picture does not represent the exact conditions and an observer has unlimited time to scan for a hazard. But it should be noted that Ms. Siegrist was walking with her dog on a leash which may have provided additional cues to the driver. In the book "Forensic Aspects of Driver Perception and Response, Paul Olson reports the results of trials in which subjects would NOT have been able to stop short of the pedestrian position as a function of speed, target reflectivity, and position with respect to the test vehicle. Table 1.

Speed (mph)	Dark Ped Right	Dark Ped Left	White Top Ped Right	White Top Ped left
25	< 1	5	< 1	< 1
35	12	70	< 1	4
45	45	> 90	3	10
55	81	> 90	15	30
65	> 90	> 90	40	65

Table 1.

While older drivers detected targets at half the distance, conservatively, Ms. Burkhart did not have to come to a stop as identified in the Olson book but only had to move laterally 1.5 feet to the left or maintained a centered position in the travel lane, to avoid striking Ms. Siegrist. The lateral movement could have been accomplished in less than a second and initiated within 45 feet of Ms. Siegrist. Ms. Burkhart likely was inattentive as she was driving.

Ms. Burkhart is heard saying that she wishes she had used her bright lights. A standard headlight should light the road ahead for a distance of 150-200 feet. Traveling at 30 mph, the pedestrian would have been illuminated 3.4 to 4.5 seconds. Had Ms. Burkhart not been operating a defective vehicle, she should have been able to move left and avoid striking Ms. Siegrist.

#### Pedestrian Actions:

During the SEL scene inspection, pedestrians were observed following the same path as Ms. Siegrist. Photograph D. A pedestrian was also captured in Google Streetview. Photograph E.



Photographs D, E. Northbound pedestrians.

Ms. Burkhart lives north of the incident location and was on her way home from dinner in town. Animas View Drive would be a common path of travel from town to her home. While she has not been deposed, it is probable that she had observed pedestrians on the roadway previously and should have been alerted to the potential presence of a pedestrian.

#### Conclusions

In addition to the opinions provided in the body of the report, the following summarizes my opinions:

- Pedestrian Katie Siegrist who was walking with her dog northbound on Animas View Drive in Durango, Colorado on September 14, 2023, at approximately 7:46 p.m.

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- A 1987 Jeep Wrangler (Jeep), driven by Olivia Burkhardt was also northbound at the same time.
- The right front fender of the Jeep struck Ms. Siegrist who was on or to the right of the northbound fog line.
- The Jeep's headlights were not in compliance with Federal Regulation 49 CFR 238.443 for luminous intensity and thus did not properly illuminate the pedestrian.
- Ms. Siegrist was wearing Hoka shoes with reflective strips as well as a light-colored top. Both are seen in the videos taken at the scene from compliant headlights.
- The Jeep's windshield was chipped and cracked, which obstructed the Ms. Burkhardt's view of Ms. Siegrist and violates CO Code §42-4-201.
- Ms. Burkhardt only had to laterally move 1.5 feet to the left or maintain a centered position in the travel lane to avoid Ms. Siegrist. The lateral movement would have required a mild steer to the left approximately 45 feet upstream of Ms. Siegrist. Ms. Burkhardt was likely inattentive as well as driving a defective vehicle.
- The location of the incident is frequented by pedestrians. As a resident of the area, Ms. Burkhardt should have used care as she navigated Animas View Drive.

The opinions in this report are based upon the materials reviewed and the application of accepted physics, engineering, and reconstruction principles. They are given to a reasonable degree of engineering probability. Should additional information become available in the future, the opinions expressed in this report are subject to change. If you desire any further information, or if we can be of further service, please do not hesitate to contact me.

Respectfully submitted,  
Stodola Engineering Limited



Anne Stodola, P.E.