

**METEOROLOGIST'S INVESTIGATION**  
**of the**  
**LADUE CRASH**

Prepared By:  
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August 4, 2005

Raymond E. Ginn, Jr., Esq.  
Ginn and Vickery, P.C.  
23 East Ave.  
Wellsboro, PA 16901

Re: Ladue

Dear Attorney Ginn:

I have examined meteorological records to determine what weather conditions existed along SR15 at and near the crash scene in this case. The police report notes that the crash occurred at 0920 EST on 22 December 2004 on southbound SR15 in Jackson Township, Lycoming County, PA (near Liberty, PA). My analysis is based in part on these materials:

- \* Pennsylvania State Police crash report #P0506450 dated 22 December 2004,
- \* National Weather Service (NWS) hourly surface weather observations for 21-22 December 2004 at Williamsport, PA (station IPT),
- \* NWS hourly surface weather observations for 21-22 December 2004 at Elmira/Corning, NY (ELM),
- \* NWS weather radar records for 22 December 2004 from NEXRAD radar site KCCX near State College, PA,
- \* NWS temperature soundings for 0700 EST on 22 December 2004 at Pittsburgh, PA (PIT) and Upton, NY (OKX),
- \* U. S. Geological Survey (USGS) 7.5-minute topographic map of the Nauvoo, PA quadrangle,
- \* USGS 8-meter resolution aerial photograph taken 14 April 1999 that includes the crash site,
- \* published references cited below.

### **Weather Conditions at the Crash Site**

Although the NWS station closest to the crash site (IPT) did not record hourly precipitation types or amounts at the crash time, the station at nearby Elmira, NY (ELM) did. Records from ELM (~ 45 miles north of Liberty, PA) show that light freezing rain fell there from 0931-0953 EST on 24 December 2004. At both ELM and IPT, skies were overcast from sunrise until the 0920 EST crash time, and air temperatures at both NWS stations were consistently below freezing. Because the crash site is some 650'-1100' higher in elevation than either NWS station, surface temperatures at the crash site probably were slightly lower than those observed at the NWS stations (Ahrens 1991, pp. 38-39; Geiger 1965, pp. 444, 448). Thus in the hours before the crash, SR15 at and near the crash site was (1) subjected to below-freezing temperatures and (2) not warmed by direct sunlight because skies were overcast. The SR15 pavement surface itself would have been below freezing (Robinson 1985) because air temperatures at IPT and ELM were < 32o F for more than 16 hours before the crash.

Compared with surface observations at IPT and ELM, precipitation at and near the crash site is recorded in much greater spatial and temporal detail in weather radar archives from KCCX near State College, PA, which is the Doppler radar site closest to the crash site. From this archived data, NWS calculates one-hour precipitation rates at the surface in inches of liquid water falling per hour. Precipitation at the surface actually may be in the form of snow, sleet, or rain, but the one-hour liquid-equivalent precipitation rate gives a consistent measure of how much liquid water reaches the surface.

KCCX archives show that a broad area of light precipitation ( $< 0.1$ "/hour) moved eastward across northern Pennsylvania and southern New York on the morning of 22 December 2004 (see light blue areas in Fig. 1). The arrow at the middle of Fig. 1 marks the SR15 crash site. In particular, note that light precipitation first fell on this site at  $\sim 0848$  EST (shown as 1348 GMT in Fig. 1) and continued uninterrupted past the crash time (see Fig. 2 at 1423 GMT). Given that (1) temperatures at the crash site were below freezing, (2) the police report noted that both lanes of the SR15 crash site were “ice covered and extremely icy” and that there was a “light coating of ice/snow on the West shoulder and median strip” (p. 9), and (3) the ELM station reported light freezing rain soon after 0920 EST, I conclude that light freezing rain or freezing drizzle fell on the SR15 crash site from  $\sim 0848$  EST onward. Freezing rain or drizzle occurs when a shallow layer of below-freezing air just above the surface lies beneath a fairly deep layer of above-freezing air (Ahrens 1991, pp. 228-230), and this layering is consistent with the NWS vertical soundings of air temperature from PIT and OKX at 0700 EST on 22 December 2004. At the crash site, this rain or drizzle was mixed with some light snow, and the liquid water froze soon after contacting the subfreezing roadway. In turn, this thin layer of ice produced the slippery conditions that led to the Ladue and Pereira crashes.

For drivers southbound on SR15 after  $\sim 0836$  EST, this icing would have been evident for several miles north of the crash site. In Fig. 1, note the large “nose” or salient of freezing rain/drizzle that extends east of SR15 north of the crash site in southern Tioga County. A time-lapse movie of the KCCX precipitation maps shows that this nose first moved eastward across SR15 to the north of the crash site at  $\sim 0836$  EST. Even allowing for several minutes of precipitation before icing became evident, the shape and movement of this nose meant that SR15 icing first occurred to the north, and not to the south, of the crash site. Because Pereira started from the Antrim landfill northwest of where he entered SR15, he first would have been exposed to this icing several minutes before 0836 EST ( $\sim 0825$  EST or earlier). In addition, NWS forecasts for 22 December 2004 ([http://www.hpc.ncep.noaa.gov/noaa/noaa\\_main.html](http://www.hpc.ncep.noaa.gov/noaa/noaa_main.html)) predicted rain and icing conditions moving across this part of Pennsylvania. Thus Pereira (1) was driving under clearly evident icing conditions for several miles before reaching the crash site and (2) publicly available weather forecasts would have given him notice that such icing was likely.

## Conclusions

In my professional opinion as a meteorologist, all available data from the police report and the NWS weather records clearly indicates that freezing rain or freezing drizzle fell at the crash site after ~ 0848 EST on 22 December 2004. Furthermore, this freezing precipitation first fell on SR15 to the north of the crash site, not to its south. Thus Pereira would have been driving under icing conditions for several minutes before he reached the crash site. In addition, NWS forecasts would have alerted him that such icing was predicted.

My opinions and conclusions are based on the information available to me as of today and are accurate to within a reasonable degree of professional certainty. If new or changed data becomes available, I would need to determine whether that data affects my conclusions above.

Sincerely,

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## References

Ahrens, C. Donald, 1991: *Meteorology Today* (West Publishing Co., St. Paul, MN; 4th edition, 576 pp.).

Geiger, Rudolf, 1965: *The Climate Near the Ground* (Harvard University Press, Cambridge, MA), 611 pp.

Robinson, R. G., 1985: "A model for calculating pavement temperatures from meteorological data," *Transportation and Road Research Laboratory Report # 44*, 16 pp.

# Figures

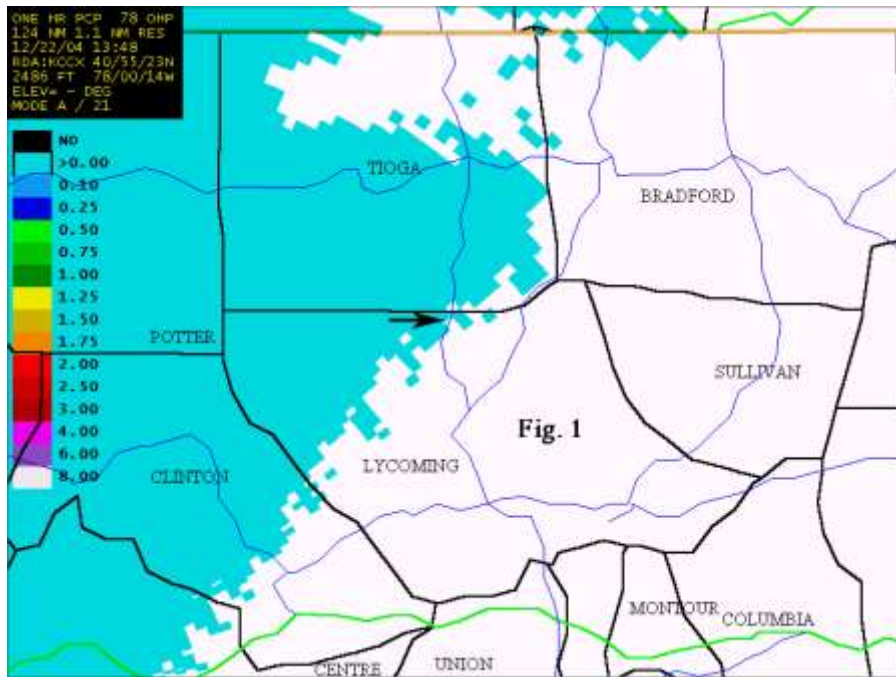


Figure 1

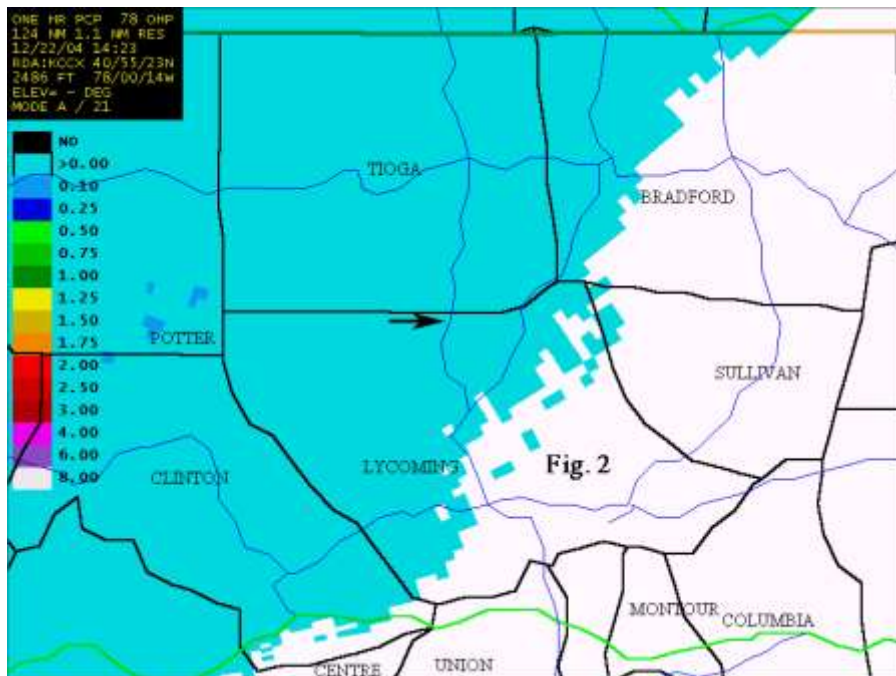


Figure 2