National Transportation Safety Board

Office of Aviation Safety
Washington, D.C. 20594-2000
October 30, 2016

WEATHER STUDY

DCA16FR005

A. Accident

Location: Granger, Wyoming
Date: March 14, 2016
Time: 2141 mountain daylight time (0341 UTC[1] on March 15, 2016)
Vehicles: Collision of Two Union Pacific Railroad Trains

B. Meteorological Specialist

Mike Richards
Senior Meteorologist
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C. Details of the Investigation

The National Transportation Safety Board's meteorological specialist did not travel in support of this accident investigation and gathered all weather data remotely. Unless otherwise noted, all times are in mountain daylight time (MDT) for March 14, 2016, directions are referenced to true north, distances are in statute miles and heights are above mean sea level (msl).

Coordinates used for the accident location: 41.596159° north latitude, 109.966214° west longitude, elevation of about 6,285 feet.

[1] UTC – abbreviation for Coordinated Universal Time

Surface Observations

Unofficial meteorological reporting station WY8 was located about 12 miles southwest of the accident site at an elevation of 6,743 feet and its data are provided courtesy of the Wyoming Department of Transportation. Calibration, maintenance and siting standards of this instrument are not known. Reports[2] from WY8 during the times surrounding the accident time are presented here.

Time	Temp	D_Temp	RH	W_Mag	W_Dir	G_Mag
2116	25.7°	22.3°	87	11.8	296°	16.8
2121	25.7°	22.6°	88	11.8	295°	18.6
2126	25.5°	23.2°	91	11.2	294°	18.6
2131	25.2°	23.7°	94	9.9	291°	17.4
2136	25.0°	24.0°	96	9.9	289°	15.5
2141	24.8°	24.1°	97	9.3	289°	15.5
2146	24.4°	22.9°	94	10.6	294°	19.3
2151	24.3°	23.5°	97	14.3	304°	19.9
2156	24.3°	23.8°	98	14.9	308°	19.9
2201	24.3°	23.3°	96	13.0	308°	18.0

Unofficial meteorological reporting station LTAW4 was located about 13 miles east-southeast of the accident site at an elevation of 6,130 feet and its data are provided courtesy of the US Geological Survey. Calibration, maintenance and siting standards of this instrument are not known. Reports from LTAW4 during the times surrounding the accident time are presented here.

Time	Temp
2100	29.5°
2200	27.0°

Unofficial meteorological reporting station KCMS was located between 17 and 23 miles east-southeast of the accident site[3] at an unknown elevation and its data are provided courtesy of the Wyoming Department of Transportation. Calibration, maintenance and siting standards of this instrument are not known. Reports from KCMS during the times surrounding the accident time are presented here.

Time	Temp	D_Temp	RH	W_Mag	W_Dir	G_Mag
2112	26.6°	23.5°	88	11.2	310°	21.7
2117	26.8°	23.1°	86	12.4	310°	16.8
2122	27.1°	22.9°	84	11.2	290°	16.8
2127	27.1°	22.9°	84	8.7	285°	16.8

[2] Temp=temperature(Fahrenheit [F]); D_Temp=dew point temperature(F); RH=relative humidity(%); W_Mag=average wind magnitude(miles-per-hour [mph]); W_Dir=average wind direction(true); G_Mag=gust wind magnitude(mph)

[3] Exact location and elevation of KCMS and KPER are not known. Varying information is available from authoritative sources. A request to the National Weather Service (NWS) Weather Forecast Office (WFO) in Riverton, Wyoming, could not resolve this issue.

2132	27.1°	22.9°	84	8.7	280°	13.7
2137	27.0°	22.7°	84	6.9	280°	13.0
2142	26.8°	22.3°	83	8.7	280°	13.7
2147	26.8°	22.0°	82	8.7	280°	13.7
2152	26.4°	21.6°	82	8.7	280°	13.0
2157	26.2°	21.7°	83	7.5	270°	11.8

Unofficial meteorological reporting station KPER was located between 17 and 23 miles east-southeast of the accident site at an unknown elevation[3] and its data are provided courtesy of the Wyoming Department of Transportation. Calibration, maintenance and siting standards of this instrument are not known. Reports from KPER during the times surrounding the accident time are presented here.

Time	Temp	D_Temp	RH	W_Mag	W_Dir	G_Mag
2107	29.5°	23.4°	78	17.4	235°	24.9
2112	29.5°	22.8°	76	16.2	240°	26.1
2117	27.7°	23.4°	84	8.7	260°	28.0
2122	27.7°	23.4°	84	7.5	220°	28.0
2127	27.7°	23.7°	85	7.5	195°	21.7
2132	27.7°	23.7°	85	11.8	225°	19.3
2137	28.2°	23.4°	82	16.8	235°	24.9
2142	28.4°	23.2°	81	15.5	235°	24.9
2147	28.0°	22.9°	81	14.3	245°	21.1
2152	27.9°	23.0°	82	11.2	230°	20.5
2157	27.7°	23.1°	83	9.9	220°	17.4

An Automated Surface Observing System was located at Fort Bridger Airport (FBR)[4] in Fort Bridger, Wyoming, which was located about 23 miles southwest of the accident location at an elevation of approximately 7,040 feet. Automated reports from FBR during the times surrounding the accident time are presented here:

[2035 MDT] METAR KFBR 150235Z AUTO 27010KT 10SM BKN030 OVC037 M03/M04 A2996 RMK AO2 T10301045=

[2055 MDT] METAR KFBR 150255Z AUTO 29007KT 10SM BKN022 BKN029 OVC036 M03/M04 A2997 RMK AO2 T10301037=

[2115 MDT] METAR KFBR 150315Z AUTO 29014G18KT 1 1/4SM -SN SCT009 OVC017 M03/M03 A2998 RMK AO2 T10311031=

[2135 MDT] METAR KFBR 150335Z AUTO 27013KT 7SM -SN BKN014 BKN023 OVC110 M03/M03 A2998 RMK AO2 T10351035=

[2155 MDT] METAR KFBR 150355Z AUTO 28013KT 10SM -SN SCT012 BKN023 OVC110 M04/M04 A3000 RMK AO2 T10371038=

[4] The NWS uses the 4-digit International Civil Aviation Organization (ICAO) format for station identifiers (as seen in the body of some formatted weather observations). This report uses the 3-digit International Air Transport Association format for station identification, which does not use the geographic designating digit ("K" for stations in the continental U.S. and "P" for U.S. stations in Alaska and the Pacific region) as found in the ICAO format.

[2215 MDT] METAR KFBR 150415Z AUTO 28012G21KT 10SM SCT018 SCT023 SCT030 M04/M05 A3000 RMK AO2 T10451050=

At 2135 MDT, FBR reported a wind from 270° at 13 knots, visibility of 7 statute miles, light snow, ceiling broken at 1,400 feet above ground level (agl), broken clouds at 2,300 feet agl, overcast clouds at 11,000 feet agl, temperature of -3° Celsius (C) and a dew point temperature of -3°C, altimeter setting of 29.98 inches of mercury; remarks included: station with a precipitation discriminator.

Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-15 and GOES-13 infrared (10.7µm) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. Imagery from near the accident time is presented in figures 1 and 2. Review of the satellite imagery, including loops of the imagery in time, revealed it was likely the accident site was under clear or partly clouds skies at the accident time. It should be noted these figures have not been corrected for any parallax error.

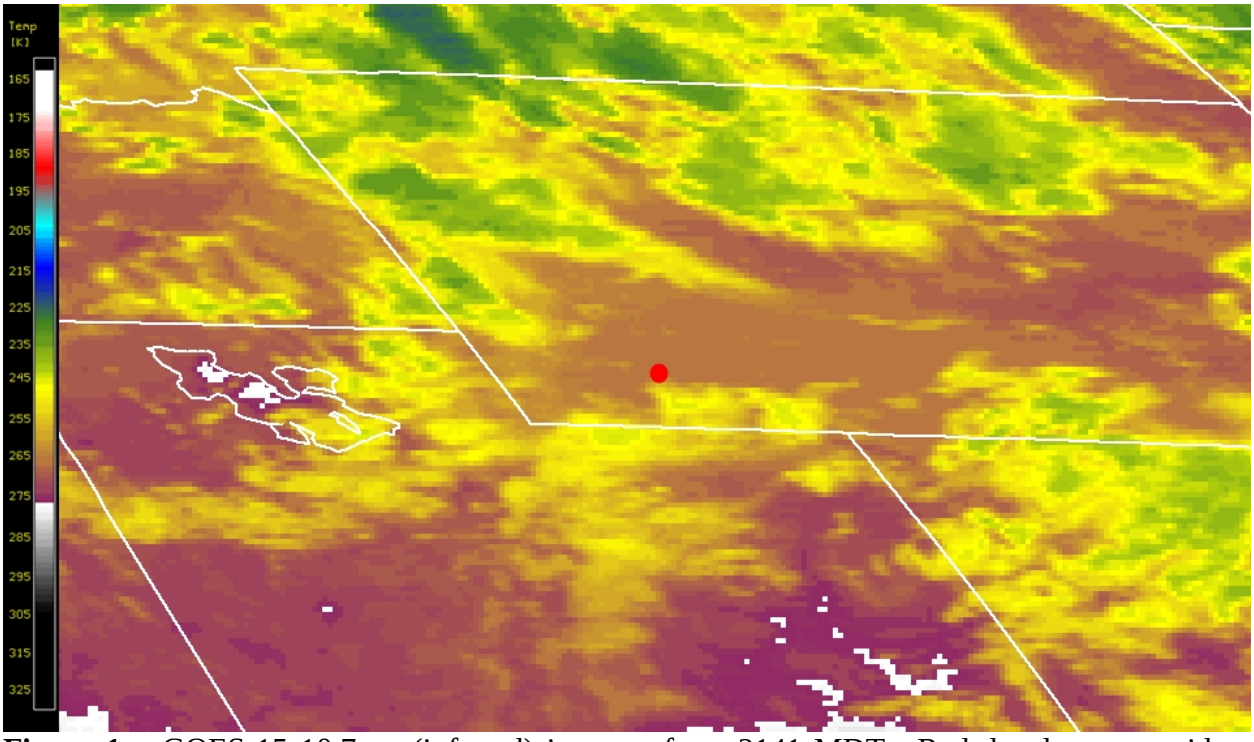

Figure 1 – GOES-15 10.7µm (infrared) imagery from 2141 MDT. Red dot denotes accident location.

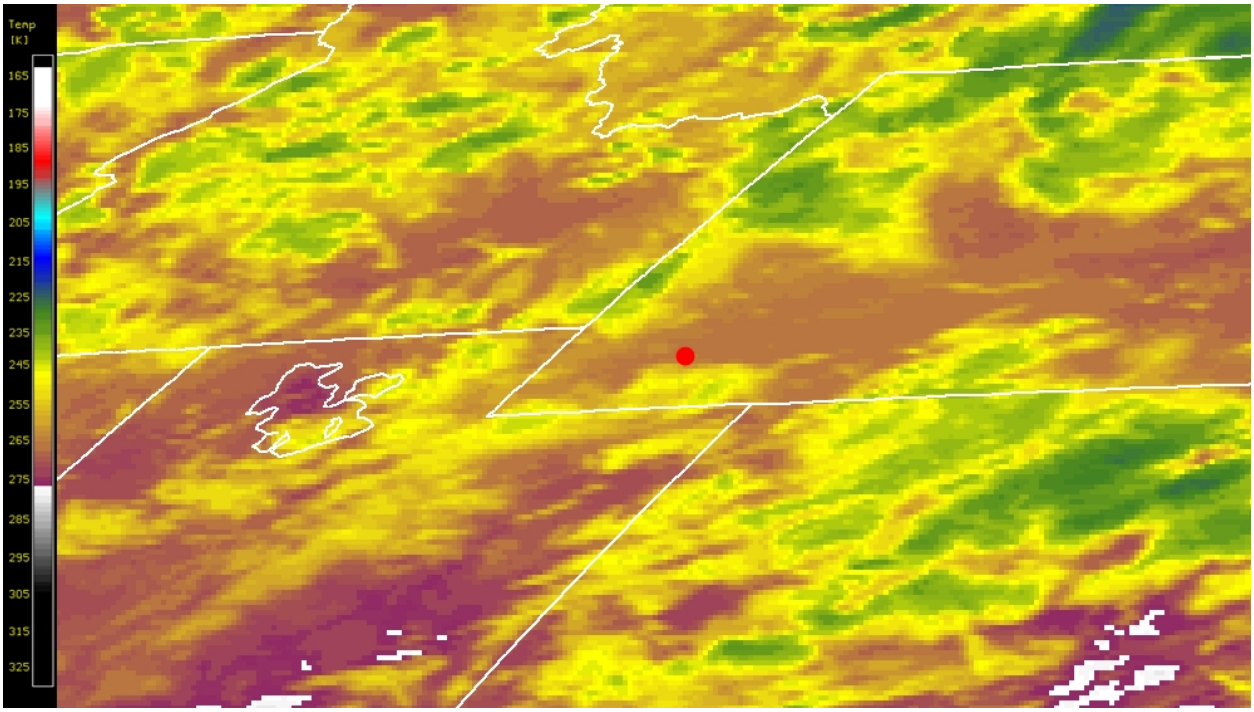

Figure 2 – GOES-13 10.7µm (infrared) imagery from 2145 MDT. Red dot denotes accident location.

Weather Radar

The closest WSR-88D radars to the accident site were KRIW (Riverton, Wyoming) located about 125 miles north-northwest of the accident location, and KMTX (Salt Lake City, Utah) located about 130 miles west of the accident location. WSR-88D data from these radars for the time surrounding the accident time did not identify any pertinent areas of reflectivity, however, due to distance between these radar sites and the accident location, as well as potential beam blockage of the KRIW lower radar tilt beams, reflectivity present at lower levels above the accident location may not have been detectable.

Weather Watches

At 1439 MDT, a Winter Weather Message was issued for the accident region by the NWS WFO in Riverton, Wyoming, that advised of a Winter Weather Advisory in effect until 2100 MDT that evening. The Winter Weather Advisory advised of snow showers with accumulations from 1 to 3 inches, a west wind of 20 to 35 mph with gusts from 40 to 55 mph and visibilities under one-half mile at times in snow and wind.

> WWUS45 KRIW 142039
> WSWRIW
> URGENT - WINTER WEATHER MESSAGE
> NATIONAL WEATHER SERVICE RIVERTON WY
> 239 PM MDT MON MAR 14 2016
> ...SNOW AND BLOWING SNOW ACROSS WESTERN AND SOUTHERN WYOMING EXPECTED TODAY THROUGH EARLY EVENING...

.A STRONG UPPER LEVEL DISTURBANCE AND COLD FRONT WILL PUSH ACROSS WYOMING TODAY...WITH SNOW SHOWERS WITH OCCASIONAL THUNDER AND WIND CONTINUING ACROSS WESTERN WYOMING BEFORE TAPERING OFF THIS EVENING.

WYZ028>030-150300-
/O.CON.KRIW.WW.Y.0012.000000T0000Z-160315T0300Z/
ROCK SPRINGS AND GREEN RIVER-FLAMING GORGE-EAST SWEETWATER COUNTY- INCLUDING THE CITIES OF...ROCK SPRINGS...GREEN RIVER...WAMSUTTER
239 PM MDT MON MAR 14 2016

...WINTER WEATHER ADVISORY REMAINS IN EFFECT UNTIL 9 PM MDT THIS EVENING...

* TIMING...SNOW SHOWERS TO CONTINUE INTO THE EVENING.
* SNOW ACCUMULATION...1 TO 3 INCHES.
* WIND AND VISIBILITY...WEST 20 TO 35 MPH WITH WIND GUSTS 40 TO 55 MPH. VISIBILITY MAY DROP TO UNDER ONE HALF MILE AT TIMES IN SNOW AND WIND.
* IMPACTS...TRAVEL WILL LIKELY BECOME DIFFICULT AS ROADS BECOME SNOW PACKED...SLICK AND SLUSHY WITH POOR VISIBILITY ALONG INTERSTATE 80. TRAVELERS SHOULD ALSO BE ALERT FOR THIS SIGNIFICANT STORM WITH PLENTY OF WIND AND SNOW. BEFORE TRAVELING... MOTORISTS SHOULD CHECK THE LATEST ROAD CONDITIONS BY VISITING WYOROAD.INFO OR BY DIALING 5 1 1.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A WINTER WEATHER ADVISORY FOR SNOW AND BLOWING SNOW MEANS THAT VISIBILITIES WILL BE LIMITED DUE TO STRONG WINDS BLOWING SNOW AROUND. USE CAUTION WHEN TRAVELING... ESPECIALLY IN OPEN AREAS.

At 2054 MDT, the NWS WFO in Riverton, Wyoming, issued a Winter Weather Message that advised that the Winter Weather Advisory in effect would be allowed to expire at 2100 MDT noting that snow had decreased in most areas.

WWUS45 KRIW 150254
WSWRIW
URGENT - WINTER WEATHER MESSAGE
NATIONAL WEATHER SERVICE RIVERTON WY
854 PM MDT MON MAR 14 2016

...SIGNIFICANT SNOW CONTINUES OVER THE TETON MOUNTAINS THROUGH TUESDAY EVENING...

.A MOIST NORTHWEST FLOW IN WAKE OF THE MAIN STORM SYSTEM WILL CONTINUE TO RESULT IN PERIODS OF SNOW ACROSS THE WESTERN MOUNTAINS THROUGH TUESDAY EVENING. THE HEAVIEST SNOWFALL IS EXPECTED TO OCCUR ACROSS THE TETON MOUNTAINS TUESDAY AFTERNOON.

WYZ028>030-150400-
/O.EXP.KRIW.WW.Y.0012.000000T0000Z-160315T0300Z/

ROCK SPRINGS AND GREEN RIVER-FLAMING GORGE-EAST SWEETWATER COUNTY- INCLUDING THE CITIES OF...ROCK SPRINGS...GREEN RIVER...WAMSUTTER
854 PM MDT MON MAR 14 2016
...WINTER WEATHER ADVISORY WILL EXPIRE AT 9 PM MDT THIS EVENING... SNOW HAS DECREASED IN MOST AREAS...AND THE WINTER WEATHER ADVISORY HAS BEEN ALLOWED TO EXPIRE.

Astronomical Data

The astronomical data obtained from the United States Naval Observatory for N41° 36’ and W109° 58’W, indicated the following:

SUN

Sunset	1926 MDT
End Civil Twilight	1954 MDT

MOON

Moonrise	1132 MDT
Moonset	0212 MDT (March 15, 2016)

Submitted by: Mike Richards
NTSB, AS-30