

**NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.**

DCA19FA089

AIRPORT SPECIALIST'S FACTUAL REPORT

ATTACHMENT 4

SNOW DEPTH MEASUREMENTS

5 Pages

Snow depth measurements in the area in front of the localizer antenna were obtained on March 5, 2019 by a surveying company contracted by PQI (BRSA, Presque Isle, ME). The information from the BRSA survey is contained in figures 1-3.

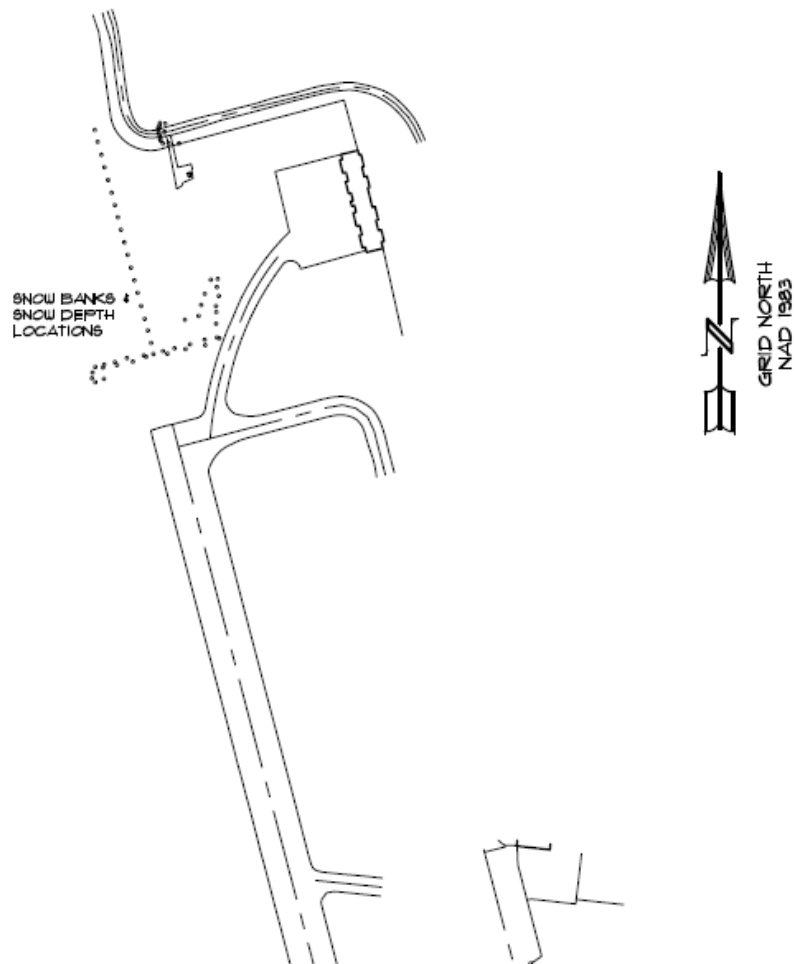
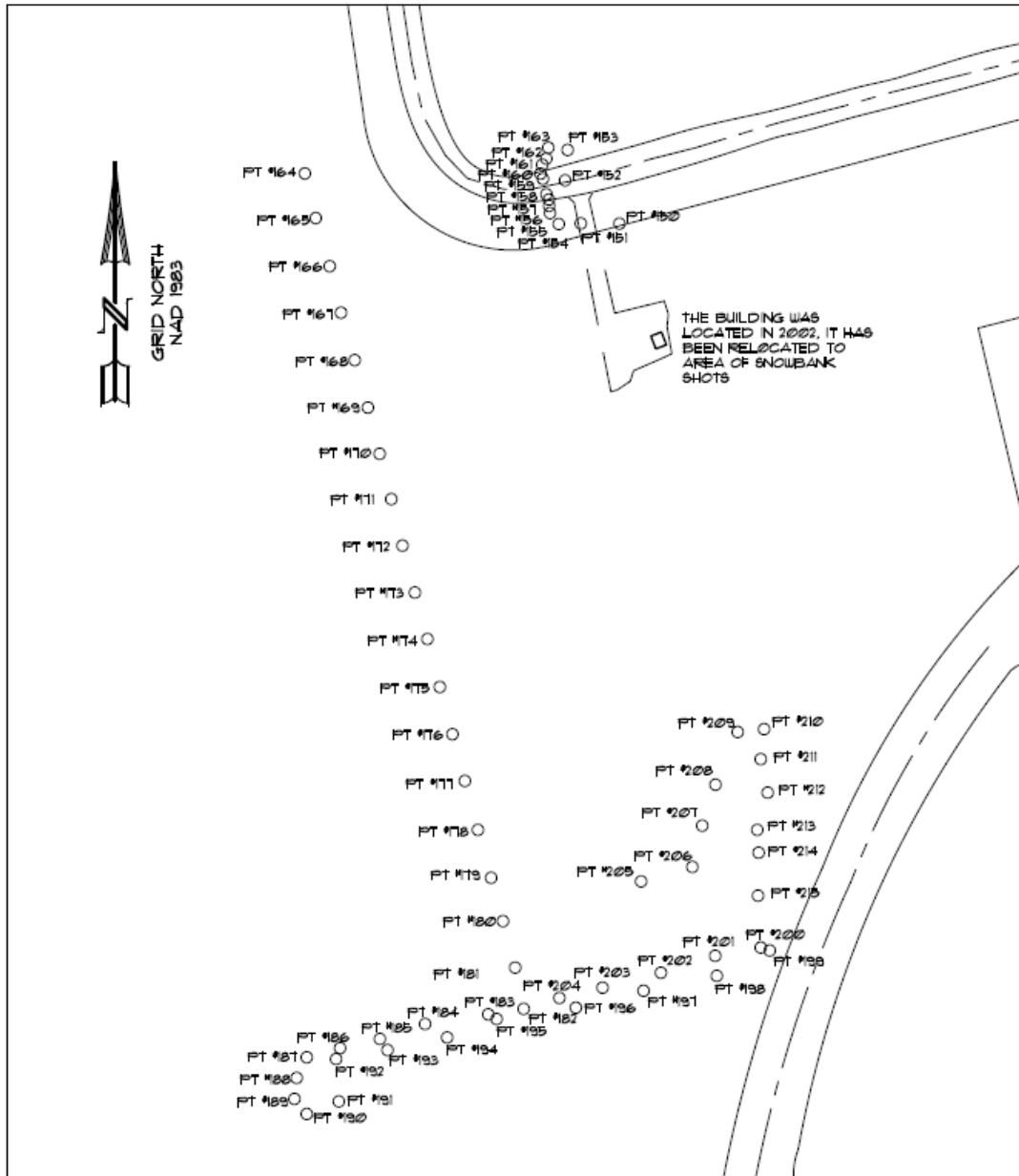


Figure 1. Overview of locations at north end of runway where snow depth measurements were obtained by PQI.



ENLARGED SNOW DEPTH LOCATIONS

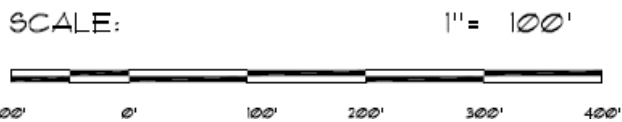


Figure 2. Locations where snow depth measurements were taken (see figure 3).

SNOW BANK ELEVATIONS & SNOW DEPTH CHART									
PT #	PT DESC	PT ELEV	PT DEPTH	REMARKS	PT #	PT DESC	PT ELEV	PT DEPTH	REMARKS
150	BOTTOM SNOW BANK	543.0			183	TOP SNOW BANK	531.1		
151	BOTTOM SNOW BANK	543.1			184	TOP SNOW BANK	531.1		
152	BOTTOM SNOW BANK	544.1			185	TOP SNOW BANK	530.4		
153	BOTTOM SNOW BANK	545.0			186	TOP SNOW BANK	530.4		
154	TOP SNOW BANK	552.7			187	TOP SNOW BANK	532.1		
155	TOP SNOW BANK	554.6			188	TOP SNOW BANK	535.3		
156	TOP SNOW BANK	554.4			189	TOP SNOW BANK	535.3		
157	TOP SNOW BANK	552.5			190	TOP SNOW BANK	535.3		
158	TOP SNOW BANK	554.1			191	BOTTOM SNOW BANK	526.1		
159	TOP SNOW BANK	554.4			192	BOTTOM SNOW BANK	526.8		
160	TOP SNOW BANK	552.6			193	BOTTOM SNOW BANK	526.2		
161	TOP SNOW BANK	554.4			194	BOTTOM SNOW BANK	526.3		
162	TOP SNOW BANK	553.6			195	BOTTOM SNOW BANK	526.5		
163	TOP SNOW BANK	552.6			196	BOTTOM SNOW BANK	526.2		
164	GROUND SHOT	548.4	3.1'		197	BOTTOM SNOW BANK	526.4		
165	GROUND SHOT	547.6	3.4'		198	BOTTOM SNOW BANK	526.1		
166	GROUND SHOT	546.8	2.5'		199	BOTTOM SNOW BANK	528.1		
167	GROUND SHOT	546.0	2.5'		200	TOP SNOW BANK	531.4		
168	GROUND SHOT	544.9	2.7'		201	TOP SNOW BANK	530.8		
169	GROUND SHOT	544.0	3.1'		202	TOP SNOW BANK	530.4		
170	GROUND SHOT	543.2	2.3'		203	TOP SNOW BANK	531.0		
171	GROUND SHOT	542.1	2.5'		204	TOP SNOW BANK	530.9		
172	GROUND SHOT	541.4	2.7'		205	TOP SNOW BANK	533.4		
173	GROUND SHOT	540.6	2.8'		206	TOP SNOW BANK	533.6		
174	GROUND SHOT	539.4	2.4'		207	TOP SNOW BANK	535.7		
175	GROUND SHOT	537.8	2.4'		208	TOP SNOW BANK	537.8		
176	GROUND SHOT	536.5	2.4'		209	TOP SNOW BANK	541.1		
177	GROUND SHOT	534.7	2.8'		210	TOP SNOW BANK	540.8		
178	GROUND SHOT	531.9	3.3'		211	TOP SNOW BANK	540.4		
179	GROUND SHOT	530.2	2.9'		212	TOP SNOW BANK	537.4		
180	GROUND SHOT	530.8	2.9'	WITHIN SNOWBLOWED SNOW	213	TOP SNOW BANK	535.2		
181	GROUND SHOT	530.6	1.7'	WITHIN SNOWBLOWED SNOW	214	TOP SNOW BANK	534.0		
182	TOP SNOW BANK	530.9			215	TOP SNOW BANK	532.6		

NOTES:

1. A STANDARD PRISM POLE WAS PUSHED INTO THE SNOW TO REFUSAL. THIS POINT WAS ASSUMED TO BE THE BASE OF THE SNOW PACK/ICE. FROZEN/PACKED SNOW CONDITIONS AT BASE LAYER MAY BE PRESENT.
2. ELEVATIONS REPORTED ARE AT THE REFUSAL POINT.
3. SNOW DEPTHS WERE MEASURED AT THE TIME OF THE MAPPING.

Figure 3. Snow depth measurements at locations specified.

On March 5-7, the NTSB Aircraft Performance Group Chairman and members of the on-scene Aircraft Performance Group convened at KPQI and surveyed ground scars, markings, and debris locations. In addition, members of the APG and Airworthiness Group measured depths of the snow field at 50 locations between the localizer antenna array and the end of runway 1. Fifty snow depth measurements were taken between the end of runway 1 and the ILS localizer antenna.

The items surveyed by the APG included:

- Two large “divots” or craters in a snow bank just northeast of the runway 1 / runway 10 intersection, about 1580 ft. from the threshold and about 220 ft. to the right of runway 1, which may have been created by the impact of the airplane’s main gear and is the first evidence of the airplane’s contact with the ground.
- Two long “furrows” (scrapes in the snow) to the right of runway 1, leading from a point about 60 ft. north of the divots to the final resting point of the airplane, about 3500 ft. from the threshold and about 300 ft. to the right of runway 1.
- The location of various larger pieces of wreckage, including the right main gear, the right inboard flap, and the airplane’s weather radar.
- Miscellaneous smaller pieces of wreckage (not all visible items were surveyed).

The results of the survey are shown in Figure 4, which plots the surveyed items over a plan view of the runway environment in “runway axes.” The runway 1 x axis originates at the threshold and extends down the runway to the threshold of runway 19. The runway 1 y axis originates at the threshold and extends to the right (east) normal to the centerline of the runway.

The top plot in Figure 1 depicts the full length of runway 1, and all of the surveyed items except for smaller pieces of debris (these smaller items are included in the *Google Earth* .kmz file described below). Figure 1 also shows the results of the snow depth measurements between the end of the runway and the localizer array.

The middle plot of Figure 1 is an expanded view of the area of the initial main gear divots, the furrows through the snow, and the final location of the airplane. The labels at each of the furrow survey points indicate the width of the furrow in feet, as measured with a tape measure.

The bottom plot of Figure 1 is an expanded view of the area between the end of the runway and the localizer array in which snow depth measurements were taken. The measured depths in feet are depicted by the point labels and by the color of the points, as indicated by the color scale. The same color scale applies to the snow depth points plotted at the top of Figure 2. The measurements show an asymmetrical snow depth distribution across the width of the localizer array, with deeper snow on the left side (looking back towards the runway) than on the right side. The snow depth measurements are described further below.

DCA19FA089: United Express flight 4933, EMB-145XR, N14171, Presque Isle, Maine, March 4 2019

Plan view of surveyed airplane path and snow depths

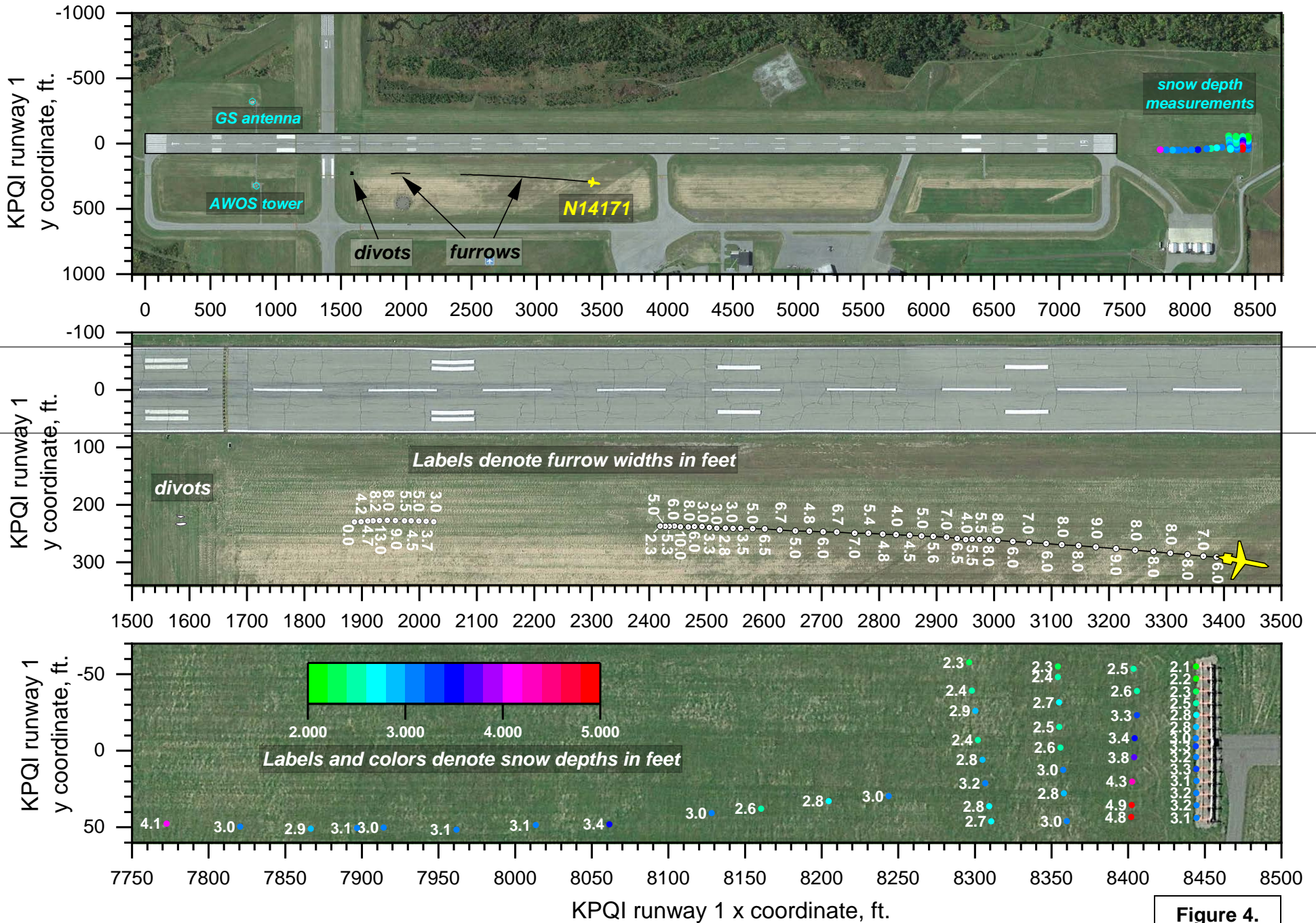


Figure 4.