



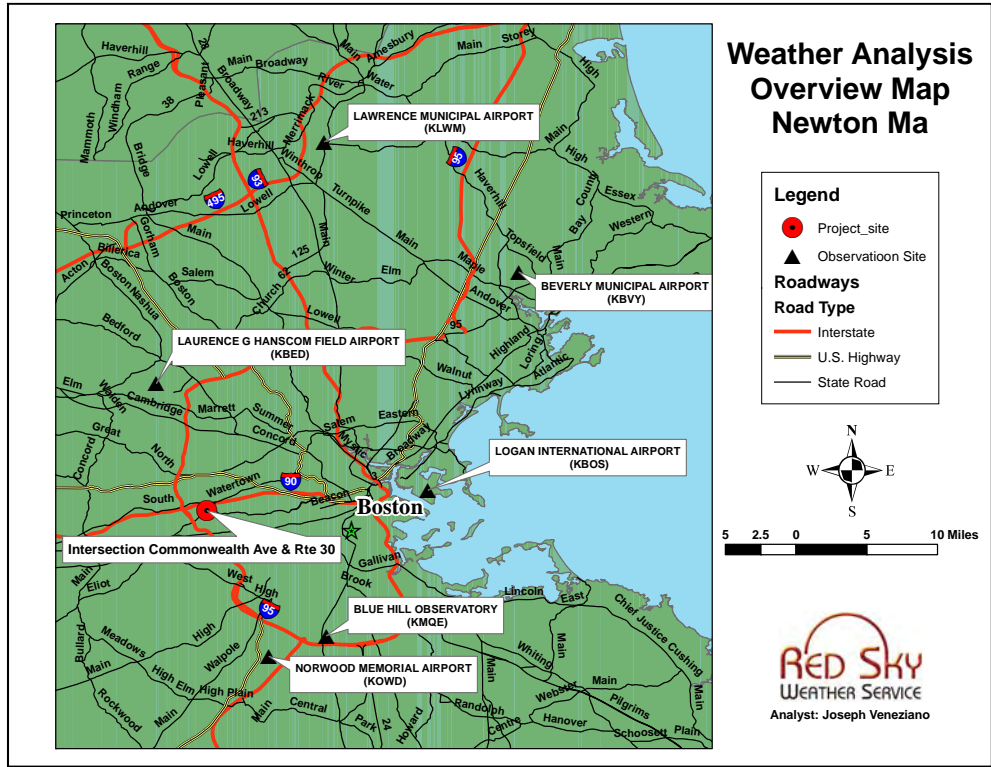
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**Historical Weather Study of
Intersection of Commonwealth Ave and
Route 30, Newton MA
January 12-13, 2011**

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1. Report Overview

This report will detail the weather that occurred in the vicinity of the intersection of Commonwealth Ave and Route 30, in Newton Massachusetts during the period January 12 and 13, 2011, figure 1. The weather report will focus on the elements, air temperature and precipitation, that may have contributed to the traffic incident that occurred at this intersection at approximately 5:45 PM on January 13. To facilitate the analysis of the weather



at this location, the weather observations from six official U.S. National Weather Service weather observation stations were reviewed, as depicted in figure 1, and listed in table 1. Elements of these observations were extracted, and geo-statistically analyzed to determine the most probable conditions that may have occurred at the intersection.

The weather observation stations used in this analysis were:

Callsign	Name	Country	State	Lon	Lat	Elev (m)
KLWM	LAWRENCE MUNI	US	MA	-71.117	42.717	46.0
KBVY	BEVERLY MUNI	US	MA	-70.918	42.584	32.0
KBED	BEDFORD HANSCOM FIELD	US	MA	-71.289	42.47	40.0
KBOS	BOSTON LOGAN INT'L ARPT	US	MA	-71.011	42.361	9.0
KMQE	EAST MILTON – BLUE HILL OBSERVATORY	US	MA	-71.115	42.212	193.0
KOWD	NORWOOD MEMORIAL	US	MA	-71.174	42.191	15.0

Table 1: Weather observation sites

2. Incident Period Weather Overview

During the period leading up to the incident, a record snowfall event occurred in the region, with over 14.6 inches of snowfall recorded at the NWS office at Boston’s Logan International Airport. Data indicates that precipitation was recorded at all stations used for this analysis, with precipitation beginning at approximately 1 AM on January 12, and peaking in the early morning hours, near 6 AM and 7 AM, figure 2 refers. A second major precipitation event was recorded at the Blue Hill Observatory in East Milton in the late afternoon on January 12.

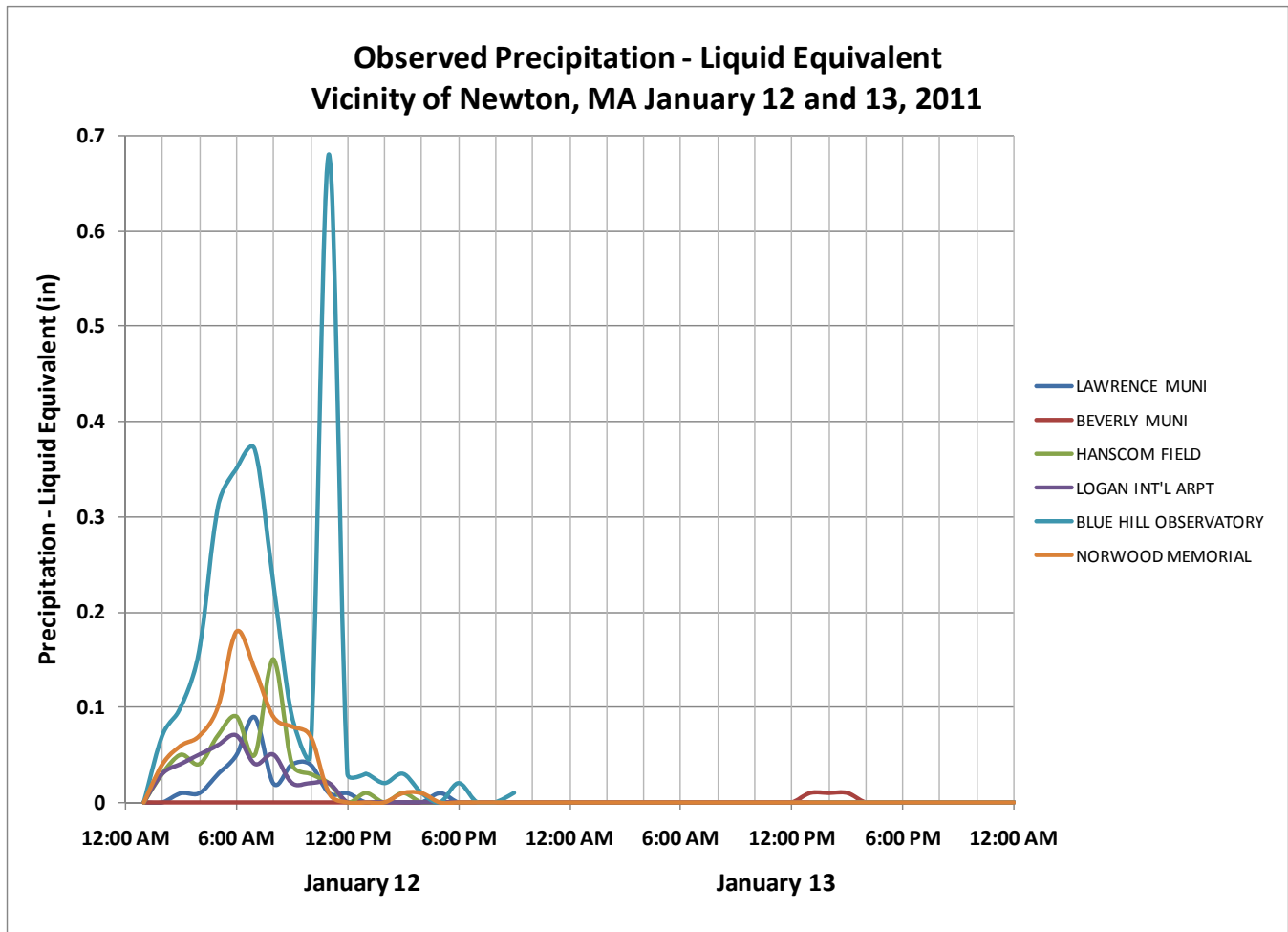


Figure 2: Observed precipitation - Liquid equivalent

Air temperatures across the region were predominately below freezing for the entire period, with the exception of at Logan International where air temperatures were above freezing until the mid-morning, near 10 AM, on January 12. Air temperatures across the region ranged between the mid 20s F to low 30s F through the period until the afternoon of January 13, when air temperatures uniformly and rapidly dropped. Air temperatures began to drop around 3 PM on January 13, and continued to drop throughout the day, reaching lows in the mid teens, to low 20s F by midnight, figure 3.

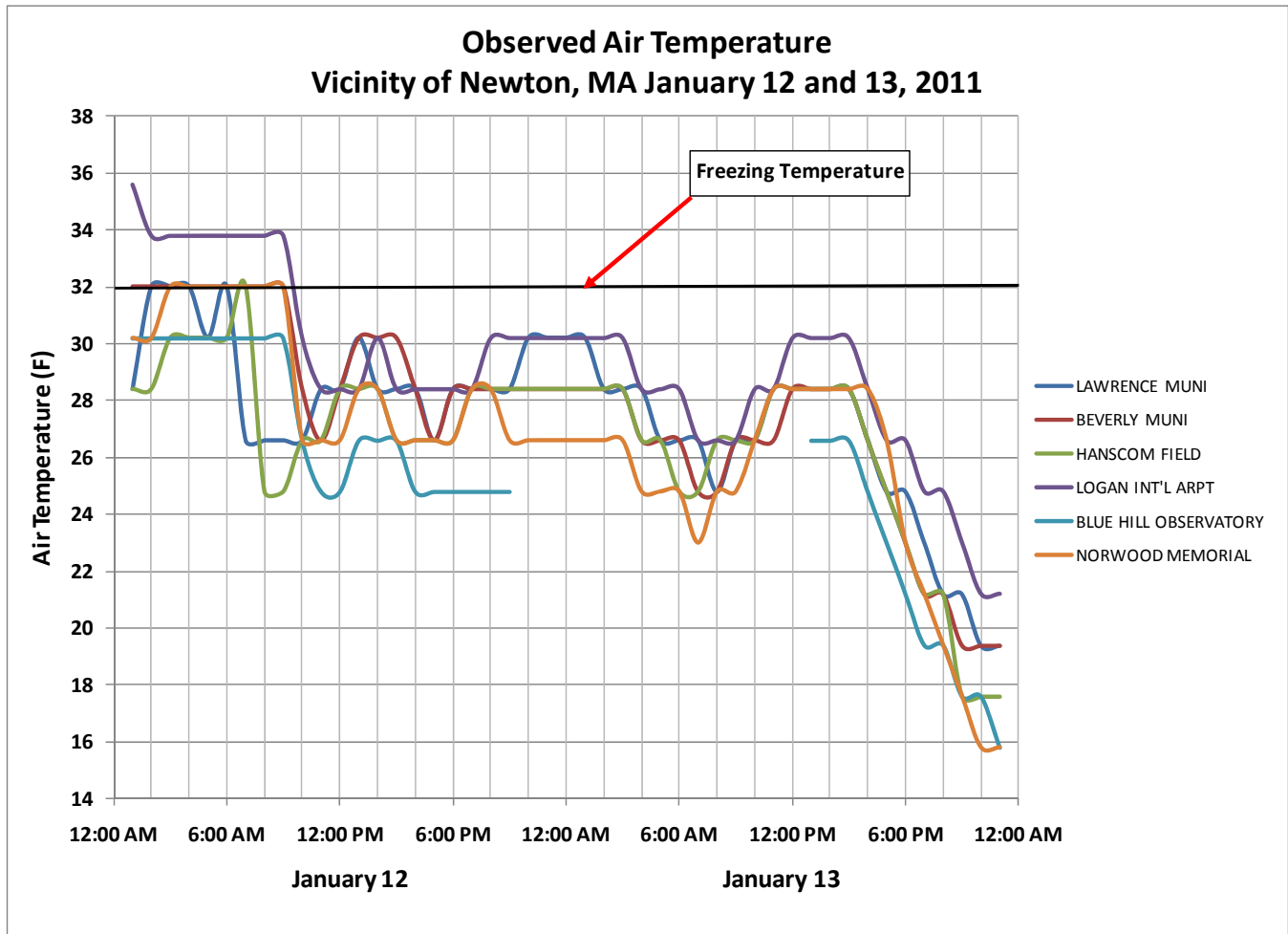


Figure 3: Observed air temperatures (f)

3. Site Weather Analysis

An analysis of precipitation and air temperature at the site of interest, the intersection of Commonwealth Ave and Route 30, was conducted utilizing an inverse distance weight scheme. This analysis indicated that air temperatures at the site were below freezing for the entire period, January 12 and 13, 2011, figure 4, and Analysis Summary Table. Temperatures were in the low 30s F on January 12 when precipitation began to fall across the region. At the first peak of the precipitation event, near 6 AM on January 12, air temperature was approximately 31 F. Air temperature dropped through the morning, reaching a low of approximately 26 F at 11 AM, at the same time that the second precipitation event occurred at the site. The second precipitation event ended near 12 PM (noon). Light precipitation most probably continued to fall through the course of the day, ending at approximately 10 PM or 11 PM that evening, as is indicated in area weather reports.

Air temperatures remained fairly constant through the afternoon and in the very early morning hours of January 13, ranging between approximately 26 F and 28 F. In the early morning hours of January 13 however, air temperatures dropped to near 24 F, at approximately 7 AM. Air temperature then began to steadily rise through

the late morning, reaching a high of approximately 28 F near noon on January 13. This rise in temperatures was produced by solar heating, and not the influx of warm air into the region. Sunrise on January 13 occurred at 7:12 AM, and a review of the weather observations indicated that skies across the region, while overcast in the early morning hours, became scattered to broken after 8 AM. After noon on that day, skies became predominately clear across the region.

Air temperatures began to rapidly drop at the site around 3 PM, and steadily fell through the remainder of the evening, reaching a low of approximately 17 F near midnight.

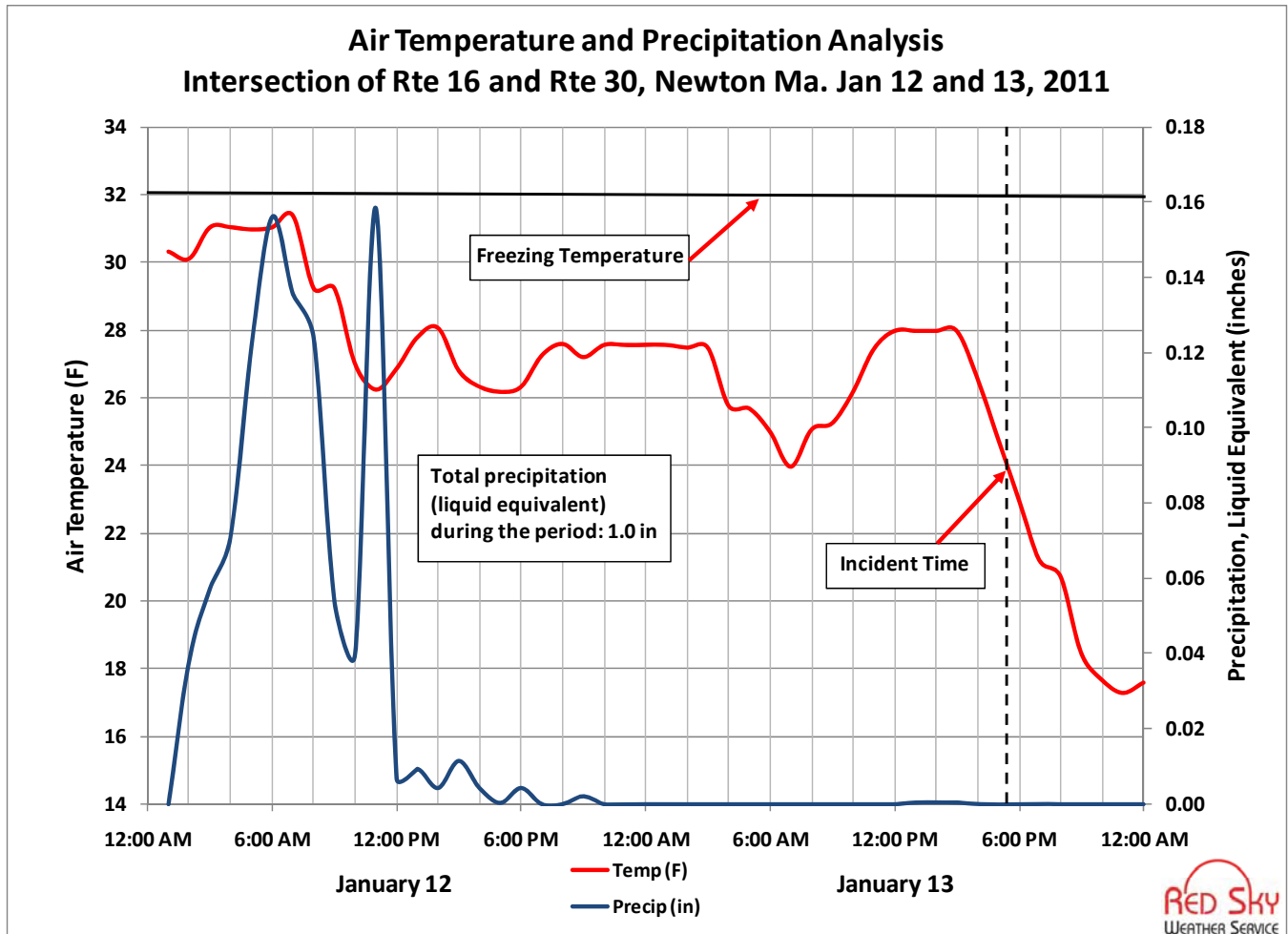


Figure 4: Site temperature and precipitation analysis

Note that at the time of the incident, approximately 5:45 PM that the air temperature was approximately 24 F.

4. Incident Weather Conditions

Analysis indicates that there was a significant amount of snow fall across the entire region on January 12, the day prior to the event. In addition, air temperatures at the site of interest were below freezing for January 12 and 13, indicating that any snow that had fallen the previous day was most probably still present at the site of interest at the time of the incident. Note however, that air temperatures reached approximately 28 F about 3

hours prior to the incident. As the atmosphere heats from the earth's surface upward, and because the sky's across the region were clear to scattered from 8 AM onward, this indicates that while the air temperature was below the freezing point, that any area exposed to sunlight would most probably heat up to a temperature above freezing during the course of the morning and early afternoon. In addition, a review of the intersection in question shows that it is a fairly heavily traveled road; therefore vehicular traffic would have also contributed to near surface heating during the course of the day. Hence, most probably there were areas at the intersection where surface temperatures were above freezing during the early afternoon on January 13. These above freezing surface temperatures would have caused some melting of frozen precipitation in the area, leaving patches of liquid water. However, with the onset of night, sunset occurred at 4:35 PM, temperatures rapidly fell after 3 PM on January 13. By the time of the event, 5:45 PM, air temperatures had most probably fallen to 24 F at the site. A reduction in surface heating in the late afternoon and after sunset at the site would also rapidly decrease surface temperatures. Most probably, by the late afternoon on January 13, those patches of liquid water produced during the afternoon melting, would have begun to refreeze, creating icy conditions at the intersection.

Site Weather Analysis

Site: Intersection of Route 16 and Route 30, Newton MA
 Period: January 12 through January 13, 2011



Date	Time (local)	Temp (F)	Pressure (hPa)	Precip (in)	Area Observed Significant Weather	Ceiling Height (ft)	Visibility (mi)	Wind Direction (degrees)	Wind Speed (mph)	Wind Gusts (mph)
Wed Jan 12	1:00 AM	30	1013.2	0.00	Light Snow, Mist	2,857	6.8	61	5.2	
	2:00 AM	30	1010.6	0.04	Light Snow, Mist	1,229	1.1	66	9.7	13.1
	3:00 AM	31	1007.1	0.06	Snow, Fog, Light Snow, Mist, Freezing Fog	855	0.9	64	14.8	23.2
	4:00 AM	31	1003.9	0.07	Snow, Fog, Light Snow, Mist, Freezing Fog	817	0.6	62	16.9	26.9
	5:00 AM	31	1001.5	0.12	Heavy Snow, Freezing Fog, Snow, Fog		0.3	55	19.0	28.1
	6:00 AM	31	990.6	0.16	Heavy Snow, Fog, Freezing Fog, Snow		0.3	50	15.9	27.0
	7:00 AM	31	965.6	0.14	Heavy Snow, Freezing Fog, Snow, Fog		0.4	40	17.8	29.5
	8:00 AM	29	937.1	0.12	Heavy Snow, Freezing Fog, Fog, Snow		0.3	27	17.8	28.5
	9:00 AM	29	921.9	0.05	Freezing Fog, Snow, Fog		0.3	17	15.6	26.5
	10:00 AM	27	908.4	0.04	Freezing Fog, Snow, Heavy Snow		0.2	349	14.3	23.7
	11:00 AM	26	898.9	0.16	Freezing Fog, Snow, Heavy Snow, Light Snow		0.4	327	15.2	24.9
	12:00 PM	27	903.8	0.01	Freezing Fog, Snow, Heavy Snow, Blowing Snow, Light Snow, Mist		0.6	317	15.8	25.2
	1:00 PM	28	898.0	0.01	Mist, Snow, Freezing Fog, Light Snow, Blowing Snow	1,612	1.0	310	16.2	26.6
	2:00 PM	28	909.8	0.00	Light Snow, Mist, Snow, Freezing Fog	2,318	1.1	308	16.1	26.5
	3:00 PM	27	926.0	0.01	Light Snow, Mist, Snow, Freezing Fog	1,710	0.7	306	15.8	24.4
	4:00 PM	26	939.7	0.00	Light Snow, Mist	3,028	2.1	308	15.8	23.3
	5:00 PM	26	951.6	0.00	Light Snow, Mist, Snow, Freezing Fog	3,723	1.8	307	15.2	22.9
	6:00 PM	26	965.1	0.00	Light Snow, Mist	3,009	2.4	309	13.4	21.6
	7:00 PM	27	978.2	0.00	Light Snow, Mist	3,517	5.6	311	12.1	18.7
	8:00 PM	28	988.3	0.00	Light Snow	3,636	6.5	303	13.8	19.1
	9:00 PM	27	994.9	0.00	Light Snow, Mist	6,566	8.7	302	11.0	18.4
	10:00 PM	28	999.8	0.00	Light Snow, Mist	4,296	7.1	311	11.0	20.5
	11:00 PM	28	1001.9	0.00	Light Snow	3,542	9.7	307	9.5	15.3
	12:00 AM	28	1002.9	0.00		3,781	9.5	302	10.3	17.6
Thu Jan 13	1:00 AM	28	1004.2	0.00		4,013	10.0	303	10.9	17.2
	2:00 AM	27	1005.8	0.00		4,683	10.0	304	11.8	19.6
	3:00 AM	27	1007.1	0.00		5,619	10.0	309	10.3	15.1
	4:00 AM	26	1008.3	0.00			10.0	308	10.7	17.0
	5:00 AM	26	1009.4	0.00			10.0	308	9.4	14.5
	6:00 AM	25	1010.7	0.00			10.0	308	10.1	16.5
	7:00 AM	24	1012.1	0.00			10.0	310	10.3	16.1
	8:00 AM	25	1013.6	0.00			10.0	326	12.9	17.9
	9:00 AM	25	1015.1	0.00			10.0	307	11.6	19.0
	10:00 AM	26	1015.9	0.00			10.0	309	12.6	19.5
	11:00 AM	27	1015.7	0.00			10.0	322	12.8	21.5
	12:00 PM	28	1015.8	0.00			9.9	305	14.7	20.5
	1:00 PM	28	1016.1	0.00			10.0	311	14.6	22.6
	2:00 PM	28	1016.6	0.00			10.0	313	14.0	21.9
	3:00 PM	28	1017.6	0.00			9.9	310	10.7	17.8
	4:00 PM	27	1018.4	0.00			10.0	311	11.6	18.6
	5:00 PM	25	1019.4	0.00			10.0	316	9.4	12.6
	6:00 PM	23	1020.3	0.00			10.0	319	8.2	12.2
	7:00 PM	21	1021.1	0.00	Haze		8.6	310	8.6	12.9
	8:00 PM	21	1021.5	0.00			10.0	315	8.0	11.9
	9:00 PM	18	1021.9	0.00			10.0	315	7.9	
	10:00 PM	18	1022.3	0.00			10.0	308	7.5	
	11:00 PM	17	1022.7	0.00			9.8	312	6.8	11.5
	12:00 AM	18	1022.7	0.00			10.0	318	6.3	12.0
Period Statistics	Maximum	31	1022.7	0.16		6,566	10		19	29
	Average	26	989.4	0.02		3,201	6		12	20
	Minimum	17	898.0	0.00		817	0		5	12
	Total			1.00						

Site Weather Analysis Summary