Extreme Precipitation in New York & New England

[http://www.precip.net]

Technical Documentation & User Manual

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About This Project

Background

Extreme precipitation events can produce localized urban and widespread flooding with damage to property, degradation of water quality, and potential loss of life. This risk can be especially serious, both ecologically and economically, where development has created or is creating a high fraction of impervious land cover. The climatology of very large precipitation events is therefore a critical component of engineering design and regulations for structures and facilities that must withstand or protect against such events. On a national level, a comprehensive climatology of rainfall events has not been updated since the early 1960s (Hershfield 1961). An update to this national analysis, NOAA Atlas 14, has been ongoing for the last three decades (Bonnin et al 2006). A regional approach is being used with analyses completed for the southwestern, Hawaiian, and middle Atlantic regions of the U.S. The Mid-Atlantic analysis extends as far north as Pennsylvania and thus excludes New York and New England.

The aim of this project was to develop a web-based platform that allows users access to updated extreme rainfall analyses for New York and New England. An analysis period, starting at the beginning of a station's record and extending through 2008 was selected via feedback from the user community. This period of record, ending in 2008, provides a standard upon which regulations, engineering design specifications, and policy can be based. However, given current trends and projected changes in extreme rainfall, the establishment of a fixed base is problematic. In fact, previous static approaches have lead to the current problems of outdated and frequently updated analyses. Thus, the methods used facilitate automated future updates of the atlas as potential changes in extreme rainfall frequency are realized. Such updates, if warranted, are likely to occur on decadal time scales as more frequent updates present an undesirable moving target to decision makers.

The website will provide a subset of users access to extreme rainfall statistics through the most recent year (i.e., there will be an automatic update of the rainfall statistics on an annual basis). In future years, these updates will provide the necessary information for considering subsequent updates and provide a readily available source of updated statistics. In other words, the already calculated updated rainfall statistics can be adapted as the new standard if desired. If a NOAA-based update of extreme rainfall becomes available for these states, it is envisioned that

the site can be adapted to use the NOAA values as the standard, if that is desired.

Goals

The overall goal of this project was to develop and make available sound data that will assist in estimating expected extreme rainfall amounts across New York and New England. To meet this goal there are six primary deliverables:

1. Gridded 1, 2, 5, 10, 25, 50, 100, 200 and 500-year return period precipitation amounts computed for durations of 5, 10, 15, 30, 60, and 120 minutes; 1, 2, 3, 6, 12, 24, and 48 hours; and 1, 2, 4, 7, and 10 days. These data are available in tabular format for inclusion in NRCS software that relies on the NOAA Atlas 14 format for extreme rainfall return intervals and accumulation periods. These grids were created using a customized regionalization, gridding, and smoothing routine, as we do not have the capability to generate PRISM-based interpolations that include elevation effects as are used in NOAA Atlas 14

2. A revised set of isohyetal maps for New York, New England and bordering states developed using the gridded data produced in goal 1. These maps provide visual information for users without GIS capabilities.

3. Station-based extreme rainfall intensity-duration-frequency curves for each analysis period.

4. Gridpoint specific 24-hour rainfall distribution curves. For this work, the traditional option of using Type II and Type III curves for the Northeast is omitted. Instead, station-specific symmetrical distribution curves are used based on the interpolated daily and hourly return period precipitation amounts and region-specific n-minute extreme precipitation ratios.

5. An interactive electronic atlas, available on the Internet to disseminate the suite of climatological products, designed based on feedback from the user community. The site is maintained and operated by the Northeast Regional Climate Center.

6. A monitoring website that highlights stations that exceeded their daily extreme rainfall return period accumulation (1, 2, 5, 10, 25, 50, and 100 year) during the previous day. The site is updated daily.

Data

National Weather Service (NWS) Cooperative Observer Network (COOP) daily precipitation data were the primary source of data for this analysis. The data were obtained from the Applied Climate Information System (ACIS) operated by the National Oceanic and Atmospheric Administrations (NOAA) Regional Climate Center Program. The data reflect National Climatic Data Center (NCDC) archive-quality values from datasets TD3200, TD3206, and TD3210. These data have undergone standard quality control screening at NCDC. Daily data were also obtained for Canadian stations bordering this region. These were available from the NCDC Global Surface Summary of the Day Dataset. Likewise, U.S. data from the bordering states of New Jersey, Pennsylvania and Ohio were included to allow consistent extreme rainfall representation in transitional regions. A total of 1,320 daily stations were available across the study region and bordering areas.

Hourly resolution data were obtained for 379 sites from NCDC data set TD3240 and at a limited number of stations (27) n-minute data were obtained from TD9649. **Table 1** lists the number of hourly, n-minute and daily stations in each state. The geographic distribution of stations is shown in **Figure 1** (daily) and **Figure 2** (hourly) and **Figure 3** (n-minute). A complete listing of stations with analysis periods is available in **Appendix A**.

	Daily Stations	Hourly Stations	N-minute Stations
Connecticut (CT)	61	12	1
Maine (ME)	76	21	2
Massachusetts (MA)	112	19	2
New Hampshire (NH)	64	22	1
New Jersey (NJ)	90	17	2
New York (NY)	319	74	7
Ohio (OH)	229	82	6
Pennsylvania (PA)	302	113	4
Rhode Island (RI)	8	2	1
Vermont (VT)	59	17	1
Canada	649	N/A	N/A
TOTAL (exc. Canada)	1320	379	27

Table 1: Number of daily, hourly, and n-minute stations used in analysis by state.

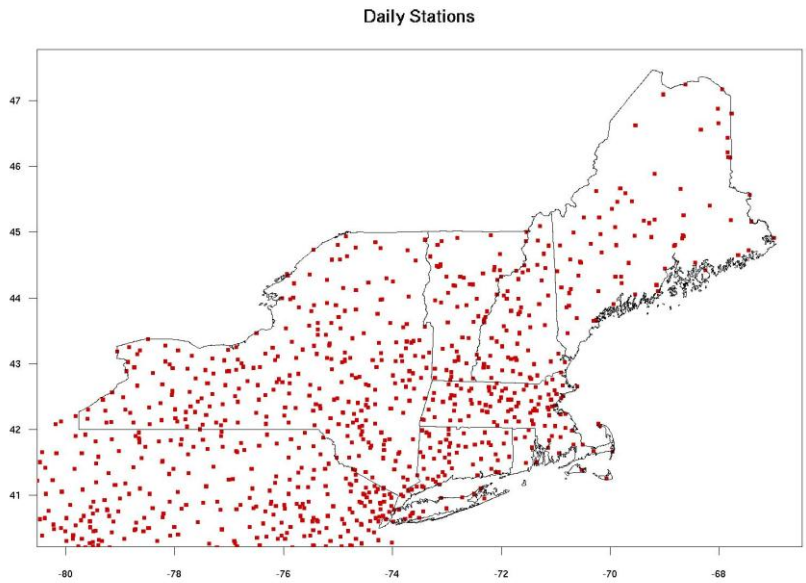

Figure 1: Geographic distribution of daily stations (each red dot represents one station)

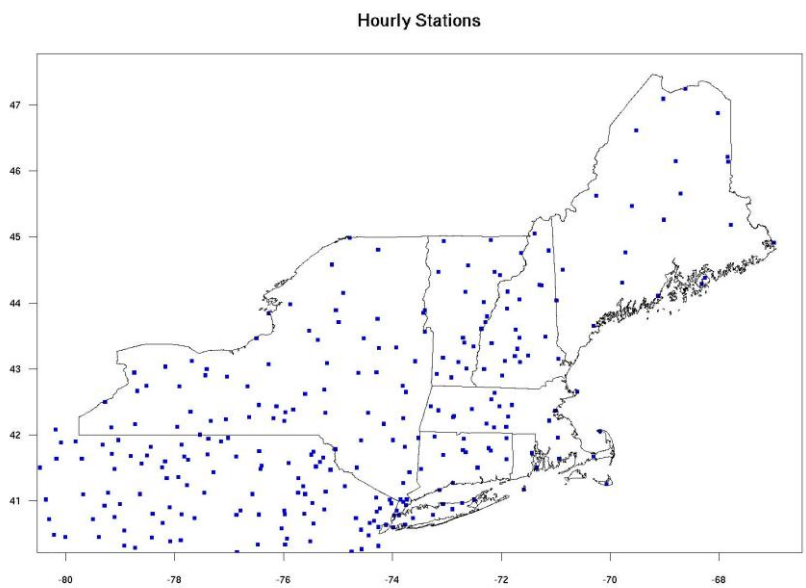

Figure 2: Geographic distribution of hourly stations (each blue dot represents one station)

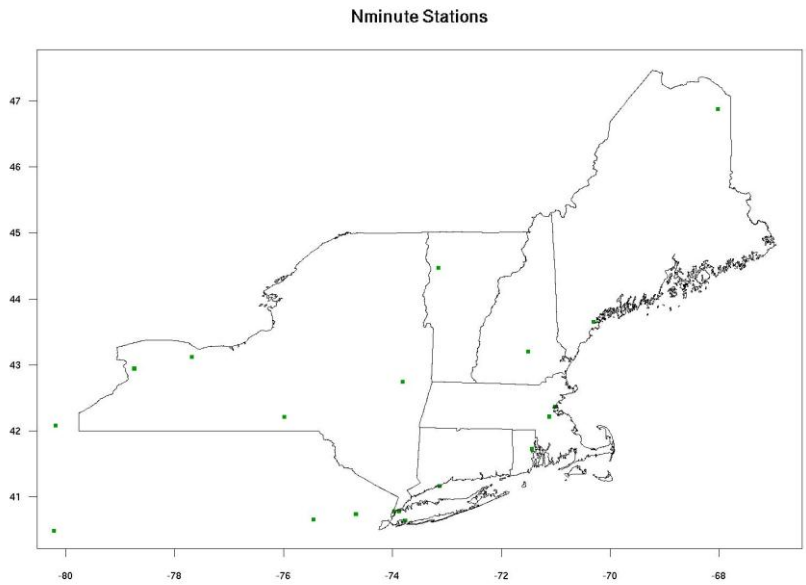

Figure 3: Geographic distribution of n-minute stations (each green dot represents one station)

Supplemental quality control

Accurate results require accurate, quality-checked data. For this analysis, three layers of quality control were integrated into the data ingestion process:

1. Data were pre-screened by NOAA automated routines and climate center staff each month, and flagged if suspect, erroneous, or an accumulated value.

2. Unusually high daily data values were checked against nearby stations. If a daily rainfall value exceeded 10.00 in, at least two nearby stations (within 200 miles) must have also reported amounts of at least 5.00 in. If a daily rainfall value exceeded 5.00 in, at least two nearby stations must also have reported amounts of at least 3.00 in.

3. Hourly precipitation data were checked against corresponding daily data. For each hour's data, at least one nearby station must have recorded a higher daily total rainfall amount.

Data values that failed the second and third criterion were researched and omitted only when their veracity could not be corroborated by this manual evaluation of available data.

Record length

Daily data were limited to those stations that had record lengths of at least 20 years. Hourly data stations also required a minimum record length of 20 years. At each station the total useable number of years formed the basis of the analysis. Thus, record lengths varied by station. When available, data records extended through December 31, 2008. On average, 57 years of data were available at daily stations, with 39 years available at hourly stations. **Figure 4** (hourly) and **Figure 5** (daily) show the distribution of stations as a function of record length. N-minute stations had either 20 or 21 years of record, but did not extend beyond June 1998 based on availability at NCDC.

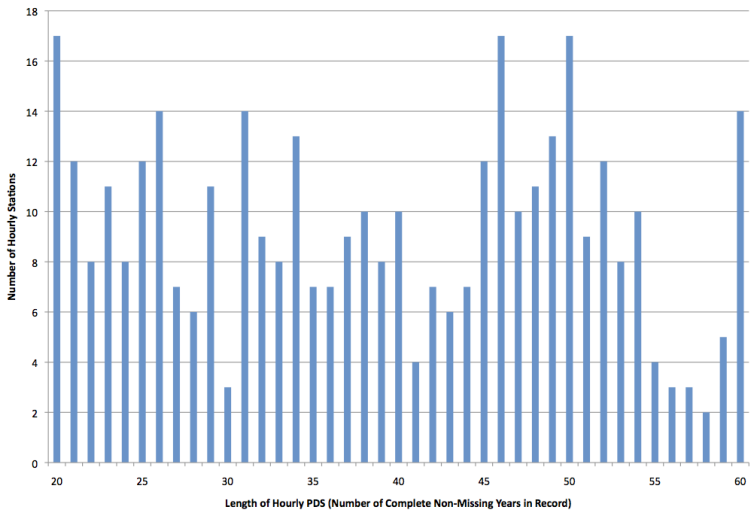

Figure 4: Distribution of hourly stations as a function of record length (min 20 years, max 60 years)

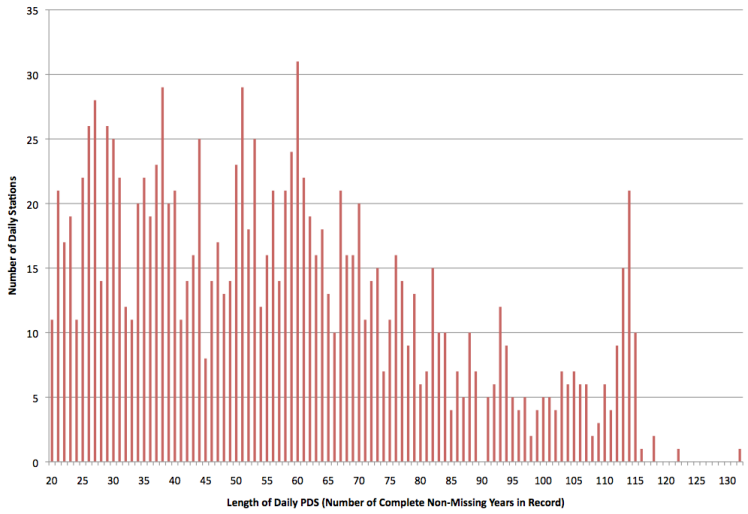

Figure 5: Distribution of daily stations as a function of record length (min 20 years, max 132 years)

N-minute data

The base measurement interval for n-minute (subhourly) data is 5 minutes. Since very few stations record at this temporal resolution, n-minute values for the region as a whole were estimated based on hourly data. This approach followed the methods used by Hershfield (1961), hereafter TP-40. Ratios of n-minute quantiles to 1 hourly quantiles were computed from the 26 collocated stations in the region and used to estimate n-minute values at all hourly grids in the region. Two hourly quantiles were also computed using the 120-minute storm accumulations. These ratios, shown in **Table 2**, are consistent with those used in NOAA Atlas 14 Volume 2.

5min/60min	1-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
NRCC	0.321	0.315	0.299	0.291	0.281	0.273	0.267	0.260	0.253
Atlas14 North	0.325	0.319	0.305	0.298	0.289	0.283	0.277	0.272	0.266
Atlas14 South	0.293	0.287	0.271	0.262	0.251	0.243	0.236	0.229	0.220

10min/60min	1-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
NRCC	0.495	0.487	0.462	0.447	0.428	0.415	0.403	0.391	0.376
Atlas14 North	0.505	0.498	0.474	0.460	0.442	0.429	0.417	0.406	0.391
Atlas14 South	0.468	0.459	0.434	0.419	0.400	0.387	0.375	0.363	0.348

15min/60min	1-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
NRCC	0.605	0.599	0.573	0.554	0.532	0.517	0.505	0.495	0.484
Atlas14 North	0.619	0.609	0.582	0.566	0.546	0.531	0.518	0.505	0.488
Atlas14 South	0.585	0.577	0.549	0.530	0.507	0.490	0.474	0.458	0.438

30min/60min	1-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
NRCC	0.814	0.811	0.786	0.774	0.760	0.743	0.729	0.717	0.703
Atlas14 North	0.819	0.815	0.797	0.786	0.771	0.759	0.748	0.737	0.723
Atlas14 South	0.802	0.797	0.780	0.768	0.751	0.738	0.726	0.713	0.697

Table 2: Computed ratios used to convert 60min extreme precipitation estimates to n-minute return periods, along with Atlas 14 ratios for comparison

Hourly and daily data

Accumulations for periods greater than 1 hour (2, 3, 6, and 12 hour) were generated by summing hourly data. Similarly, multi-day (2, 4, 7 and 10 day) accumulations represented the sum of individual daily observations. In the data set, precipitation values following a single or multiple day period with missing data are often flagged as an accumulation. Such values were used to generate multi-day precipitation accumulations, provided the total number of missing data values was less than the accumulation period.

For instance, consider a 3-day period with missing observations that is followed on day four by a multi-day precipitation accumulation. Since this accumulation represents the total amount of rain that fell during the 3-day period during which individual observations were not reported as well as

any rain that fell on day 4, the accumulation can be used along with the rainfall reported on days 5-7 to compute a valid 7-day precipitation accumulation. However, the value reported on day 4 could not be used as part of a 2-day (or 1-day) precipitation accumulation.

Data conversion

Daily precipitation accumulations represent a fixed 24-hour observation interval. Thus, these data underestimate the precipitation that can accumulate in any 24-hour period. For instance, if a fixed observation interval ends at midnight, a large storm that produces 3 inches of rain in the 12 hours before midnight and 3 additional inches in the 12 hours following midnight would be recorded as producing 2 daily rainfall totals of 3 inches. However, the storm actually produced a 6-inch rainfall total in a 24-hour period. Both TP-40 and NOAA Atlas 14 used a derived factor of 1.13 to adjust observation-day accumulations to true 24-hour amounts. This value was also indicated in the current study based on comparison of precipitation totals at 210 stations with coincident hourly and daily observations. A similar calculation was performed to determine the relationship between 2-day and 48-hour rainfall to be 1.04; this ratio was again the same as TP-40 and Atlas 14.

A similar problem affected the hourly data, as these values were constrained to clock-hour observations rather than unconstrained 60- or 120-minute intervals. Thus, conversion factors were also developed for these values based on 26 co-located n-minute and hourly recording stations. The resulting adjustments were 1.16 and 1.02 for the 60- and 120- minute accumulations, respectively. The 1-hour to 60-minute adjustment agrees well with the TP-40 value of 1.13 and Atlas 14 value of 1.12. Likewise, the 2-hour to 120-minute adjustment agrees with the value of 1.03 used in Atlas 14.

Computation of Extreme Precipitation Statistics

Partial duration and annual maximum series

In all cases partial duration series (PDS) and annual maximum series (AMS) were developed for each station. Katz (2010) advocates the use of PDS particularly in regions where the climate record is non-stationary. This is a feature of the region encompassed by this study (USGCRP 2009; DeGaetano 2009). PDS allow for the occurrence of more than one large precipitation event during a calendar year. In developing PDS, the largest N cases in an N-year period of record are included in the series. An additional criterion is that the events forming the series are independent.

This was assured by requiring that events forming the PDS be separated by at least seven days. If two events selected for the PDS occurred over a shorter time interval, only the largest was retained in forming the N-year PDS. In the AMS, only the single largest event in each calendar year is selected.

Owing to the primarily volunteer nature of the COOP network, missing data are common at most stations. In essence, the effect of missing data is to shorten the period of record upon which extreme value analyses are based. For instance, a 60-year record in which 20% of the data are missing actually represents 48 years of observations. PDS lengths were prorated to account for missing data.

$$\text{PDS Length} = \left\lfloor \frac{\text{Number of non - missing data days}}{365.25} \right\rfloor$$

Equation 1

Thus in the example above, a 48-year PDS would have been generated.

60 year record = 21,915 day record

4,383 days marked as missing, suspect, deleted, or accumulations

17,532 "good" daily data values

$$\text{PDS Length} = \left\lfloor \frac{17532}{365.25} \right\rfloor = 48 \text{ PDS values}$$

Equation 2

This is another advantage of PDS series as the record length can be a non-integer value (e.g. a fractional year), eliminating the need to develop subjective missing data criteria for including years with missing data in AMS.

Despite these advantages of the PDS, it was still necessary to construct AMS in order to allow the computation of the 1-year recurrence interval precipitation amount that is required in some applications. AMS include the largest single precipitation event from each year. Thus, unlike PDS, AMS is limited to one precipitation event from each year of record. In the case that the two largest precipitation events happen to occur within the same calendar year, the second largest event would be omitted from the AMS.

In the common case where one or more precipitation observations were missing during a year, it was necessary to determine whether the year should be counted as contributing to the AMS length. This is an arbitrary decision since *a priori* it is impossible to ascertain whether the missing

value may have been the annual extreme. As in Atlas 14, this decision was aided by dividing the year into wet and dry seasons. During the wet season (defined as the months of May-Oct), the occurrence of extreme rainfall is more likely and thus missing data during this period is more problematic than that occurring during the remaining months. In the region, 74% of all PDS series values fell within this 6-month wet season.

Years in which more than 50% of the daily (or hourly) observations from the wet season were missing were excluded from consideration in both the daily and hourly AMS. However, if a non-missing precipitation value occurring in either the wet or dry season during that year was included in the PDS, then this data value and year were included as part of the AMS.

Computation of 1-year average recurrence intervals

The 1-year average recurrence interval precipitation frequency estimates were computed based on the AMS. By definition, the average recurrence interval is the average period between exceedances and thus is associated with the PDS since this series enumerates exceedances. Conversely, the AMS is comprised of individual annual occurrences and hence gives a measure of the annual exceedance probability or the probability that a particular level of rainfall will be exceeded in any particular year. This is subtly different than the average interval between exceedances that is characterized by the PDS. Intuitively, the precipitation amount associated with the 1-year average return interval should be similar in magnitude to the smallest precipitation amount included in the PDS. However, statistically this is not the case. In case of the AMS, the average probability of an extreme precipitation event occurring in a particular year is greater than **1/N** (where **N** is the number of years of record). Chow et al. (1988) present a relationship for converting frequencies, T, based on AMS to those based on PDS. It is given as:

$$T_{PDS} = \left[\ln\left(\frac{T_{AMS}}{T_{AMS} - 1} \right) \right]^{-1}$$

Equation 3

Transforming the equation gives:

$$T_{AMS} = \frac{1}{1 - e^{-T_{PDS}^{-1}}}$$

Equation 4

or $\mathbf{T_{AMS}}$ = 1.58 year when $\mathbf{T_{PDS}}$ = 1 year. This relationship was used to compute 1-year average recurrence intervals for the PDS based on the AMS. **Equation 4** can also be used to convert the average recurrence

intervals given by the PDS for other return intervals to average exceedance probabilities. Note that based on the equation, it is mathematically impossible for $\mathbf{T_{AMS}}$ to equal 1.

NOAA Atlas 14 also provides empirical average ratios for converting between AMS-based average exceedance probabilities and PDS average recurrence intervals. **Table 3** gives the inverse of these ratios, which provide a means of converting the PDS average recurrence intervals used here to average exceedance probabilities that are consistent with Atlas 14.

2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
1.086	1.023	1.010	1.004	1.004	1.004	1.004	1.004

Table 3: PDS to AMS ratios with asymptote applied after 50-year (NOAA Atlas 14)

Station-specific extreme value distribution fitting

Unlike Atlas 14, which used a regional extreme value distribution fitting technique based on L-moments, extreme value distributions were fit individually at each station using maximum likelihood fitting. Subsequent analysis allowed for regionalization of the station-specific extremes. There is considerable debate in the literature as to the most appropriate approach for regional extreme value analysis, with no one method emerging as superior in all instances. The decision to fit station-specific extreme value distributions using maximum likelihood followed by regional smoothing was based on the following considerations.

Wilks (1993) showed that the beta-P distribution (Mielke and Johnson 1974) outperformed an array of other traditional extreme value distributions in extrapolating beyond the observed data series. This is an important feature as 100-year station records are uncommon, yet design criteria require statistics on storms with 100-year or greater recurrence intervals. Those methods for which L-moments fitting is possible typically underestimate return periods of lengths greater than the available station record. In terms of interpolating return intervals of lengths encompassed by the observed data record, the beta-P distribution was comparable to more traditional extreme value distributions

L-moments regionalization requires a somewhat subjective grouping of stations and may require manual intervention. Given the non-stationarity of extreme rainfall series across New York and New England, we sought to entirely automate the approach. This will facilitate the recomputation of extreme rainfall statistics on an annual basis and provide guidance as to when design criteria may need to be updated.

Finally, maximum likelihood fitting allows the incorporation of a trend term, providing a possible mechanism for statistically accounting for series non-

stationarity. This is not possible using L-moments. Although not incorporated in the current study, the use of maximum likelihood fitting will facilitate the potential inclusion of trend terms in subsequent work.

Beta-P fitting

Precipitation amounts corresponding to the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year recurrence intervals (return periods) were computed by fitting a beta-P distribution (Mielke and Johnson 1974) to the daily extreme precipitation partial-duration series at each station. Fitting a theoretical distribution to the observed data serves two purposes: 1) when computing precipitation amounts for shorter return periods, sampling irregularities are smoothed out of the observed data (**Figure 6**), and 2) due to the limited length of observation records at most stations, computation of precipitation amounts corresponding to longer (50 or greater year) return periods requires extrapolation beyond the observed data (**Figure 7**).

Of eight candidate extreme-value distributions, Wilks (1993) found that the beta-P distribution best described the extreme right tail of partial duration extreme rainfall observations in the Northeast. DeGaetano (2011) found a similar result using a much larger sample of stations with 100-year-or-more records. (**Figure 7**) The Generalized Extreme Value (GEV) distribution was found to underestimate probabilities associated with the larger partial duration precipitation amounts.

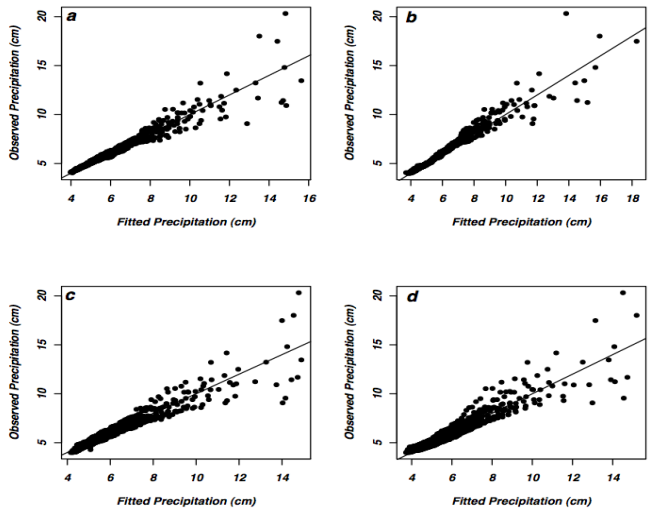

Figure 6: QQ-plots for partial duration extreme rainfall at stations in western NY and PA for fits based on non-regionalized results using a) maximum likelihood fitting of the beta-P distribution b) L-moments fitting of the GEV distribution and regionalized results using c) maximum likelihood fitting of the beta-P distribution and d) L-moments fitting of the GEV distribution. (DeGaetano 2011)

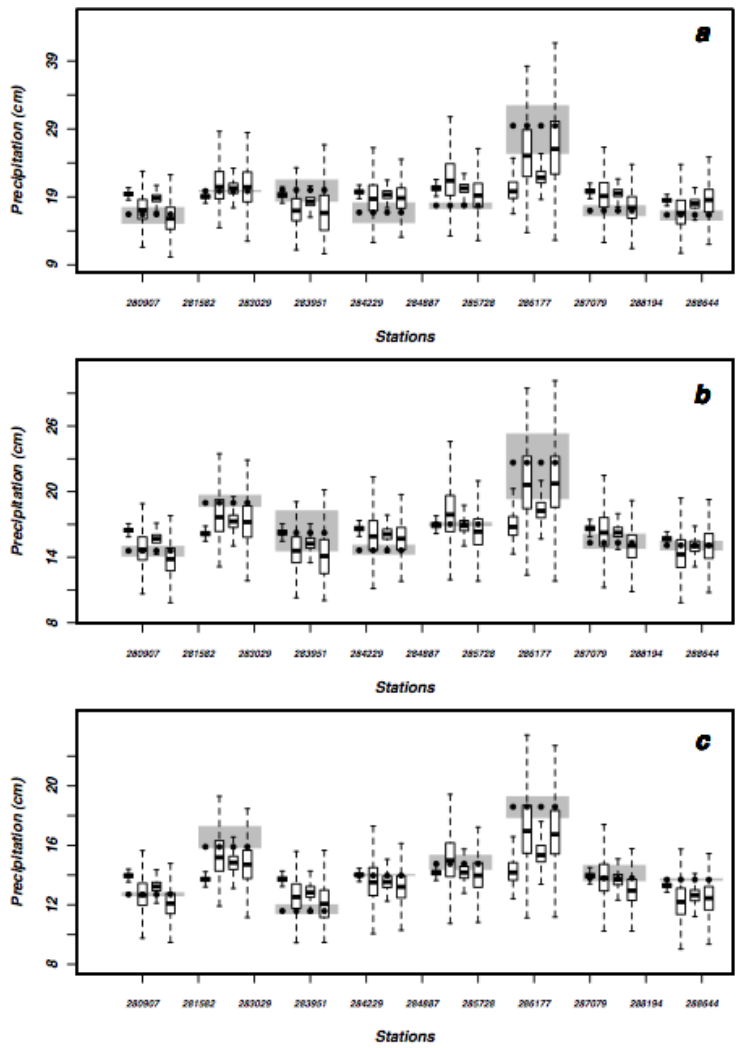

Figure 7: Boxplots showing extrapolated (interpolated) quantities corresponding to the a) 100-, b) 50 and c) 25-year storm, precipitation amounts from 1000 bootstrapped PDS of length 50. Solid circles indicate the data values with empirical probabilities corresponding to the return period. Gray boxes show the values with the next highest and lowest empirical probability. Each grouping of boxplots corresponds to the four methods compared: regionalized beta-P, non-regionalized beta-P, regionalized L-moments GEV and non-regionalized L-moments GEV, from left to right. (DeGaetano 2011)

The following details about the beta-P distribution and its use in return period computation follow those described by Wilks and Cember (1993), and were used identically in the present analyses. The probability density function for the beta-P distribution is

$$f(x) = \frac{\alpha\theta}{\beta}\left(\frac{x}{\beta}\right)^{\theta-1}\left[1+\frac{x}{\beta}\right]^{-(\alpha+1)}$$

Equation 5

where **x** is the random variable (here, daily extreme precipitation partial-duration amounts), which must be nonnegative. The distribution has three parameters: α and θ are dimensionless shape parameters, and β is a scale parameter having the same physical units as the random variable. The distributions were fit to data for each station by maximum likelihood, using the Levenberg-Marquardt method (Press et al. 1986), as described in Wilks (1993). One convenient feature of the beta-P distribution is that it is analytically integrable, so that its cumulative distribution function can be written in closed form. That is, beta-P probabilities can be obtained using

$$F(x) = \Pr\{X \le x\} = \int_0^x f(x)dx = 1 - \left[1+\left(\frac{x}{\beta}\right)^{\theta}\right]^{-\alpha}$$

Equation 6

Recurrence interval computation

Average return periods, **R**, relate to cumulative probabilities, **F**, of the distributions of partial-duration data according to

$$R = \frac{1}{\omega[1-F(x)]}$$

Equation 7

where ω is the average frequency with which the partial-duration data sample the full record of daily observations, in years^{-1}. The average sampling frequency was chosen to be close to 1 yr^{-1}, but because individual data records may start and stop on different dates and may contain different numbers of missing data, ω varies slightly from station to station. Let **N** represent the number of daily observations passing the quality control screening that are available for a particular station. The partial-duration data were then constructed to consist of the largest **n** precipitation accumulations, where **n** is the greatest integer not exceeding **N/365.25**. This convention results in the average sampling frequency being

$$\omega = \frac{365.25n}{N} yr^{-1}$$

Equation 8

Precipitation amounts, **x**, corresponding to specified return periods are obtained by inverting **Equation 5** (i.e., solving it for **x**), and substituting the expression **F(x)=1 – 1/ωR** obtained by rearrangement of **Equation 6**. These operations yield the expression for precipitation amounts as a function of return period, and of the parameters of the fitted beta-P distribution,

$$x = \beta\left[(\omega R)^{1/\alpha} - 1\right]^{1/\theta}$$

Equation 9

One-year average recurrence interval frequency estimates were also computed based on the AMS. This is the probability that a particular value of rainfall will be exceeded on average in any given year.

Regionalization

Methodology

Regionalization provides a means of supplementing the finite and often limited data record at individual stations with information from other hydrologically similar sites. NOAA Atlas 14 used the method of Hoskings and Wallace (1997) to group hydrologically similar sites. In this method, discrete grouping of stations share common extreme value distribution characteristics. In this approach the formation of “regions” is not easily automatable, although DeGaetano (2000) proposes a method by which regional station groupings can be established objectively. Durrans and Kirby (2004) point out two additional limitations with regionalization methods that rely on discrete station groupings. The first is that discontinuities may arise at the boundaries between regions. The assignment of ungauged locations to a particular region was also cited as problematic.

To address these problems and facilitate automation, the regionalization approach of Durrans and Kirby (2004) was adapted. The method uses a combination of distance and station-record length, giving greater weighs to stations that are closer to a particular location and sites that have longer record lengths. The method weights precipitation extremes using the equation:

$$\theta_k = \alpha(\theta_d)_k + (1-\alpha)(\theta_n)_k$$

Equation 10

where $(\theta_d)_k$ is the distance component given by:

$$(\theta_d)_k = \sum_{i=1}^{N} \frac{\theta_k^i}{d_i^2} \left(\sum_{i=1}^{N} \frac{1}{d_i^2} \right)^{-1}$$

Equation 11

and $(\theta_n)_k$ is the record length weighing given by:

$$(\theta_n)_k = \sum_{i=1}^{N} n_i \theta_k^i \left(\sum_{i=1}^{N} n_i \right)^{-1}$$

Equation 12

In **Equation 11** and **Equation 12**, N is the number of stations considered, $\mathbf{d_i}$ is the distance from station ***i*** to the site of interest, and θ_k^i is the precipitation extreme for recurrence interval ***k*** at site ***i***.

The value of α was developed using a cross-validation technique in which the data from specific observation sites were iteratively excluded from the analysis and **Equation 10** used to estimate the precipitation extreme at the omitted station based on a range of α values. Specifically, α values in the range of 0.05 - 0.95 in increments of 0.05 were evaluated. For each α value, the average mean squared error

$$MSE = (\text{computed extreme} - \text{estimated extreme})^2$$

Equation 13

across all stations was computed (**Table 4**) and that which minimized the estimation MSE adopted for the analysis. This was done separately for daily and hourly reporting stations. Based on **Table 4**, the weighting for distance, α, was 0.60 for both data networks implying a record length weight (1- α) of 0.40.

		Radius (miles)						
		30	**45**	**60**	**75**	**90**	**105**	**120**
Gridding Parameter (% weight for Distance)	**0**	1.195	1.206	1.053	1.270	1.302	1.348	1.400
	5	1.184	1.193	1.041	1.252	1.283	1.326	1.375
	10	1.174	1.182	1.030	1.237	1.266	1.305	1.350
	15	1.166	1.171	1.020	1.222	1.249	1.286	1.328
	20	1.159	1.163	1.012	1.209	1.235	1.268	1.307
	25	1.153	1.155	1.005	1.198	1.221	1.253	1.288
	30	1.149	1.149	0.999	1.188	1.210	1.238	1.270
	35	1.146	1.144	0.994	1.179	1.199	1.225	1.254
	40	1.144	1.141	0.990	1.172	1.190	1.214	1.240
	45	1.144	1.075	0.987	1.166	1.183	1.204	1.228
	50	1.146	1.138	0.986	1.162	1.177	1.196	1.217
	55	1.148	1.139	0.986	1.159	1.172	1.190	1.208
	60	1.152	1.141	**0.986**	1.157	1.169	1.184	1.201
	65	1.157	1.144	0.989	1.157	1.167	1.181	1.195
	70	1.164	1.148	0.992	1.158	1.168	1.179	1.191
	75	1.172	1.155	0.996	1.161	1.169	1.178	1.189
	80	1.181	1.162	1.002	1.165	1.172	1.179	1.188
	85	1.192	1.171	1.009	1.171	1.176	1.182	1.189
	90	1.204	1.181	1.017	1.178	1.182	1.186	1.192
	95	1.218	1.192	1.026	1.186	1.188	1.192	1.196
	100	1.232	1.205	1.037	1.196	1.197	1.200	1.203

Table 4: Results of gridding parameter (a) tests for each data radius for 1day duration; test results confirmed the best estimates to use across the region are a=0.60, radius=60 miles

Search distance cut-off

Similar to the analysis of gridding parameters, varying radii were tested to determine the optimum search distance. As **Table 4** shows, among all station points in the Northeast, 60 miles (96 km) was found to produce the lowest mean squared error when comparing actual return periods to computed values. Thus, when analyzing each point in the region, all stations located within 60 miles in each direction were used to determine the point's computed return period. This radius is large enough to guarantee sufficient data is available in sparse areas (such as northwestern Maine), and small enough to ensure distant stations are not included in a point's regionalization calculation.

Shape and scale parameters

It should be noted that in the current work, regionalization was conducted on the return period rainfall amounts directly, as opposed to the distribution parameters as was the case in Durrans and Kirby. This was necessary given the relationship between the shape and scale parameters in the beta-P distribution. The parameters in general are inversely related and fall into two groups with large shape parameters associated with small scale parameters in one group and small shape parameters associated with large-scale parameters in a second group. (**Figure 8**) As there was not spatial consistency in group membership (adjacent stations are

equally likely to be a part of either group), spatial interpolation of these parameters individually was problematic. Using this approach, a separate regionalization was conducted for each return period.

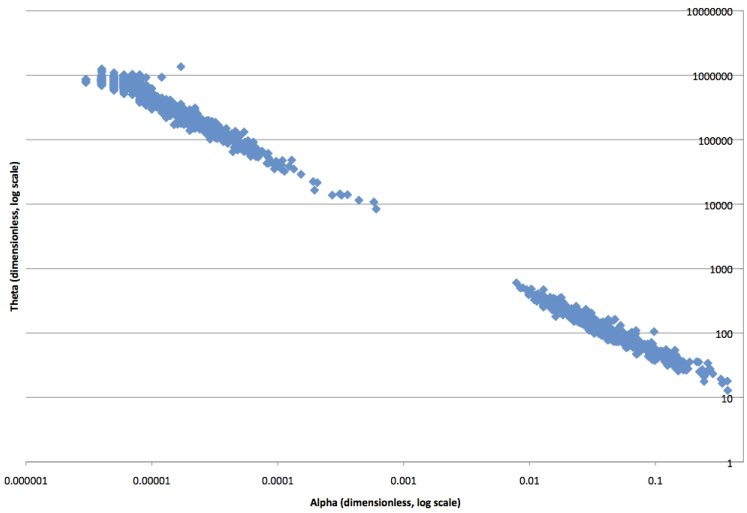

Figure 8: Plot of alpha vs. theta distribution parameters for each daily station in the region, showing two distinct areas – one with large theta, small alpha and the other with small theta, large alpha

Manual filtering

After completing the regionalization analysis for the entire region, several station-specific data problems were elucidated as prominent "bullseyes" were noted on graphical map products. The data records of these outlier stations were manually screened for veracity. Five stations (**Table 5**) throughout the region were removed, since their reported data could not be verified.

Station ID	State	Name	Daily Years	Hourly Years
170200	ME	ALLAGASH	22	27
177174	ME	RIPGENUS DAM	71	---
194667	MA	MENDON	---	25
301484	NY	CHURCHVILLE	21	---
308058	NY	S WALES EMERY PARK	50	---

Table 5: Five stations that were manually removed due to inconsistencies with neighboring stations on graphical map products

Final Smoothing

Following the regionalization, a final smoothing was applied using a moving average of grid values within a radius of 20 grid units

(approximately 16 km) of each point. For return intervals of 50 years and greater the smoothing window was increased to 30 grid units (approximately 25 km). This smoothing provided more aesthetically pleasing map products by eliminating small physically unrealistic bulleyes in the extreme precipitation field. A similar smoothing step was applied in Atlas 14.

Elevation effects

Differences in elevation were not explicitly considered in the interpolation procedures used in the New York analysis, a notable difference between this study and the NOAA Atlas 14 methodology. In Atlas 14, the Parameter-elevation Regressions on Independent Slopes Model (PRISM) (Daly et al., 1992, Daly, et al., 1994; Daly et al., 2002) was used to interpolate precipitation extremes via a relationship between mean annual and extreme precipitation. The annual means were first interpolated spatially using PRISM, accounting for elevation, and then these interpolated mean annual precipitation estimates transformed to extremes.

In the region studied here, a consistent relationship between elevation and extreme precipitation was not apparent. This is illustrated in **Figures 9a-9b**.

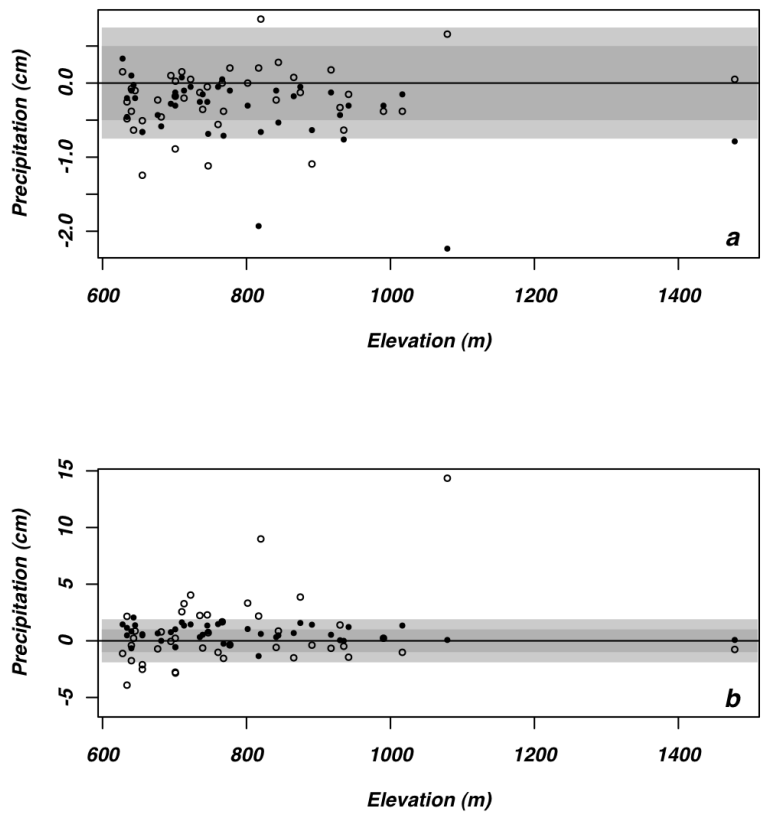

Figure 9: Analysis of precipitation vs. elevation in New Jersey, Pennsylvania, West Virginia, and Virginia, comparing the NRCC-NRCS student to NOAA Atlas 14. Open circles represent NOAA Atlas 14 values. Solid circles represent NRCC-NRCS results. **Figure "a"** depicts 1day 2yr precipitation. **Figure "b"** shows 1day 100yr values.

Figure 9a shows that the differences between the interpolated NRCC-NRCS and Atlas14 rainfall for the 2-year 1-day storm is minimal at grid cells corresponding with station locations having elevations > 625 m. These are the stations with elevations above the 90th percentile in New Jersey, Pennsylvania, West Virginia and Virginia and characterize the portion of these states in which light or moderate smoothing was applied in Atlas 14. It should be noted that the differences shown in **Figure 9** reflect the previously discussed methodological differences (i.e. the choice of distribution, conversion of the AMS values to PDS values, etc.) in addition to the influence of elevation on the spatial interpolation of the data.

In terms of the median difference, the NRCC-NRCS values are 0.25 cm less than the Atlas 14 values. Across the region, this bias is 4% of the average 2-year 1-day rainfall event. The majority of points fall within a representative confidence bound for Atlas 14 at stations with high elevation in this region. In terms of the median difference at lower

elevations that represent 90% of stations, the NRCC-NRCS values are 0.13 cm less than the Atlas 14 data (not shown). This bias is 2% of the average 2-year 1-day rainfall at these elevations and well within a representative confidence interval reported by Atlas 14 for stations across the region.

For the 100-year 1-day rainfall, the interpolated NRCC-NRCS values at high elevation grids tend to be larger than those given by Atlas 14 (**Figure 9b**). The median bias is 0.65 cm or about 5% of the average 100-year rainfall event at the stations. At lower elevations (not shown), the median bias is larger with the NRCC-NRCS values exceeding those from Atlas14 by 1.28 cm (8% of the average 100-year precipitation amount). Most of the differences are within representative confidence intervals for both high and low elevation stations in the region.

Figure 9 also shows the difference between the non-interpolated (station) values from the NRCC-NRCC analysis and the corresponding interpolated Atlas 14 values (open symbols). Cases in which the solid and open symbols are closely paired indicate that the interpolated Atlas 14 value has a similar bias with respect to both the interpolated and station values from the NRCC-NRCS analysis. Conversely, separation between the points indicates that either the interpolated NRCC-NRCS was a better representation of the station value (open symbols far from the zero line) or the Atlas 14 value most closely matched that computed at the station (open symbols near the zero line). In terms of the median difference for the subset of highest elevation sites, the interpolated 2-year recurrence interval Atlas 14 values were 0.17 cm (3%) higher than the station values (**Fig. 9a**). For the Atlas 14 100-year values, the difference was 0.20 cm (1%) higher than those based on the station data.

Smaller median biases were noted at the lower elevation stations (not shown). For the 2-year storm the Atlas 14 values were 0.08 cm (1%) higher than the station values. In the case of the 100-year storm, the Atlas 14 values were 1.46 cm (9%) less than that at the stations.

Two points with elevations of 1078 m and 820 m appear as outliers in **Figure 9**. In addition a third point (Snowshoe, West Virginia) is an outlier in terms of its elevation (1478 m). The 100-year storm at Snowshoe is represented within 7% by both the NRCC-NRCS and Atlas 14 interpolation. In terms of the two-year recurrence interval amount, the NRCC-NRCS interpolation underestimates the station-value by 0.78 cm., whereas the Atlas 14 value is within 0.05 cm of the station value.

At the sites with more modest elevations (Big Meadows and Copper Hill, Virginia) both methods underestimate the magnitude of both the station-based 2-year and the 100-year storm. The 2-year amounts at these outlying sites are underestimated by approximately 10% for the Atlas14

interpolation whereas the magnitude of the underestimation is more on the order of 25% for the NRCC-NRCS approach. For the 100-year storm both methods underestimate the station value by nearly 40% . Hence the solid dots in **Figure 9b** lie close to the zero-line indicating little between-method difference, but the open circles are far above the zero line indicating that the station values exceed the interpolations. A similar degree of underestimation is noted for the 50-year storm.

For both Atlas 14 and the NRCC-NRCS values, the underestimation can be attributed to the regionalization and/or smoothing process, given the station-based values replicate the empirical 50-year storm well, but larger differences exist between the station-based and regionalized 50-year storm values. To separate the effects of regionalization versus smoothing, intermediate (regionalized, but non-smoothed) values were obtained directly from the NRCC-NRCS analysis. For Atlas 14, the non-smoothed values were generated using the regional grouping of stations reported in Bonnin et al. (2006). In the case of the NRCC-NRCS values, approximately two-thirds of the underestimation of the station-based 100- and 50-year storm amounts was due to the regionalization process. At Big Meadow, regionalization also accounted for the majority of the underestimation (up to 70%) using the Atlas 14 method, with the remaining 30% of the underestimation due to the smoothing process. However at Cooper Hill, the L-moments regionalization process accounted for only 35% of the underestimation of the station-based storm. Regionalization accounted for a larger percentage difference in 50-year storm, however the absolute difference between the station and regionalized values was much smaller than in the other cases.

Given these results and the results of the regionalization analysis that showed that differences in period of record influenced extreme rainfall amounts to the same degree as station-proximity, a more complex interpolation accounting for elevational differences was not justified. This decision was further supported by a comparison of rainfall extremes across the Mid-Atlantic states from Atlas 14 with those computed using the present study's methodology (*see Comparisons section*).

Internal consistency adjustments

Since the quantiles for each duration were computed separately at a given station, it was possible that the quantile for the shorter duration exceeded that of the next longer duration for a given recurrence interval. Although this is plausible statistically, for say the 500-year 2-hour quantile to exceed the 500-year 3-hour quantile, it is physically unreasonable. Typically these discrepancies occurred at return intervals > 25 years. The inconsistencies were identified on a grid-point-by-grid-point basis and, when found, adjusted. First, the ratio of the longer duration quantile to the shorter

duration value was computed. When internally inconsistent, this ratio was < 1.0. The ratio for inconsistent points were forced to be 1.0 by adjusting the shorter duration quantile downward at increments of 0.01 inches.

At a limited number of individual stations, cases were identified in which the period of record maximum precipitation amount recorded for a short accumulation period exceeded that of the maximum reported for some longer duration. This was investigated on a case-by-case basis and typically found to result from missing data and/or nuances of the reported rainfall amounts for one duration that were inconsistent with those reported for the next shorter accumulation period. As in Atlas 14 for occurrences where the inconsistencies were small the smaller longer-duration value was set equal to the shorter-duration amount.

A third inconsistency occurred as an artifact of the use of separate hourly and daily data sets. At co-located hourly and daily stations, it was possible that the daily precipitation amount was different than the sum of the corresponding hourly values. In these cases, the daily values were given preference since the daily data typically were associated with a longer historical period of record. In addition, potential differences in instrumentation may have resulted in the undercatch of the individual hourly amounts. Discrepancies at these stations were also possible across the 12-hour and 24-hour durations and similarly the 30-minute and 1-hour boundary. These cases were adjusted such that the 1-day (and 24-hour) values were fixed (i.e. not adjusted) for each recurrence interval and the adjacent data revised upward or downward accordingly**. (Figure 10)**

Figure 10: Process flow for final consistency adjustments

Confidence intervals

Numerous factors introduce uncertainty into the extreme precipitation statistics presented in this atlas. Some uncertainty is related to the choice of distribution used to fit the rainfall extremes and the estimation of the parameters of the beta-P distribution associated with specific stations and precipitation series. Uncertainties are also introduced by the limited data sample that is available from the observing stations. It is possible that the available sample does not represent a snapshot of the true extreme precipitation distribution. Similarly, the assumption of a stationary data

record also introduces uncertainty into the analyses, as do errors in the data values and the spatial interpolation of values between stations.

Monte-Carlo techniques were used to quantify the portion of this uncertainty introduced by the limited data sample. As this is only one component of the uncertainty, it is likely that the true confidence intervals are somewhat wider than those presented here. Unfortunately, the literature provides little guidance for quantifying the other components of uncertainty and the development of a viable method is beyond the scope of this work. It should be noted that the use of uncertainty measures in the practical application of the precipitation extremes is not well developed.

Confidence intervals were constructed by resampling the PDS (AMS for 1-year) from each station, with replacement, 1000 times. The beta-p distribution was then fit to each randomly generated PDS giving an empirical distribution of return period precipitation amounts for each recurrence interval and duration. The 5th and 95th percentiles of these empirical distributions provided the lower and upper bounds of the 90% confidence interval for each station's specific precipitation frequency estimate. As expected, a small amount of stations (<5%) returned confidence intervals where the calculated value fell outside the confidence limits.

This technique was used independently for all daily and hourly accumulation periods. In the case of the sub-hourly, 24-hour and 48-hour confidence intervals, the n-minute and daily-to-hourly ratios discussed previously were applied to the hourly 1-day and 2-day confidence interval bounds

Regionalization and gridding of confidence intervals

Similar to the return period calculations, a regionalization scheme was implemented for the confidence interval bounds. As stated previously, regionalization provides a means of supplementing the finite and often limited data record at individual stations with information from other hydrologically similar sites.

Applying the same procedure to the lower and upper confidence limits would be unrealistic. Because of the nature of confidence intervals, two adjacent stations could produce the same extreme precipitation estimate, but very different confidence intervals with different widths and/or different bounds. Thus, it was imperative to utilize an adjusted regionalization schema.

Rather than independently using the lower and upper bounds of the confidence intervals for the regionalization and gridding, two related parameters, confidence width (**W_C**) and the location of the computed extreme rainfall within the confidence interval (**L_E**) were used in the regionalization and gridding procedure. These parameters were defined as:

$$W_C = \text{upper} - \text{lower}$$

Equation 14

and:

$$\mathrm{L}_E = \frac{\text{estimate} - \text{lower}}{W_C}$$

Equation 15

where upper and lower represent the confidence bounds for a given station, and estimate represents the extreme precipitation estimate for that station. **L_E** is a representation of where the estimate falls within the confidence interval, ranging from 0.00 to 1.00 as a linear function of where the estimate falls between the lower and upper bounds.

Once confidence intervals are calculated for each station, and the subsequent values of **W_C** and **L_E** were determined, the regionalization and gridding procedure was followed for each of these parameters (as before, α = 0.60, radius = 60 miles). The **W_C** and **L_E** parameters were then radially smoothed as described above. These interpolated **W_C** and **L_E** values along with the corresponding gridded estimate produced earlier are used to solve for regionalized upper and lower confidence interval bounds based on **Equation 15**.

Confidence interval analysis

Although a similar technique was used to derive confidence intervals in NOAA Atlas 14, the intervals presented in that publication tend to be narrower than those given here. This appears to be the result of the confidence intervals in Atlas 14 being representative of regionalized values (i.e. the confidence intervals are computed based on regional station groupings rather than individual station data). The confidence intervals in the New York – New England analysis are based on data from individual stations, with regionalization and interpolation applied to these values. Hence, these confidence intervals also incorporate the uncertainty associated with the grouping of stations and the fitted shape and scale parameters of the extreme value distribution. Therefore, this should not be taken to mean that the uncertainty associated with the present analysis

is greater than that in Atlas 14. Rather the larger confidence intervals represent additional components of the inherent uncertainty in both analyses. The widths of the confidence intervals presented in the present study are in line with those reported for single station data in other studies.

Comparisons

Since the methods used in NOAA Atlas 14 differ from those used here for New York and the New England states, a comparison of the extreme precipitation statistics that resulted from the two procedures is informative for assessing the consequences of differences in methodology. The methods used in the New York and New England analysis were applied to stations in Ohio, Pennsylvania, New Jersey, Delaware, Maryland, West Virginia, Virginia, and Kentucky. This allows for a direct comparison of the precipitation extreme statistics that resulted from the two methods.

In general, the different approaches produced results that were not statistically different. As expected, for the 1-, 2-, 5-, 10- and 25-year storms across all accumulation periods, 90% of the rainfall extremes based on the methods used in this study fell within the Atlas 14 90% confidence interval, as expected **(Figure 11)**. For longer recurrence intervals, extreme precipitation amounts tended to exceed the 90% confidence intervals based on Atlas 14. This was also expected, as the GEV distribution, which was used in the majority of the Atlas 14 regions, has a tendency to underestimate extreme rainfall relative to the beta-P distribution for return periods beyond the available data station record (DeGaetano and Zarrow 2011). Only 51% of the stations in the eight overlapping Atlas 14 states had record lengths of 50 years or greater, whereas all stations have at least 20 years of data.

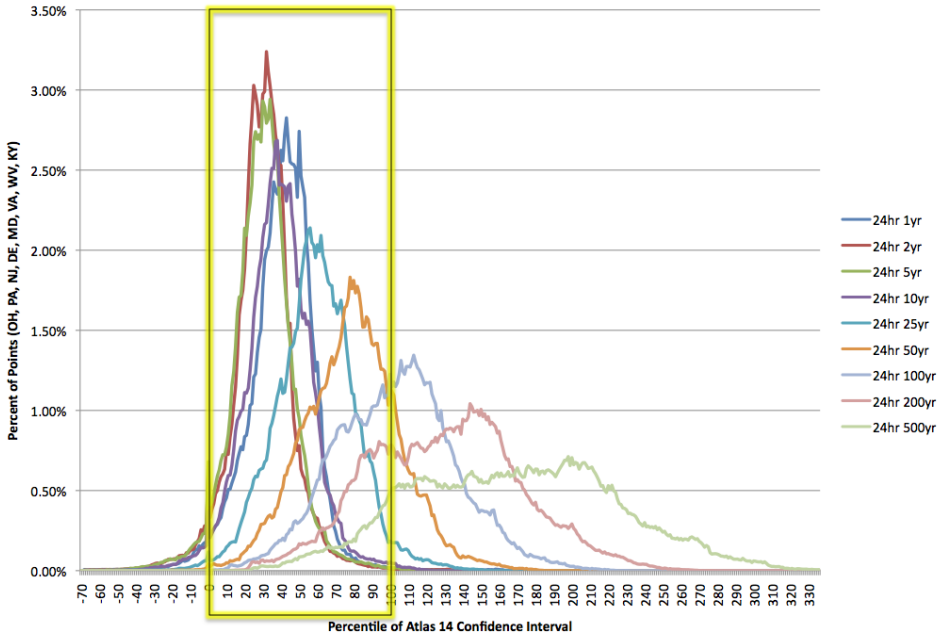

Figure 11: Graphs showing where 24hr NRCC return period results fall with regard to Atlas 14 Volume 2 confidence intervals for all nine recurrence intervals in the Mid-Atlantic states of Ohio, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, West Virginia, and Kentucky. Data is normalized for each point, indexing the Atlas 14 confidence interval for each station from 0 to 100 along the horizontal axis. (See **Equation 15** for explanation of this percentile calculation.) The yellow box represents the normalized Atlas 14 confidence interval. Short recurrence return periods (1yr, 2yr, 5yr) fall almost exclusively within the Atlas 14 confidence intervals, while NRCC data are generally above the Atlas 14 upper bound for long recurrences (100yr, 200yr, 500yr)

Differences in the final smoothing step that was applied in both approaches account for a large proportion of the differences, particularly in areas of complex terrain. Here the net effect of smoothing is to decrease extreme rainfall along the peaks, but introduce an overestimation of extremes in valleys to the west. (**Figures 12-13**) In addition, along the Appalachians, there is a marked difference in the character of the PDS across the mountains. On the eastern slopes, the highest PDS values exclusively occur in association with storms of tropical origin with the lower PDS values related to other systems and of similar magnitude to the highest PDS values on the western slopes. This dichotomy does not appear to be represented by the Atlas 14 L-moments regions and contributes to the differences seen in **Figures 12-13**. Nonetheless, even in these mountainous regions, the differences are within the confidence intervals reported by Atlas 14.

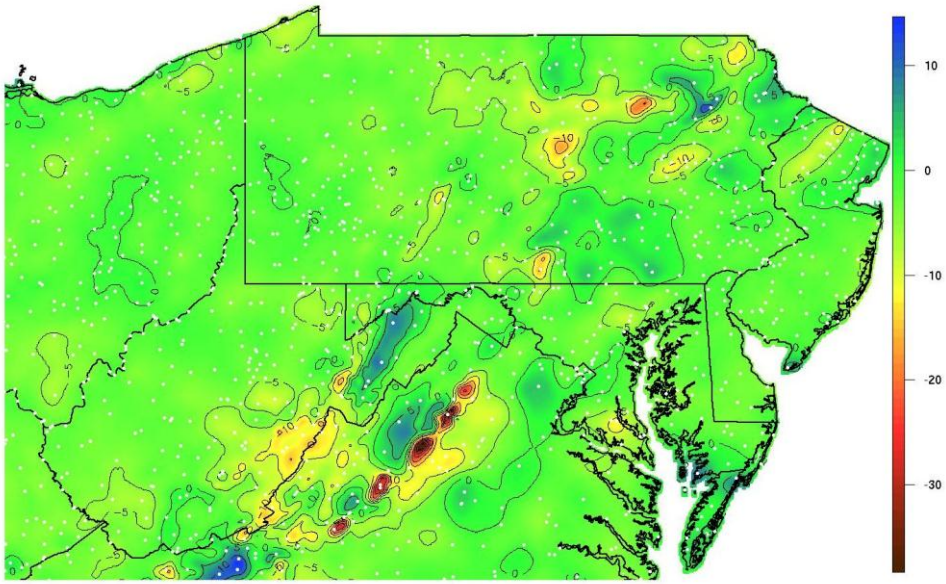

Figure 12: Percent difference between NRCC-NRCS and NOAA Atlas 14 24-hour 2-year rainfall. Locations of stations are indicated by white dots.

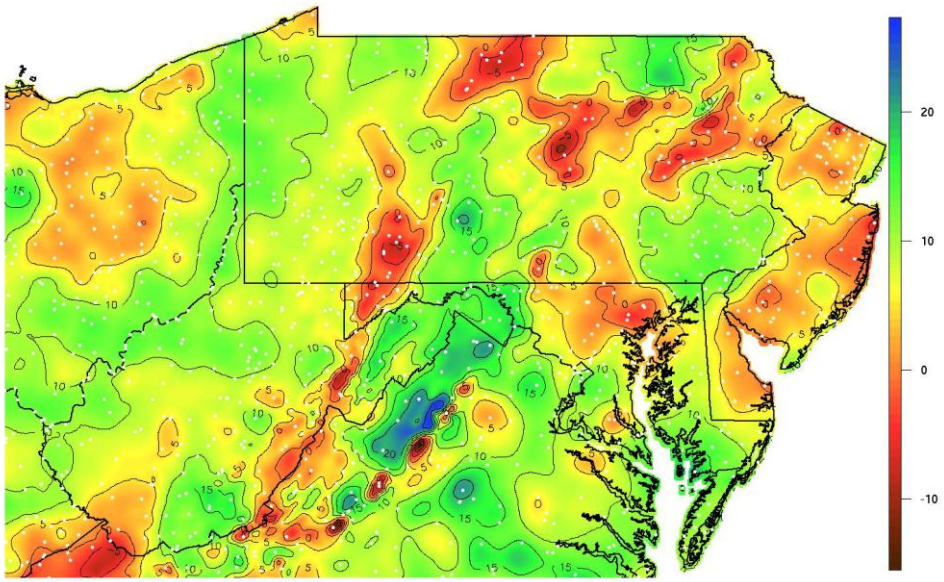

Figure 13: Percent difference between NRCC-NRCS and NOAA Atlas 14 24-hour 100-year rainfall. Locations of stations are indicated by white dots.

Finally, the differences also result from the inclusion of data through 2008, when using the methods used in this study. The Atlas 14 data series end

in 2000. Given the increase in extreme rainfall that has been documented in the Northeastern United States (DeGaetano 2009; USGCRP 2009) the addition of the most recent eight years of data also contribute to the higher precipitation extremes using the current methodology.

Even at the higher return intervals, the differences in the precipitation amount are relatively small. **Figures 14-16** show charts of the ratio of the precipitation amount estimated by the present method with that given by Atlas 14. In general, the values derived from New York and New England methods are less than 10% higher than those reported by Atlas 14.

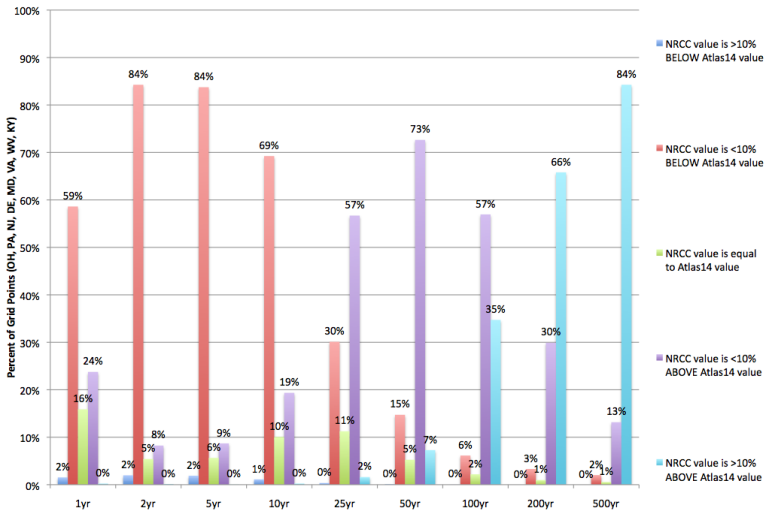

Figure 14: Graph showing how 24-hour NRCC results compare to Atlas 14 return periods

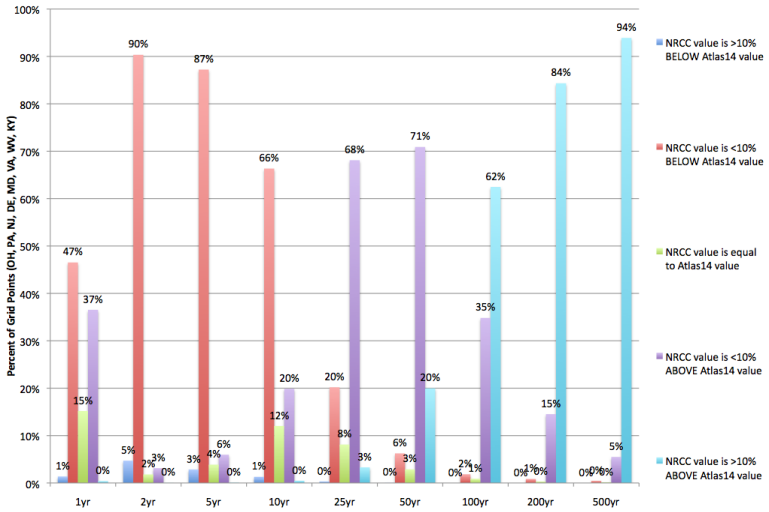

Figure 15: Graph showing how 10-day NRCC results compare to Atlas 14 return periods

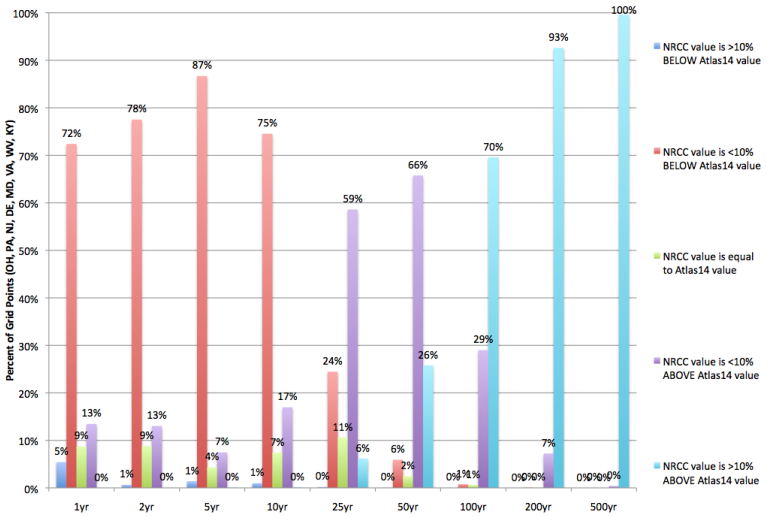

Figure 16: Graph showing how 60-minute NRCC results compare to Atlas 14 return periods

Station Distribution Curves

Starting in the early 1960s, a set of standard NRCS rainfall distribution curves were developed to express different rainfall amounts, and therefore intensities, relative to a 24-hour storm (**Figure 17**). The distributions relate the total rainfall occurring with a 24-hour storm to rainfall amounts occurring within shorter time intervals. For instance, the type II curve shown in **Figure 17** implies that on average 50% of the 24-hour rainfall amount would be expected to occur within a 12-hour interval. Using the return periods from the n-minute and hourly durations, it is possible to construct point-specific distribution curves (**Figure 18**).

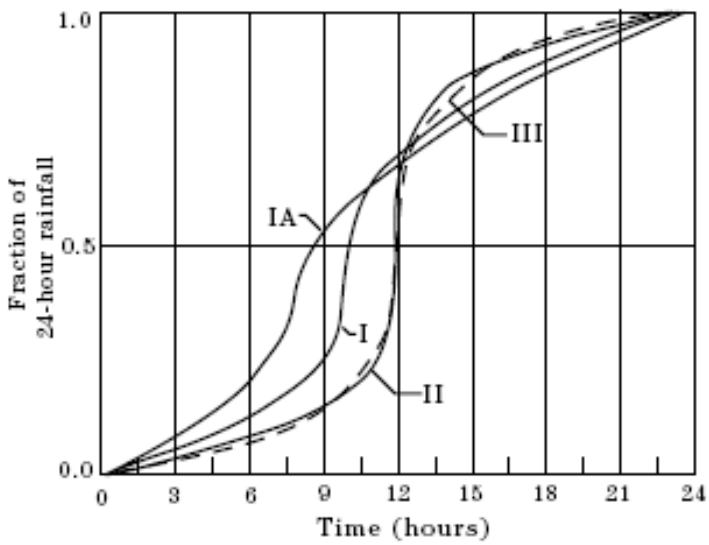

Figure 17: Standard type curves utilized by NRCS and others to characterize average precipitation distribution (NRCS)

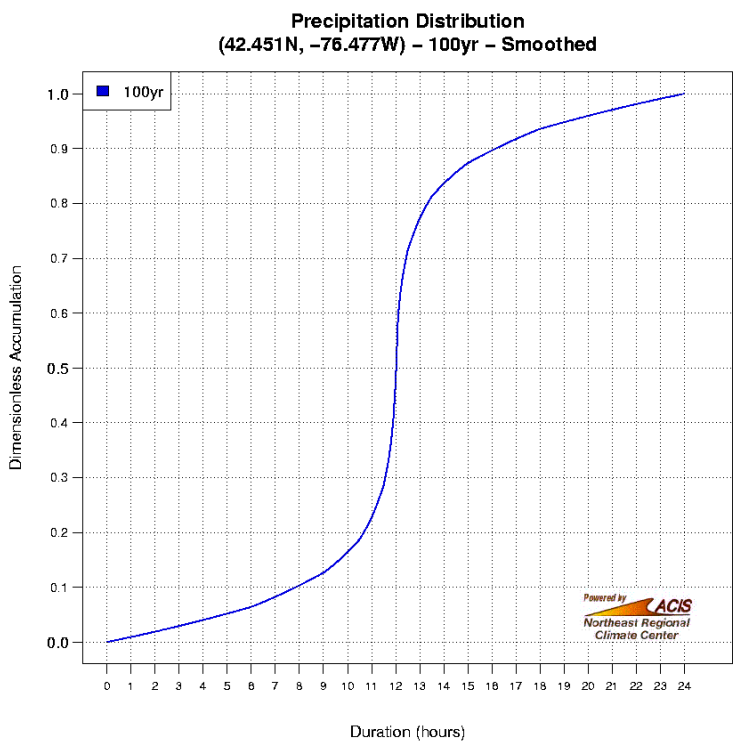

Figure 18: Sample precipitation distribution curve for Ithaca, New York (42.451N, -76.477W) from precip.net web tool

Different curves (i.e. Type I, IA, II and III) characterize the geographic variably of this relationship across the United States **(Figure 19)**. Across most of New York and New England, the use of a Type II curve is indicated, with the exception of coastal regions were a Type III curve is used. The use of Type I and Type IA curves is confined to the west coast. In the Northeast, the difference between the Type II and Type III distribution curves is minimal **(Figure 17)**, even though the respective design storms show some differences (**Figures 20-21**). In the Type III curve a higher proportion of the 24-hour rainfall occurs within 12 to 15 hour periods. This is related to the timing of rainfall occurrence with tropical storm systems.

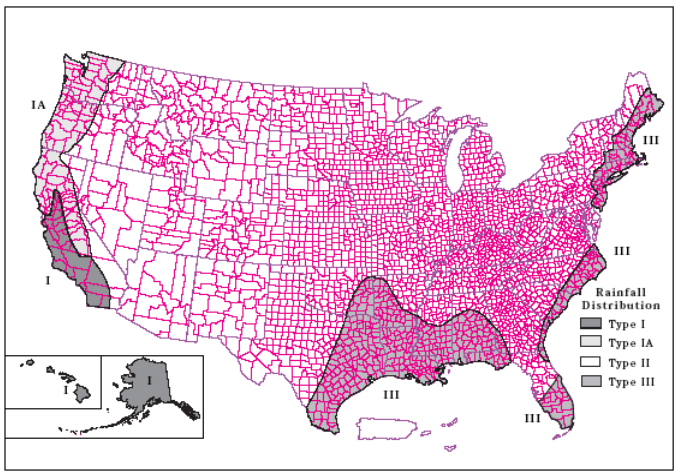

Figure 19: Map showing where each of the four rainfall distributions is valid across the United States; the Northeast solely utilizes the Type II and Type III curves (NRCS)

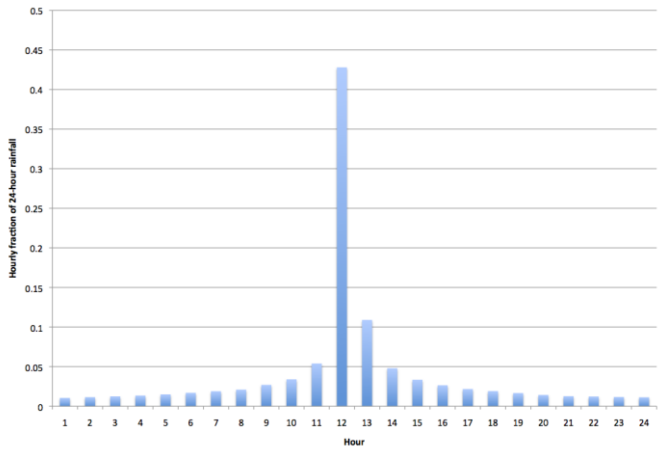

Figure 20: A depiction of the 24-hour design storm used to calculate the Type II curve; it is assumed that the majority of rainfall occurs within Hour 12

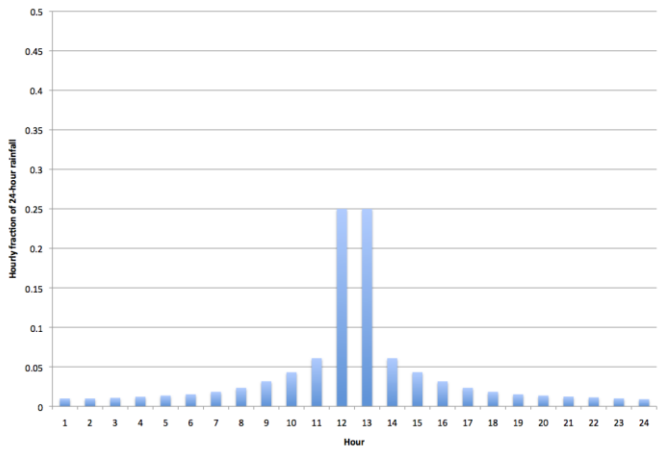

Figure 21: A depiction of the 24-hour design storm used to calculate the Type III curve; it is assumed that the majority of rainfall occurs between Hours 12 and 13

Data from TP-40 was used to empirically determine precipitation ratios (n-hour (or n-minute) precipitation amount/ 24-hour rainfall). By definition, the distribution curve ratios equal 1.0 at 24 hours (i.e. all of the precipitation occurring with a 24-hour storm is expected to occur within a 24-hour period) and 0.0 at zero hours. For intermediate time intervals, the most intense 5-minute portion of the 24-hr storm is assumed to occur at the center of the storm (i.e. for a storm that begins at midnight, the most intense 5-hour period is assumed to occur from 11:57:30 am to 12:02:30 pm). Subsequent accumulation periods are also centered on hour 12. Thus, the 5-minute amount is centered within the 10-minute amount, which is centered within the 15-minute amount, etc. The Type II and III curves are therefore symmetric across hour 12 of the 24-hour storm.

The TP-40 era distribution curves represent average conditions across broad, somewhat-subjectively-defined geographic areas. However, given the gridded nature of the rainfall extremes developed in present study, it was possible to compute individual curves at each grid point. This provided a means of accounting for possible changes in the mean storm intensity characteristics (Palecki 2005), allowed within-region variations to be considered and eliminated to need to subjectively assign grids to a curve-type region. The procedure for developing these gridpoint-specific curves followed that of TP-40. For each recurrence interval, the rainfall associated with the 5-minute storm was assumed to be centered on hour 12 of the 24-hour storm. Similarly, the rainfall associated with the 10-, 15-, 30-, and 60-minute storms was distributed about hour 12, as was the 2-, 3-, 6-, and 12-hour amounts. This allowed symmetric distribution curves to be developed for each grid. As in TP-40, these curves assume that the 5-minute storm for a given return interval is a subset of the 10-minute

storm, which is a subset of the 15-minute storm, etc. Thus, each shorter duration accumulation is assumed to be a subset of the 24-hour storm for a given return interval.

Distribution curve smoothing

Unlike the TP-40 distribution curves that represent average conditions over a large number of stations, the grid-point-specific curves often contained sharp jumps and discontinuities that are an artifact of the data at a particular point. For example, it was not uncommon for the 2- and 3-hour storm for a particular recurrence interval to be the same. Although physically possible, this occurrence resulted in an unsmooth distribution curve. Smoothing assures that incremental intensity decreases with duration.

The smoothing process assumes that the raw 60-minute and 24-hour precipitation values remain essentially fixed. Intermediate intensities are expressed using the linear relationship between the natural logarithm of duration and the natural logarithm of incremental intensity. Thus, for a given recurrence interval, the smoothed incremental intensity for the ith duration, I_i, *where* i = 10, 15 and 30 minute durations, is given by:

$$I_i = \exp\left[\ln(12P_5) + \frac{\ln(I_{60}) - \ln(I_5)}{(\ln 60 - \ln 5)}(\ln i - \ln 5)\right]$$

Equation 16

and $\mathbf{P_5}$ is the 5-minute precipitation accumulation.

For **i** = 120,180, 360 and 720 minute durations (2, 3, 6, and 12 hours), **Equation 16** becomes:

$$I_i = \exp\left[\ln(I_{60}) + \frac{\ln(I_{1440}) - \ln(I_{60})}{(\ln 1440 - \ln 60)}(\ln i - \ln 60)\right]$$

Equation 17

These equations are applied iteratively first adjusting $\mathbf{I_{60}}$ ($\mathbf{I_{1440}}$) until the difference between the smoothed 60 (1440) minute precipitation value is within 0.005 (0.01) of the raw value. The adjustment is such that:

$$I_{60} = I_{60}\left(\frac{P_{60}}{P_{30} + \frac{I_{60}}{2}}\right)$$

Equation 18

or

$$I_{1440} = I_{1440}\left(\frac{P_{1440}}{P_{720} + 12I_{1440}}\right)$$

Equation 19

In the second iteration,

$\mathbf{I_5}$ is modified in 0.01 inch increments until the sum of the squared errors for durations from 5 to 30 minutes is minimized.

Daily Monitoring

Although the data presented through the above website are imperative for design specifications, they provide little guidance on the occurrence of new storms with precipitation accumulations that exceed the extremes given by the historical record. Knowledge of such new events is necessary to assess compliance to extreme rainfall regulations. Likewise, a means of monitoring recent extremes will be useful to drive policy decisions regarding when it may be necessary to consider a more recent data period in design specifications. As part of this work, a section of the final web tool will highlight those stations that have exceeded storms of a given return period.

The Northeast Regional Climate Center receives real-time rainfall data from approximately 1000 stations in the Northeast each day through the Applied Climate Information System (ACIS) interface. Using this real time data feed, newly received data is polled each day to identify sites with an observation that exceeds the 1, 2, 5, 10, 25, 50, 100, 200, and 500 year return period daily accumulation. These stations are then displayed on several map and table products, which are automatically updated and posted on the web site each day.

Conclusion

This project provides a much-needed update to extreme precipitation statistics for the Northeast US, the first regional effort to do so in almost five decades. The NRCC methodology for creating this atlas relies on work done by several previous local and regional extreme rainfall studies including Technical Paper 40, NOAA Atlas 14, and Wilks 1993. Steps have been taken to ensure this procedure would be objective and automatable, to allow for regular reanalysis as the climate changes and as new data becomes available. The web tool at **http://www.precip.net/** or

http://precip.eas.cornell.edu/ allows for easy access to the atlas, along with special products to assess daily extreme rainfall events in near-realtime.

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Appendix A: List of All Stations

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
060128	CT	ANSONIA 1 NE	41.349	73.069	140	40		
060227	CT	BAKERSVILLE	41.842	73.009	686	44		
060251	CT	BALTIC	41.617	72.100	141	34		
060299	CT	BARKHAMSTED	41.921	72.964	705	75		
060801	CT	BRIDGEPORT	41.200	73.200	141	56		
060806	CT	BRIDGEPORT SIKORSKY MEM AP	41.158	73.129	5	60	60	20
060918	CT	BROOKLYN	41.783	71.950	240	31		
060961	CT	BULLS BRG DAM	41.650	73.483	260	59		
060973	CT	BURLINGTON	41.794	72.932	505	74		
061093	CT	CANDLEWOOD LAKE	41.483	73.467	502		25	
061488	CT	COCKAPONSET RS	41.461	72.520	160	50		
061499	CT	COLCHESTER 2 W	41.550	72.367	479	75		
061689	CT	COVENTRY	41.800	72.350	480	34		
061715	CT	CREAM HILL	41.900	73.317	1302	67		
061762	CT	DANBURY	41.400	73.417	405	64		
061798	CT	DAWSON LAKE	41.367	72.983	161	26		
062169	CT	EAST HAVEN SALTONSTA	41.285	72.856	30	28		
062288	CT	EASTON RSVR	41.233	73.250	171	27		
062655	CT	FALLS VILLAGE 1	41.933	73.317	940	28		
062658	CT	FALLS VILLAGE	41.950	73.367	550	92		
063207	CT	GROTON	41.351	72.039	40	60		
063451	CT	HARTFORD BRAINARD FLD	41.733	72.650	20	94	45	
063456	CT	HARTFORD BRADLEY INTL AP	41.938	72.683	190	60	54	
063857	CT	JEWETT CITY	41.630	71.901	400		42	
063989	CT	LAKE KONOMOC	41.400	72.183	180	75		
064443	CT	MANCHESTER	41.767	72.483	420	20		
064488	CT	MANSFIELD HOLLOW LAK	41.757	72.186	250	53	46	
064767	CT	MIDDLETOWN 4 W	41.550	72.717	369	68		
064790	CT	MILFORD	41.200	73.083	30	26		
065018	CT	MOODUS RSVR	41.500	72.433	459		26	
065077	CT	MT CARMEL	41.407	72.903	180	65		
065273	CT	NEW HAVEN TWEED AP	41.264	72.887	3	37	21	
065309	CT	NEW LONDON	41.350	72.100	60	57		
065445	CT	NORFOLK 2 SW	41.972	73.221	1340	68	52	
065510	CT	NORTH BRANFORD	41.333	72.767	210	26		
065641	CT	NORTH GUILFORD	41.383	72.717	279	26		
065892	CT	NORWALK	41.133	73.450	121	61		
065893	CT	NORWALK GAS PLT	41.117	73.417	37	29		
065910	CT	NORWICH PUB UTIL PLA	41.527	72.064	20	51		
066131	CT	PACHAUG FOREST	41.583	71.850	269	20		
066597	CT	PROSPECT	41.500	72.950	420	25		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
066655	CT	PUTNAM LAKE	41.083	73.639	300	56		
066966	CT	ROCKY RIVER DAM	41.583	73.433	220	59		
067002	CT	ROUND POND	41.301	73.537	800	53		
067109	CT	SALISBURY	41.983	73.450	1079	31		
067157	CT	SAUGATUCK RSVR	41.250	73.350	300	54		
067373	CT	SHEPAUG DAM	41.717	73.300	840	53		
067432	CT	SHUTTLE MEADOW RESRV	41.644	72.817	410	58		
067959	CT	STAFFORD SPRINGS 2	41.950	72.300	455	29		
067970	CT	STAMFORD 5 N	41.125	73.547	190	49		
068138	CT	STORRS	41.795	72.229	665	114	40	
068330	CT	THOMASTON DAM	41.693	73.060	538		35	
068436	CT	TORRINGTON	41.800	73.117	580	51		
068488	CT	TRAP FALLS RSVR	41.283	73.150	322	27		
068906	CT	WATERBURY ANACONDA	41.567	73.033	322	60		
068911	CT	WATERBURY CITY HALL	41.567	73.033	341	30		
069007	CT	WEPAWAUG RSVR	41.300	73.033	190	25		
069067	CT	WESTBROOK	41.300	72.433	39	37		
069162	CT	WEST HARTFORD	41.750	72.783	275	52		
069174	CT	WEST HARTLAND	42.000	72.967	1161	29		
069388	CT	WEST THOMPSON LAKE	41.944	71.903	370	44	28	
069508	CT	WHIGVILLE RSVR	41.733	72.950	581	25		
069568	CT	WIGWAM RSVR	41.667	73.133	570	48		
069759	CT	WOLCOTT RSVR	41.617	72.950	850	25		
069775	CT	WOODBURY	41.554	73.230	650	42		
170100	ME	ACADIA NP	44.374	68.259	470	25	22	
170273	ME	AUGUSTA	44.301	69.778	35		44	
170275	ME	AUGUSTA STATE AP	44.321	69.797	350	60		
170350	ME	BANGOR	44.800	68.800	59	27		
170355	ME	BANGOR INTL AP	44.788	68.821	148	51		
170371	ME	BAR HARBOR 3 NW	44.417	68.250	112	80		
170480	ME	BELFAST	44.439	68.989	30	63		
170600	ME	BINGHAM WYMAN DAM	45.071	69.904	400	51		
170655	ME	BLANCHARD	45.267	69.584	600	25		
170814	ME	BRASSUA DAM	45.660	69.812	1060	79		
170833	ME	BRIDGEWATER	46.428	67.844	420	48		
170844	ME	BRIDGTON 3 NW	44.070	70.747	560	50		
170934	ME	BRUNSWICK NAS	43.900	69.933	70	61		
171175	ME	CARIBOU MUNI AP	46.871	68.017	624	69	60	20
171472	ME	CLAYTON LAKE	46.611	69.522	1000		50	
171479	ME	CLAYTON LAKE 2	46.617	69.533	1000	21		
171628	ME	CORINNA	44.920	69.242	297	60		
171975	ME	DOVER-FOXCROFT	45.187	69.184	370	32		
172238	ME	EAST HIRAM	43.879	70.754	528	42		
172426	ME	EASTPORT	44.907	66.992	85	113	46	
172442	ME	EAST SANGERVILLE 5 S	45.133	69.283	541	21		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
172539	ME	EAST WINTHROP	44.317	69.900	171	27		
172620	ME	ELLSWORTH	44.533	68.433	20	69		
172700	ME	EUSTIS	45.217	70.483	1260	65		
172765	ME	FARMINGTON	44.689	70.157	420	114		
172868	ME	FT FAIRFIELD 5 NE	46.800	67.767	302	58		
172878	ME	FT KENT	47.239	68.614	610	76	44	
173046	ME	GARDINER	44.220	69.789	140	118		
173110	ME	GILEAD	44.400	70.967	702	21		
173250	ME	GRAND LAKE MATAGAMON	46.141	68.791	660		26	
173261	ME	GRAND LAKE STREAM	45.178	67.785	290	49	51	
173353	ME	GREENVILLE MAINE FORESTRY SVC	45.462	69.595	1028	59	24	
173417	ME	GUILFORD	45.170	69.382	400	29		
173567	ME	HARMONY	44.944	69.546	320	30		
173588	ME	HARRIS STN	45.459	69.863	830	39		
173800	ME	HIRAM 2 S	43.850	70.800	289	39		
173892	ME	HOULTON INTL AP	46.124	67.793	476	58		
173897	ME	HOULTON	46.133	67.833	410	82	34	
173944	ME	HOULTON 5 N	46.206	67.842	390	23	20	
174086	ME	JACKMAN	45.623	70.255	1190	88	26	
174183	ME	JONESBORO	44.644	67.647	185	58		
174324	ME	KINGFIELD	44.966	70.171	630	29		
174566	ME	LEWISTON	44.100	70.217	180	115		
174781	ME	LONG FALLS DAM	45.222	70.198	1160	56		
174817	ME	LOVELL	44.157	70.894	490	23		
174878	ME	MACHIAS	44.719	67.454	20	82		
174927	ME	MADISON	44.798	69.888	260	105		
175261	ME	MIDDLE DAM	44.793	70.917	1460	82		
175304	ME	MILLINOCKET	45.650	68.705	360	105	47	
175309	ME	MILLINOCKET MUNI AP	45.648	68.686	408	35		
175347	ME	MILO	45.256	69.010	420		30	
175460	ME	MOOSEHEAD	45.587	69.716	1028	77		
175675	ME	NEWCASTLE	44.046	69.537	190	43		
175875	ME	NORTH BRIDGTON	44.133	70.717	449	57		
176420	ME	OLD TOWN	44.933	68.650	112	35		
176425	ME	OLD TOWN FAA AP	44.950	68.667	135	23		
176430	ME	ORONO	44.899	68.674	115	102		
176435	ME	ORONO 2	44.878	68.669	58		46	
176705	ME	PHILLIPS	44.817	70.350	600	21		
176900	ME	PORTLAND CITY	43.667	70.250	66	25		
176902	ME	PORTLAND	43.650	70.250	102	69		
176905	ME	PORTLAND INTL JETPORT	43.650	70.300	45	68	59	20
176937	ME	PRESQUE ISLE	46.654	68.009	599	97		
177037	ME	RANGELEY	44.989	70.672	1530	38		
177250	ME	ROCKLAND	44.100	69.117	39	38		
177255	ME	ROCKLAND 1 W	44.102	69.117	35		51	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
177325	ME	RUMFORD 1 SSE	44.531	70.537	630	59	34	
177330	ME	RUMFORD	44.550	70.550	505	60		
177479	ME	SANFORD 2 NNW	43.457	70.780	280	55		
177827	ME	SKOWHEGAN	44.764	69.719	165		52	
177940	ME	SOUTH ANDOVER	44.583	70.733	659	27		
178301	ME	SOUTHWEST HARBOR	44.283	68.317	10		25	
178353	ME	SPRINGFIELD	45.400	68.167	440	32		
178398	ME	SQUA PAN DAM	46.550	68.333	610	70		
178641	ME	SWANS FALLS	44.033	70.983	400		41	
178721	ME	THE FORKS	45.350	69.967	600	55		
178942	ME	UPPER DAM	44.883	70.862	1480	37		
178965	ME	VAN BUREN 2	47.166	67.940	456	38		
178974	ME	VANCEBORO 2	45.561	67.430	420	42		
179151	ME	WATERVILLE WWTP	44.527	69.654	73	112		
179314	ME	WEST BUXTON 2 NNW	43.688	70.612	150	55		
179360	ME	WEST ENFIELD	45.250	68.650	161	22		
179538	ME	WEST PARIS	44.333	70.583	540	25		
179593	ME	WEST ROCKPORT 1 NNW	44.193	69.146	380	31		
179891	ME	WOODLAND	45.157	67.404	140	88		
190049	MA	ADAMS	42.650	73.100	751	54		
190120	MA	AMHERST	42.386	72.537	150	114		
190190	MA	ASHBURNHAM	42.618	71.916	1108	68		
190213	MA	ASHFIELD	42.513	72.851	1350	30		
190218	MA	ASHLAND	42.250	71.467	230	76		
190257	MA	ATHOL	42.583	72.217	850	29		
190408	MA	BARRE FALLS DAM	42.428	72.028	830	49	40	
190535	MA	BEDFORD	42.483	71.283	160	51		
190551	MA	BEECHWOOD	42.233	70.817	62	55		
190562	MA	BELCHERTOWN	42.279	72.348	560	66		
190666	MA	BIRCH HILL DAM	42.633	72.123	864	60	53	
190736	MA	BLUE HILL	42.212	71.114	630	115	60	20
190759	MA	BORDEN BROOK RSVR	42.133	72.933	1110	25		
190770	MA	BOSTON LOGAN INTL AP	42.361	71.011	12	73	60	20
190775	MA	BOSTON CITY WSO	42.350	71.067	20	64		
190801	MA	BOYLSTON	42.350	71.717	630	82		
190860	MA	BROCKTON	42.048	71.005	80	101		
190998	MA	BUFFUMVILLE LAKE	42.116	71.907	525	48	38	
191386	MA	CHATHAM WSMO	41.657	69.959	50	35		
191430	MA	CHESTER 2	42.300	72.983	640	55		
191436	MA	CHESTERFIELD	42.383	72.850	1345	77		
191447	MA	CHESTNUT HILL	42.333	71.150	121	92		
191561	MA	CLINTON	42.400	71.683	400	78		
191622	MA	CONCORD	42.450	71.367	141	47		
191774	MA	CUMMINGTON HILL	42.467	72.933	1610	30		
192107	MA	EAST BRIMFIELD LAKE	42.110	72.127	690	46	40	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
192451	MA	EAST WAREHAM	41.765	70.670	30	86		
192501	MA	EDGARTOWN	41.384	70.517	30	62		
192642	MA	FALL RIVER	41.717	71.133	190	82		
192806	MA	FITCHBURG 4 SE	42.550	71.750	331	85		
192975	MA	FRAMINGHAM	42.283	71.417	171	95		
192997	MA	FRANKLIN	42.079	71.409	240	79		
193052	MA	GARDNER	42.583	71.983	1110	70		
193213	MA	GREAT BARRINGTON	42.145	73.417	817	27		
193270	MA	GROTON	42.600	71.583	341	63		
193401	MA	HARDWICK	42.350	72.200	970	79		
193471	MA	HATCHVILLE	41.617	70.533	70	73		
193505	MA	HAVERHILL	42.759	71.060	20	104		
193549	MA	HEATH	42.667	72.817	1590	75		
193624	MA	HINGHAM	42.227	70.912	35	48		
193702	MA	HOLYOKE	42.200	72.600	98	95		
193713	MA	HOOSAC TUNNEL	42.683	72.967	801	43		
193772	MA	HUBBARDSTON	42.483	72.000	981	55		
193821	MA	HYANNIS	41.665	70.304	50	106	45	
193876	MA	IPSWICH	42.665	70.866	85	80		
193890	MA	JAMAICA PLAIN	42.303	71.124	150	41		
193931	MA	JEFFERSON	42.367	71.900	810	60		
193985	MA	KNIGHTVILLE DAM	42.283	72.867	630	48	45	
194012	MA	LAKE COCHITUATE	42.317	71.383	151	75		
194075	MA	LANESBORO	42.550	73.233	1236	22		
194105	MA	LAWRENCE	42.699	71.166	50	113		
194246	MA	LITTLEVILLE LAKE	42.267	72.883	600		27	
194313	MA	LOWELL	42.641	71.364	110	107		
194449	MA	MANSFIELD	42.050	71.200	141	62		
194502	MA	MARBLEHEAD	42.501	70.864	84	24		
194580	MA	MAYNARD	42.429	71.442	205	45		
194711	MA	MIDDLEBORO	41.882	70.909	57	98		
194744	MA	MIDDLETON	42.595	71.021	90	83		
194760	MA	MILFORD	42.162	71.512	280	77		
194771	MA	MILLBURY	42.183	71.750	351	29		
194903	MA	MONTAGUE CITY	42.583	72.583	100	22		
195159	MA	NANTUCKET MEM AP	41.253	70.061	45	42	21	
195175	MA	NATICK	42.282	71.344	180	30		
195246	MA	NEW BEDFORD	41.633	70.933	70	103	49	
195285	MA	NEWBURYPORT 3 WNW	42.863	70.900	85	79		
195306	MA	NEW SALEM	42.450	72.333	845	53		
195514	MA	NORTHBRIDGE	42.117	71.683	0	37		
195524	MA	NORTHBRIDGE 2	42.115	71.676	315	44		
196245	MA	PEABODY	42.533	70.983	170	27		
196251	MA	PELHAM	42.400	72.400	1102	39		
196262	MA	PEMBROKE	42.017	70.817	69	60		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
196286	MA	PEPPERELL	42.667	71.533	210	26		
196311	MA	PERU	42.417	73.067	1831	34		
196322	MA	PETERSHAM 3 N	42.533	72.183	1090	73	38	
196409	MA	PITTSFIELD	42.450	73.250	1040	36		
196414	MA	PITTSFIELD MUNI AP	42.427	73.289	1194	51	21	
196425	MA	PLAINFIELD	42.517	72.917	1620	56		
196486	MA	PLYMOUTH-KINGSTON	41.982	70.696	45	114		
196644	MA	PRINCETON	42.450	71.867	1040	61		
196676	MA	PROVINCETOWN 3 NW	42.083	70.217	39	57		
196681	MA	PROVINCETOWN	42.050	70.183	20	29	41	
196699	MA	QUABBIN INTAKE	42.367	72.283	550	41		
196783	MA	READING	42.524	71.126	90	48		
196938	MA	ROCHESTER	41.786	70.917	65	58		
196977	MA	ROCKPORT 1 ESE	42.650	70.600	79	77	32	
197190	MA	SANDWICH	41.767	70.500	20	22		
197293	MA	SEGREGANSET	41.833	71.117	39	33		
197370	MA	SHELBURNE FALLS	42.617	72.733	449	47		
197627	MA	SOUTHBRIDGE 3 SW	42.058	72.072	685	82		
197692	MA	SOUTH EGREMONT	42.150	73.450	840	56		
198030	MA	SPOT POND	42.450	71.083	171	72		
198046	MA	SPRINGFIELD	42.100	72.583	190	70		
198154	MA	STERLING	42.450	71.817	480	83		
198159	MA	STERLING 2 NNW	42.450	71.800	722		23	
198181	MA	STOCKBRIDGE	42.300	73.333	860	51		
198278	MA	SUNDERLAND	42.444	72.553	225	30		
198301	MA	SWAMPSCOTT	42.467	70.900	20	27		
198367	MA	TAUNTON	41.900	71.066	20	114		
198573	MA	TULLY LAKE	42.640	72.224	690	59		
198580	MA	TURNERS FALLS	42.617	72.550	190	82		
198755	MA	WALPOLE	42.167	71.233	171	23		
198757	MA	WALPOLE 2	42.161	71.246	165	36		
198793	MA	WARE	42.262	72.248	400	67		
198798	MA	WARE 2	42.267	72.267	502	29		
198843	MA	WASHINGTON 2	42.367	73.150	1962		21	
198918	MA	WEBSTER	42.050	71.883	469	42		
199093	MA	WEST BRIMFIELD	42.167	72.267	375		46	
199191	MA	WESTFIELD	42.133	72.750	120	61		
199316	MA	WEST MEDWAY	42.133	71.433	210	47		
199360	MA	WESTON	42.383	71.317	220	49		
199371	MA	WEST OTIS	42.182	73.224	1295	77		
199442	MA	WEST RUTLAND	42.367	71.983	860	21		
199770	MA	WINCHENDON	42.700	72.083	860	69		
199780	MA	WINCHENDON 2	42.683	72.050	1020	21		
199923	MA	WORCESTER RGNL AP	42.271	71.873	1000	60	52	
199928	MA	WORCESTER	42.300	71.817	620	69		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
270675	NH	BENTON	44.100	71.883	1312	21		
270681	NH	BENTON 5 SW	44.034	71.949	1200	44		
270690	NH	BERLIN	44.449	71.184	930	94		
270703	NH	BETHLEHEM	44.283	71.683	1380	96		
270741	NH	WEBSTER	43.300	71.700	450		42	
270910	NH	BRADFORD	43.259	71.980	940	56		
270998	NH	BRISTOL	43.589	71.736	470		50	
271099	NH	CAMPTON	43.850	71.633	620	26		
271647	NH	COLEBROOK	44.861	71.540	1120	44		
271683	NH	CONCORD MUNI AP	43.195	71.501	346	88	60	20
271950	NH	DEERING	43.091	71.868	1067	21		
272023	NH	DIXVILLE NOTCH	44.869	71.325	1690	69		
272174	NH	DURHAM	43.150	70.950	80	112	48	
272284	NH	EAST DEERING	43.067	71.817	791	27		
272800	NH	EPPING	43.030	71.084	160	44		
272842	NH	ERROL	44.789	71.123	1280	81	51	
272870	NH	EVERETT LAKE	43.100	71.650	435		22	
272999	NH	FIRST CONNECTICUT LAKE	45.087	71.287	1660	84		
273024	NH	FITZWILLIAM 2 W	42.780	72.179	1160	71		
273177	NH	FRANKLIN	43.450	71.667	390	70		
273182	NH	FRANKLIN FALLS DAM	43.467	71.666	430	51	53	
273409	NH	GLENCLIFF	43.983	71.900	1650	43		
273415	NH	GLENCLIFF 2	43.985	71.895	1080	29		
273530	NH	GRAFTON	43.567	71.950	830	78		
273626	NH	GREENLAND	43.017	70.833	85	35		
273850	NH	HANOVER	43.703	72.285	603	122	53	
274062	NH	HILLSBORO 2 W	43.117	71.933	600		26	
274218	NH	HOPKINTON LAKE	43.192	71.748	440		38	
274329	NH	JEFFERSON	44.417	71.501	1235	31		
274399	NH	KEENE	42.939	72.324	520	114		
274475	NH	LAKEPORT	43.550	71.467	560	33		
274480	NH	LAKEPORT 2	43.549	71.464	500	81		
274556	NH	LANCASTER	44.491	71.573	860	76		
274568	NH	LANDAFF	44.167	71.883	1050		20	
274656	NH	LEBANON MUNI AP	43.626	72.305	594	49		
274732	NH	LINCOLN	44.050	71.667	875	46	46	
275013	NH	MACDOWELL DAM	42.894	71.984	970	44	47	
275072	NH	MANCHESTER	43.033	71.483	210	63		
275150	NH	MARLOW	43.117	72.200	1170	59		
275211	NH	MASSABESIC LAKE	42.989	71.393	253	64		
275400	NH	MILAN 7 NNW	44.667	71.217	1181	54		
275412	NH	MILFORD	42.839	71.649	320	60		
275500	NH	MONROE 5 NNE	44.317	72.000	660	37		
275532	NH	MOULTONBORO 5 WSW	43.733	71.483	600	40		
275629	NH	MT SUNAPEE	43.333	72.082	1270	50		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
275639	NH	MT WASHINGTON	44.267	71.299	6267	61	60	
275702	NH	NASHUA	42.767	71.450	87	44		
275712	NH	NASHUA 2 NNW	42.791	71.473	140	110		
275780	NH	NEW DURHAM 3 NNW	43.483	71.183	640		54	
275868	NH	NEWPORT	43.384	72.175	790	79	29	
275995	NH	NORTH CONWAY	44.030	71.138	544	34		
276234	NH	NORTH STRATFORD	44.750	71.630	910	59		
276550	NH	OTTER BROOK LAKE	42.945	72.237	680	41	38	
276818	NH	PINKHAM NOTCH	44.263	71.255	2010	78	47	
276856	NH	PITTSBURG RSVR	45.046	71.383	1350		51	
276944	NH	PLYMOUTH	43.750	71.683	502	62		
276945	NH	PLYMOUTH	43.783	71.650	660	55		
277747	NH	RUMNEY	43.800	71.817	510	43		
277967	NH	SOUTH DANBURY	43.500	71.900	932	39		
278081	NH	SOUTH LYNDEBORO	42.883	71.783	650	51		
278194	NH	SOUTH WEARE 1 SE	43.050	71.717	702	23		
278539	NH	SURRY MTN LAKE	42.996	72.313	550	51	52	
278612	NH	TAMWORTH 3	43.900	71.300	790	28		
278858	NH	WALPOLE 3	43.074	72.405	920	29		
278885	NH	WARREN	43.910	71.888	710		48	
278972	NH	WEARE	43.085	71.738	720	35		
279045	NH	WEBSTER	43.300	71.700	450	44		
279318	NH	WEST LEBANON	43.633	72.317	380	29		
279618	NH	WHITEFIELD	44.383	71.600	1089	27		
279726	NH	WINCHESTER	42.767	72.367	489		34	
279740	NH	WINDHAM 3 NW	42.817	71.333	220	28		
279865	NH	WOLFEBORO FALLS	43.583	71.200	531	30		
279940	NH	WOODSTOCK	43.983	71.683	722	38		
279966	NH	YORK POND	44.500	71.333	1530	65		
280311	NJ	ATLANTIC CITY INTL AP	39.449	74.567	60	50	50	20
280325	NJ	ATLANTIC CITY	39.379	74.424	10	59		
280346	NJ	AUDUBON	39.883	75.083	39	40		
280528	NJ	BASS RIVER SF	39.617	74.433	30	24		
280690	NJ	BELLEPLAIN SF	39.248	74.843	30	81		
280721	NJ	BELMAR 2 SW	40.150	74.067	39	21		
280729	NJ	BELVIDERE	40.833	75.083	279	88		
280734	NJ	BELVIDERE BRG	40.829	75.084	263	26		
280847	NJ	BLACKWELLS MILLS	40.460	74.582	40	37		
280907	NJ	BOONTON 1 SE	40.900	74.400	280	107		
280927	NJ	BOUND BROOK 2 W	40.560	74.575	50	51	21	
280978	NJ	BRANCHVILLE	41.150	74.750	581	27		
281028	NJ	BRIDGETON 1 NE	39.467	75.200	112	62		
281211	NJ	BURLINGTON	40.083	74.867	12	69		
281327	NJ	CANISTEAR RSVR	41.109	74.482	1100	59		
281335	NJ	CANOE BROOK	40.744	74.354	180	77		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
281343	NJ	CANTON	39.467	75.417	20	37		
281351	NJ	CAPE MAY 2 NW	38.954	74.936	20	86	51	
281472	NJ	CEDAR GROVE	40.867	74.217	400	23		
281582	NJ	CHARLOTTEBURG RSVR	41.035	74.423	760	115		
281590	NJ	CHATHAM	40.750	74.367	190	58		
281598	NJ	CHATSWORTH	39.817	74.533	102	27		
281708	NJ	CLAYTON	39.650	75.100	121	51		
281749	NJ	CLINTON	40.633	74.917	200	25		
282023	NJ	CRANFORD	40.650	74.300	75	39		
282130	NJ	CULVERS LAKE	41.167	74.783	761	50		
282340	NJ	DOVER	40.883	74.567	575	50		
282644	NJ	ELIZABETH	40.667	74.233	39	76		
282768	NJ	ESSEX FELLS SERV BLDG	40.831	74.286	350	62	40	
283029	NJ	FLEMINGTON 5 NNW	40.563	74.883	260	109		
283102	NJ	FORTESCUE	39.233	75.167	10	30		
283181	NJ	FREEHOLD MARLBORO	40.314	74.251	194	75	31	
283291	NJ	GLASSBORO 2 NE	39.736	75.095	100	40	47	
283516	NJ	GREENWOOD LAKE	41.139	74.324	470	67		
283662	NJ	HAMMONTON 1 NE	39.644	74.807	90	80		
283935	NJ	HIGH POINT PARK	41.306	74.671	1520	34		
283951	NJ	HIGHTSTOWN 2 W	40.265	74.564	100	111		
284229	NJ	INDIAN MILLS	39.814	74.788	100	107		
284339	NJ	JERSEY CITY	40.742	74.057	135	88		
284596	NJ	LAKEHURST NAS	40.033	74.350	112	51		
284635	NJ	LAMBERTVILLE	40.367	74.947	68	76		
284653	NJ	LAMBERTVILLE RIVER	40.367	74.950	60	53		
284735	NJ	LAYTON 3 NW	41.250	74.850	469	60		
284887	NJ	LITTLE FALLS	40.886	74.226	150	104	37	
284987	NJ	LONG BRANCH OAKHURST	40.280	74.005	30	93		
285003	NJ	LONG VALLEY	40.788	74.779	550	71		
285055	NJ	MT HOLLY	39.988	74.805	10		20	
285104	NJ	MAHWAH	41.100	74.167	249	31		
285197	NJ	MANVILLE	40.550	74.567	49	25		
285346	NJ	MAYS LANDING 1 W	39.451	74.747	20	62		
285503	NJ	MIDLAND PARK	40.994	74.145	210	60		
285581	NJ	MILLVILLE MUNI AP	39.366	75.078	70	58		
285597	NJ	MILTON	41.017	74.533	951	30		
285728	NJ	MOORESTOWN	39.951	74.970	45	113		
285769	NJ	MORRIS PLAINS 1 W	40.833	74.500	400	48		
286026	NJ	NEWARK INTL AP	40.682	74.169	7	77	60	20
286055	NJ	NEW BRUNSWICK 3 SE	40.472	74.436	86	40	31	
286062	NJ	NEW BRUNSWICK EXP ST	40.467	74.433	89	56		
286146	NJ	NEW MILFORD	40.961	74.016	12	89	30	
286177	NJ	NEWTON	41.055	74.759	605	106		
286320	NJ	NORTHFIELD	39.367	74.533	25	31		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
286460	NJ	OAK RIDGE RSVR	41.004	74.499	880	67		
286560	NJ	ORANGE	40.783	74.217	161	23		
286775	NJ	PATERSON	40.900	74.150	102	78		
286843	NJ	PEMBERTON	39.971	74.683	60	72		
286974	NJ	PHILLIPSBURG	40.683	75.183	180	72		
286979	NJ	PHILLIPSBURG EASTON	40.697	75.204	200	37		
287079	NJ	PLAINFIELD	40.604	74.403	90	113		
287131	NJ	PLEASANTVILLE 1 N	39.417	74.517	10	59		
287301	NJ	POTTERSVILLE 2 NNW	40.737	74.732	365	40		
287328	NJ	PRINCETON WATER WORK	40.333	74.667	59	44		
287393	NJ	RAHWAY	40.601	74.257	20	53	42	
287545	NJ	RIDGEFIELD	40.833	74.017	79	42		
287587	NJ	RINGWOOD	41.092	74.268	305	69		
287825	NJ	RUNYON	40.433	74.333	20	37		
287865	NJ	SANDY HOOK	40.463	74.006	10	27		
287936	NJ	SEABROOK FARMS	39.487	75.220	90	42		
288051	NJ	SHILOH	39.467	75.300	121	29		
288194	NJ	SOMERVILLE 4 NW	40.615	74.653	134	109		
288402	NJ	SPLIT ROCK POND	40.967	74.467	800	48		
288423	NJ	SPRINGFIELD	40.696	74.336	90		45	
288644	NJ	SUSSEX 2 NW	41.221	74.660	649	103		
288816	NJ	TOMS RIVER	39.950	74.217	100	82		
288878	NJ	TRENTON-NOTTINGHAMWA	40.233	74.767	39	51		
288883	NJ	TRENTON WSO CITY	40.227	74.746	190	50	33	
288899	NJ	TUCKERTON 2 NE	39.602	74.339	10	93		
289135	NJ	VINELAND	39.483	75.000	112	54		
289187	NJ	WANAQUE RAYMOND DAM	41.044	74.293	245	61	37	
289271	NJ	WATCHUNG	40.662	74.416	260		45	
289363	NJ	WERTSVILLE 4 NE	40.453	74.808	240	44		
289608	NJ	WEST WHARTON	40.900	74.600	679	30		
289832	NJ	WOODCLIFF LAKE	41.014	74.043	103	87	29	
289910	NJ	WOODSTOWN PITTSGROV 4E	39.546	75.164	98	63		
300023	NY	ADDISON	42.101	77.234	999	102		
300042	NY	ALBANY AP	42.743	73.809	275	70	60	20
300047	NY	ALBANY	42.646	73.747	0	67	23	
300055	NY	ALBION 2 NE	43.272	78.167	440	59		
300063	NY	ALCOVE DAM	42.470	73.927	607	64		
300077	NY	ALEXANDRIA BAY 1 SW	44.333	75.917	259	40		
300085	NY	ALFRED	42.261	77.785	1770	106		
300093	NY	ALLEGANY SP	42.100	78.750	1500	83		
300159	NY	AMSTERDAM LOCK 1O	42.917	74.133	279	31		
300175	NY	ANDOVER	42.150	77.800	1670	26		
300183	NY	ANGELICA	42.302	77.989	1445	113		
300220	NY	ARCADE	42.533	78.417	1580	62		
300237	NY	ARENA	42.100	74.717	1450	22		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
300254	NY	ARKVILLE 2 W	42.139	74.653	1310	56		
300270	NY	ARNOT FOREST	42.263	76.628	1200		49	
300321	NY	AUBURN	42.933	76.545	770	93		
300331	NY	AURORA RSCH FARM	42.734	76.659	830	51		
300343	NY	AVON	42.920	77.756	545	104		
300360	NY	BAINBRIDGE 2 E	42.283	75.450	994	82		
300368	NY	BAKERS MILLS	43.617	74.033	1581	33		
300379	NY	BALDWINSVILLE	43.150	76.333	379	89		
300393	NY	BALSAM LAKE	42.033	74.600	2602	22		
300412	NY	BARKER 4 NE	43.367	78.483	279	34		
300443	NY	BATAVIA	43.030	78.169	913	92	20	
300448	NY	BATH	42.349	77.348	1120	53		
300452	NY	BATTENVILLE	43.101	73.432	380	44		
300500	NY	BEAVER FALLS	43.883	75.433	740	62		
300511	NY	BEDFORD HILLS	41.233	73.717	430	76		
300608	NY	BENNETTS BRG	43.532	75.953	660	64		
300613	NY	BENNINGTON	42.856	78.396	1245	29		
300668	NY	BIG MOOSE 3 SE	43.800	74.867	1760	76		
300681	NY	BINGHAMTON SUSQ RVR	42.100	75.900	854	71		
300687	NY	BINGHAMTON GREATER AP	42.207	75.980	1595	61	57	20
300691	NY	BINGHAMTON WB CITY	42.100	75.917	909	46		
300706	NY	BLACK RIVER 1 SW	44.000	75.817	531	34		
300766	NY	BOLIVAR	42.123	78.206	1790	66	45	
300780	NY	BOONVILLE 2 N	43.517	75.367	1181	40		
300785	NY	BOONVILLE 4 SSW	43.436	75.370	1550	59	44	
300817	NY	BRADFORD 1 NW	42.383	77.117	1362	37		
300862	NY	BRENTWOOD	40.783	73.250	102		23	
300870	NY	BREWERTON LOCK 23	43.239	76.196	377	73		
300889	NY	BRIDGEHAMPTON	40.946	72.307	60	78		
300921	NY	BRISTOL SPRINGS	42.700	77.383	1201	33		
300929	NY	BROADALBIN	43.051	74.198	840	61		
300937	NY	BROCKPORT	43.200	77.933	535	86		
301010	NY	BUFFALO	42.883	78.883	823	73		
301012	NY	BUFFALO NIAGARA INTL AP	42.941	78.736	705	70	60	20
301032	NY	BURDETT 1 NE	42.417	76.833	1030	35		
301093	NY	CAIRO	42.317	74.017	302	39		
301095	NY	CAIRO 4 NW	42.317	74.033	490	29		
301110	NY	CAMDEN	43.331	75.842	580	53		
301144	NY	CANAJOHARIE	42.917	74.583	302	50		
301152	NY	CANANDAIGUA 3 S	42.845	77.281	720	65		
301160	NY	CANASTOTA	43.083	75.767	410	51		
301168	NY	CANDOR 2 SE	42.194	76.313	920	61		
301173	NY	CANISTEO 1 SW	42.261	77.616	1155	53		
301185	NY	CANTON 4 SE	44.577	75.110	448	95	54	
301207	NY	CARMEL	41.433	73.683	530	94	30	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
301265	NY	CAYUGA LOCK #1	42.948	76.734	380	73		
301387	NY	CHASM FALLS	44.750	74.217	1060	70		
301401	NY	CHAZY	44.879	73.395	157	99		
301413	NY	CHEMUNG	42.002	76.638	822	69		
301424	NY	CHEPACHET	42.910	75.111	1320	43		
301436	NY	CHERRY VALLEY 2 NNE	42.824	74.739	1360	58		
301492	NY	CINCINNATUS	42.543	75.895	1050	70		
301521	NY	CLARYVILLE	41.913	74.572	1653	46		
301559	NY	CLINTON CORNERS	41.817	73.767	280		23	
301580	NY	CLYDE LOCK 26	43.059	76.838	392	72		
301593	NY	COBLESKILL	42.683	74.483	900	30		
301595	NY	COBLESKILL 2 ESE	42.667	74.433	1169	21		
301603	NY	COHOCTON SCS	42.467	77.500	1460	29		
301623	NY	COLDEN 1 N	42.663	78.683	1025	44	41	
301664	NY	COLTON 2 N	44.584	74.957	580	71		
301708	NY	CONKLINGVILLE DAM	43.320	73.926	808	59	50	
301752	NY	COOPERSTOWN	42.717	74.927	1257	113		
301787	NY	CORNING	42.134	77.069	1147	72		
301799	NY	CORTLAND	42.600	76.183	1129	105		
301949	NY	CUTCHOGUE	41.017	72.500	39	73	27	
301966	NY	DANNEMORA	44.719	73.721	1340	101		
301974	NY	DANSVILLE	42.566	77.718	660	88		
302036	NY	DELHI 2 SE	42.256	74.913	1420	75		
302045	NY	DELTA	43.267	75.433	561	44		
302060	NY	DEPOSIT	42.063	75.426	1000	55		
302079	NY	DE RUYTER 4 N	42.817	75.883	1302	74		
302129	NY	DOBBS FERRY ARDSLEY	41.007	73.834	200	62		
302137	NY	DOLGEVILLE	43.083	74.767	685	71		
302169	NY	DOWNSVILLE DAM	42.077	74.983	1200	35		
302198	NY	DUNKIRK CHAUTAUQUA AP	42.493	79.272	666		21	
302234	NY	EAGLE BAY 3 SE	43.750	74.767	1801	34		
302236	NY	EAGLE BRG 2 SE	42.933	73.367	380	31		
302239	NY	EAGLE FALLS	43.917	75.200	1302	36		
302277	NY	EAST BLOOMFIELD	42.900	77.433	870	27	24	
302356	NY	EAST HOMER 2	42.717	76.117	1562	21		
302366	NY	EAST JEWETT	42.236	74.143	1991	22		
302454	NY	EAST SIDNEY	42.333	75.230	1155		50	
302526	NY	EDMESTON	42.683	75.250	1180		39	
302554	NY	ELIZABETHTOWN	44.214	73.599	611	62		
302574	NY	ELLENBURG DEPOT	44.909	73.794	860	62		
302582	NY	ELLENVILLE	41.717	74.400	350	60		
302599	NY	ELMA	42.850	78.633	775	23		
302610	NY	ELMIRA	42.100	76.836	947	114		
302760	NY	FARMINGDALE 2 NE	40.750	73.433	79	29		
302829	NY	FISHS EDDY	41.967	75.183	1020	46		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
302917	NY	FORESTPORT	43.433	75.217	1132	35		
302953	NY	FT PLAIN	42.938	74.623	305		51	
303010	NY	FRANKFORT LOCK 19	43.067	75.117	410	63		
303025	NY	FRANKLINVILLE	42.330	78.463	1590	85		
303033	NY	FREDONIA	42.450	79.312	760	94	24	
303050	NY	FREEVILLE 1 NE	42.519	76.331	1050	57		
303065	NY	FRIENDSHIP 7 SW	42.138	78.237	1640	39		
303076	NY	FROST VALLEY	41.967	74.550	1841	32		
303102	NY	GABRIELS	44.433	74.167	1762	51		
303124	NY	GANNETT HILL	42.700	77.400	1975	26		
303128	NY	GARBUTT	43.000	77.783	561	27		
303138	NY	GARDINER 1 W	41.683	74.150	320	31		
303144	NY	GARDNERVILLE	41.346	74.487	460	51		
303177	NY	GENEVA EXP ST	42.883	77.000	591	56		
303184	NY	GENEVA RSCH FARM	42.877	77.031	718	39	35	
303259	NY	GLENHAM	41.517	73.933	275	64		
303284	NY	GLENS FALLS FARM	43.333	73.733	504	65		
303289	NY	GLENS FALLS FIRE STN	43.317	73.650	351	53		
303294	NY	GLENS FALLS AP	43.341	73.610	320	63		
303319	NY	GLOVERSVILLE	43.049	74.359	810	111		
303346	NY	GOUVERNEUR 3 NW	44.354	75.512	420	71		
303360	NY	GRAFTON	42.783	73.467	1560	53		
303365	NY	GRAHAMSVILLE	41.850	74.533	960	52		
303373	NY	GRAND GORGE	42.367	74.483	1362	29		
303444	NY	GREENE	42.324	75.771	920	69		
303452	NY	GREENFIELD CTR	43.117	73.833	610	51		
303464	NY	GREENPORT PWR HOUS	41.102	72.373	16	37		
303507	NY	GRIFFISS AFB	43.233	75.400	519	64		
303722	NY	HASKINVILLE	42.421	77.567	1650	97		
303766	NY	HECTOR	42.500	76.883	780	27		
303769	NY	HELMUTH FIRE CTRL	42.485	78.937	870	50		
303773	NY	HEMLOCK	42.775	77.608	902	109		
303781	NY	HEMPSTEAD GARDEN CIT	40.717	73.633	79	22		
303786	NY	HEMPSTEAD MALVERNE	40.683	73.667	39	24		
303839	NY	HIGH FALLS	41.833	74.133	141	40		
303851	NY	HIGHMARKET	43.575	75.521	1763	83	34	
303864	NY	HIGHMOUNT	42.133	74.483	1841	28		
303889	NY	HINCKLEY 2 SW	43.300	75.150	1141	68		
303916	NY	HOFFMEISTER 3 W	43.383	74.733	1880	44		
303953	NY	HONK FALLS	41.750	74.383	430	25		
303961	NY	HOOKER 12 NNW	43.852	75.716	1800	69		
303970	NY	HOPE	43.312	74.248	880	67	45	
303979	NY	HORNBY	42.233	77.050	1795		25	
303983	NY	HORNELL ALMOND DAM	42.349	77.704	1325	56	52	
304025	NY	HUDSON CORRECTIONAL	42.250	73.800	60	50		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
304102	NY	INDIAN LAKE 2 SW	43.755	74.269	1660	108	46	
304130	NY	ISLIP LI MACARTHUR AP	40.794	73.102	84	25		
304174	NY	ITHACA CORNELL UNIV	42.449	76.449	960	112	52	
304182	NY	JACKSONBURG	43.017	74.917	390	31		
304206	NY	JAMESTOWN	42.100	79.250	1391	52		
304207	NY	JAMESTOWN 4 ENE	42.110	79.159	1250	33		
304424	NY	KINGSTON CITY HALL	41.917	73.983	49		23	
304473	NY	KORTRIGHT 2	42.417	74.800	1730	32		
304525	NY	LAKE DELAWARE	42.250	74.900	1470	32		
304555	NY	LAKE PLACID 2 S	44.244	73.985	1940	99	51	
304575	NY	LANSING MANOR	42.449	74.465	1100	22		
304613	NY	LARCHMONT	40.933	73.750	39		27	
304647	NY	LAWRENCEVILLE 3 SW	44.758	74.669	466	76		
304698	NY	LETCHWORTH PARK	42.583	78.033	1260	39		
304715	NY	LEWISTON 1 N	43.183	79.050	331	37		
304731	NY	LIBERTY 1 NE	41.802	74.740	1580	78		
304754	NY	LINCKLAEN	42.700	75.883	1270	25		
304767	NY	LINDEN	42.883	78.167	1122	34		
304772	NY	LINDLEY 2 N	42.064	77.147	1040	55		
304791	NY	LITTLE FALLS CITY RSVR	43.060	74.869	900	107		
304796	NY	LITTLE FALLS MILL ST	43.033	74.867	360	69		
304808	NY	LITTLE VALLEY	42.247	78.812	1625	66		
304836	NY	LOCKE 2 W	42.670	76.472	1200	76		
304844	NY	LOCKPORT 3 S	43.139	78.681	605	103		
304849	NY	LOCKPORT 4 NE	43.200	78.633	440	33		
304912	NY	LOWVILLE	43.797	75.482	860	116		
304944	NY	LYONS FALLS	43.617	75.367	800	70		
304952	NY	MACEDON	43.073	77.302	466	63		
304996	NY	MALONE	44.842	74.308	880	25		
305032	NY	MANORKILL	42.383	74.317	1620	46		
305113	NY	MARYLAND 6 SW	42.469	75.011	1225	25		
305120	NY	MARY SMITH	42.050	74.817	1522	28		
305129	NY	MASSENA SNELL LOCK	44.983	74.783	220		32	
305134	NY	MASSENA INTL AP	44.936	74.846	214	60		
305171	NY	MAYS POINT LOCK 25	43.000	76.767	400	61		
305199	NY	MCKEEVER	43.617	75.117	1480	24		
305231	NY	MECHANICVILLE 2 S	42.883	73.683	39	65		
305248	NY	MELROSE 1 NE	42.850	73.617	350	42		
305276	NY	MERRIMAN DAM	41.800	74.433	865	40		
305291	NY	MIDDLEBURG	42.600	74.317	722	29		
305310	NY	MIDDLETOWN 2 NW	41.460	74.449	700	71		
305334	NY	MILLBROOK	41.850	73.617	820	58		
305346	NY	MILLERTON	41.950	73.517	732		32	
305377	NY	MINEOLA	40.733	73.618	96	70	52	
305426	NY	MOHONK LAKE	41.768	74.155	1245	112		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
305435	NY	MONGAUP VALLEY 4 SSW	41.570	74.793	1246	26		
305512	NY	MORRISVILLE 6 SW	42.842	75.726	1300	87		
305560	NY	MT LEBANON	42.467	73.400	720	23		
305597	NY	MT MORRIS 2 W	42.731	77.905	880	65	51	
305604	NY	MT PLEASANT FARM	42.450	76.367	1650	26		
305639	NY	NARROWSBURG 4 SE	41.567	75.017	740	40		
305673	NY	NEW ALBION	42.300	78.900	1860	30		
305679	NY	NEWARK	43.047	77.084	430	73		
305682	NY	NEWARK VALLEY 1 N	42.246	76.177	990		48	
305687	NY	NEW BERLIN	42.617	75.333	1080	67		
305711	NY	NEWCOMB 3 W	43.967	74.217	1621	36		
305714	NY	NEWCOMB	43.975	74.188	1629	49		
305743	NY	NEW KINGSTON	42.233	74.700	1923	36		
305751	NY	NEW LONDON LOCK 22	43.210	75.645	400	75		
305796	NY	NEW YORK BROOKLYN AVE V	40.594	73.981	20	56	28	
305801	NY	NEW YORK CNTRL PK TWR	40.779	73.969	130	132	60	20
305803	NY	NEW YORK JFK INTL AP	40.639	73.762	11	46		20
305804	NY	NEW YORK LAUREL HILL	40.733	73.933	10	33		
305806	NY	NEW YORK UNIV ST	40.850	73.917	180		21	
305811	NY	NEW YORK LAGUARDIA AP	40.779	73.880	11	61	59	20
305821	NY	NEW YORK WESTERLEIGH	40.633	74.117	80	42	35	
305869	NY	NORFOLK	44.805	75.000	230	63		
305925	NY	NORTH CREEK 5 SE	43.661	73.897	890	60		
305987	NY	NORTH LAKE	43.533	74.950	1831	44		
306047	NY	NORTH TONAWANDA	43.022	78.847	600	26		
306062	NY	NORTHVILLE	43.159	74.204	790	76		
306085	NY	NORWICH	42.512	75.520	989	101		
306164	NY	OGDENSBURG 4 NE	44.728	75.444	280	110		
306184	NY	OLD FORGE	43.703	74.984	1748	71	47	
306196	NY	OLEAN	42.074	78.452	1420	93		
306225	NY	ONEONTA	42.450	75.067	1152	60		
306229	NY	ONEONTA 3 SE	42.450	75.000	1161	20		
306314	NY	OSWEGO EAST	43.462	76.493	350	82	53	
306346	NY	OVID 4 S	42.617	76.817	1122	38		
306356	NY	OWEGO 3 WSW	42.081	76.318	810	29		
306411	NY	PARISHVILLE 1 WNW	44.633	74.833	751	39		
306426	NY	PARKSTON	41.900	74.817	1460	21		
306441	NY	PATCHOGUE 2 N	40.797	73.001	55	58		
306464	NY	PAVILION	42.929	78.032	956	40	31	
306510	NY	PENN YAN	42.671	77.063	830	74		
306538	NY	PERU 2 WSW	44.566	73.570	510	68		
306567	NY	PHOENICIA	42.086	74.314	870	50		
306623	NY	PISECO	43.461	74.523	1730	65	45	
306659	NY	PLATTSBURGH AFB	44.650	73.467	165	60		
306674	NY	PLEASANTVILLE	41.131	73.776	320	53		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
306685	NY	PLYMOUTH	42.617	75.600	1280		38	
306745	NY	PORTAGEVILLE	42.570	78.040	1168	72		
306768	NY	PORT JEFFERSON	40.950	73.067	10		22	
306774	NY	PORT JERVIS	41.380	74.685	470	114		
306817	NY	POUGHKEEPSIE	41.683	73.933	102	50		
306820	NY	POUGHKEEPSIE DUTCHESS CO AP	41.627	73.884	166	52		
306831	NY	PRATTSBURG 2 NW	42.533	77.300	1942	40		
306839	NY	PRATTSVILLE	42.328	74.442	1207	43	44	
306867	NY	PULASKI 1 N	43.583	76.117	400	25		
306941	NY	RAQUETTE LAKE	43.817	74.667	1781	51		
306957	NY	RAY BROOK	44.296	74.103	1620	33		
307115	NY	RIFTON 1 N	41.850	74.050	39	46		
307129	NY	RIVERBANK	43.600	73.733	750	26		
307134	NY	RIVERHEAD RSCH FARM	40.962	72.716	100	70	46	
307167	NY	ROCHESTER GTR INTL AP	43.117	77.677	533	83	60	20
307195	NY	ROCKDALE	42.383	75.400	1030	60		
307210	NY	ROCK HILL 3 SW	41.592	74.614	1270	51		
307274	NY	ROSENDALE 2 E	41.850	74.050	40	49		
307317	NY	ROXBURY	42.283	74.567	1490	56		
307329	NY	RUSHFORD	42.394	78.252	1540	53		
307348	NY	SABATTIS 3 NE	44.117	74.667	1762	45		
307398	NY	SALAMANCA	42.159	78.722	1372		50	
307405	NY	SALEM	43.167	73.317	490	52		
307413	NY	SALISBURY	43.167	74.867	1381	75		
307484	NY	SARATOGA SPRINGS 4 S	43.033	73.817	310	53		
307497	NY	SCARSDALE	40.983	73.800	199	84	34	
307513	NY	SCHENECTADY	42.833	73.917	220		35	
307532	NY	SCHROON RIVER 4 N	44.017	73.700	932	25		
307544	NY	SCHUYLERVILLE LOCK 5	43.117	73.583	112	31		
307549	NY	SCHUYLERVILLE	43.113	73.578	120		48	
307568	NY	SCOTIA	42.817	73.983	230	31		
307596	NY	SEAGER	42.050	74.550	1923	22		
307633	NY	SETAUKET STRONG	40.959	73.105	40	114		
307659	NY	SHARON SPRINGS 1N	42.800	74.600	820	38		
307664	NY	SHARON SPRINGS 2 SW	42.783	74.667	1362	34		
307705	NY	SHERBURNE	42.677	75.506	1095	100		
307713	NY	SHERMAN	42.157	79.594	1560	53		
307721	NY	SHOKAN BROWN STN	41.950	74.200	510	59		
307742	NY	SHRUB OAK	41.333	73.833	420	21		
307750	NY	SILVER CREEK 2 NE	42.558	79.143	582	20		
307772	NY	SINCLAIRVILLE	42.279	79.266	1620	43		
307780	NY	SKANEATELES	42.946	76.431	875	105		
307799	NY	SLIDE MTN	42.017	74.417	2650	60		
307818	NY	SMITHS BASIN	43.352	73.496	142	68		
307830	NY	SMITHVILLE FLATS	42.383	75.817	1080		43	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
307842	NY	SODUS CTR	43.208	77.013	420	77		
307944	NY	SOUTH EDWARDS 1 E	44.267	75.200	801	49		
308088	NY	SPENCER 2 N	42.250	76.500	1050	47		
308096	NY	SPENCERTOWN	42.333	73.550	630	24		
308104	NY	SPIER FALLS	43.233	73.750	390	72		
308152	NY	STAFFORD	42.983	78.083	912	35		
308160	NY	STAMFORD	42.400	74.633	1779	55		
308232	NY	STEWART FLD	41.500	74.100	581	21		
308248	NY	STILLWATER RSVR	43.883	75.033	1690	79	50	
308290	NY	STONY POINT 2E	43.839	76.267	250		25	
308322	NY	SUFFERN	41.113	74.157	270	44		
308380	NY	SYRACUSE	43.050	76.150	443	37		
308383	NY	SYRACUSE HANCOCK INTL AP	43.111	76.104	413	58	58	
308406	NY	TANNERSVILLE 2 SE	42.163	74.157	1950		25	
308455	NY	THERESA	44.217	75.800	341	36		
308498	NY	THURSTON	42.207	77.331	1620		46	
308507	NY	TICONDEROGA B MILL	43.847	73.428	315		36	
308578	NY	TRENTON FALLS	43.276	75.157	800	89		
308586	NY	TRIBES HILL	42.946	74.289	300	100	54	
308594	NY	TROUPSBURG 4 NE	42.067	77.483	1710	57		
308600	NY	TROY L&D	42.750	73.683	24	52		
308611	NY	TRUXTON	42.717	76.017	1161	22		
308627	NY	TULLY HEIBERG FOREST	42.760	76.080	1899	40		
308631	NY	TUPPER LAKE SUNMOUNT	44.231	74.438	1680	93		
308665	NY	UNADILLA	42.317	75.317	1020	31		
308670	NY	UNADILLA 2 N	42.354	75.324	1480	31		
308720	NY	UPTON	40.871	72.891	75		45	
308733	NY	UTICA HARBOR POINT	43.117	75.233	410	29		
308737	NY	UTICA ONEIDA CO AP	43.145	75.384	711	55		
308739	NY	UTICA	43.083	75.200	580	39	32	
308746	NY	VALATIE 1 N	42.433	73.683	300	34		
308870	NY	VOORHEESVILLE DEPOT	42.700	73.950	322	26		
308902	NY	WALDEN 2 NE	41.567	74.167	400	37		
308906	NY	WALDEN 1 ESE	41.551	74.163	380	36		
308910	NY	WALES	42.741	78.510	1090		54	
308936	NY	WALTON	42.167	75.133	1240	40		
308944	NY	WANAKENA RNGR SCHOOL	44.148	74.900	1510	97	52	
308946	NY	WANTAGH CEDAR CREEK	40.655	73.505	10	32		
308949	NY	WAPPINGERS FALLS	41.650	73.867	114	57		
308959	NY	WARRENSBURG 4 NW	43.550	73.800	780	30		
308962	NY	WARSAW 6 SW	42.686	78.220	1820	53		
308967	NY	WARWICK	41.267	74.367	541	72		
308987	NY	WATERLOO	42.901	76.864	452	67		
309000	NY	WATERTOWN	43.976	75.875	497	113	54	
309005	NY	WATERTOWN INTL AP	43.992	76.022	318	59		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
309055	NY	WELLESLEY ISLAND	44.356	75.929	285	29		
309072	NY	WELLSVILLE	42.117	77.948	1510	50	48	
309076	NY	WELLSVILLE 4 NNW	42.167	77.983	1460	50		
309125	NY	WEST CAMERON	42.217	77.417	1060	28		
309140	NY	WESTCHESTER CO AP	41.067	73.707	379	62		
309189	NY	WESTFIELD 2 SSE	42.296	79.586	707	85		
309250	NY	WEST MILTON	43.033	73.933	440	31		
309292	NY	WEST POINT	41.391	73.961	320	110		
309303	NY	WEST SAND LAKE 2 S	42.617	73.600	640	43		
309374	NY	WHIPPLEVILLE	44.805	74.260	830		54	
309389	NY	WHITEHALL	43.557	73.401	119	75	55	
309400	NY	WHITE PLAINS MAPLE M	41.017	73.733	150		34	
309425	NY	WHITESVILLE	42.040	77.765	1740	54		
309437	NY	WHITNEY POINT LAKE	42.333	75.967	1040	64		
309442	NY	WHITNEY POINT DAM	42.342	75.965	1040		56	
309507	NY	WILSON 4 S	43.250	78.833	350	53		
309516	NY	WINDHAM 3 E	42.303	74.201	1680	64		
309533	NY	WISCOY 1 E	42.517	78.050	1151	51		
309544	NY	WOLCOTT 3 NW	43.250	76.867	400	46		
309576	NY	WOODLANDS ARDSLEY	41.017	73.850	140		34	
309670	NY	YORKTOWN HEIGHTS 1 W	41.266	73.797	670	43	34	
330058	OH	AKRON CANTON RGNL AP	40.917	81.433	1208	60	57	20
330059	OH	AKRON	41.157	81.566	750		46	
330061	OH	AKRON	41.080	81.517	1080	26		
330063	OH	AKRON FULTON INTL AP	41.038	81.464	1044	63		
330083	OH	ALEXANDRIA 4 WSW	40.083	82.683	1220	79		
330107	OH	ALLIANCE 3 NNW	40.955	81.117	1055		49	
330141	OH	AMESVILLE	39.400	81.967	660	61		
330251	OH	ASHLAND	40.867	82.300	1050	62		
330256	OH	ASHLAND 2 SW	40.833	82.350	1265	64	26	
330264	OH	ASHTABULA	41.850	80.800	690	47		
330274	OH	ATHENS 5 NW	39.383	82.183	689	59		
330279	OH	ATHENS	39.343	82.096	800	57		
330298	OH	ATWOOD LAKE	40.517	81.283	950	38		
330430	OH	BARNESVILLE	39.992	81.185	1280	64		
330460	OH	BATAVIA 4 N	39.117	84.167	850	35		
330493	OH	BEACH CITY LAKE	40.633	81.567	985	38	47	
330563	OH	BELLEFONTAINE	40.353	83.775	1185	111		
330573	OH	BELLEVILLE L&D	39.116	81.744	560	39		
330581	OH	BELMONT 4 SE	39.983	80.983	1332	52		
330639	OH	BERLIN LAKE	41.033	81.017	1040		54	
330823	OH	BOLIVAR DAM	40.650	81.433	981	37		
330854	OH	BOURNEVILLE 1 SSW	39.267	83.167	705	36		
330862	OH	BOWLING GREEN WWTP	41.383	83.611	675	114	20	
331042	OH	BRYAN 2 SE	41.462	84.527	730		34	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
331057	OH	BUCKEYE LAKE 1 N	39.952	82.482	887	51		
331072	OH	BUCYRUS	40.813	82.969	955	113		
331113	OH	BURTON 1 W	41.467	81.167	1160		35	
331152	OH	CADIZ	40.269	80.998	1260	104		
331177	OH	CALDWELL 4 W	39.733	81.583	1001	20		
331178	OH	CALDWELL 6 NW	39.817	81.600	980	47		
331182	OH	CALDWELL WTR WKS	39.750	81.533	740		25	
331197	OH	CAMBRIDGE	40.017	81.583	800	47		
331202	OH	CAMBRIDGE STATE HOSP	40.083	81.583	850	70		
331245	OH	CANFIELD 1 S	41.017	80.767	1140	88		
331254	OH	CANTON 5 N	40.867	81.400	1132	52		
331288	OH	CARPENTER 2 S	39.147	82.219	822	42		
331315	OH	CARROLLTON 3 NNE	40.617	81.067	1190	53		
331353	OH	CATAWBA ISLAND 1 SW	41.550	82.850	600	41		
331404	OH	CENTERBURG 2 SE	40.300	82.650	1205	54	50	
331458	OH	CHARDON	41.583	81.183	1130	63		
331466	OH	CHARLES MILL LAKE	40.740	82.357	1025	48	55	
331515	OH	CHEVIOT	39.155	84.623	960	42		
331523	OH	CHILLICOTHE	39.333	82.967	620	64		
331528	OH	CHILLICOTHE MND CITY	39.374	83.004	650	34		
331536	OH	CHILO MELDAHL L&D	38.798	84.173	500	87	38	
331541	OH	CHIPPEWA LAKE	41.052	81.936	1180	113	53	
331550	OH	CINCINNATI FERNBANK	39.117	84.696	500	93		
331561	OH	CINCINNATI ABBE WSO	39.150	84.517	760	67	32	
331571	OH	CINCINNATI SUS BRIDG	39.100	84.500	0	43		
331576	OH	CINCINNATI LUNKEN AP	39.103	84.419	490	54		
331581	OH	CINCINNATI WSO CITY	39.100	84.517	636	93	21	
331592	OH	CIRCLEVILLE	39.611	82.955	673	112	53	
331600	OH	CLARINGTON LOCK 14	39.800	80.833	640	59		
331642	OH	CLENDENING LAKE	40.267	81.283	924	38	21	
331657	OH	CLEVELAND HOPKINS INTL AP	41.405	81.853	770	70	59	20
331662	OH	CLEVELAND WB CITY	41.500	81.667	659	78		
331777	OH	COLUMBUS HAP CREMEAN W	40.061	82.894	800	30		
331778	OH	COLUMBUS OHIO STATE	40.000	83.017	761	64		
331781	OH	COLUMBUS SULLIVANT A	39.950	83.117	879	30		
331783	OH	COLUMBUS VLY CROSSING	39.905	82.920	760	92		
331786	OH	COLUMBUS PORT COLUMBUS INTL AP	39.991	82.881	810	61	59	20
331788	OH	COLUMBUS	39.967	83.000	725	94	23	
331818	OH	CONNEAUT	41.983	80.567	640		43	
331858	OH	COOPERDALE	40.221	82.067	780	60		
331890	OH	COSHOCTON WPC PLT	40.240	81.871	760	100		
331905	OH	COSHOCTON ARGI RS STN	40.371	81.791	1140	52		
332044	OH	DANVILLE 2 W	40.440	82.304	970	45		
332067	OH	DAYTON MCD	39.763	84.191	745	114		
332075	OH	DAYTON INTL AP	39.906	84.219	1000	61	58	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
332090	OH	DEER CREEK LAKE	39.625	83.213	860		31	
332098	OH	DEFIANCE	41.278	84.385	700	104	36	
332119	OH	DELAWARE	40.318	83.074	920	104		
332124	OH	DELAWARE LAKE	40.367	83.067	930	40		
332160	OH	DENNISON WTR WKS	40.389	81.343	860	72		
332205	OH	DILLON LAKE	40.000	82.083	820		23	
332251	OH	DORSET	41.683	80.667	980	51		
332270	OH	DOVER	40.533	81.483	884	41		
332272	OH	DOVER DAM	40.567	81.417	930	38		
332305	OH	DUFFY DAM 15	39.633	80.883	630		22	
332485	OH	EATON	39.735	84.634	1002	93		
332512	OH	EDGERTON WTR WKS	41.450	84.733	830		24	
332580	OH	ELLSWORTH	41.017	80.850	1040	35		
332599	OH	ELYRIA 3 E	41.383	82.050	730	67		
332626	OH	ENTERPRISE	39.559	82.484	820	59		
332651	OH	FAIRFIELD	39.350	84.583	575	96	20	
332727	OH	FAYETTEVILLE	39.212	83.878	986	21		
332786	OH	FINDLAY AP	41.014	83.669	800	66		
332791	OH	FINDLAY WPCC	41.046	83.662	768	115	55	
332905	OH	FOSTORIA WEST END SU	41.150	83.433	781		25	
332928	OH	FRANKLIN	39.554	84.319	670	84		
332956	OH	FREDERICKTOWN 4 S	40.417	82.533	1050	66		
332974	OH	FREMONT	41.333	83.117	600	100	50	
333021	OH	GALION WTR WKS	40.724	82.800	1170	59	50	
333029	OH	GALLIPOLIS	38.820	82.182	569	96		
333042	OH	GAMBIER	40.383	82.400	1089		20	
333095	OH	GENEVA 3 S	41.750	80.950	751	39		
333120	OH	GERMANTOWN DAM	39.636	84.400	740		49	
333125	OH	GERMANTOWN 3 NE	39.667	84.333	791	38		
333356	OH	GREENFIELD 1 WNW	39.354	83.406	970		50	
333362	OH	GREEN HILL	40.733	81.017	1135	32		
333375	OH	GREENVILLE WTP	40.100	84.650	1024	115	46	
333393	OH	GREER	40.517	82.200	900	60		
333421	OH	GROVER HILL	41.019	84.477	730	52		
333482	OH	HAMILTON 2	39.400	84.567	590	78		
333483	OH	FAIRFIELD	39.350	84.583	575		31	
333500	OH	HANNIBAL L&D	39.667	80.867	620	33		
333722	OH	HICKSVILLE	41.321	84.748	790	27		
333730	OH	HIGGINSPORT	38.783	83.967	502	35		
333758	OH	HILLSBORO	39.200	83.617	1100	115	40	
333780	OH	HIRAM	41.300	81.150	1230	114		
333801	OH	HOLGATE	41.250	84.150	712	21		
333838	OH	HOPEDALE	40.324	80.899	1220	26		
333874	OH	HOYTVILLE 2 NE	41.217	83.767	700	56		
333915	OH	HUNTSVILLE 3 N	40.480	83.813	1030	58		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
333971	OH	IRONTON	38.533	82.683	541	81		
333987	OH	IRWIN	40.117	83.483	1010	56		
334004	OH	JACKSON	39.078	82.705	800	89	39	
334189	OH	KENTON	40.649	83.606	995	114	27	
334238	OH	KINGS MILLS	39.353	84.261	750	94		
334248	OH	KINSMAN	41.450	80.583	990	26		
334319	OH	LAGRANGE 1 NE	41.250	82.100	818	27		
334363	OH	LAKEVIEW 3 NE	40.517	83.883	1020	68		
334378	OH	LANCASTER 2 NW	39.733	82.633	860	56		
334383	OH	LANCASTER 2 NW	39.733	82.633	860	96		
334403	OH	LANCASTER	39.716	82.607	840		36	
334409	OH	LA RUE	40.583	83.383	930	69		
334434	OH	LAURELVILLE	39.467	82.733	760	56		
334473	OH	LEESVILLE LAKE	40.467	81.200	980	38		
334551	OH	LIMA WWTP	40.725	84.129	850	107		
334556	OH	LIMA WTR WKS	40.750	84.083	870		37	
334616	OH	LITHOPOLIS 2 S	39.783	82.817	990	36		
334681	OH	LONDON	39.883	83.450	1020	84		
334728	OH	LOUISVILLE	40.833	81.250	1170	58		
334789	OH	LYONS HIGH SCHOOL	41.700	84.067	771		21	
334865	OH	MANSFIELD LAHM MUNI AP	40.820	82.518	1295	57	50	20
334874	OH	MANSFIELD 5 W	40.767	82.617	1350	97		
334924	OH	MARIETTA LOCK 1	39.411	81.454	610	91	26	
334927	OH	MARIETTA WWTP	39.409	81.433	580	45		
334929	OH	MARIETTA WTR WKS	39.433	81.467	830	67		
334937	OH	MARION	40.583	83.133	981	56		
334942	OH	MARION 2 N	40.617	83.133	965	72	52	
334967	OH	MARSHALLVILLE 1 SSW	40.883	81.733	1120	58		
334979	OH	MARYSVILLE	40.241	83.367	1000	91	42	
335021	OH	MCARTHUR	39.250	82.483	740	34		
335029	OH	MC ARTHUR	39.250	82.482	785		46	
335041	OH	MCCONNELSVILLE LOCK7	39.654	81.857	760	114	48	
335185	OH	MIAMISBURG	39.617	84.283	697	61		
335199	OH	MIDDLEBOURNE	40.050	81.333	880	39		
335215	OH	MIDDLEPORT	39.083	82.067	575	23		
335220	OH	MIDDLETOWN	39.517	84.417	635	84		
335268	OH	MILFORD	39.181	84.287	520	35		
335297	OH	MILLERSBURG	40.550	81.917	819	81		
335315	OH	MILLPORT 2 NW	40.769	80.856	1170	114		
335356	OH	MINERAL RIDGE W WKS	41.150	80.783	890	70		
335398	OH	MOHAWK DAM	40.349	82.091	865	38	25	
335406	OH	MOHICANVILLE DAM	40.733	82.150	971	37		
335438	OH	MONTPELIER	41.589	84.585	860	112		
335505	OH	MOSQUITO CREEK LAKE	41.300	80.767	910	64	25	
335535	OH	MT GILEAD LAKES P	40.550	82.817	1090	45		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
335543	OH	MT HEALTHY EXP FA	39.283	84.567	850	41		
335573	OH	MT STERLING GAS P	39.733	83.283	922		26	
335585	OH	MT VERNON	40.383	82.467	980	32	33	
335669	OH	NAPOLEON	41.394	84.114	682	112		
335718	OH	NELSONVILLE	39.501	82.244	700	56		
335747	OH	NEWARK WTR WKS	40.087	82.413	835	74	44	
335752	OH	NEW BREMEN	40.450	84.367	1038	44		
335786	OH	NEW CARLISLE	39.932	84.033	880	88		
335794	OH	NEWCOMERSTOWN	40.267	81.600	801	53		
335857	OH	NEW LEXINGTON 2 NW	39.733	82.216	890	67		
335878	OH	NEW MATAMORAS DAM 16	39.467	81.117	620		24	
335894	OH	NEW PHILADELPHIA	40.488	81.432	925	47	36	
335904	OH	NEW PHILADELPHIA 1 A	40.500	81.450	920	42		
335939	OH	NEWPORT	39.394	81.223	668	22		
335947	OH	NEW STRAITSVILLE	39.583	82.250	780	38		
336061	OH	NORTH KENOVA	38.417	82.500	565	38		
336118	OH	NORWALK WWTP	41.267	82.617	670	114		
336136	OH	NORWICH 1 E	39.983	81.783	980	36		
336196	OH	OBERLIN	41.267	82.217	816	114	56	
336337	OH	OTTAWA	41.017	84.050	722	53		
336342	OH	OTTAWA	41.032	84.054	730	44		
336371	OH	OXFORD	39.517	84.750	902	20		
336375	OH	OXFORD	39.517	84.733	860		46	
336384	OH	PAINESVILLE HWY DE	41.717	81.217	702		21	
336389	OH	PAINESVILLE 4 NW	41.750	81.300	600	58		
336405	OH	PANDORA	40.954	83.962	770	58	39	
336465	OH	PAULDING	41.124	84.592	725	93		
336493	OH	PEEBLES	38.950	83.417	810	34	29	
336498	OH	PEEBLES 1 S	38.933	83.417	830	51		
336590	OH	PHILO	39.867	81.900	751	63		
336600	OH	PHILO 3 SW	39.839	81.917	1020	113		
336616	OH	PIEDMONT LAKE	40.183	81.217	940	38		
336630	OH	PIKETON AEC PUMP STN	39.071	83.020	570	66		
336645	OH	PIQUA	40.153	84.237	950	94		
336650	OH	PIQUA WWTP	40.131	84.234	800		48	
336697	OH	PLEASANT HILL	40.049	84.346	920	85		
336702	OH	PLEASANT HILL LAKE	40.617	82.333	1125	37	34	
336729	OH	PLYMOUTH 2 WSW	40.983	82.700	961	49		
336773	OH	PORTLAND DAM 21	39.017	81.767	591	22		
336781	OH	PORTSMOUTH SCIOTOVIL	38.757	82.887	540	115	45	
336786	OH	PORTSMOUTH US GRANT	38.731	82.997	570	78		
336861	OH	PROSPECT	40.483	83.200	915	95		
336882	OH	PUT-IN-BAY	41.650	82.800	580	80		
336912	OH	RACINE DAM 23	38.883	81.867	561	38		
336949	OH	RAVENNA 2 S	41.133	81.283	1107	57	48	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
337255	OH	ROSEVILLE	39.816	82.072	740	46		
337333	OH	RUSSELLS POINT LAKEV	40.517	83.900	1015		26	
337375	OH	ST MARTIN URSULINE S	39.217	83.883	985		32	
337383	OH	ST MARYS 3 W	40.545	84.438	875	70	37	
337400	OH	ST PARIS 2 NE	40.139	83.929	1180	26		
337410	OH	SALEM CTR 2 E	39.070	82.291	740	29		
337447	OH	SANDUSKY	41.450	82.717	584	111		
337476	OH	SAYRE	39.683	82.050	890	37		
337538	OH	SEDALIA	39.734	83.478	1070	67		
337559	OH	SENECAVILLE LAKE	39.922	81.435	875	48		
337693	OH	SIDNEY 1 S	40.271	84.151	940	60		
337698	OH	SIDNEY HWY DEPT	40.298	84.163	1030		49	
337700	OH	SIDNEY 2 N	40.317	84.167	1040	79		
337925	OH	SPRINGFIELD	39.917	83.817	1020	26		
337927	OH	SPRINGFIELD ELMWOOD	39.917	83.783	1020	49		
337930	OH	SPRINGFIELD MAD RIVE	39.917	83.850	932	35		
337932	OH	SPRINGFIELD WWTP	39.917	83.850	902	35		
337935	OH	SPRINGFIELD NEW WW	39.967	83.817	930	41	50	
338025	OH	STEUBENVILLE	40.376	80.628	992	67		
338110	OH	STRYKER	41.504	84.430	700	41		
338148	OH	SUMMERFIELD 2 NE	39.817	81.300	980	68		
338240	OH	TAPPAN DAM	40.356	81.228	950	38		
338313	OH	TIFFIN	41.117	83.167	740	114		
338332	OH	TIPP CITY	39.953	84.169	900	84		
338356	OH	TOLEDO METCALF FLD	41.563	83.476	622	58		
338357	OH	TOLEDO EXPRESS AP	41.589	83.801	669	54	53	20
338366	OH	TOLEDO BLADE	41.650	83.533	600	118		
338378	OH	TOM JENKINS DAM-BURR	39.544	82.059	760	36	51	
338534	OH	UPPER SANDUSKY	40.833	83.283	854	113		
338539	OH	UPPER SANDUSKY W WKS	40.817	83.283	820		45	
338552	OH	URBANA WWTP	40.100	83.783	1000	112	43	
338560	OH	UTICA	40.217	82.433	1005	53		
338609	OH	VAN WERT 1 S	40.849	84.581	790	92		
338642	OH	VERSAILLES	40.220	84.482	975	94		
338656	OH	VICKERY 2 NW	41.367	82.967	591	59		
338769	OH	WARREN 3 S	41.200	80.817	900	115		
338774	OH	WARREN OHIO EDISON	41.217	80.800	902	30	20	
338794	OH	WASHINGTON COURT HSE	39.527	83.428	960	86	22	
338810	OH	WATERLOO	38.700	82.474	625	37		
338822	OH	WAUSEON WTP	41.518	84.145	750	115		
338830	OH	WAVERLY	39.111	82.980	560	113		
338951	OH	WESTERVILLE	40.126	82.943	810	60		
338990	OH	WEST MANCHESTER 3 SW	39.873	84.656	1085	86		
339190	OH	WILLOWGHBY EAST LAKE	41.667	81.433	640	70		
339211	OH	WILLS CREEK LAKE	40.150	81.850	780	38		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
339219	OH	WILMINGTON 3 N	39.483	83.817	1030	93		
339224	OH	WILMINGTON	39.433	83.850	975		52	
339298	OH	WOODSFIELD	39.783	81.100	1220		37	
339312	OH	WOOSTER EXP STN	40.783	81.917	1020	113	57	
339322	OH	WOOSTER 2 SE	40.783	81.933	1102	44		
339338	OH	DAYTON W PATTERSON AFB	39.833	84.050	820	22		
339357	OH	XENIA TRTMT PLAN	39.717	83.967	820	23	46	
339361	OH	XENIA 6 SSE	39.617	83.900	968	89		
339406	OH	YOUNGSTOWN RGNL AP	41.254	80.674	1180	101	59	20
339417	OH	ZANESVILLE MUNI AP	39.944	81.892	880	62		
339422	OH	ZANESVILLE WWTP	39.913	82.004	700	72		
360022	PA	ACMETONIA LOCK 3	40.536	79.815	748	103		
360106	PA	ALLENTOWN INTL AP	40.651	75.449	390	70	60	20
360111	PA	ALLENTOWN GAS COMPAN	40.600	75.467	249	51		
360130	PA	ALTOONA BLAIR CO AP	40.300	78.317	1476	60		
360134	PA	ALTOONA HORSESHOE CU	40.500	78.483	1503	74		
360140	PA	ALTOONA 3 W	40.495	78.467	1320	39		
360147	PA	ALVIN R BUSH DAM	41.358	77.927	930		40	
360204	PA	APOLLO 2 W	40.583	79.600	1060		29	
360229	PA	ARENDTSVILLE	39.917	77.300	712	47		
360313	PA	AUSTINBURG 2 W	42.000	77.533	1591	30	27	
360355	PA	BAKERSTOWN 3 WNW	40.650	79.983	1230	40		
360409	PA	BARNES	41.668	79.019	1360	49		
360457	PA	BEAR GAP	40.824	76.498	1015	63		
360475	PA	BEAVER FALLS 1 NE	40.763	80.313	760	99		
360482	PA	BEAVERTOWN 1 NE	40.774	77.157	540	61		
360488	PA	BECHTELSVILLE 1 ENE	40.378	75.615	460	49		
360530	PA	BELLEFONTE 4 S	40.850	77.783	1112	51		
360560	PA	BELTZVILLE DAM	40.862	75.643	735	30		
360611	PA	BERWICK	41.067	76.250	571	31		
360629	PA	BETHLEHEM	40.617	75.383	240	38		
360634	PA	BETHLEHEM LEHIGH UNI	40.600	75.367	361	60		
360656	PA	BIGLERVILLE	39.936	77.258	720	36		
360725	PA	BLAIN 5 SW	40.300	77.583	820		49	
360738	PA	BLAIRSVILLE 5 E	40.433	79.150	2020	47		
360743	PA	BLAKESLEE CORNERS	41.100	75.600	1650		28	
360763	PA	BLOSERVILLE 1 N	40.264	77.364	700	93	27	
360785	PA	BLUE MARSH LAKE	40.384	76.034	350	26		
360821	PA	BOSWELL	40.159	79.028	1872	41	38	
360861	PA	BRADDOCK LOCK 2	40.392	79.859	730	65		
360865	PA	BRADFORD RGNL AP	41.803	78.640	2117	47		
360867	PA	BRADFORD CNTRL FIR	41.950	78.650	1500	77		
360868	PA	BRADFORD 4 SW RSCH 5	41.898	78.714	1660	73		
360905	PA	BREEZEWOOD	40.000	78.233	1352	24		
361002	PA	BROOKVILLE FAA AP	41.150	79.100	1401	35		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
361004	PA	BROOKVILLE SWG PLT	41.150	79.083	1210	32		
361033	PA	BRUCETON 1 S	40.300	79.983	1040	50		
361073	PA	BUCKSTOWN 1 SE	40.063	78.842	2460		29	
361080	PA	BUCKSVILLE	40.500	75.204	460	25		
361087	PA	BUFFALO MILLS	39.946	78.646	1310	83		
361105	PA	BURGETTSTOWN 2 W	40.383	80.433	981	40		
361115	PA	BURNT CABINS 2 NE	40.083	77.867	991	33		
361130	PA	BUTLER	40.867	79.900	1102	39		
361139	PA	BUTLER 2 SW	40.850	79.917	1000	41	31	
361212	PA	CANTON	41.652	76.846	1140	31		
361215	PA	CANTON 1 NW	41.667	76.867	1522	35		
361234	PA	CARLISLE	40.200	77.217	469	71		
361255	PA	CARROLLTOWN 1 NNE	40.583	78.700	2080	47		
361262	PA	CARTER CAMP 2 W	41.617	77.750	2031	28	22	
361301	PA	CEDAR RUN RIVER	41.522	77.448	780	60		
361342	PA	CHADDS FORD 2 NE	39.869	75.582	229	55		
361350	PA	CHALK HILL 2 ENE	39.851	79.583	1980	31		
361354	PA	CHAMBERSBURG 1 ESE	39.935	77.639	640	97	39	
361377	PA	CHARLEROI LOCK 4	40.150	79.900	749	77		
361400	PA	CHERRY SPRINGS	41.667	77.817	2300		23	
361480	PA	CLARENCE	41.049	77.941	1390	58		
361485	PA	CLARION 3 SW	41.192	79.436	1040	106	20	
361505	PA	CLAUSSVILLE	40.617	75.650	670	63		
361512	PA	CLAYSVILLE 3 W	40.117	80.467	1001	66		
361519	PA	CLEARFIELD	41.017	78.450	1140	83		
361529	PA	CLERMONT	41.683	78.500	2103		24	
361534	PA	CLERMONT 8 SW	41.733	78.533	1620	34		
361589	PA	COATESVILLE 1 SW	39.967	75.833	341	88	31	
361591	PA	COATESVILLE 2 W	39.985	75.860	640	24		
361705	PA	CONFLUENCE 1 SW DAM	39.799	79.367	1490	62	47	
361710	PA	CONFLUENCE 1 NW	39.833	79.367	1331	88		
361723	PA	CONNELLSVILLE	40.017	79.600	870	43		
361726	PA	CONNELLSVILLE 2 SSW	39.997	79.596	900	31		
361737	PA	CONSHOHOCKEN	40.074	75.318	70	82		
361749	PA	COOKSBURG RIVER	41.331	79.209	1180	34		
361773	PA	CORAOPOLIS NEVILLE I	40.500	80.083	720	76		
361790	PA	CORRY	41.917	79.633	1440	77		
361804	PA	COUDERSPORT 1 NNE	41.783	78.017	1690	27		
361806	PA	COUDERSPORT 4 NW	41.833	78.067	2301	30		
361809	PA	COUDERSPORT 7 E	41.767	77.883	2421	23		
361833	PA	COVINGTON 2 WSW	41.733	77.117	1745	70		
361881	PA	CREEKSIDE	40.683	79.200	1050	79		
361895	PA	CRESSON 2 SE	40.450	78.567	2543	36		
361961	PA	CURWENSVILLE LAKE	40.958	78.529	1165		32	
362013	PA	DANVILLE	40.959	76.618	478	67		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
362108	PA	DERRY 4 SW	40.300	79.333	1060	102		
362116	PA	DEVAULT 1 W	40.083	75.550	360	36		
362160	PA	DINGMANS FERRY	41.217	74.867	430		31	
362163	PA	DINGMANS FERRY 3 W	41.218	74.907	908		22	
362171	PA	DIXON	41.567	75.900	620	20		
362183	PA	DONEGAL 2 NW	40.133	79.400	1800	62		
362190	PA	DONORA 1 SW	40.164	79.869	762	81		
362221	PA	DOYLESTOWN	40.300	75.133	361	82		
362236	PA	DREXEL UNIV	39.950	75.183	30	36		
362245	PA	DRIFTWOOD	41.342	78.140	820		49	
362260	PA	DUBOIS JEFFERSON CO AP	41.178	78.899	1814	42		
362265	PA	DU BOIS 7 E	41.100	78.633	1670	37	26	
362298	PA	DUNLO	40.287	78.724	2360		49	
362325	PA	DUSHORE 3 SSW	41.477	76.418	1890		29	
362343	PA	EAGLES MERE	41.400	76.583	1991	37		
362363	PA	EAST BRADY	40.983	79.617	850	35		
362466	PA	EBENSBURG	40.483	78.717	2090	45		
362470	PA	EBENSBURG SEWAGE PLT	40.468	78.729	1940	44		
362537	PA	EISENHOWER NHS	39.805	77.229	540	26		
362560	PA	ELIZABETHTOWN	40.133	76.617	479	28		
362629	PA	EMPORIUM	41.507	78.228	1040	38	33	
362633	PA	EMPORIUM 1 E	41.517	78.217	1161	61		
362644	PA	ENGLISH CTR	41.433	77.283	879	36	34	
362662	PA	EPHRATA	40.167	76.167	510	82		
362671	PA	EQUINUNK	41.872	75.266	890	62		
362677	PA	ERIE WB CITY	42.117	80.083	689	80		
362682	PA	ERIE INTL AP	42.080	80.183	730	83	54	20
362721	PA	EVERETT	40.014	78.365	1000	84		
362814	PA	FARRELL SHARON	41.217	80.517	850	68		
362838	PA	FAYETTEVILLE 10 ENE	39.991	77.409	2050		28	
362942	PA	FORD CITY 4 S DAM	40.717	79.500	930	65	34	
363018	PA	FRANCIS E WALTER DAM	41.118	75.728	1509	47	37	
363028	PA	FRANKLIN	41.400	79.830	1015	110		
363056	PA	FREELAND	41.017	75.900	1903	73		
363130	PA	GALETON	41.736	77.652	1345	77		
363158	PA	GARLAND 1 SW	41.817	79.450	1300	27		
363189	PA	GEIGERTOWN	40.200	75.833	400	29		
363200	PA	GEORGE SCHOOL	40.217	74.933	141	70		
363218	PA	GETTYSBURG	39.833	77.233	541	82		
363223	PA	GETTYSBURG 1 S	39.800	77.233	531		26	
363298	PA	GLENCOE 1 ENE	39.817	78.833	1611		29	
363311	PA	GLEN HAZEL 2 NE DAM	41.563	78.601	1720	61	33	
363321	PA	GLENMOORE	40.100	75.751	500	50	33	
363330	PA	GLEN ROCK	39.800	76.733	620		20	
363343	PA	GLENWILLARD DASH DAM	40.551	80.217	710	64		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
363379	PA	GORDON	40.750	76.333	902	52		
363394	PA	GOULDSBORO	41.250	75.450	1890	72		
363435	PA	GRATERFORD	40.233	75.450	151	50		
363437	PA	GRATERFORD 1 E	40.231	75.435	240	46		
363488	PA	GREEN LANE	40.342	75.478	305	24		
363503	PA	GREENSBORO LOCK 7	39.783	79.917	788	107		
363510	PA	GREENSBURG 2 S	40.267	79.550	981	43		
363516	PA	GREENSBURG 3 SE UNIT	40.283	79.500	1240	48		
363526	PA	GREENVILLE 2 NE	41.417	80.367	1130	95		
363632	PA	HAMBURG	40.552	75.995	350	72		
363662	PA	HANOVER	39.800	76.983	600	87		
363699	PA	HARRISBURG CPTL CY AP	40.217	76.851	340	61	36	
363704	PA	HARRISBURG NORTH	40.300	76.900	322	39		
363711	PA	HARRISBURG	40.267	76.883	394	54		
363758	PA	HAWLEY 1 E	41.476	75.165	890	89		
363762	PA	HAWLEY 3 ESE	41.467	75.133	850		24	
363764	PA	HAWLEY 4 SW	41.450	75.267	1460	44		
364001	PA	HOLLIDAYSBURG 2 NW	40.438	78.417	990		56	
364008	PA	HOLLISTERVILLE	41.383	75.433	1370	73		
364019	PA	HOLTWOOD	39.833	76.333	190	91	25	
364027	PA	HOME	40.750	79.100	1220		39	
364043	PA	HONESDALE 4 NW	41.617	75.317	1410	50		
364044	PA	HONESDALE 5 NNW	41.650	75.267	1040		29	
364047	PA	HONEY BROOK 2 SSE	40.079	75.897	665	51		
364058	PA	HOOVERSVILLE	40.150	78.917	1670	21		
364066	PA	HOP BOTTOM 2 SE	41.717	75.717	902	27		
364076	PA	HOPEWELL	40.159	75.886	550	23		
364159	PA	HUNTINGDON	40.515	78.002	685	84		
364166	PA	HUNTSDALE	40.100	77.300	620	44	32	
364190	PA	HYNDMAN	39.817	78.733	960	80		
364214	PA	INDIANA 3 SE	40.597	79.118	1102	62		
364219	PA	INDIANA	40.617	79.167	1302	36		
364276	PA	IRWIN	40.333	79.700	1102	61		
364304	PA	JACKSON SUMMIT	41.950	77.017	1690		31	
364325	PA	JAMESTOWN 2 NW	41.500	80.467	1040	76	50	
364370	PA	JIM THORPE	40.867	75.750	830	63		
364385	PA	JOHNSTOWN	40.333	78.917	1214	100		
364390	PA	JOHNSTOWN 2	40.317	78.917	1280		44	
364432	PA	KANE 1 NNE	41.677	78.804	1750	69	48	
364481	PA	KEGG	39.983	78.717	1280	35		
364611	PA	KITTANNING LOCK 7	40.817	79.533	790	54		
364672	PA	KRESGEVILLE 2 W	40.900	75.533	830	46		
364727	PA	LAKE MINISINK	41.217	75.050	1362	27		
364758	PA	LANCASTER	40.050	76.283	259	67		
364763	PA	LANCASTER 2 NE FLTR	40.050	76.274	270	35	46	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
364778	PA	LANDISVILLE 2 NW	40.117	76.433	360	56	49	
364804	PA	LANSFORD	40.833	75.883	1142	38		
364832	PA	LATROBE	40.317	79.383	1001	27		
364836	PA	LAUREL MTN	40.200	79.188	2760	27		
364853	PA	LAURELTON CTR	40.902	77.214	800	44		
364873	PA	LAWRENCEVILLE 2 S	41.967	77.133	922	77		
364893	PA	LEBANON 4 WNW	40.350	76.483	591	68		
364896	PA	LEBANON 2 W	40.333	76.467	450	45		
364934	PA	LEHIGHTON	40.822	75.696	580	73	23	
364972	PA	LE ROY	41.683	76.717	1040	74		
364983	PA	LEWIS RUN	41.867	78.650	1560	30		
364984	PA	LEWIS RUN 3 SE	41.842	78.643	1740	20		
364992	PA	LEWISTOWN	40.587	77.570	460	69	26	
365050	PA	LINESVILLE 1 S	41.650	80.433	1030	64		
365104	PA	LOCK HAVEN	41.133	77.417	551	82		
365109	PA	LOCK HAVEN SEWAGE PLT	41.117	77.450	566	39		
365160	PA	LONG POND POCONO LAKE	41.119	75.548	1800	52		
365212	PA	LOYALHANNA LAKE	40.459	79.450	990	27		
365259	PA	LYCIPPUS 1 E	40.233	79.400	1421	56		
365336	PA	MADERA 2 SE	40.800	78.400	1600	39	35	
365344	PA	MAHANOY CITY 2 N	40.834	76.135	1710	32		
365381	PA	MAPLETON DEPOT	40.400	77.933	580	57		
365390	PA	MARCUS HOOK	39.825	75.428	10	79		
365400	PA	MARIENVILLE 2 NE	41.483	79.100	1779		40	
365408	PA	MARION CTR 2 SE	40.750	79.033	1611	53		
365470	PA	MATAMORAS	41.391	74.717	459	99		
365573	PA	MCKEESPORT	40.339	79.860	740	73		
365601	PA	MEADOW RUN PONDS	41.217	75.633	1910		42	
365606	PA	MEADVILLE 1 S	41.633	80.167	1065	73	42	
365627	PA	MEDIX RUN	41.283	78.400	1102		20	
365651	PA	MERCER	41.225	80.235	1220	54		
365662	PA	MERCERSBURG 1 E	39.833	77.900	541	59		
365676	PA	MERWINSBURG	40.967	75.467	985		37	
365684	PA	MEYERSDALE	39.817	79.017	2103	22		
365686	PA	MEYERSDALE 2 SSW	39.781	79.041	2000	46		
365703	PA	MIDDLETOWN HARRISBURG INTL AP	40.194	76.763	312	43		
365710	PA	MIDLAND DAM 7	40.633	80.467	689	24		
365790	PA	MILLHEIM	40.884	77.474	1120	58	31	
365817	PA	MILLVILLE 2 SW	41.100	76.567	860	41	34	
365825	PA	MILROY 2 WNW	40.733	77.633	1030		25	
365902	PA	MONTGOMERY L&D	40.650	80.383	690	47		
365915	PA	MONTROSE	41.851	75.858	1420	103	48	
365956	PA	MORGANTOWN	40.158	75.886	591	36		
365987	PA	MOSGROVE LOCK 8	40.900	79.483	810	26		
366004	PA	MT CARMEL 2 W	40.788	76.451	1000		23	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
366028	PA	MT GRETNA 2 SE	40.233	76.433	669	20		
366042	PA	MT PLEASANT	40.216	79.499	1003	26		
366067	PA	MT UNION I N	40.400	77.883	820		22	
366111	PA	MURRYSVILLE 2 SW	40.412	79.724	860		48	
366126	PA	MYERSTOWN	40.367	76.306	480	67		
366151	PA	NATRONA LOCK 4	40.617	79.717	760	81		
366194	PA	NESHAMINY FALLS	40.136	74.955	60	93		
366233	PA	NEW CASTLE 1 N	41.017	80.362	825	105	46	
366246	PA	NEWELL	40.083	79.900	810	70		
366289	PA	NEW PARK	39.734	76.504	800	84		
366297	PA	NEWPORT RIVER	40.478	77.129	380	65		
366310	PA	NEW STANTON 1 SW	40.200	79.633	950	47		
366326	PA	NEW TRIPOLI 4 E	40.683	75.683	689	43		
366370	PA	NORRISTOWN	40.120	75.358	70	46		
366396	PA	NORTH EAST 2 SE	42.200	79.817	1060	28		
366419	PA	PHILADELPHIA NE AP	40.082	75.011	100		20	
366508	PA	OCTORARO LAKE	39.800	76.050	260	30		
366622	PA	ORWELL 2 NW	41.917	76.300	1600	32		
366681	PA	PALM 3 SE	40.386	75.502	300	66	33	
366689	PA	PALMERTON	40.800	75.617	410	79	46	
366721	PA	PARKER	41.083	79.683	1060	94		
366724	PA	PARKER 1 E	41.096	79.672	1100		50	
366762	PA	PAUPACK 1 WSW	41.400	75.233	1360	74		
366792	PA	PEN ARGYL	40.865	75.246	718		35	
366889	PA	PHILADELPHIA INTL AP	39.868	75.231	10	68	108	20
366899	PA	PHILADELPHIA POINT B	39.917	75.200	30	38		
366904	PA	PHILADELPHIA SHAWMON	40.033	75.250	69	60		
366909	PA	PHILADELPHIA	39.950	75.150	36	84		
366916	PA	PHILIPSBURG MID ST AP	40.900	78.083	1942	38	49	
366927	PA	PHOENIXVILLE 1 E	40.120	75.501	105	92	41	
366954	PA	PINE GROVE 1 NE	40.567	76.367	541	36		
366955	PA	PINE GROVE FURNACE	40.033	77.300	885	26		
366993	PA	PITTSBURGH INTL AP	40.485	80.214	1203	61		20
366997	PA	PITTSBURGH WSO CITY	40.450	80.000	1017	108	31	
367029	PA	PLEASANT MT 1 W	41.739	75.446	1800	83	39	
367073	PA	POINT MARION LOCK 8	39.733	79.917	810	50		
367103	PA	PORT ALLEGANY	41.816	78.287	1475	42		
367116	PA	PORT CLINTON	40.583	76.033	449	40	28	
367161	PA	POTTSVILLE PALO ALTO	40.700	76.183	689	29		
367167	PA	PRINCE GALLITZIN SP	40.651	78.551	1520	25		
367186	PA	PROMPTON DAM	41.589	75.330	1230		32	
367217	PA	PUNXSUTAWNEY	40.950	79.000	1300	26	38	
367229	PA	PUTNEYVILLE 2 SE DAM	40.925	79.282	1280	65	49	
367239	PA	QUAKERTOWN	40.433	75.333	489	65		
367310	PA	RAYMOND	41.850	77.867	2300	40	37	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
367312	PA	RAYSTOWN LAKE 2	40.381	78.075	1000	34	29	
367318	PA	READING	40.333	75.967	289	71	21	
367322	PA	READING 4 NNW	40.427	75.932	360	34	20	
367338	PA	RECTOR 3 SSW	40.167	79.267	1330	31		
367409	PA	RENOVO	41.330	77.738	660	103		
367443	PA	RICES LANDING L 6	39.950	80.000	781	22		
367477	PA	RIDGWAY	41.420	78.750	1360	101		
367497	PA	RINGTOWN	40.867	76.233	1089	52		
367540	PA	ROCHESTER 1 NW	40.717	80.300	900		39	
367578	PA	RODALE RSCH CTR	40.551	75.722	550	23		
367727	PA	RUSHVILLE	41.783	76.117	870	54		
367729	PA	RUSSELL RIVER	41.938	79.133	1240	24		
367730	PA	SABINSVILLE 3 SE	41.842	77.475	1999	38		
367732	PA	SAFE HARBOR DAM	39.896	76.395	195		38	
367735	PA	SAGAMORE	40.782	79.237	1160	43		
367739	PA	SAGAMORE 1 S	40.767	79.233	1320	33		
367782	PA	SALINA 3 W	40.510	79.546	1109	55		
367796	PA	SALTSBURG	40.450	79.483	850	53		
367846	PA	SAXTON 1W	40.125	78.151	830	67	26	
367855	PA	SCANDIA 1 E	41.917	79.033	2120		46	
367863	PA	SCHENLEY LOCK 5	40.683	79.667	783	114		
367902	PA	SCRANTON	41.417	75.667	804	73		
367931	PA	SELINSGROVE 2 S	40.783	76.861	420	86		
367931	PA	SELINSGROVE 2 S	40.783	76.861	420	86		
367938	PA	SELLERSVILLE	40.359	75.322	340		33	
367965	PA	SHADE GAP	40.183	77.867	922		28	
367978	PA	SHAMOKIN	40.800	76.550	770	48		
368026	PA	SHEFFIELD 5 W	41.709	79.146	1920		52	
368057	PA	SHICKSHINNY 3 N	41.183	76.149	685	37		
368073	PA	SHIPPENSBURG	40.050	77.517	680	79		
368145	PA	SINNEMAHONING	41.320	78.096	820	57		
368155	PA	SIZERVILLE	41.593	78.171	1290		20	
368184	PA	SLIPPERY ROCK	41.050	80.067	1250	59		
368190	PA	SMETHPORT	41.817	78.433	1469		36	
368244	PA	SOMERSET	39.996	79.083	2100	59		
368249	PA	SOMERSET WTR WKS	40.017	79.083	2152	63		
368263	PA	SOUTHAMPTON	40.172	75.036	250	23		
368275	PA	SOUTH CANAAN 1 NE	41.517	75.400	1400		38	
368308	PA	SOUTH MTN	39.858	77.477	1520	67		
368379	PA	SPRING GROVE	39.869	76.863	450	76	36	
368388	PA	SPRINGHOUSE 2 NE	40.217	75.217	240	50		
368395	PA	SPRINGS 1 SW	39.733	79.167	2503	38		
368449	PA	STATE COLLEGE	40.793	77.867	1170	114	25	
368469	PA	STEVENSON DAM	41.400	78.017	932	38		
368491	PA	STILLWATER DAM	41.697	75.483	1650		37	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
368560	PA	STOYSTOWN	40.100	78.950	1801	30		
368570	PA	STRAUSSTOWN	40.483	76.183	600	62		
368589	PA	STRONGSTOWN	40.550	78.917	1880		45	
368596	PA	STROUDSBURG	41.013	75.191	460	89	29	
368610	PA	STUMP CREEK	41.017	78.833	1322	27		
368668	PA	SUNBURY	40.853	76.789	575	58	20	
368692	PA	SUSQUEHANNA	41.948	75.605	910	72		
368725	PA	SWEET VALLEY	41.283	76.133	1342	21		
368758	PA	TAMAQUA	40.795	75.975	925	67	33	
368763	PA	TAMAQUA 4 N DAM	40.850	75.983	1110	71	40	
368868	PA	TIOGA HAMMOND DAM	41.898	77.142	1230	28	26	
368873	PA	TIONESTA 2 SE LAKE	41.483	79.433	1200	69	43	
368885	PA	TITUSVILLE	41.633	79.667	1552		27	
368888	PA	TITUSVILLE WTR WORKS	41.633	79.700	1220	53		
368893	PA	TOBYHANNA POCONO MTN AP	41.139	75.222	1916	91	26	
368905	PA	TOWANDA 1 S	41.751	76.443	760	113	52	
368910	PA	TOWER CITY 5 SW	40.517	76.617	741	23		
368959	PA	TROY 1 NE	41.790	76.772	1045	52		
368989	PA	TUNNELTON	40.450	79.383	889		31	
369022	PA	TYRONE	40.664	78.219	890	30		
369024	PA	TYRONE 4 NE BALD EAG	40.717	78.200	1020	24	24	
369042	PA	UNION CITY FILT PLT	41.900	79.817	1400	55	49	
369050	PA	UNIONTOWN 1 NE	39.915	79.719	956	113		
369128	PA	VANDERGRIFT	40.600	79.550	800	48		
369196	PA	VIRGINVILLE	40.517	75.867	351	25		
369298	PA	WARREN	41.850	79.150	1210	115		
369312	PA	WASHINGTON	40.183	80.233	1150		31	
369318	PA	WASHINGTON 3 NE	40.179	80.189	1300	28		
369362	PA	WAYNESBURG 2 W	39.900	80.217	981	35		
369367	PA	WAYNESBURG 1 E	39.900	80.167	940	50	50	
369408	PA	WELLSBORO 4 SW	41.700	77.389	1818	75		
369430	PA	WERNERSVILLE	40.333	76.100	410	20		
369464	PA	WEST CHESTER	39.971	75.635	375	105		
369503	PA	WEST GROVE 1 SE	39.800	75.800	449	47		
369507	PA	WEST HICKORY RIVER	41.583	79.400	1180	38		
369555	PA	WEST NEWTON	40.217	79.767	771	55		
369655	PA	WHITESBURG	40.767	79.417	1350	57		
369702	PA	WILKES BARRE	41.233	75.883	660	106		
369705	PA	WILKES-BARRE INTL AP	41.339	75.727	930	60	44	
369714	PA	WILLIAMSBURG	40.467	78.200	845	52		
369728	PA	WILLIAMSPORT	41.243	76.922	520	64		
369733	PA	WILLIAMSPORT	41.233	77.000	495	52		
369823	PA	WOLFSBURG	40.042	78.528	1185	57		
369933	PA	YORK 3 SSW PUMP STN	39.917	76.750	390	103		
369938	PA	YORK 1 S FLTR PLAN	39.940	76.725	640		47	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
369950	PA	YORK HAVEN	40.117	76.717	310	87		
369966	PA	YOUNGSVILLE	41.850	79.317	1217		29	
369990	PA	ZION GROVE	40.900	76.217	942	21		
369995	PA	ZIONSVILLE 3 ESE	40.467	75.450	585	64		
370896	RI	BLOCK ISLAND STATE AP	41.167	71.583	110	47	43	
373306	RI	GREENVILLE	41.883	71.567	420	28		
374266	RI	KINGSTON	41.491	71.541	114	110		
375215	RI	NEWPORT ROSE	41.500	71.350	15	45		
375270	RI	NORTH FOSTER 1 E	41.856	71.733	630	34		
376698	RI	PROVIDENCE T F GREEN AP	41.722	71.433	51	76	60	20
376703	RI	PROVIDENCE	41.833	71.417	69	32		
379423	RI	WOONSOCKET	41.984	71.491	115	55		
430277	VT	BALL MTN LAKE	43.100	72.783	1130	30	40	
430337	VT	BARRE	44.200	72.517	600	23		
430499	VT	BELLOWS FALLS	43.133	72.450	270	83		
430563	VT	BENNINGTON 2 NNW	42.917	73.217	669	51		
430661	VT	BETHEL 4 N	43.883	72.634	660	49		
431072	VT	BURLINGTON	44.483	73.183	404	59		
431081	VT	BURLINGTON INTL AP	44.468	73.150	330	68	60	20
431213	VT	CANAAN	44.996	71.536	1070	68		
431243	VT	CAVENDISH	43.385	72.599	842	105		
431360	VT	CHELSEA	43.983	72.450	800	112		
431433	VT	CHITTENDEN	43.706	72.962	1060	61		
431565	VT	CORINTH	44.007	72.319	1180		55	
431580	VT	CORNWALL	43.957	73.211	345	106		
431715	VT	DANVILLE	44.417	72.133	1391	26		
431786	VT	DORSET 2 SE	43.224	73.075	930	49		
432769	VT	ENOSBURG FALLS	44.909	72.808	420	110		
432828	VT	ESSEX JUNCTION	44.483	73.117	240	23		
432843	VT	ESSEX JUNCTION 1 N	44.508	73.115	340	23		
433341	VT	GILMAN	44.411	71.719	840	76		
433400	VT	GRAFTON 1 NW	43.191	72.625	1175		47	
433914	VT	HIGHGATE FALLS	44.934	73.049	175		54	
434052	VT	HUNTINGTON CTR	44.317	73.000	730	37		
434747	VT	LUDLOW	43.394	72.710	1265	34		
434749	VT	LUDLOW 2	43.392	72.679	970		31	
434985	VT	MARSHFIELD	44.367	72.333	860	21		
435029	VT	MAYS MILL	42.750	72.733	830	44		
435044	VT	MC INDOE FALLS	44.267	72.067	479	40		
435132	VT	MIDDLESEX	44.300	72.683	459	31		
435278	VT	BARRE MONTPELIER AP	44.203	72.579	1126	57		
435366	VT	MORRISVILLE	44.566	72.604	620		50	
435416	VT	MT MANSFIELD	44.525	72.815	3950	53		
435492	VT	NEWFANE	43.000	72.633	420	38	20	
435542	VT	NEWPORT	44.949	72.191	790	76	49	

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
435632	VT	NORTH DANVILLE	44.467	72.117	1142	21	20	
435733	VT	NORTHFIELD	44.165	72.657	670	63		
435768	VT	NORTH HARTLAND LAKE	43.603	72.362	570		40	
435982	VT	NORTH SPRINGFIELD LAKE	43.339	72.506	560		43	
436335	VT	PERU	43.267	72.900	1700	66		
436500	VT	POWNAL 1 NE	42.783	73.217	1140	29		
436761	VT	READSBORO 1 SE	42.750	72.933	1120	67		
436893	VT	ROCHESTER	43.858	72.804	830	79		
436995	VT	RUTLAND	43.625	72.978	620	91		
437026	VT	ST ALBANS BAY	44.800	73.167	112	20		
437032	VT	ST ALBANS RADIO	44.859	73.091	380	52		
437054	VT	SAINT JOHNSBURY	44.420	72.019	700	114	53	
437098	VT	SALISBURY 2 N	43.926	73.099	420	58		
437142	VT	SEARBURG PWR PLT	42.900	73.000	0	35		
437152	VT	SEARSBURG STN	42.867	72.917	1560	68	42	
437401	VT	SOMERSET	42.967	72.950	2080	56		
437607	VT	SOUTH HERO	44.626	73.303	110	39		
437612	VT	SOUTH LINCOLN	44.072	72.974	1341	25		
437617	VT	SOUTH LONDONDERRY	43.183	72.817	1050	43		
437646	VT	SOUTH NEWBURY	44.050	72.075	470	66		
438172	VT	SUTTON 2 NE	44.665	72.023	1000	77		
438428	VT	TOWNSHEND LAKE	43.050	72.700	510		39	
438512	VT	TYSON	43.467	72.700	1102		23	
438556	VT	UNION VILLAGE DAM	43.792	72.258	460	50	47	
438600	VT	VERNON	42.772	72.515	226	98		
438637	VT	WAITSFIELD 2 W	44.187	72.878	1028	22		
438644	VT	WAITSFIELD 2 WSW	44.183	72.850	820	27		
438747	VT	WARDSBORO	43.050	72.783	981	31		
438815	VT	WATERBURY 2 SSE	44.317	72.750	760	50		
439329	VT	WEST HARTFORD	43.717	72.417	410	27		
439591	VT	WEST WARDSBORO	43.033	72.850	1410	28		
439691	VT	WHITE RIVER JUNCTION	43.650	72.317	361	52		
439735	VT	WHITINGHAM 1 W	42.800	72.917	1402	68		
439764	VT	WILDER	43.670	72.308	365	30		
439984	VT	WOODSTOCK	43.630	72.507	600	102		
CA001014508	Canada	ARGENTIA	47.300	54.000	0	25		
CA006055210	Canada	MISSISSAGI ONT HYDRO	46.430	83.380	226	25		
CA006061847	Canada	CONISTON	46.470	80.820	237	53		
CA006061850	Canada	CONISTON STP	46.480	80.850	268	37		
CA006065006	Canada	MASSEY	46.180	82.020	198	26		
CA006065043	Canada	MCVITTIES	46.280	80.850	213	23		
CA006065250	Canada	MONETVILLE	46.150	80.300	221	42		
CA006068150	Canada	SUDBURY A	46.620	80.800	348	56		
CA006068980	Canada	TURBINE	46.380	81.570	206	68		
CA006070027	Canada	ABITIBI CANYON	49.880	81.570	204	32		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA006071712	Canada	COCHRANE	49.070	81.030	275	77		
CA006072183	Canada	DYMOND ONT HYDRO	47.520	79.680	198	24		
CA006072225	Canada	EARLTON A	47.700	79.850	243	66		
CA006072325	Canada	ENGLEHART	47.820	79.900	252	51		
CA006073630	Canada	HUNTA	49.120	81.270	274	22		
CA006073810	Canada	IROQUOIS FALLS	48.750	80.670	259	84		
CA006073840	Canada	ISLAND FALLS	49.580	81.370	178	41		
CA006073975	Canada	KAPUSKASING A	49.420	82.470	227	72		
CA006074209	Canada	KIRKLAND LAKE	48.150	80.000	324	44		
CA006075024	Canada	MATTICE TCPL	49.600	83.170	233	27		
CA006075379	Canada	MONTREAL RIVER	47.120	79.480	183	56		
CA006076572	Canada	PORCUPINE ONT HYDRO	48.470	81.270	299	30		
CA006078280	Canada	TIMMINS	48.500	81.330	335	33		
CA006078285	Canada	TIMMINS A	48.570	81.380	295	54		
CA006079068	Canada	UPPER NOTCH	47.250	79.580	241	20		
CA006079415	Canada	WAWAITIN	48.350	81.400	271	50		
CA006080189	Canada	ALGONQUIN PARK	45.580	78.550	433	42		
CA006082178	Canada	DWIGHT	45.380	78.900	404	32		
CA006082612	Canada	FRENCH R CHAUDIERE DAM	46.130	80.020	198	33		
CA006084278	Canada	LA CAVE	46.370	78.730	172	24		
CA006084307	Canada	LAKE TRAVERSE	45.950	78.070	236	21		
CA006084770	Canada	MADAWASKA	45.500	77.980	316	84		
CA006085700	Canada	NORTH BAY A	46.370	79.420	370	71		
CA006097915	Canada	SOUTH BAYMOUTH	45.580	82.020	182	37		
CA006100345	Canada	ARNPRIOR GRANDON	45.420	76.370	107	38		
CA006100398	Canada	AVONMORE	45.170	74.970	91	29		
CA006100493	Canada	BARK LAKE DAM	45.420	77.800	335	21		
CA006100720	Canada	BELLROCK	44.480	76.770	146	21		
CA006100971	Canada	BROCKVILLE PCC	44.600	75.670	96	44		
CA006101249	Canada	CARLETON PLACE	45.150	76.170	137	25		
CA006101265	Canada	CATARAQUI TS	44.370	76.620	145	34		
CA006101440	Canada	CHATS FALLS	45.470	76.230	94	40		
CA006101494	Canada	CHENAUX	45.580	76.680	84	40		
CA006101555	Canada	CLAYBANK	45.420	76.400	107	32		
CA006101820	Canada	COMBERMERE	45.370	77.620	287	48		
CA006101874	Canada	CORNWALL	45.020	74.750	64	58		
CA006101901	Canada	CORNWALL ONT HYDRO	45.030	74.800	76	38		
CA006101955	Canada	DALHOUSIE L HIGH FALLS	44.970	76.620	160	57		
CA006101958	Canada	DALHOUSIE MILLS	45.320	74.470	69	36		
CA006102009	Canada	DES JOACHIMS	46.180	77.700	130	27		
CA006102808	Canada	GLENBURNIE	44.330	76.500	114	26		
CA006102832	Canada	GLEN GORDON	45.170	74.530	53	30		
CA006102857	Canada	GODFREY	44.570	76.630	160	21		
CA006102J13	Canada	DRUMMOND CENTRE	45.030	76.250	145	25		
CA006103367	Canada	HARTINGTON IHD	44.430	76.700	160	42		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA006104125	Canada	KILLALOE	45.570	77.420	174	34		
CA006104165	Canada	KINGSTON ONT HYDRO	44.270	76.500	91	25		
CA006104175	Canada	KINGSTON PUMPING STATION	44.230	76.480	77	46		
CA006104725	Canada	LYNDHURST SHAWMERE	44.520	76.100	87	30		
CA006104733	Canada	MACCUE	44.880	76.170	116	33		
CA006104880	Canada	MALLORYTOWN GRAHAM LAKE	44.570	75.880	122	27		
CA006105460	Canada	MORRISBURG	44.920	75.180	82	94		
CA006105976	Canada	OTTAWA CDA	45.380	75.720	79	120		
CA006106000	Canada	OTTAWA MACDONALD-CARTIER INT'L	45.320	75.670	114	71		
CA006106052	Canada	OTTAWA LEMIEUX ISLAND	45.420	75.730	61	24		
CA006106090	Canada	OTTAWA NRC	45.450	75.620	98	31		
CA006106100	Canada	OTTAWA ROCKCLIFFE A	45.450	75.630	54	21		
CA006106779	Canada	PURDY	45.320	77.720	491	38		
CA006107002	Canada	RENFREW	45.480	76.700	130	28		
CA006107004	Canada	RENFREW SAND POINT	45.480	76.430	127	29		
CA006107276	Canada	ST. ALBERT	45.280	75.050	70	20		
CA006107955	Canada	SOUTH MOUNTAIN	44.970	75.480	85	36		
CA006108060	Canada	STONECLIFFE	46.150	78.100	149	45		
CA006110218	Canada	ALLISTON NELSON	44.150	79.870	221	33		
CA006110270	Canada	ANGUS	44.320	79.870	191	32		
CA006110458	Canada	BALA	45.000	79.500	226	24		
CA006110605	Canada	BEATRICE	45.130	79.380	290	100		
CA006110606	Canada	BEATRICE 2	45.130	79.400	297	28		
CA006110661	Canada	BEETON	44.100	79.780	233	50		
CA006110745	Canada	BINGHAM CHUTE	46.080	79.400	242	37		
CA006111769	Canada	COLDWATER WARMINSTER	44.630	79.530	285	37		
CA006111859	Canada	COOKSTOWN	44.200	79.680	244	34		
CA006112072	Canada	DORSET MOE	45.220	78.930	323	24		
CA006112133	Canada	DUNCHURCH	45.620	79.880	268	33		
CA006112340	Canada	ESSA ONT HYDRO	44.350	79.820	216	42		
CA006112350	Canada	EUGENIA	44.330	80.550	274	50		
CA006113329	Canada	HANOVER	44.120	81.000	270	34		
CA006113663	Canada	HUNTSVILLE WPCP	45.350	79.170	321	41		
CA006114805	Canada	MAGNETAWAN	45.670	79.780	280	32		
CA006115525	Canada	MUSKOKA A	44.970	79.300	282	72		
CA006115820	Canada	ORILLIA TS	44.620	79.420	220	28		
CA006116132	Canada	OWEN SOUND MOE	44.580	80.930	179	42		
CA006116254	Canada	PARRY SOUND	45.330	80.000	194	101		
CA006116702	Canada	POWASSAN	46.120	79.250	274	35		
CA006116705	Canada	PRESQU'ILE	44.700	80.920	228	21		
CA006116718	Canada	PRICEVILLE	44.200	80.630	472	26		
CA006116750	Canada	PROTON STATION	44.170	80.520	480	33		
CA006116843	Canada	RAGGED RAPIDS	45.020	79.680	229	20		
CA006116902	Canada	RAVENSHOE	44.220	79.400	251	22		
CA006117663	Canada	SCOTIA	45.520	79.300	390	49		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA006117684	Canada	SHANTY BAY	44.400	79.630	252	37		
CA006118938	Canada	TROUT CREEK	46.030	79.380	333	24		
CA006119055	Canada	UDORA	44.270	79.170	262	20		
CA006119064	Canada	UPLANDS	45.800	79.420	381	26		
CA006119274	Canada	WALTERS FALLS	44.520	80.730	305	21		
CA006119500	Canada	WIARTON A	44.750	81.100	222	62		
CA00611HBEC	Canada	THORNBURY SLAMA	44.570	80.480	213	37		
CA006120315	Canada	ARKONA	43.030	81.920	183	31		
CA006120819	Canada	BLYTH	43.720	81.380	351	47		
CA006121969	Canada	DASHWOOD	43.370	81.620	253	22		
CA0061219J1	Canada	COURTRIGHT	42.750	82.450	186	28		
CA006122851	Canada	GODERICH TOWNSHIP	43.720	81.700	221	54		
CA006124700	Canada	LUCKNOW	43.950	81.500	290	107		
CA006125705	Canada	NORTH BRUCE	44.380	81.420	213	34		
CA006126210	Canada	PAISLEY	44.270	81.370	244	31		
CA006126499	Canada	PETROLIA TOWN	42.880	82.170	201	44		
CA006126558	Canada	POINT CLARK	44.080	81.680	181	36		
CA006127887	Canada	SOUTHAMPTON	44.500	81.370	186	109		
CA006128206	Canada	TARA	44.520	81.150	235	20		
CA006130257	Canada	AMHERSTBURG	42.100	83.080	182	21		
CA006131081	Canada	CALEDONIA	43.080	79.950	206	35		
CA006131165	Canada	CANBORO	42.970	79.580	183	24		
CA006131415	Canada	CHATHAM WPCP	42.380	82.200	179	26		
CA006131910	Canada	COTTAM	42.120	82.750	185	38		
CA006131970	Canada	DEALTOWN	42.280	82.120	196	21		
CA006132148	Canada	DUNNVILLE PUMPING STN	42.830	79.620	175	28		
CA006132470	Canada	FORT ERIE	42.880	78.970	180	43		
CA006133120	Canada	HAGERSVILLE	42.970	80.070	221	55		
CA006134190	Canada	KINGSVILLE MOE	42.050	82.680	198	49		
CA006134390	Canada	LEAMINGTON	42.050	82.630	213	61		
CA006135583	Canada	NEW GLASGOW	42.520	81.630	198	51		
CA006135657	Canada	NIAGARA FALLS NPCSH	43.130	79.050	175	25		
CA006136606	Canada	PORT COLBORNE	42.880	79.250	175	45		
CA006137287	Canada	ST CATHARINES A	43.200	79.170	98	29		
CA006137306	Canada	ST CATHARINES POWER GLEN	43.120	79.250	122	40		
CA006137362	Canada	ST THOMAS WPCP	42.770	81.220	209	30		
CA006137399	Canada	ST WILLIAMS	42.700	80.450	213	33		
CA006137730	Canada	SIMCOE	42.850	80.270	241	24		
CA006139143	Canada	VINELAND RITTENHOUSE	43.170	79.420	95	36		
CA006139356	Canada	WATERFORD	42.930	80.230	223	35		
CA006139525	Canada	WINDSOR A	42.270	82.970	190	69		
CA006139600	Canada	WOODSLEE CDA	42.220	82.730	183	39		
CA006140348	Canada	ARTHUR	43.820	80.570	452	20		
CA006141100	Canada	CAMBRIDGE-STEWART	43.350	80.300	289	27		
CA006141919	Canada	CROMARTY	43.420	81.330	328	21		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA006141933	Canada	CULLODEN EASEY	42.880	80.850	274	32		
CA006142066	Canada	DORCHESTER	43.000	81.030	271	34		
CA006142400	Canada	FERGUS SHAND DAM	43.730	80.330	418	69		
CA006142420	Canada	FOLDENS	43.020	80.780	328	46		
CA006142798	Canada	GLANWORTH CFPL	42.880	81.200	280	21		
CA006142803	Canada	GLEN ALLAN	43.680	80.720	404	49		
CA006142991	Canada	GRAND VALLEY WPCP	43.880	80.330	465	20		
CA006143722	Canada	ILDERTON BEAR CREEK	43.050	81.430	267	29		
CA006144232	Canada	KITCHENER	43.430	80.500	343	62		
CA006144475	Canada	LONDON A	43.030	81.150	278	65		
CA006144500	Canada	LONDON SHARON DRIVE	43.030	81.280	274	36		
CA006144505	Canada	LONDON SOUTH	42.980	81.220	246	48		
CA006145267	Canada	MONTICELLO	43.970	80.400	482	39		
CA006146711	Canada	PRESTON	43.400	80.420	291	43		
CA006146714	Canada	PRESTON WPCP	43.380	80.350	273	25		
CA006146728	Canada	PRINCETON	43.220	80.630	285	27		
CA006147188	Canada	ROSEVILLE	43.350	80.470	328	37		
CA006147229	Canada	RUSKVIEW	44.230	80.130	472	21		
CA006147664	Canada	SCOTLAND	43.000	80.430	247	35		
CA006148105	Canada	STRATFORD MOE	43.370	81.000	354	50		
CA006148212	Canada	TAVISTOCK	43.320	80.830	343	21		
CA006149205	Canada	WALDEMAR	43.880	80.280	450	23		
CA006149387	Canada	WATERLOO WELLINGTON A	43.450	80.380	317	32		
CA006149454	Canada	WESTMINSTER	42.930	81.280	267	48		
CA006149455	Canada	WESTMINSTER TWP WPCP	42.920	81.220	259	33		
CA006149625	Canada	WOODSTOCK	43.130	80.770	282	138		
CA006150100	Canada	ALBION	43.930	79.830	274	41		
CA006150103	Canada	ALBION FIELD CENTRE	43.920	79.830	282	30		
CA006150135	Canada	ALDERSHOT	43.320	79.870	145	29		
CA006150395	Canada	AURORA	43.950	79.400	270	35		
CA006150717	Canada	BELLEVILLE PAR LAB	44.170	77.350	88	28		
CA006150830	Canada	BOWMANVILLE MOSTERT	43.920	78.670	99	34		
CA006150863	Canada	BRADFORD MUCK RESEARCH	44.030	79.600	221	24		
CA006151042	Canada	BURKETON MCLAUGHLIN	44.030	78.800	312	33		
CA006151053	Canada	BURLINGTON	43.350	79.800	105	24		
CA006151064	Canada	BURLINGTON TS	43.330	79.830	99	46		
CA006151137	Canada	CAMPBELLFORD	44.300	77.800	146	77		
CA006151309	Canada	CENTREVILLE	44.400	76.920	149	24		
CA006151545	Canada	CLAREMONT	43.950	79.070	175	28		
CA006151689	Canada	COBOURG STP	43.970	78.180	79	35		
CA006151750	Canada	COLD CREEK	43.920	79.700	251	27		
CA006151866	Canada	COPETOWN	43.250	80.120	229	22		
CA0061519JM	Canada	CRESSY	44.100	76.850	84	34		
CA006152007	Canada	DESERONTO	44.180	77.070	81	22		
CA006152605	Canada	FRENCHMANS BAY	43.820	79.080	76	44		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA006152691	Canada	GEORGETOWN	43.650	79.950	274	82		
CA006152695	Canada	GEORGETOWN WWTP	43.630	79.880	221	46		
CA006152833	Canada	GLEN HAFFY MONO MILLS	43.930	79.950	434	43		
CA006152950	Canada	GORES LANDING	44.130	78.220	191	23		
CA006153020	Canada	GREENWOOD MTRCA	43.900	79.070	128	30		
CA006153194	Canada	HAMILTON A	43.170	79.930	238	49		
CA006153290	Canada	HAMILTON MUNICIPAL LAB	43.250	79.770	76	26		
CA006153298	Canada	HAMILTON PSYCH HOSPITAL	43.230	79.900	198	32		
CA006153300	Canada	HAMILTON RBG	43.280	79.880	102	47		
CA006153410	Canada	HEART LAKE	43.730	79.780	259	31		
CA006153853	Canada	JANETVILLE	44.220	78.630	297	25		
CA006154142	Canada	KING SMOKE TREE	44.020	79.520	352	28		
CA006154310	Canada	LAKEVIEW MOE	43.570	79.570	76	30		
CA006154950	Canada	MAPLE	43.870	79.480	244	25		
CA006155183	Canada	MILLGROVE	43.320	79.970	255	53		
CA006155790	Canada	ORANGEVILLE MOE	43.920	80.080	412	48		
CA006155878	Canada	OSHAWA WPCP	43.870	78.830	84	40		
CA006156515	Canada	PICKERING AUDLEY	43.900	79.050	110	26		
CA006157012	Canada	RICHMOND HILL	43.880	79.450	233	47		
CA006157014	Canada	RICHMOND HILL WPCP	43.870	79.430	218	20		
CA006157194	Canada	ROUGE PARK	43.820	79.130	125	29		
CA006157431	Canada	SANDHILL	43.820	79.820	274	29		
CA006157625	Canada	SCARBOROUGH JUNCTION	43.720	79.220	167	28		
CA006158050	Canada	STIRLING	44.320	77.630	139	28		
CA006158065	Canada	STONEY CREEK	43.220	79.750	89	43		
CA006158084	Canada	STOUFFVILLE WPCP	43.970	79.250	267	20		
CA006158255	Canada	THORNHILL GRANDVIEW	43.800	79.420	199	41		
CA006158350	Canada	TORONTO	43.670	79.400	113	163		
CA006158363	Canada	TORONTO AGINCOURT	43.780	79.270	180	69		
CA006158370	Canada	TORONTO ASHBRIDGES BAY	43.670	79.320	74	34		
CA006158386	Canada	TORONTO BEVERLEY HILLS	43.730	79.500	145	23		
CA006158417	Canada	TORONTO DEER PARK	43.680	79.380	144	41		
CA006158443	Canada	TORONTO DOWNSVIEW A	43.750	79.480	198	24		
CA006158520	Canada	TORONTO ELLESMERE	43.770	79.270	164	33		
CA006158733	Canada	TORONTO LESTER B. PEARSON INT'	43.670	79.600	173	72		
CA006158740	Canada	TORONTO MET RES STN	43.800	79.550	194	22		
CA006158762	Canada	TORONTO NORTHCLIFFE	43.680	79.450	168	22		
CA006158764	Canada	TORONTO OLD WESTON RD	43.650	79.470	122	23		
CA006158779	Canada	TORONTO SUNNYBROOK	43.720	79.380	157	27		
CA006158875	Canada	TRENTON A	44.120	77.530	86	73		
CA006158885	Canada	TRENTON ONT HYDRO	44.130	77.600	88	76		
CA006159048	Canada	TYRONE	44.020	78.730	206	32		
CA006159122	Canada	UXBRIDGE	44.080	79.130	270	22		
CA006159124	Canada	UXBRIDGE 2	44.120	79.100	270	28		
CA006159127	Canada	VALENS	43.380	80.130	282	23		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA006159575	Canada	WOODBRIDGE	43.780	79.600	164	54		
CA00615EMR7	Canada	MOUNTAINVIEW	44.050	77.300	108	24		
CA00615HMAK	Canada	TORONTO BUTTONVILLE A	43.870	79.370	198	24		
CA00615N745	Canada	OAKVILLE SOUTHEAST WPCP	43.480	79.630	87	31		
CA006162328	Canada	ENNISMORE	44.380	78.450	263	27		
CA006163156	Canada	HALIBURTON A	45.000	78.580	320	95		
CA006163171	Canada	HALIBURTON 3	45.030	78.530	330	22		
CA006164430	Canada	LINDSAY	44.350	78.750	267	89		
CA006164432	Canada	LINDSAY FILTRATION PLANT	44.350	78.730	252	25		
CA006164433	Canada	LINDSAY FROST	44.330	78.730	262	32		
CA006164615	Canada	LORNEVILLE	44.480	78.950	274	22		
CA006166418	Canada	PETERBOROUGH A	44.230	78.370	191	41		
CA006166428	Canada	PETERBOROUGH DOBBIN TS	44.320	78.400	244	29		
CA006166455	Canada	PETERBOROUGH TRENT U	44.370	78.300	198	38		
CA007010720	Canada	BERTHIERVILLE	46.050	73.180	12	74		
CA007011600	Canada	CHUTE PANET	46.870	71.870	152	31		
CA007011947	Canada	COTEAU DU LAC	45.320	74.170	49	43		
CA007011982	Canada	DESCHAMBAULT	46.670	71.920	15	34		
CA007012070	Canada	DONNACONA	46.670	71.750	11	42		
CA007012071	Canada	DONNACONA 2	46.680	71.730	46	55		
CA007012232	Canada	DUBERGER	46.820	71.300	15	21		
CA007013360	Canada	JOLIETTE	46.030	73.430	59	55		
CA007013362	Canada	JOLIETTE VILLE	46.020	73.430	56	42		
CA007014160	Canada	L'ASSOMPTION	45.820	73.430	21	79		
CA007014260	Canada	LAVALTRIE CDA	45.930	73.320	31	25		
CA007014290	Canada	LES CEDRES	45.300	74.050	47	94		
CA007014332	Canada	LOUISEVILLE	46.270	73.020	45	40		
CA007014629	Canada	MASCOUCHE	45.750	73.600	15	30		
CA007016280	Canada	QUEBEC	46.800	71.220	90	86		
CA007016294	Canada	QUEBEC A	46.800	71.380	74	52		
CA007016470	Canada	RIGAUD	45.500	74.370	46	46		
CA007016675	Canada	RIVIERE VERTE OUEST	46.980	71.830	213	43		
CA007016800	Canada	ST ALBAN	46.720	72.080	76	60		
CA007016816	Canada	ST ALEXIS DES MONTS	46.530	73.150	183	46		
CA007016840	Canada	STE ANNE DE LA PERADE	46.580	72.230	16	59		
CA007016900	Canada	ST AUGUSTIN	46.730	71.500	58	24		
CA007016902	Canada	STE BEATRIX	46.200	73.600	198	35		
CA007016932	Canada	STE CATHERINE	46.850	71.620	152	28		
CA007016960	Canada	ST CHARLES DE MANDEVILLE	46.350	73.350	168	83		
CA007017080	Canada	ST COME	46.280	73.750	244	58		
CA007017100	Canada	ST DONAT	46.320	74.200	389	43		
CA007017386	Canada	ST JANVIER	45.730	73.880	61	35		
CA007017422	Canada	ST JOSEPH DE MEKINAC	46.920	72.680	122	20		
CA007017480	Canada	ST LIN DES LAURENTIDES	45.850	73.750	64	65		
CA007017585	Canada	ST NARCISSE	46.530	72.430	46	36		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA007017755	Canada	STE THERESE OUEST	45.650	73.880	61	48		
CA007017760	Canada	ST TITE	46.730	72.570	142	62		
CA007017BFN	Canada	STE FOY (PIE XII)	46.780	71.320	79	24		
CA007018564	Canada	TROIS RIVIERES	46.370	72.600	53	51		
CA00701HE63	Canada	TROIS RIVIERES AQUEDUC	46.380	72.620	55	34		
CA00701LEEH	Canada	LAC AUX SABLES	46.870	72.400	160	45		
CA007020040	Canada	ABERCORN	45.030	72.670	149	34		
CA007020360	Canada	ASBESTOS	45.770	71.950	229	37		
CA007020392	Canada	AUTEUIL	45.650	73.730	53	25		
CA007020567	Canada	BEAUSEJOUR	46.670	71.170	107	34		
CA007020800	Canada	BISHOPTON	45.580	71.570	213	43		
CA007020828	Canada	BONSECOURS	45.400	72.270	297	42		
CA007020860	Canada	BROMPTONVILLE	45.480	71.950	130	52		
CA007020885	Canada	BURY	45.520	71.480	378	24		
CA007021320	Canada	CHARTIERVILLE	45.280	71.200	518	37		
CA007021580	Canada	CHUTE HEMMINGS	45.870	72.450	87	52		
CA007021840	Canada	COATICOOK	45.150	71.800	259	60		
CA007022000	Canada	DISRAELI	45.920	71.320	350	78		
CA007022160	Canada	DRUMMONDVILLE	45.880	72.480	82	94		
CA007022280	Canada	EAST ANGUS	45.480	71.670	189	63		
CA007022300	Canada	EAST HEREFORD	45.080	71.500	358	43		
CA007022375	Canada	FLEURY	45.800	73.000	31	43		
CA007022494	Canada	FORTIERVILLE	46.480	72.050	53	37		
CA007022596	Canada	GARTHBY	45.830	71.380	251	31		
CA007022720	Canada	GEORGEVILLE	45.130	72.230	267	55		
CA007022800	Canada	GRANBY	45.380	72.720	175	61		
CA007023075	Canada	HEMMINGFORD FOUR WINDS	45.070	73.720	61	47		
CA007023270	Canada	IBERVILLE	45.330	73.250	31	46		
CA007023677	Canada	LAC MEGANTIC 2	45.600	70.870	426	46		
CA007023800	Canada	LAKE MEGANTIC	45.600	70.880	401	33		
CA007024080	Canada	LA PATRIE	45.400	71.250	381	31		
CA007024100	Canada	LAPRAIRIE	45.380	73.430	30	44		
CA007024250	Canada	LAURIERVILLE	46.330	71.670	152	44		
CA007024254	Canada	LAUZON	46.820	71.100	69	30		
CA007024320	Canada	LINGWICK	45.630	71.370	267	55		
CA007024400	Canada	MACDONALD COLLEGE	45.420	73.930	27	66		
CA007024440	Canada	MAGOG	45.270	72.120	274	60		
CA007024800	Canada	MEGANTIC A	45.580	70.870	415	22		
CA007024920	Canada	MILAN	45.580	71.120	482	60		
CA007025250	Canada	MONTREAL/DORVAL INT'L A	45.470	73.750	36	68		
CA007025257	Canada	MONTREAL JAR BOT	45.570	73.550	46	40		
CA007025260	Canada	MONTREAL JEAN BREBEUF	45.500	73.620	133	28		
CA007025267	Canada	MONTREAL LAFONTAINE	45.520	73.570	41	20		
CA007025280	Canada	MONTREAL MCGILL	45.500	73.580	57	121		
CA007025440	Canada	NICOLET	46.200	72.620	30	95		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA007025745	Canada	ORMSTOWN	45.120	74.050	46	47		
CA007026040	Canada	PHILIPSBURG	45.030	73.080	53	58		
CA007026043	Canada	PIERREVILLE	46.080	72.830	15	29		
CA00702607F	Canada	POINTE DU MOULIN	45.350	73.920	38	21		
CA007026612	Canada	RIVIERE DES PRAIRIES	45.700	73.500	9	37		
CA007026734	Canada	SABREVOIS	45.220	73.200	38	33		
CA007026739	Canada	SACRE COEUR DE MARIE	46.130	71.170	468	20		
CA007026818	Canada	ST AMABLE	45.670	73.300	41	28		
CA007026836	Canada	ST ANICET	45.130	74.350	53	48		
CA007026916	Canada	ST BERNARD DE LACOLLE	45.080	73.380	49	34		
CA007026920	Canada	ST BRUNO	45.550	73.350	61	31		
CA007027083	Canada	ST COME DE LINIERE	46.050	70.520	244	44		
CA007027120	Canada	STE EDWIDGE	45.200	71.680	381	31		
CA007027259	Canada	ST FLAVIEN	46.480	71.570	137	46		
CA007027267	Canada	STE FRANCOISE ROMAINE	46.480	71.930	91	22		
CA007027277	Canada	ST GEDEON	45.870	70.620	282	28		
CA007027280	Canada	STE GENEVIEVE	45.500	73.850	23	54		
CA007027309	Canada	ST HILAIRE DORSET	45.870	70.870	506	24		
CA007027440	Canada	ST LAURENT (COLLEGE)	45.520	73.670	38	34		
CA007027516	Canada	ST LUDGER	45.750	70.680	335	45		
CA007027517	Canada	STE MADELEINE	45.620	73.130	30	29		
CA007027520	Canada	ST MALO D AUCKLAND	45.200	71.500	564	58		
CA007027540	Canada	STE MARTINE	45.220	73.850	38	47		
CA007027560	Canada	ST MATHIEU LAPRAIRIE	45.350	73.530	31	32		
CA007027588	Canada	ST NAZAIRE	45.730	72.620	69	36		
CA007027593	Canada	ST ODILON	46.350	70.650	358	28		
CA007027660	Canada	ST PROSPER	46.220	70.500	282	46		
CA007027690	Canada	ST REMI	45.280	73.600	53	27		
CA007027725	Canada	ST SEBASTIEN	45.770	70.950	442	45		
CA007027733	Canada	ST SEVERIN	46.330	71.050	442	43		
CA007027772	Canada	ST VALERIEN	45.570	72.670	91	25		
CA007027783	Canada	ST WENCESLAS	46.170	72.330	84	29		
CA007027785	Canada	ST ZACHARIE	46.120	70.380	480	28		
CA007027800	Canada	SAWYERVILLE	45.330	71.570	277	28		
CA007027802	Canada	SAWYERVILLE NORD	45.370	71.530	346	48		
CA007027840	Canada	SCOTT	46.500	71.080	145	57		
CA007028200	Canada	SOREL	46.030	73.120	15	93		
CA007028240	Canada	STANHOPE	45.020	71.780	389	28		
CA007028280	Canada	STANSTEAD	45.020	72.100	320	43		
CA007028292	Canada	SUTTON	45.070	72.680	244	31		
CA007028295	Canada	SUTTON JONCTION	45.150	72.630	213	21		
CA007028440	Canada	THETFORD MINES	46.070	71.320	311	41		
CA007028441	Canada	THETFORD MINES	46.100	71.350	381	46		
CA007028676	Canada	VALLEE JONCTION	46.380	70.930	152	44		
CA007028680	Canada	VALLEYFIELD	45.280	74.100	46	56		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA007028890	Canada	WARDEN	45.380	72.500	198	22		
CA007028906	Canada	WEST DITTON	45.400	71.300	512	27		
CA007028946	Canada	WOBURN	45.380	70.870	396	23		
CA00702A9ND	Canada	DAVELUYVILLE	46.180	72.200	84	27		
CA00702FR30	Canada	ST CAMILLE WOLFE	45.670	71.730	268	34		
CA007030170	Canada	ANGERS	45.550	75.550	91	47		
CA007030310	Canada	ARUNDEL	45.950	74.620	191	45		
CA007030457	Canada	BARRAGE MERCIER	46.720	75.980	236	52		
CA007030462	Canada	BARRAGE MITCHINAMECUS	47.220	75.170	390	26		
CA007031315	Canada	CHARTERIS	45.680	76.430	168	25		
CA007031360	Canada	CHELSEA	45.520	75.780	113	81		
CA007031375	Canada	CHENEVILLE	45.900	75.080	223	44		
CA007031636	Canada	CHUTE ST PHILIPPE	46.650	75.250	252	24		
CA007032370	Canada	FERME NEUVE	46.700	75.450	213	27		
CA007032440	Canada	FORT COULONGE	45.820	76.750	107	37		
CA007032997	Canada	HARRINGTON FOREST FARM	45.850	74.630	183	28		
CA007033160	Canada	HUBERDEAU	45.970	74.630	213	64		
CA007033650	Canada	LACHUTE	45.650	74.330	91	47		
CA007033939	Canada	LA MACAZA	46.370	74.770	244	33		
CA007034350	Canada	LUCERNE	45.530	75.970	101	32		
CA007034365	Canada	LUSKVILLE	45.530	76.050	69	29		
CA007034480	Canada	MANIWAKI UA	46.300	76.000	192	56		
CA007035112	Canada	MONTEBELLO SEIGNIORY	45.650	74.950	52	44		
CA007035158	Canada	MONT LAURIER	46.570	75.500	244	41		
CA007035160	Canada	MONT LAURIER	46.570	75.550	244	42		
CA007035290	Canada	MONTREAL/MIRABEL INT'L A	45.670	74.030	82	33		
CA007035360	Canada	MORIN HEIGHTS	45.920	74.270	290	33		
CA007035520	Canada	NOMININGUE	46.400	75.080	274	92		
CA007035666	Canada	NOTRE DAME DE LA PAIX	45.800	74.980	183	29		
CA007035680	Canada	NOTRE DAME DU LAUS	46.120	75.630	213	60		
CA007036000	Canada	PERKINS	45.600	75.620	152	76		
CA007036063	Canada	POINTE AU CHENE	45.650	74.800	51	46		
CA007036762	Canada	STE AGATHE DES MONTS	46.050	74.280	395	26		
CA007036855	Canada	STE ANNE DU LAC	46.850	75.330	262	46		
CA007037230	Canada	ST FAUSTIN	46.120	74.480	366	26		
CA007037310	Canada	ST HIPPOLYTE	45.980	74.000	366	47		
CA007037400	Canada	ST JEROME	45.800	74.050	170	75		
CA007038080	Canada	SHEENBORO	45.970	77.250	137	56		
CA007038500	Canada	THURSO	45.600	75.270	55	26		
CA007038587	Canada	VAL DES BOIS	45.900	75.600	198	20		
CA007038835	Canada	WAKEFIELD	45.600	75.900	152	29		
CA007038975	Canada	WRIGHT	46.070	76.050	142	42		
CA007041330	Canada	CHATEAU RICHER	46.970	71.030	15	27		
CA007042378	Canada	FORESTVILLE	48.730	69.080	76	33		
CA007042388	Canada	FORET MONTMORENCY	47.320	71.150	640	34		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA007042749	Canada	GODBOUT	49.320	67.620	30	36		
CA007042840	Canada	GRANDES BERGERONNES	48.250	69.520	61	57		
CA007042870	Canada	GRAND FONDS	47.750	70.120	366	22		
CA007043540	Canada	LABRIEVILLE B1	49.300	69.550	152	39		
CA007044288	Canada	LES BUISSONS	49.120	68.380	1	26		
CA007044292	Canada	LES EBOULEMENTS	47.500	70.250	267	25		
CA007045672	Canada	NOTRE DAME DES MONTS	47.670	70.420	267	25		
CA007046931	Canada	ST CASSIEN DES CAPS	47.370	70.620	373	21		
CA007047250	Canada	ST FEREOL	47.120	70.830	229	67		
CA007047396	Canada	ST JEAN (IO)	46.920	70.920	31	21		
CA007047722	Canada	STE ROSE DU NORD	48.400	70.530	205	36		
CA00704GBFF	Canada	ST FRANCOIS IO	46.980	70.830	49	24		
CA007050085	Canada	ALBERTVILLE	48.300	67.350	335	21		
CA007050200	Canada	ANTICOSTI SW POINT	49.400	63.550	7	77		
CA007050210	Canada	ANTICOSTI WEST POINT	49.870	64.530	9	48		
CA007050455	Canada	BARRAGE LAC MORIN	47.650	69.520	198	41		
CA007050463	Canada	BARRAGE MITIS	48.330	67.900	267	39		
CA007050760	Canada	BIC	48.370	68.700	18	75		
CA007051055	Canada	CAP DES ROSIERS	48.850	64.200	15	36		
CA007051160	Canada	CAP MADELEINE	49.230	65.320	2	108		
CA007051175	Canada	CAP SEIZE	49.020	66.400	229	27		
CA007051240	Canada	CAUSAPSCAL RECHERCHES	48.500	67.170	332	21		
CA007052820	Canada	GRANDE RIVIERE	48.380	64.530	8	30		
CA007053649	Canada	LAC HUMQUI	48.280	67.570	236	37		
CA007053935	Canada	L'ALVERNE	48.130	66.700	290	21		
CA007053980	Canada	LAMARTINE	47.030	70.350	63	32		
CA007055120	Canada	MONT-JOLI A	48.600	68.220	52	67		
CA007055380	Canada	MURDOCHVILLE	48.950	65.520	575	41		
CA007055430	Canada	NEW RICHMOND	48.170	65.800	47	26		
CA007055770	Canada	OUIMET	48.320	68.200	305	29		
CA007056240	Canada	PRICE	48.600	68.130	73	52		
CA007056480	Canada	RIMOUSKI	48.450	68.520	36	55		
CA007056930	Canada	ST CAMILLE	46.480	70.220	396	46		
CA007056970	Canada	ST CHARLES GARNIER	48.330	68.050	323	30		
CA007057090	Canada	ST DAMASE DES AULNAIES	47.200	70.130	274	20		
CA007057145	Canada	ST ELEUTHERE	47.480	69.280	290	30		
CA007057287	Canada	STE GERMAINE	46.420	70.470	511	46		
CA007057395	Canada	ST JEAN DE CHERBOURG	48.880	67.120	351	44		
CA007057515	Canada	STE LUCIE	46.730	70.020	373	46		
CA007057518	Canada	ST MALACHIE	46.550	70.820	221	28		
CA007057567	Canada	SAINT MICHEL	46.870	70.880	69	31		
CA007057650	Canada	STE PERPETUE	47.050	69.930	411	34		
CA007057680	Canada	ST RAPHAEL	46.820	70.750	107	33		
CA007058220	Canada	SQUATECK	47.880	68.700	198	31		
CA007058590	Canada	VAL D ESPOIR	48.520	64.380	91	29		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA00705C2G9	Canada	ILES DE LA MADELEINE A	47.420	61.780	10	32		
CA007060080	Canada	ALBANEL	48.880	72.450	152	67		
CA007060320	Canada	ARVIDA	48.430	71.170	102	56		
CA007060400	Canada	BAGOTVILLE A	48.330	71.000	159	66		
CA007061475	Canada	CHUTE A LA SAVANE	48.780	71.850	140	23		
CA007061480	Canada	CHUTE A MURDOCK	48.520	71.250	188	35		
CA007061520	Canada	CHUTE AUX GALETS	48.650	71.200	152	40		
CA007061560	Canada	CHUTE DU DIABLE	48.750	71.700	174	25		
CA007062368	Canada	FERLAND	48.200	70.830	198	26		
CA007063560	Canada	LAC BOUCHETTE	48.220	72.170	358	58		
CA007063690	Canada	LAC STE CROIX	48.420	71.750	152	50		
CA007065960	Canada	PERIBONCA	48.770	72.030	103	56		
CA007066080	Canada	PORTAGE DES ROCHES	48.300	71.220	165	58		
CA007066685	Canada	ROBERVAL A	48.520	72.270	179	52		
CA007066820	Canada	ST AMBROISE	48.570	71.330	122	54		
CA007067658	Canada	ST PRIME	48.620	72.420	122	29		
CA007068160	Canada	SHIPSHAW	48.450	71.220	23	49		
CA007070451	Canada	BGE C LAC CHATEAUVERT	47.770	73.900	383	39		
CA007070454	Canada	BARRAGE GOUIN	48.350	74.100	404	67		
CA007070456	Canada	BARRAGE MATTAWIN	46.850	73.650	366	52		
CA007070464	Canada	BARRAGE MONDONAC	47.450	73.930	457	23		
CA007072816	Canada	GRANDE ANSE	47.100	72.930	119	27		
CA007074600	Canada	MANOUAN SANMAUR	47.900	73.800	357	52		
CA007076360	Canada	RAPIDE BLANC	47.800	72.970	277	43		
CA007077570	Canada	ST MICHEL DES SAINTS	46.680	73.920	351	42		
CA007080449	Canada	BARRAGE CABONGA	47.320	76.470	366	39		
CA007083480	Canada	KIPAWA LANIEL	47.050	79.270	280	74		
CA007084560	Canada	MANNEVILLE	48.550	78.480	311	41		
CA007085106	Canada	MONT BRUN	48.420	78.730	305	29		
CA007086380	Canada	RAPIDE DES JOACHIMS	46.200	77.700	137	32		
CA007090050	Canada	ABITIBI POST	48.720	79.370	259	37		
CA007090120	Canada	AMOS	48.570	78.130	310	82		
CA007093376	Canada	JOUTEL	49.470	78.300	290	22		
CA007096215	Canada	POULARIES	48.680	78.980	290	24		
CA007097900	Canada	SENNETERRE	48.330	77.270	310	25		
CA00709CEE9	Canada	LAC BERRY	48.800	78.280	305	36		
CA008100100	Canada	ACADIA FOREST EXP ST	45.980	66.370	61	52		
CA008100200	Canada	ALMA	45.600	64.950	43	55		
CA008100566	Canada	BON ACCORD	46.650	67.580	442	41		
CA008100590	Canada	BUCTOUCHE	46.520	64.720	11	33		
CA008100700	Canada	CAMPBELLTON	48.000	66.670	8	21		
CA008100850	Canada	CENTREVILLE	46.380	67.700	143	26		
CA008100880	Canada	CHARLO A	47.980	66.330	40	36		
CA008100900	Canada	CHARLO FALLS	47.970	66.480	17	23		
CA008100990	Canada	CHATHAM	47.050	65.480	30	74		

Station ID	State	Name	Lat (ºN)	Lon (ºW)	Elev (ft)	Daily Years	Hourly Years	Nminute Years
CA008101000	Canada	MIRAMICHI A	47.020	65.470	33	62		
CA008101100	Canada	CHIPMAN	46.180	65.870	11	35		
CA008101151	Canada	COLESON COVE	45.150	66.200	31	27		
CA008101170	Canada	DALHOUSIE	48.070	66.370	12	40		
CA008101300	Canada	EDMUNDSTON	47.370	68.330	174	40		
CA008101600	Canada	FREDERICTON CDA	45.920	66.620	40	86		
CA008101904	Canada	GRAND FALLS DRUMMOND	47.030	67.700	229	26		
CA008102000	Canada	GREEN RIVER	47.470	68.230	183	25		
CA008102151	Canada	HARCOURT	46.500	65.270	40	22		
CA008102160	Canada	HARDWOOD RIDGE	46.170	65.920	36	22		
CA008102200	Canada	HARVEY STATION	45.730	67.000	152	55		
CA008102275	Canada	JUNIPER	46.550	67.170	259	33		
CA008102325	Canada	KOUCHIBOUGUAC	46.770	65.000	35	21		
CA008102700	Canada	MCDONALDS CORNER CDA	45.780	66.000	38	21		
CA008102800	Canada	MCGIVNEY	46.370	66.570	177	21		
CA008102808	Canada	MCGRAW BROOK	46.820	66.120	53	26		
CA008103000	Canada	MINTO	46.030	66.030	23	38		
CA008103200	Canada	MONCTON A	46.100	64.680	71	70		
CA008103256	Canada	MOUNT CARLETON	47.420	66.930	265	28		
CA008103400	Canada	MUSQUASH	45.200	66.330	15	57		
CA008103500	Canada	NEPISIGUIT FALLS	47.400	65.780	106	79		
CA008103800	Canada	OROMOCTO	45.830	66.470	46	36		
CA008103828	Canada	PARKINDALE	45.870	65.070	153	21		
CA008103845	Canada	PENNFIELD	45.100	66.730	23	41		
CA008104300	Canada	RENOUS	46.800	65.800	46	22		
CA008104400	Canada	REXTON	46.670	64.870	5	79		
CA008104480	Canada	ROYAL ROAD	46.050	66.720	116	27		
CA008104501	Canada	SACKVILLE	45.850	64.380	46	21		
CA008104700	Canada	ST GEORGE	45.130	66.830	34	58		
CA008104928	Canada	ST LEONARD A	47.150	67.830	243	25		
CA008104938	Canada	SEARSVILLE	45.720	65.700	61	20		
CA008105100	Canada	SUMMIT DEPOT	47.780	68.330	412	21		
CA008105200	Canada	SUSSEX	45.720	65.530	21	110		
CA008105551	Canada	UPSALQUITCH LAKE	47.450	66.420	625	40		
CA008105568	Canada	WIGGINS POINT	45.920	66.000	15	25		
CA00810AL00	Canada	EDMUNDSTON	47.330	68.180	152	22		
CA008200200	Canada	AVON	44.880	64.220	24	48		
CA008200860	Canada	CLARENCE	44.920	65.170	52	34		
CA008200900	Canada	CLIFTON	45.350	63.420	15	38		
CA008201100	Canada	COPPER LAKE	45.380	61.970	97	28		
CA008201700	Canada	ECUM SECUM	44.980	62.180	15	45		
CA008201766	Canada	FARMINGTON	44.630	64.670	152	21		
CA008201800	Canada	FIVE MILE LAKE	44.950	64.000	46	45		
CA008202000	Canada	GREENWOOD A	44.980	64.920	28	67		
CA008202200	Canada	HALIFAX	44.650	63.570	32	34		

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CA008202300	Canada	HARMONY	44.420	65.050	107	35		
CA008202465	Canada	INDIAN BROOK	46.370	60.530	13	24		
CA008202700	Canada	KEMPTVILLE	44.080	65.770	76	40		
CA008202900	Canada	LAKE ROSSIGNOL	44.220	65.230	85	25		
CA008203001	Canada	LIVERPOOL	44.070	64.670	15	25		
CA008203161	Canada	LOUISBOURG	45.900	60.000	46	33		
CA008203165	Canada	LOWER MEAGHERS GRANT	44.920	63.230	41	25		
CA008203230	Canada	LYONS BROOK	45.650	62.800	29	25		
CA008203423	Canada	MARGAREE FORKS	46.330	61.100	23	27		
CA008203500	Canada	METEGHAN RIVER	44.270	66.130	15	46		
CA008203510	Canada	MIDDLEBORO	45.770	63.570	31	22		
CA008203535	Canada	MIDDLE MUSQUODOBOIT	45.070	63.100	48	42		
CA008203570	Canada	MILL VILLAGE	44.180	64.670	15	20		
CA008204100	Canada	NOEL	45.280	63.730	46	24		
CA008204200	Canada	OXFORD	45.730	63.870	13	26		
CA008204300	Canada	PARADISE	44.830	65.230	46	46		
CA008204450	Canada	PLEASANT BAY GRAND ANSE	46.820	60.770	29	37		
CA008204453	Canada	POCKWOCK LAKE	44.770	63.830	165	30		
CA008204510	Canada	PORT MORIEN	46.130	59.870	12	30		
CA008204525	Canada	PUGWASH	45.850	63.650	5	43		
CA008204600	Canada	ROSEWAY	43.780	65.350	15	45		
CA008204620	Canada	RUTH FALLS	44.930	62.500	8	25		
CA008204800	Canada	ST MARGARET'S BAY	44.700	63.900	17	82		
CA008205000	Canada	SALMON HOLE	44.930	64.030	84	64		
CA008205062	Canada	SANDY COVE NRC	44.470	63.570	10	25		
CA008205090	Canada	SHEARWATER A	44.630	63.500	51	63		
CA008205200	Canada	SPRINGFIELD	44.670	64.850	167	83		
CA008205300	Canada	SPRUCE HILL LAKE	44.580	63.650	108	31		
CA008205401	Canada	STELLARTON LOURDES	45.570	62.650	11	24		
CA008205650	Canada	SUMMERVILLE	45.120	64.180	38	38		
CA008205700	Canada	SYDNEY A	46.170	60.050	62	69		
CA008205988	Canada	TRURO	45.350	63.300	12	42		
CA008205990	Canada	TRURO	45.370	63.270	40	41		
CA008206000	Canada	TRURO NSAC	45.370	63.300	24	54		
CA008206100	Canada	TUSKET	43.880	65.980	9	54		
CA008206200	Canada	UPPER STEWIACKE	45.220	63.000	23	85		
CA008206222	Canada	WATERVILLE CAMBRIDGE	45.050	64.650	31	25		
CA008206275	Canada	WEYMOUTH FALLS	44.400	65.950	11	33		
CA008206316	Canada	WHITE ROCK	45.050	64.380	38	27		
CA008206415	Canada	WINDSOR MARTOCK	44.930	64.170	38	25		
CA008206450	Canada	WRECK COVE BROOK	46.530	60.450	76	27		
CA008206500	Canada	YARMOUTH A	43.830	66.080	43	70		
CA008300080	Canada	ALBERTON	46.850	64.020	3	37		
CA008300128	Canada	BANGOR	46.350	62.680	37	32		
CA008300300	Canada	CHARLOTTETOWN A	46.280	63.130	49	66		

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CA008300400	Canada	CHARLOTTETOWN CDA	46.250	63.130	23	81		
CA008300416	Canada	EAST BALTIC	46.430	62.170	61	28		
CA008300447	Canada	MONTICELLO	46.470	62.470	32	43		
CA008300497	Canada	NEW GLASGOW	46.420	63.350	6	37		
CA008300500	Canada	NEW LONDON	46.500	63.550	15	46		
CA008300525	Canada	O'LEARY	46.700	64.270	38	46		
CA008300590	Canada	STANHOPE	46.420	63.080	3	41		
CA008300800	Canada	TIGNISH	46.950	64.070	23	21		
CA008400135	Canada	ARNOLDS COVE	47.750	54.000	15	22		
CA008400350	Canada	BAIE VERTE	49.980	56.180	110	33		
CA008400413	Canada	BAY D'ESPOIR GEN STN	47.980	55.800	23	41		
CA008400600	Canada	BONAVISTA	48.670	53.120	26	49		
CA008400698	Canada	BUCHANS	48.820	56.870	270	38		
CA008400700	Canada	BUCHANS A	48.850	56.830	276	21		
CA008400850	Canada	CAPE BROYLE	47.100	52.930	6	41		
CA008401078	Canada	CARMANVILLE	49.400	54.270	4	20		
CA008401200	Canada	COLINET	47.220	53.550	27	53		
CA008401259	Canada	COMFORT COVE	49.270	54.880	99	29		
CA008401286	Canada	CORMACK	49.320	57.400	154	29		
CA008401300	Canada	CORNER BROOK	48.950	57.950	5	74		
CA008401335	Canada	COW HEAD	49.900	57.800	15	27		
CA008401500	Canada	DEER LAKE	49.170	57.430	11	74		
CA008401550	Canada	EXPLOITS DAM	48.770	56.600	154	49		
CA008401642	Canada	GALLANTS	48.700	58.230	143	23		
CA008401700	Canada	GANDER INT'L A	48.950	54.580	151	73		
CA008401800	Canada	GLENWOOD	49.000	54.870	31	40		
CA008401880	Canada	GOOBIES	47.950	53.970	72	25		
CA008402000	Canada	GRAND BANK	47.100	55.770	2	29		
CA008402071	Canada	HARBOUR BRETON	47.470	55.830	30	26		
CA008402309	Canada	HOLYROOD GEN STN	47.450	53.100	6	33		
CA008402450	Canada	ISLE AUX MORTS	47.580	58.970	5	21		
CA008402568	Canada	LOGY BAY	47.620	52.670	27	33		
CA008402569	Canada	LONG HARBOUR	47.420	53.820	8	29		
CA008402840	Canada	NEW CHELSEA	48.030	53.220	9	29		
CA008402925	Canada	PETTY HARBOUR	47.470	52.720	6	42		
CA008402966	Canada	POINT LEAMINGTON	49.330	55.400	8	26		
CA008403085	Canada	RATTLING BRK NORRIS ARM	49.070	55.300	9	48		
CA008403096	Canada	ROCKY HARBOUR	49.570	57.880	68	20		
CA008403300	Canada	ST ANDREWS	47.770	59.330	11	22		
CA008403506	Canada	ST JOHN'S A	47.620	52.750	141	68		
CA008403615	Canada	ST LAWRENCE	46.920	55.380	49	38		
CA008403617	Canada	ST SHOTTS	46.630	53.580	46	23		
CA008403621	Canada	SALMONIER NATURE PARK	47.270	53.280	136	23		
CA008403623	Canada	SALT POND	47.100	55.200	30	28		
CA008403650	Canada	SEAL COVE	47.450	53.070	23	24		

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CA008403690	Canada	SOPS ARM WHITE BAY	49.770	56.880	17	30		
CA008403800	Canada	STEPHENVILLE A	48.530	58.550	26	67		
CA008403818	Canada	SUNNYSIDE	47.870	53.930	15	23		
CA008403825	Canada	SWIFT CURRENT	47.880	54.220	18	21		
CA008403950	Canada	TORS COVE	47.220	52.850	6	37		
CA008404201	Canada	WESTBROOK ST LAWRENCE	46.950	55.380	31	32		
CA008404240	Canada	WINTERLAND	47.170	55.300	52	27		
CA008404310	Canada	WOODDALE BISHOP'S FALLS	49.030	55.550	46	35		
CA008404320	Canada	WOODY POINT	49.500	57.920	23	23		