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ENHANCEMENTS TO THE MECHANISTIC-EMPIRICAL PAVEMENT DESIGN GUIDE:  
CLIMATE DATA UPDATE

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**ADDENDUM NUMBER: FY2016.02**

**ADDENDUM TITLE: UPDATED CLIMATE DATA FOR ALL EXISTING CLIMATE STATIONS – 37 YEARS OF CONTINUOUS HOURLY DATA**

Addendum Date: June 28, 2016  
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Addendum #FY2016.02 overviews the new climate files added to the Pavement ME Design software. The existing climate files available for use with previous versions of the Pavement ME Design software were limited to around a maximum of 15 years of hourly climate data. Many of the existing weather stations had missing or anomalous data. Some of these weather stations which could not be used directly in the software without interpolation (i.e.; creating a virtual weather station). The new climate HCD files or stations have 37 years of continuously hourly data points without the need for interpolation. Thus, the number of usable climate stations has increased.

The intent of this addendum is to supplement the Second Edition of the MEPDG Manual of Practice (2015) and provide a brief overview of the process for selecting an individual station for use in pavement design.

## **8.2 CLIMATE**

The climate station data was repopulated using the North American Regional Reanalysis (NARR) database. The temperature, wind speed, precipitation, percent sunshine and relative humidity data were updated for all existing weather stations available for downloading with the Pavement-ME Design software. The NARR data are available from 1979 – 2015. All 1,083 climate stations were updated with 37-year hourly climate data generated from the NARR.

[NOTE: If a user has an existing pavement design run or predicted distresses based on one of the existing weather stations (prior to 2016), there will be differences in the predicted distresses between using the existing and new stations (after 2016) for the same location, everything else being equal. The reason for the differences is the new stations have longer periods of climate data, all obvious anomalies have been eliminated from the dataset, and/or the new station represents a grid point while the existing station represents a specific airfield or location. Few of the new grid points with the same weather station name have the exact longitude, latitude, and elevation of the existing airfield or weather station. The new grid points are within less than 20 miles of the existing airfield or weather station.]

### **8.2.1 Available Climate Datasets**

The NARR dataset and the original existing climate dataset will **both** be made available to users. The original climate station dataset using the NCDC weather stations will remain available to those users who are currently using them. **It should be noted** that the climate data for the **existing** stations will **no longer** be maintained or updated and is not recommended for future use. The NARR generated dataset will be available with a new naming convention as to not confuse the user. The new naming convention consist of the original climate station name and “\_NARR\_GRIDPOINT” in the name. Depending on which dataset the user plans to use, the “station.dat” file needs to be manually copied into the “Defaults” folder in the “AASHTOWare\ME Design\” directory on the user’s computer. This file is needed to select the corresponding climate file in the Pavement-ME software. The updated naming convention is shown in Figure 2.

### **8.2.2 Number of Stations with Complete Data**

The user will see a difference in the number of climate stations for each State because all stations now have complete data. Figures 1 and 2 below show an example of the changes in the user interface when selecting a climate stations in New York (NY). Prior to the current update, only complete stations were visible. As an example, the existing or older climate files totaled 23 weather stations for NY (see Figure 1), while the number of weather stations with complete dataset has increased to 28. In summary, the number of existing weather stations with a complete climate dataset increased from 870 to 1,083.

The other difference between the existing or older weather stations and new stations is that elevation is now included in the name of a few existing weather stations, and up to four grid points can be included for the same name of existing weather stations. The reason multiple stations have been added for the same weather station name is a result of significant elevation differences within a specific NARR grid (for example: California, Colorado, Wyoming, etc.).

### **8.2.3 Selecting a Station for a Specific Project Location**

The Second Edition (2015), as well as the 2008 Edition of the MEPDG Manual of Practice suggest that a climate station be selected close to the specific project location with a similar elevation. With the addition of many more new stations represented by grid points in the NARR, the elevation becomes more important to ensure the selected station has a climate representative of the project location. The user should review the elevation for the specific project location entered (longitude and latitude) in selecting one or more climate stations.

A few of the existing weather stations (prior to 2016) now have multiple stations with the same name but with a significant difference in elevation. The station or stations selected by the user should have a similar elevation or within  $\pm 500$  feet in elevation, as a guide. It is also recommended that in areas with significant elevation differences, a virtual climate station be created for the specific project location. New climate stations should be selected with elevations above and below that of the project location in creating a virtual weather station.

### **8.2.4 Selecting a Starting Date or Year for a Specific Analysis**

Prior to the 2016 release of the software, most of the weather stations only contained less than 10 years of continuous climate data. The software simply repeated that climate dataset for the design or analysis life for a specific pavement design. The start date for climate was always the beginning date of the climate data because it was being repeated for the pavement design period.

The new climate data files (after the 2016 release of the software) now have 37 years (1979 to 2015) of continuous data for each station. Most pavement design periods are less than 37 years, so the climate data does not need to be repeated within the design period. The issue or question, however, is: what climate year should be used to start the pavement design period? The starting climate year for the pavement design analyses is left to the judgment of the user, but there are two basic recommendations, as listed below.

1. The default starting year for the climate analysis is the first year that is included in the NARR (1979) and in the new climate dataset that can be downloaded with the MEPDG software. Thus, all climate data for a specific analysis starts at year 1979. As more and more years are added to the NARR over time, however, using the number of years from 1979 to be representative of the design period becomes a greater extrapolation from current weather patterns.
2. The user can select a different starting year for the climate analysis, but this selection is not automatic. The user has to manually delete the time from 1979 to whatever year is selected to start the climate analysis. The second option is to select the last or most recent number of years in the climate data to be consistent with the design period. For example; for a 10 year pavement rehabilitation design period, the starting climate year would be 2005.

It is recommended that the user or agency be consistent in selecting one of the two options, especially for pavement type selection projects.

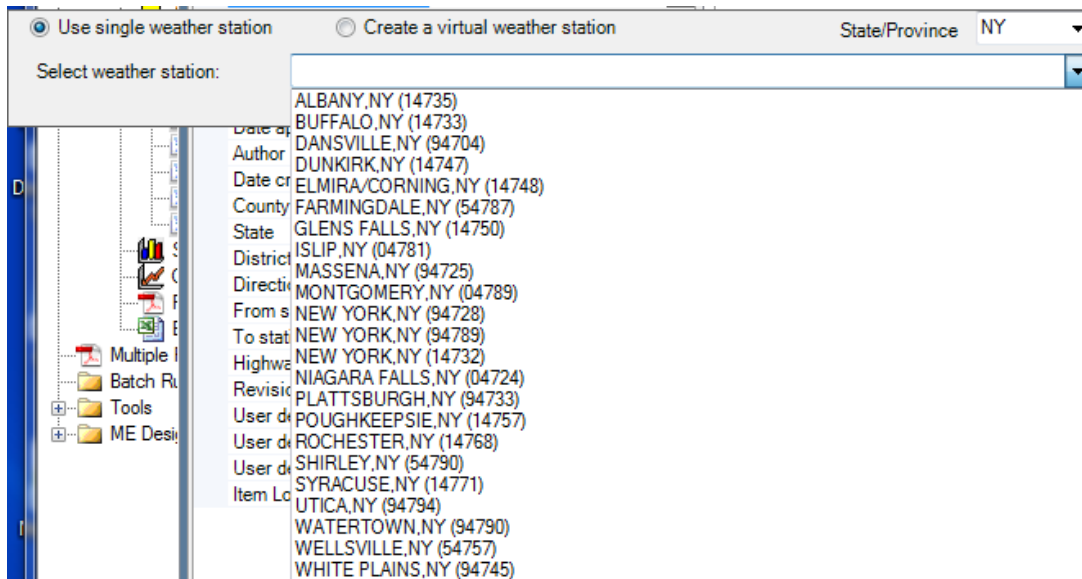


Figure 1. Climate stations available for NY – Existing stations with 2015 software release.

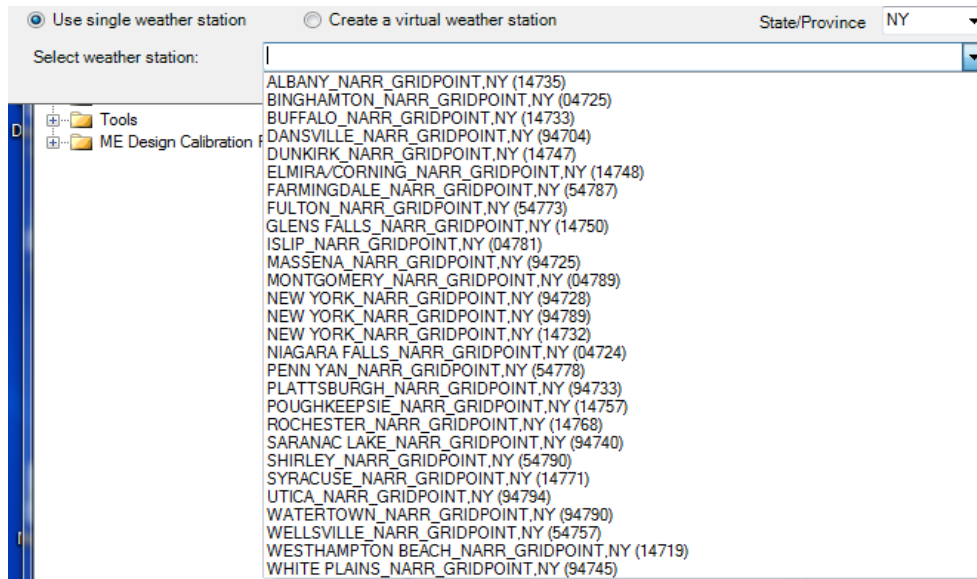


Figure 2. Climate stations available for NY – New stations with 2016 software release.