AREVA

CALCULATION SUMMARY SHEET (CSS)

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Title Arkansas Nuclear One Flooding Hazard Re-Evaluation – Probable Maximum Precipitation

PURPOSE AND SUMMARY OF RESULTS:

The purpose of this calculation is to establish the Probable Maximum Precipitation (PMP) at Arkansas Nuclear One (ANO), both at the site and its upstream Arkansas River watershed. The PMP will be used as input to Calculation No. 32-9207382-000 "ANO Local Intense Precipitation – Generated Flow and Elevations", and Calculation No. 32-9207375-000 "ANO Probable Maximum Flood (PMF) on Arkansas River - Hydrology." This calculation supports the flood hazard re-evaluation of ANO Units 1 and 2.

The results of the re-evaluated PMP at ANO are as follows:

1. A site specific PMP study was performed for the 1-hour, 1-square-mile "point" PMP and the 6-hour, 10-square-mile PMP for application to the Local Intense Precipitation. The 1-hour, 1-square-mile "point" PMP and the 6-hour, 10-square-mile PMP were calculated as 16.3 inches and 22.0 inches, respectively.
2. A site specific PMP study was also conducted for the Arkansas River watershed near ANO because the watershed (over 150,000 square miles) exceeds the watershed area upper limit of 20,000 square miles in Hydrometeorological Reports 51 and 52.
3. The results on the site specific PMP study are that the maximum storm duration is 72-hours and the maximum storm size is 100,000 square miles.
4. The 100,000 square mile PMP does not cover the entire watershed due to meteorological limitations on storm duration, size, and orientation.
5. The average PMP rainfall depth for the portion of the watershed covered by the 100,000 square mile, 72-hour PMP centered at the watershed centroid is 7.7 inches. A higher average PMP rainfall depth of 10.2 inches for the 72-hour duration occurs with the PMP centered at the centroid of the Robert Kerr subwatershed. See Sections 6.4.1 and 6.4.2 for the results of other PMP storm center locations.

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1.0 INTRODUCTION

1.1 Background

Following the Fukushima Daiichi accident on March 11, 2011, which resulted from an earthquake and subsequent tsunami, the U.S. Nuclear Regulatory Commission (NRC) established the Near-Term Task Force (NTTF) to review the accident.

In response to the NTTF recommendations, and pursuant to Title 10 of the Code of Federal Regulations, Section 50.54 (f), the NRC has requested information from all operating power licensees (NRC, 2012). The purpose of the request is to gather information to re-evaluate seismic and flooding hazards at U.S. operating reactor sites.

Arkansas Nuclear One (ANO), located on a peninsula formed by Lake Dardanelle (Pool No. 10, Dardanelle Lock and Dam as owned and operated by the U.S. Army Corps of Engineers), is one of the sites required to submit information. ANO is located near river mile 210 of the Arkansas River, approximately 6 miles northwest of Russellville, Arkansas. A locus map of the site is included as Figure 1.

The NRC information request relating to flooding hazards requires licensees to re-evaluate their sites using updated flooding hazard information and present-day regulatory guidance and methodologies. The results of the re-evaluation are then compared against the site's current licensing basis (CLB) for protection and mitigation from external flood events. Attachment 1 to Enclosure 2 of the NRC information request (NRC, 2012) identifies eight flood causing mechanisms to be considered, as well as a combined effect flood.

This document addresses one of the inputs, the Probable Maximum Precipitation (PMP) to flooding causing mechanisms at ANO, the Local Intense Precipitation (LIP) and the Probable Maximum Flood (PMF). The other mechanisms are addressed in other documents.

This calculation was prepared by GZA GeoEnvironmental, Inc. under subcontract to AREVA.

1.2 Purpose

The purpose of this calculation is to establish the PMP on the local drainage area (for the LIP analysis) of ANO Units 1 and 2 and the separate larger watershed of the Arkansas River upstream of ANO.

As noted below, the watersheds locations, areas, boundaries and configurations, used as input in this calculation, were developed in another calculation (AREVA, 2014a).

This calculation also used a site specific Probable Maximum Precipitation Study provided by Applied Weather Associates, LLC (AWA), under subcontract to GZA, as technical input for the development of the site specific PMP (see Appendix A).

2.0 METHODOLOGY

The calculation methodology is described below. Unless noted otherwise, the methodology used in the calculation is consistent with the following standards and guidance documents:

1. NRC Standard Review Plan, NUREG-0800, revised March 2007 (NRC, 2007);
2. NRC Office of Standards Development, Regulatory Guides:
   - RG 1.102 – Flood Protection for Nuclear Power Plants, Revision 1, dated September 1976 (NRC, 1976);

- RG 1.59 – Design Basis Floods for Nuclear Power Plants, Revision 2, dated August 1977 (NRC, 1977);

3. NUREG/CR-7046 – Design Basis Flood Estimation for Site Characterization at Nuclear Power Plants in the United States of America, dated November 2011 (NRC, 2011); and
4. American National Standard for Determining Design Basis Flooding at Power Reactor Sites (ANSI, 1992).

The method of analysis for calculation of the Local Intense Precipitation PMP is summarized briefly below and in more detail as described in Sections 2.1 through 2.2. The calculation methodology includes the following steps:

Local Intense Precipitation PMP Calculation:

1. Perform site specific Probable Maximum Precipitation study to calculate the one-hour, one-square mile and six-hour, ten-square mile PMP.

The method of analysis for the PMP over the contributory Arkansas River watershed at ANO is summarized briefly below and in more detail as described in Sections 2.2 through 2.4. The calculation methodology includes the following steps:

1. Perform site specific PMP Study
2. Calculate site specific depth-area-duration data for various PMP storm centers.
3. Calculate 6-hour incremental 72-hour PMP values.

2.1 Local Intense Precipitation PMP Calculation

The Local Intense Precipitation event is a distinct flooding mechanism that consists of locally heavy rainfall centered upon the plant site itself. As per guidance contained in NUREG/CR-7046 (NRC, 2011), the LIP is considered to include the one-square-mile, one-hour-duration PMP. The one-square-mile, one-hour-duration PMP depth was calculated based on the site specific Probable Maximum Precipitation study (see Section 2.2 below and also refer to Appendix A for a detailed summary of this work). Note that the cool season PMP with snow melt is typically not part of the LIP evaluation; therefore, the cool season with snow melt was not incorporated in the LIP analysis (see Section 2.5 for additional discussion). The sub-one hour divisions are calculated based on the methodology of Hydrometeorological Report No. 52 (HMR-52) (NOAA, 1982). The sub-hour divisions for the one-hour, one square-mile PMP are based on Figures 36, 37, and 38 in HMR-52 (NOAA, 1982, see Appendix B).

The LIP also included the ten-square-mile, six-hour duration PMP, which was calculated as part of the site specific study (see Appendix A). The sub divisions of the ten-square-mile six-hour PMP are calculated based on methodology of HMR-52 and are the same as the sub-divisions for the one-square-mile one-hour PMP for the first hour. The sub-divisions from the second hour to the sixth hour are based on recommendations in NUREG/CR-7046 (NRC, 2011).

2.2 Perform Site Specific Probable Maximum Precipitation Study

The majority of the ANO watershed is within the domain of the National Weather Service / U.S. Army Corps of Engineers Hydrometeorological Report No. 51 (HMR-51) (NOAA, 1978), with areas west of 103° longitude covered by HMR 55A. However, the use of HMR-51 for developing PMP values was not applicable due to the watershed area size limitation of 20,000 square miles. The watershed contributory to the Arkansas River upstream of ANO is over 150,000 square miles.

A site specific PMP study for ANO was therefore performed (Appendix A). The purpose of the study was to calculate PMP values specific to entire contributory watershed of the Arkansas River upstream of ANO. This included only an all season PMP analysis due to the climatology of the watershed, which would not support a cool-season PMF that would exceed the all-season PMF (see Section 2.5).
The understanding of meteorological processes, interactions, and storm patterns have advanced since the publication of HMR-51 and HMR-55A. Satellite and radar technology have added to the understanding of storm patterns over the last 40 years. The site specific study incorporated the current understanding and updated technology to analyze extreme rainfall events.

2.2.1 Storm-Based Approach

The approach used in the study is storm-based using many of the procedures used by the National Weather Service (NWS) in the development of the HMRs. These same procedures are recommended by the World Meteorological Organization (WMO) for PMP determination (WMO, 1986 and WMO, 2009). The methods and procedures used to derive the site specific PMP values are similar to other site specific PMP studies conducted by AWA located within the HMR-51 domain. This approach identifies extreme rainfall events that have occurred in a region that has meteorological and topographical characteristics similar to extreme rain storms that could occur over the ANO watershed. The largest of these historic rainfall events are selected for detailed analyses.

Extreme rainfall events were identified as storms having similar characteristics to extreme rainfall events that could potentially occur over the ANO watershed and could potentially influence PMP values at one or more of the area sizes and/or durations analyzed.

2.2.2 Storm maximization and transposition

HMR procedures for maximization, transposition, and elevation moisture adjustments were used in the site specific study. Additional techniques, as described in Appendix A, were used in the study to increase accuracy and reliability, while adhering to the basic procedures depicted in the HMRs and in the WMO Manuals. For the storms previously analyzed as part of existing PMP studies (i.e., HMR-52, see reference list in Appendix A), existing storm maximization factors were used. For additional storms analyzed as part of this calculation using the Storm Precipitation Analysis System (SPAS), maximization factors were calculated following standard HMR / WMO procedures and employing updated climatology and data.

2.2.3 PMP Depth-Area and Depth-Duration

The storms of interest were maximized, transpositioned, and elevation-adjusted to the watershed centroid and to each of 22 grid points used to distribute the PMP over the large ANO watershed. Depth-Area (DA) plots were made for durations of 6-, 12-, 24-, 48-, and 72-hour for area sizes of 10-, 200-, 1,000-, 5,000-, 10,000-, 20,000-, 50,000-, and 100,000-square miles. Enveloping curves were constructed for each set of curves at each grid point and at the watershed centroid. Depth-Duration (DD) plots were then made and curves constructed. These final curves provide PMP values for each grid point and the watershed centroid. The resulting values were spatially interpolated using ArcMap 10.1 Geographic Information System (GIS) and manually adjusted to ensure continuity in space and time across the watershed. The results allow PMP values for standard duration and project specific and standard area sizes (up to 100,000-square miles), to be calculated from any point within the entire watershed.

2.3 Calculate Site Specific Depth-Area-Duration data for the watershed for various storm centers

Site specific depth-area-duration (DAD) data was calculated using the results of the site specific PMP study described above based on the location of the storm center being evaluated. Given the large watershed size, several storm centering locations were selected based on the shape/configuration of the watershed and evaluated to support the generation of candidate PMF inflow hydrographs. Site-specific DAD data was generated in a graphical (i.e., GIS-based) and limited (watershed centroid only) tabular format (Appendix A). DAD information (resulting from the site-specific PMP study) was extracted for storm durations of 6, 12, 24, 48, and 72-hours for area sizes of 10, 200, 1,000, 5,000, 10,000, 20,000, 50,000, and 100,000 square miles. The site specific study findings indicated the 72-hour duration captures the significant storm rainfall and evaluation of longer durations was not necessary.

DAD values were extracted from the GIS maps for each storm center evaluated, except the storm evaluated at the watershed centroid. Subwatershed centroids were calculated using the calculated x-coordinate and y-coordinate feature in GIS. The DAD values for the location of the storm centers being evaluated are extracted from GIS using the information feature.

2.4 Calculate 6-hour Incremental 72-hour PMP Values

The methodology of HMR-52 was applied to generate 6-hour incremental 72-hour PMP values. In certain instances, noted below, the procedures used in HMR-52 were extrapolated to cover the ANO watershed area (i.e., 72-hour PMP values for storms larger than 20,000 square miles). The methodology applied is as follows (NOAA, 1982):

1. Establish the center of the PMP storm to be evaluated based on the shape/configuration of the watershed. 6-hour Incremental PMP values were calculated from the site specific DAD data for various storm center locations. Site specific DAD data allowed isohyetal patterns greater than 20,000 square miles, (i.e. 50,000 and 100,000 square miles) to be used.

    a) The DAD data was plotted on a semi-log scale, with the storm area size plotted on the log scale. For each storm duration (6, 12, 24, 48, and 72 hours) the points are joined to create smooth curves. The curves are either parallel or slightly converging with increasing area size.

    b) Depth-duration data was obtained from the DAD curves. For a set of standard isohyetal area sizes (provided in HMR-52 and extrapolated to cover the ANO watershed), DAD values are taken from the curves.

    c) For each of the isohyetal area sizes selected, the depth-duration data was plotted. Smooth curves are creating by connecting values of common isohyetal area sizes. From these curves, the 18-hour duration was obtained for each of the isohyetal areas.

    d) Incremental differences for the first three 6-hour periods were obtained through the depth-duration values for the 6, 12, and 18 hour duration for the isohyetal areas of interest. The values are calculated by subtracting depth-duration values from each successive time step (i.e., the incremental value for the 2nd 6-hour period is equal to the 12-hour depth-duration value minus the 6-hour value). The 6-hour values were plotted on a semi-log scale and smoothed to create a consistent data set.

a) Isohyetal Pattern

   a) Using GIS, standard isohyetal patterns (NOAA, 1982, Appendix B) and additional larger isohyetal patterns consistent with HMR-52 geometry (NOAA, 1982, Appendix B), were placed over the storm center of interest. Several storm centers were analyzed by placing the isohyetal pattern over the centroids of different subwatersheds. Visual inspection of the isohyetal pattern was used to encompass the greatest number of whole isohyets within the drainage area to maximize the extent of precipitation occurring in the watershed, by rotating the isohyetal pattern about the subwatershed centroid of interest within the range recommended by HMR-52.

   b) The orientation of the pattern placed on the drainage was found relative to degrees clockwise from the north.

   c) The preferred orientation of the PMP from HMR-52 (see Appendix B) was obtained for each of the storm centers. HMR-52 states that if the selected storm orientation differs from the preferred pattern by more than 40°; a reduction to the isohyetal values should be made.

b) Maximum Precipitation Value

   The maximum volume of precipitation for the three largest 6-hour increments were calculated based on the placement of the preferred isohyetal pattern over the drainage using the following steps (see spreadsheets in Appendix C).

   a) The first area size from step 1b – (the isohyetal patterns smaller and larger than the drainage area) is inserted into the column labeled Area Size.

   b) Column I (Iso) contains the list of standard isohyetal labels.

   c) For the area size selected in step 3a, list the appropriate percentages (percent of 1st 6-hour PMP increment, see Appendix D, Figure D1) in column II for each of the isohyets selected in step 3b. The second, third and fourth through twelfth, 6-hour increment percentages (see Appendix D Figure D2, D3 and D4, respectively) will be used in subsequent steps.

      The percentages of each 6-hour increment of the PMP were calculated from nomographs and/or tables. The figures included in Appendix D were calculated by extrapolating the nomographs and tables included within HMR-52 (Appendix E), which were limited to storm sizes up to 20,000 square miles. Due to the size of the watershed contributory to ANO, larger standard isohyetal area size and two non-standard isohyetal area sizes are necessary to generate a PMP over the drainage area. The larger standard sizes used are isohyets Q, R, and S corresponding to 25,000, 40,000 and 60,000 square miles. The additional non-standard sizes are the 50,000 and 100,000 square miles isohyets. The nomographs and tables included in HMR-52 were extrapolated to include the additional larger storm sizes (25,000, 40,000, 50,000, 60,000 and 100,000 square miles). The additional percentages were extrapolated from the nomographs and tables to maintain the continuity of the curves presented in the HMR-52 nomographs. The extrapolated nomographs and tabular data are included in Appendix D.

d) The value from step 1c that corresponds to the area size specified in step 3a and increment of computation from step 3c is placed in column III, under the heading Amt. The percentage in column II is multiplied by the amount (Amt.) specified in this step to fill in column III.

$$\text{column}_{\text{III}} = \text{column}_{\text{II}} * \text{Amt}$$

e) Column IV describes the average depth between adjacent isohyets. The average depth for isohyet A is equal to value from column III. For other isohyets fully encompassed by the drainage area, the average depth is the arithmetic average with the subsequent isohyet.

$$\text{column}_{\text{IV B}} = \frac{\text{column}_{\text{III B}} + \text{column}_{\text{III A}}}{2}$$

For isohyets which are not fully encompassed within the drainage area, weighted averages are used to describe the portion of the drainage area which extends beyond the isohyet of interest. The average depth for the portion of the drainage extending beyond the isohyet is taken to be between 0.5 to 1 times the difference between the enclosing isohyet plus the lower isohyet. The weighed relation between the isohyets is:

$$\text{column}_{\text{IV B}} = \text{F} * (\text{column}_{\text{III A}} - \text{column}_{\text{III B}}) + \text{column}_{\text{III B}}$$

Where F is between 0.5 and 1, A and B are adjacent isohyet values.

When only a small portion of drainage extends beyond isohyet A then F would be closer 1. If the portion of the drainage area extends almost to isohyet B then the value of F is close to 0.5.

f) Column V (ΔA) is the incremental area (in square miles) between adjacent isohyets. See Appendix B for the incremental areas for isohyets that are fully enclosed by the drainage area. GIS was used to calculate the incremental areas between isohyets for isohyets that are not fully encompassed. The GIS calculate geometry for area command was used to calculate the area of the watershed between adjacent isohyets using the preferred isohyetal orientation placed over the storm center being evaluated.

g) Column VI lists the incremental volume (in inch-square miles) between adjacent isohyets and is calculated by multiplying the average depths from column IV by the incremental areas in column V. Summing the incremental volumes yields total volume of precipitation in the watershed for the specified pattern area size in a 6-hour period.

$$\text{column}_{\text{VI}} = \text{column}_{\text{IV}} * \text{column}_{\text{V}}$$

h) Steps 3a through 3g are repeated for other storm pattern area sizes selected in step 1b.

i) The 2nd and 3rd 6-hour incremental volumes are computed by repeating steps 3a through 3h.

j) The incremental volumes for the 1st, 2nd and 3rd 6-hour increments, calculated in steps 3g and 3i are summed at corresponding storm area sizes and plotted against storm area size on a semi log plot. The storm area size for the precipitation pattern that yields the maximum 18-hour volume over the watershed is found from this plot.

$$18\ Hr\ Volume_{storm\ area} = 1st\ 6\ hr\ inc_{storm\ area} + 2nd\ 6\ hr\ inc_{storm\ area} + 3rd\ 6\ hr\ inc_{storm\ area}$$

c) Distribution of Storm-Area Averaged PMP over the Watershed:

a) For the storm area size for the PMP calculated in step 3j, the values are extracted from the smoothed curves on the depth-duration graphs for each 6 hour increment up to 72 hours.

b) The incremental 6-hour amounts are calculated for the 4th through 12th 6-hour increment by sequentially subtracting the values from step 4a. Note that the values should decrease with increasing 6-hour increments (NOAA, 1982). If the values do not decrease, the order was rearranged.

c) Step 4b yields the incremental average depths for each of 12, 6-hour increments which make the 72 hour PMP storm. The values of the isohyets that cover the drainage during the 72 hour PMP was computed by multiplying the 1st 6-hour incremental depth by the 1st 6-hour percentages obtained in step 3c for the storm area size calculated in step 3j. This was repeated for the 2nd, 3rd and 4th through 12th 6-hour increments using the appropriate nomographs as discussed in step 3c. The isohyetal matrix is compiled from these resulting values.

d) To calculate the incremental average depths for the watershed, spreadsheets similar to those explained in step 3 were set up. Tables were set up for the storm area size selected in step 3j and for all twelve, 6-hour increments. The inputs to column II and column III were explained in step 3c. The values for columns IV and V are the same from step 3e and 3f for the selected storm area size. Column VI yields the incremental volume between adjacent isohyets and was calculated by multiplying the average depths from column IV by the incremental areas in column V. Summing the incremental volumes yields the total volume of precipitation in the watershed for the specified pattern area size in a 6-hour period. Dividing this by the area of the drainage encompassed by the selected storm size yields the average depth for a given 6 hour increment.

$$Avg\ Depth = \frac{\sum column_{VI}}{\sum column_{V}}$$

d) Temporal Distribution

The temporal distribution for the PMP was based on recommendations from HMR-52, “Section 2.3, Recommended Sequence for PMP Increments,” as follows:

a) The 6-hour increments are arranged to decrease to either side of the greatest 6-hour increment.

b) The 4 greatest 6-hour increments are placed at any portion within the sequences except during the first 24-hour period.

The hyetograph for the all season PMP and the moving all season PMP were constructed using 40 percent of the PMP depths during the first 72 hours (i.e., antecedent storm), followed by a dry 72-hour period, and finally followed by the full 72-hour PMP storm (NRC, 2011).

e) Spatial Distribution of PMP across Subwatersheds

The spatial distribution of the PMP across the subwatersheds was calculated by the following steps:

a) For the storm area size for the PMP calculated in step 3j and with the isohyetal storm pattern placed on the subwatershed as in step 2a, the incremental areas contained between isohyets within each subwatershed were calculated using the same process as described in step 3f.
b) Following steps 3d to 3g, as outlined above, the incremental subwatershed volumes for the twelve, 6-hour increments was calculated.
c) For each 6-hour increment, the subwatershed volumes were divided by the subwatershed area covered by precipitation to yield the average depth for the subwatershed.

f) Effective Area Adjustment Factors

The spatially distributed PMP values for each subwatershed was adjusted based on the percent of the subwatershed that is covered by the PMP, and was calculated as follow:

a) The area covered by the PMP for each subwatershed was calculated in GIS using the calculate geometry command.
b) The effective area adjustment factor was calculated as the area of the subwatershed covered by the PMP divided by the total area of the subwatershed.
c) The effective area adjustment factor was applied to the spatially distributed PMP values for each subwatershed.

2.4.1 72-Hour PMP - Moving Storm

The large drainage area contributory to the Arkansas River upstream of ANO makes it meteorologically reasonable for the rainfall center to travel across the drainage with time during the storm. It is conceivable that such movement could result in a higher flood peak if the direction and speed of movement coincides with downstream progression of the flood crest. While HMR-52 states that for drainages larger than 10,000 square miles, moving PMPs may produce high flood peaks, neither HMR-52 (NOAA, 1982) or NUREG/CR-7046 (NRC, 2011) does not provide guidance or design methodology for calculating a moving PMP.

The approach to calculate a moving 72-hour PMP was to evaluate the movement as three distinct storm center locations. Three 24-hour periods of the 72-hour PMPs centered at different points in the watershed were generated to simulate the movement of a PMP. A 24-hour period of precipitation is taken from each of the three storm centers, resulting in the total storm duration of 72-hours.

The speed that the PMP moves across the watershed and the storm track (direction the storm move through the watershed) were selected to maximize precipitation in the watershed and were selected with AWA consultation and limitations calculated in Appendix A. The minimum storm velocity is 20 miles per day and the maximum velocity is 200 miles per day (Appendix A).

Storm track is defined with a starting position and end position of the moving storm. The position is defined numerically with north being 360, east at position 90, south at position 180 and west being 270. A storm moving from north to south would have a track from position 360 to 180. The minimum storm ordinates correspond to a storm moving from position 220 to 40, and the maximum is moving from position 320 to 140 (Appendix A).

The three 72-hour PMPs were generated following the procedure described above. The temporal distribution of the moving storm is the same distribution used in the stationary storms as described in Section 2.4, step 5. The moving storm hyetographs were constructed by taking a 24-hour period of precipitation from each of the three storm center locations resulting in the total storm duration of 72-hours. The first 24-hour period was selected from first four of the 6-hour precipitation increments calculated from the first storm centering. The second 24-hour period is selected from the second set of four 6-hour precipitation increments calculated from the second storm centering. The last 24-hour period was selected from the final four of the 6-hour precipitation increments calculated from the third storm centering.

The hyetographs for the moving PMPs were constructed using 40 percent of the PMP depths during the first 72 hours (antecedent storm), followed by a dry 72-hour period, and finally followed by the full 72-hour moving PMP storm (NRC, 2011). The antecedent storm was modeled as a separate moving storm following the methodology described above. Each of the final hyetograph for the two moving PMP consists of 5 storm centers, with one storm center shared by the final center for the antecedent storm and the initial center of the PMP.

2.5 Cool-Season PMP

The cool-season PMP for ANO was not evaluated because the climatology of the watershed does not support a bounding or controlling cool-season PMF consisting of a cool-season PMP in combination with snowmelt. The time of year when the PMP occurs (April through October) has no significant snowpack would be available in the majority of the watershed. Representative National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center (NCDC) Global Historical Climatology Network (GHCN) weather stations were selected to calculate maximum monthly average snow depth throughout the watershed. Multiple stations were analyzed for each state within the watershed. Stations were selected based on having an elevation that was representative for the portion the watershed it was located in, as well as length and quality of snow depth data. The entire period record for the selected gages was obtained from NOAA's online climate data (NOAA, 2013). For each cool season month (January through April and October through December) the average monthly snow depth was calculated, and subsequently the maximum of the cool season monthly average was calculated. The average monthly snow depth was calculated using a Pivot Table in an Excel spreadsheet which is included as Appendix F.

3.0 ASSUMPTIONS

3.1 Unverified Assumptions

There are no assumptions that require verification in this calculation.

3.2 Justified Assumptions

The following justified assumptions were made:

1. Site specific PMP study was used because the watershed area size of the Arkansas River at ANO exceeds the limitation of 20,000 square miles of HMR-51 (see Section 2.2).
2. The site specific PMP included only an all season PMP analysis due to the climatology of the watershed, which would not support a cool-season PMF that would exceed the all-season PMF (see Section 2.5).
3. The depth-duration values were spatially interpolated using GIS and manually adjusted based on the guidance of HMR-52 (NOAA, 1982) to ensure continuity in space and time across the watershed.
4. Given the large watershed size (i.e. over 150,000 square miles), several storm center locations were selected based on the shape/configuration of the watershed to develop a number of candidate PMP storms. These will be evaluated in the PMF calculation.
5. The nomographs and tables included in HMR-52 used to calculate the percentages of each 6-hour increment of the PMP were extrapolated based on information in HMR-52 to include the additional larger storm sizes: 25,000, 40,000, 50,000, 60,000 and 100,000 square miles.
6. Three 24-hour periods of the 72-hour PMPs centered at different points in the watershed were generated to conservatively simulate the movement of a PMP, covering as much of the watershed as practicable based on the results of the site specific PMP study. PMP speed and the storm track for the moving storms were selected to maximize precipitation in the watershed and were selected with AWA consultation and limitations.

Other assumptions made as part of the site-specific PMP study are noted in Appendix A, Section 13.1.

3.3 Model Simplifications

No model simplifications were used in this calculation.

4.0 DESIGN INPUTS

Design inputs are identified and addressed throughout the applicable sections of this calculation.

5.0 COMPUTER USAGE

The following GZA workstations were used for the calculation:

- System Name: Microsoft Windows 7 Ultimate
- Version: Service Pack 1
- Computer Name: 01-stonierc
- Processor Intel® Xeon® CPU
- Memory: 12.00 GB of RAM

- System Name: Microsoft Windows 7 Ultimate
- Version: Service Pack 1
- Computer Name: 01-HergottMA
- Processor Intel® Xeon® CPU E5620
- Memory: 12.00 GB of RAM

The following AWA workstation was used for the calculation:

- System Name: Community enterprise Operating System (CentOS)
- Version: 6.3
- Computer Name: Irene
- Processor Intel(R) Xeon(R) CPU E5530 @ 2.40 GHz
- Memory: 12 GB

5.1 Software

1. ESRI® ArcMap™ 10.1, Service Pack 1 (Build 3143)
2. Microsoft® Excel™ 2010, Version 14.0.7106.5001 (64-bit)
3. Storm Precipitation Analysis (SPAS by Applied Weather Associates, LLC)

ArcMap 10.1 (GIS) was used to generate graphic outputs of the calculated results and is not subject to verification per AREVA Procedure 0902-30, Section 4.6.

Excel 2010 was used to create calculation spreadsheets and organize data and is not subject to verification per AREVA Procedure 0902-30, Section 4.6. Excel spreadsheets are presented with dual tables: one with the spreadsheet itself and another showing only the formulas used in the spreadsheet.

SPAS is used for storm precipitation analysis for historic events under Section 4.7 of AREVA Procedure 0902-30. Software validation is provided in Appendix G. SPAS was tested on the computer used for this document by Douglas Hultstrand on January 3, 2014. The inputs for the installation test were the same as those used in the software verification report Appendix G, and the outputs are documented in Appendix H. The results of the installation test were acceptable.

5.2 Computer Files

The full results from the site specific PMP, including SPAS input/output, for ANO can be found in Appendix A. Figures from HMR-52 can be bound in Appendix B. ArcMAP and Excel input/output is provided in Appendix C. Average monthly snow depth calculation is provided in Appendix F. Depth-Area-Duration tables and maps can be found in Appendix I.

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6.0 CALCULATIONS AND RESULTS

The Arkansas River watershed was subdivided, into 22 subwatersheds based on the location of major tributaries to the Arkansas River, USGS stream gages and selected dams (Figure 2).

The following watershed areas are in units of square miles were calculated:

- Arkansas River watershed area upstream of ANO: approximately 153,380 square miles,

The following subwatershed areas, in units of square miles (mi^2), were calculated:

Name	Point of Delineation	Area (mi^2)
Amarillo	USGS Stream Gage 07227500	19,010
Arkansas City	USGS Stream Gage 07146500	7,640
Bridgeport	USGS Stream Gage 07228500	5,810
Calvin	USGS Stream Gage 07231500	2,720
Commerce	USGS Stream Gage 07185000	5,940
Eufaula	USGS Stream Gage 07245000	5,280
Great Bend	USGS Stream Gage 07141300	17,290
Hudson	USGS Stream Gage 07191500	1,200
Las Animas	USGS Stream Gage 07124000	14,410
Lenapah	USGS Stream Gage 07171000	3,590
Pensacola	USGS Stream Gage 07190500	4,460
Ramona	USGS Stream Gage 07175500	1,940
Ripley	USGS Stream Gage 07161450	4,720
Seiling	USGS Stream Gage 07238000	12,480
Tenkiller	USGS Stream Gage 07198000	1,620
Tulsa	USGS Stream Gage 07164500	12,920
Waynoka	USGS Stream Gage 07158000	11,570
Wetumka	USGS Stream Gage 07242000	2,030
John Martin	Ungaged – John Martin Reservoir	4,170
Walnut	Ungaged – Walnut Creek	1,870
Robert Kerr	Robert S. Kerr Lock and Dam	6,760
Dardanelle	Dardanelle Lock and Dam (outlet of ANO entire watershed)	5,950

6.1 Local Intense Precipitation PMP Calculation

The one-square-mile, one-hour duration PMP was calculated in the site specific LIP analysis (see Appendix A) as 16.3 inches. The one-hour PMP was further subdivided into shorter duration increments based on methodology of HMR-52 (NOAA, 1982) as shown in Table 1.

The one-square-mile, one-hour duration PMP hyetograph was developed using guidance from NUREG/CR-7046 (NRC, 2011) and is shown in Figure 3.

The ten-square-mile, six-hour duration PMP was calculated in the site specific PMP analysis (see Appendix A) as 22.0 inches. The ten-square-mile, six-hour duration PMP hyetograph is shown in Figure 4.

6.2 Perform Site Specific Probable Maximum Precipitation Study

The full results from the Probable Maximum Precipitation Study for ANO are included in Appendix A. The site specific PMP values were calculated following the overall methodology used in HMR 51 and previous site-specific PMP studies in the area, and incorporated updated changes in technology, meteorological understanding, and availability of updated data. Consideration was given to the size of the ANO watershed as it relates to the PMP design storm movement and shape. The results from the site specific study indicated that it is not meteorologically feasible for the PMP to be larger than 100,000 square miles to occur in the ANO watershed based on the available storm data. Consideration was also given to the 72-hour duration limit in HMR-51/52 and longer durations were evaluated; however, the available data indicated durations beyond 72-hours were of limited importance (i.e., most

rainfall occurs well before the 72 hour duration is reached or exceeded). The final PMP maps are included in Appendix A.

The following list contains the main conclusions from the site specific study:

- HMR-51 and HMR-55A PMP values are outdated. The study provided updated PMP values to replace HMR-51 and HMR-55A values.
- HMR-52 PMP design storm parameters were based on a set of storms that were not specifically transpositionable to the ANO watershed. The study provided updated PMP design storm movement guidance based on storms transpositionable to the ANO watershed and took into consideration the large size of this watershed.
- The most recent storm used to derive PMP values in HMR-51 occurred in 1972. The study updated the storm database to include storms through 2013.
- HMR-51 and HMR-52 did not use computer based technologies in the storm analyses procedures. The study used computer technology and GIS to more accurately analyze storm rainfall patterns and implement the spatially distributed PMP values.
- HMR-51, HMR-52, and HMR-55A did not have weather radar to help spatially distribute rainfall among rain gage locations. SPAS storm analyses incorporates this information when available to provide the most advanced spatial representation of rainfall storm patterns possible.
- The understanding of meteorological processes, interactions, and storm patterns have advanced since the publication of HMR-51 and HMR-55A. Satellite and radar technology have added to the understanding of storm patterns over the last 40 years. The site specific study incorporated the current understanding and updated technology to analyze extreme rainfall events.
- HMR-51 and HMR-52 provide generalized and smoothed LIP values over a large geographic domain that covers the United States east of the 105th meridian. This calculation considered characteristics specific to the site, and produced PMP values that explicitly considered the meteorology of the PMP storm type which would result in the 1-hour 1-square mile area size LIP values.
- The transposition limits of the Smethport, PA July 1942 storm, which produced the 4- and 6-hour world record rainfall, were not allowed to influence the LIP values at the ANO site. The refined transposition limits used in this calculation result in lower LIP values compared to HMR-52 for locations where the Smethport storm apparently influenced PMP values in HMR-51. Smoothing of the PMP/LIP isolines in HMR-51 and HMR-52 necessarily had to encompass the Smethport maximized in-place rainfall far beyond its explicit transposition limits. Note that Section 3.2.4 of HMR-51 states that they "slightly undercut" the maximize d 6-, 12-, and 24-hour values by up to 7% to avoid "excessive envelopment of all other data in a large region surrounding the Smethport location." This over envelopment effect extended well beyond the intended transposition limits of the Smethport storm because the PMP/LIP isolines required smoothing and fitting over surrounding regions.
- Each storm's inflow vector was re-evaluated and combined with an updated set of dew point climatologies and when necessary, updated storm representative dew point values were used for the in-place maximization and transposition factors. A trajectory model was used to evaluate moisture inflow vectors for storms on the short storm list. Trajectory models were not available in HMR studies. Use of a trajectory model allowed for a high degree of confidence when evaluating moisture inflow vectors and storm representative dew points.
- Several new storms have been analyzed and included in the LIP analysis that were not included in HMR-51 and HMR-52. This provided a higher level of confidence in the final PMP values. Further, this allowed for a refined set of values that better represent the LIP estimates at the

site. This expanded the data set used to derive LIP includes a large number of recent storms where weather radar data were available.

- The study provided adjustments for storm elevation to the nearest 100 feet of elevation, whereas HMR-51 and HMR-52 made no explicit adjustment for elevation. This adjustment depends on the elevation of the historic storm's maximum rainfall location and therefore varies from storm to storm.
- Storms analyzed by the NWS/ U.S. Army corps of Engineers (USACE which) occurred prior to 1948 and used 12-hour persisting dew points in the storm maximization process were adjusted so that the updated dew point climatology could be used consistently. For thunderstorms and MCC storm events 7°F was added to the NWS/USACE storm representative dew point. This was done to adjust for using average dew point values for varying durations vs. 12-hour persisting dew point values. Recent evaluations of 12-hour persisting storm representative dew points showed those used in HMR-51 underestimated the storm representative dew point values.

6.3 Calculate Site Specific Depth-Area-Duration data for various stationary PMP storm centers

See Appendix A for detailed description for the calculation of site specific DAD data. For storm centers not located at the watershed centroid, values were obtained from site specific DAD maps (see Appendix A) created in GIS. Three storm centers were used for stationary PMPs:

1. Watershed Centroid: represents a PMP centered over the centroid of the overall Arkansas River watershed contributory to ANO;
2. Robert Kerr subwatershed centroid: represents a PMP centered over the lower portion of the watershed, closer to ANO than the overall watershed centroid;
3. John Martin subwatershed centroid: represents a PMP centered over the upper portion of the watershed, further from ANO than the overall watershed centroid.

The location of the storm centers evaluated are summarized in Table 2 and illustrated in Figure 5. The effects of the various storm centers on the PMF will be evaluated in a separate calculation.

In addition to the locations list in Table 2, Table 3 identifies the location of the moving PMP storm centers (see Figures 6, 7 and 8).

DAD tables for the PMP at various storm centers are included as Appendix I.

6.4 Calculate 6-hour Incremental 72-hour PMP Values

6.4.1 72-Hour Stationary PMP

The spreadsheets used to calculate 72-hour PMP values on a watershed average basis and on a subwatershed basis are included in Appendix C, the results are summarized below:

1. From the DAD tables, DAD plots and subsequent curves are created and as included in Appendix C. Depth-Duration data was read from the DAD curves for 8 isohyetal pattern sizes. The selected isohyetal pattern area sizes selected were: 6,500, 10,000, 15,000, 25,000, 40,000, 50,000, 60,000 and 100,000- square miles. HMR-52 recommends selecting 4 pattern area sizes larger and 4 smaller than the watershed area. However, it is not considered meteorologically feasible for the PMP to be larger than 100,000 square miles.

2. Isohyetal Pattern
   The isohyetal orientations were measured relative to degrees from the north. Listed below is the range of isohyetal orientations based on HMR-52 at the watershed centroid. Keeping the isohyetal orientation within the HMR-52, 40° range of the preferred isohyetal orientation, allows for the retention of the full value of the isohyets without having to apply the reduction factor while allowing for maximization of the orientation over the watershed.

   HMR-52 preferred isohyetal orientation at watershed centroid is 225°.
   HMR-52 preferred isohyetal storm orientation range: 185° to 265°

   The selected isohyetal pattern orientation for the PMP at the various storm centers are included as Figures 9 to 11 and are summarized in Table 4.

3. Maximum Precipitation Value
   The values of 18-hour Maximum Precipitation for the various PMP scenarios are included in the spreadsheets in Appendix C and are summarized in Table 5.

4. Distribution of Storm-Area Averaged PMP over the Drainage Area
   The 72-hour total watershed averaged PMP values are summarized below (see Appendix C for isohyetal matrix):

   - The total 72-hour PMP
     - Centered at Watershed Centroid 7.7 inches
     - Centered at John Martin Subwatershed Centroid 4.7 inches
     - Centered at Robert Kerr Subwatershed Centroid 10.2 inches

5. Temporal Distribution

The temporal distribution for the PMPs are based in HMR-52 guidance and are as follows: 12, 11, 10, 9, 7, 6, 5, 3, 1, 2, 4, and 8, where the numbers indicate the largest precipitation (1) to smallest (12). The hyetograph for PMPs were constructed using 40 percent of the PMP depths during the first 72 hours, followed by a dry 72-hour period, and finally followed by the full 72-hour PMP storm (NRC, 2011).

6. Subwatersheds

The hyetographs graphically and in tabular format for the subwatersheds for each of the PMP storm centers and are included within Appendix J.

7. Effective Area Adjustment Factor

The hyetographs for the subwatersheds for each of the PMP storm centers and are included graphically and in tabular format within Appendix J.

6.4.2 72-Hour Moving PMP

The selected isohyetal pattern orientation for the PMP for each storm center are included as Figures 12 to 23 and are summarized in Table 6:

The storm velocities selected were based on maximizing the precipitation occurring over the watershed (i.e., maximizing the number of fully encompassed isohyets for the three storm movements) and moving a distance large enough to generate a difference compared to a stationary PMP. The selected storm velocities were 160 miles per day and 80 miles per day.

The storm orientation (direction the PMP moves across the watershed) was selected to maximize the precipitation occurring over the watershed (i.e. maximizing the number of fully encompassed isohyets for the three storm movements). The storm orientation ordinates move from 293 to 113.

The values of 18-hour Maximum Precipitation for the moving PMP scenarios are included in the spreadsheets in Appendix C and are summarized in Table 7.

The 72-hour total watershed averaged PMP values are summarized below (see Appendix C for isohyetal matrix):

- The total 72-hour Moving PMP (160 miles per day) 7.1 inches
- The total 72-hour Moving PMP (80 miles per day) 8.1 inches

The temporal distribution for the all season and cool season PMPs are based in HMR-52 guidance and are as follows: 12, 11, 10, 9, 7, 6, 5, 3, 1, 2, 4, and 8, where the numbers indicate the largest precipitation (1) to smallest (12). The moving storm hyetographs were constructed by taking a 24-hour period of precipitation from each of the three storm center locations resulting in the total storm duration of 72-hours. The hyetographs for the moving PMPs were constructed using 40 percent of the PMP depths during the first 72 hours (antecedent storm), followed by a dry 72-hour period, and finally followed by the full 72-hour moving PMP storm (NRC, 2011). The antecedent storm was modeled as a separate moving storm following the methodology described above. The final hyetograph for the moving PMP consists of 5 storm centers.

The hyetographs graphically and in tabular format for the subwatersheds for the moving PMPs are included in Appendix J.

6.5 Cool-Season PMP

The cool-season PMP for ANO was not evaluated because the climatology of the watershed does not support a bounding or controlling cool-season PMF consisting of a cool-season PMP in combination with snowmelt. The time of year when the PMP occurs (April through October) has no significant snowpack would be available in the majority of the watershed. The results from the analysis of the maximum monthly average snow depth during the cool season (January through April and October through December) indicated that on average there is less than 1.5 inches of snow within the watershed. The maximum month average snow depths are summarized in Tables 8 through 14. The raw data and Pivot Tables are included as Appendix F.

Additionally, the largest amount of moisture available for rainfall (and thus the PMP) over the region comes from the Gulf of Mexico. The major types of extreme rainfall events in the region are produced by Mesoscale Convective Systems (MCS) (short durations and small area sizes), synoptic events/fronts (large areas sizes and longer durations), and remnant moisture from tropical systems which have made landfall along the Gulf of Mexico coastline. MCSs primarily form during the warm season months (April through October) around the ANO region and tropical systems typically occur from June through November. Since snow depth is insignificant and based on the results of the site specific PMP study,

no explicit cool-season PMP values and/or rain-on-snow analyses were completed. See Appendix A for additional discussion.

7.0 CONCLUSIONS

The following summarizes the results and conclusions:

1. A site specific PMP study was performed for the 1-hour, 1-square-mile "point" PMP and the 6-hour, 10-square-mile PMP for application to the Local Intense Precipitation. The 1-hour, 1-square-mile "point" PMP and the 6-hour, 10-square-mile PMP were calculated as 16.3 inches and 22.0 inches, respectively.
2. A site specific PMP study was also conducted for the Arkansas River watershed near ANO because the watershed (over 150,000 square miles) exceeds the watershed area upper limit of 20,000 square miles in Hydrometeorological Reports 51 and 52.
3. The results on the site specific PMP study are that the maximum storm duration is 72-hours and the maximum storm size is 100,000 square miles.
4. The 100,000 square mile PMP does not cover the entire watershed due to meteorological limitations on storm duration, size, and orientation.
5. The average PMP rainfall depth for the portion of the watershed covered by the 100,000 square mile, 72-hour PMP centered at the watershed centroid is 7.7 inches. A higher average PMP rainfall depth of 10.2 inches for the 72-hour duration occurs with the PMP centered at the centroid of the Robert Kerr subwatershed. See Sections 6.4.1 and 6.4.2 for the results of other PMP storm center locations.

Comparison of the stationary and moving storm for all storm centers, indicates that the controlling PMP (i.e., resulting in the PMF) cannot be determined based on inspection of rainfall data alone and these scenarios will be evaluated to determine the controlling PMF at ANO.

8.0 REFERENCES

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* Reference archived in the AREVA file management system, ColdStor.
The path to the file is: **\cold\General-Access\32\32-9000000\32-9207374-000\official**

TABLES

Table 1: Point (1 square mile) Probable maximum Precipitation Depths

Time (min)	PMP Depth (in)
60	16.3
30	12.2
15	8.4
5	5.4

Table 2: Location of Stationary Storm Centers

Storm Center	Latitude	Longitude
Watershed Centroid	36.9533	-99.8638
John Martin Subwatershed Centroid	37.4133	-103.9165
Robert Kerr Subwatershed Centroid	35.9541	-95.5654

Table 3: Location of Moving Storm Centers

Storm Center	Latitude	Longitude
Moving Point 1	38.2869	-105.4485
Moving Point 2	37.6518	-102.6323
Moving Point 3	37.3104	-101.2420
Moving Point 4 (Watershed Centroid)	36.9533	-99.8638
Moving Point 5	36.5809	-98.4983
Moving Point 6	36.1932	-97.1459
Moving Point 7	35.3732	-94.4811

Table 4: Isohyetal Pattern Orientations for Stationary PMP

Storm Center	PMP Orientation
Watershed Centroid	225°
John Martin Subwatershed Centroid	209°
Robert Kerr Subwatershed Centroid	235°

Table 5: Maximum 18-hour Precipitation Volume for Stationary PMP

Storm Centering	Storm Area (square miles)	Maximum 18-hr Volume (inch-square miles)
Watershed Centroid	100,000	368,700
John Martin Subwatershed Centroid	60,000	155,200
Robert Kerr Subwatershed Centroid	100,000	300,600

Table 6: Isohyetal Pattern Orientations for Moving PMP

Storm Center	PMP Orientation
Moving Point 1	206°
Moving Point 2	216°
Moving Point 3	221°
Moving Point 4 (Watershed Centroid)	225°
Moving Point 5	229°
Moving Point 6	232°
Moving Point 7	236°

Table 7: Maximum 18-hour Precipitation Volume for Moving PMP

Storm Centering	Storm Area (square miles)	Maximum 18-hr Volume (inch-square miles)
Moving Point 1	100,000	53,200
Moving Point 2	60,000	193,600
Moving Point 3	60,000	273,300
Moving Point 4 (Watershed Centroid)	100,000	368,700
Moving Point 5	100,000	420,800
Moving Point 6	100,000	453,300
Moving Point 7	100,000	241,100

Table 8: Cool Season Maximum Monthly Average Snow Depth for Arkansas

Arkansas			
Station Name	Maximum Monthly Average Snow Depth (mm)	Maximum Monthly Average Snow Depth (inches)	Period of Snow Depth Record (years)
ODELL AR US	**9.1**	**0.4**	73
SUBIACO AR US	6.2	0.2	101
MOUNTAINBURG 2 NE AR US	3.4	0.1	29
RATCLIFF AR US	2.6	0.1	68
NATURAL DAM AR US	2.0	0.1	51
OZONE AR US	1.5	0.1	59
OZARK 2 AR US	0.6	0.0	20
COAL HILL AR US	0.5	0.0	15

Table 9: Cool Season Maximum Monthly Average Snow Depth for Kansas

Kansas			
Station Name	Maximum Monthly Average Snow Depth (mm)	Maximum Monthly Average Snow Depth (inches)	Period of Snow Depth Record (years)
KINGMAN KS US	**17.7**	**0.7**	81
HUDSON KS US	17.4	0.7	92
TROUSDALE 1 NE KS US	15.2	0.6	98
PRATT KS US	12.1	0.5	88

Table 10: Cool Season Maximum Monthly Average Snow Depth for Missouri

Missouri			
Station Name	Maximum Monthly Average Snow Depth (mm)	Maximum Monthly Average Snow Depth (inches)	Period of Snow Depth Record (years)
GOLDEN CITY 6 S MO US	**23.7**	**0.9**	15
MONETT MO US	17.9	0.7	42
JOPLIN REGIONAL AIRPORT MO US	11.8	0.5	59
MOUNT VERNON MU SW CNTR MO US	10.7	0.4	53
CARTHAGE 5 S MO US	7.4	0.3	70
NEOSHO MO US	6.0	0.2	113
DIAMOND 2 W MO US	3.8	0.1	40
SENECA OK US	1.3	0.1	25

Table 11: Cool Season Maximum Monthly Average Snow Depth for Oklahoma

Oklahoma			
Station Name	Maximum Monthly Average Snow Depth (mm)	Maximum Monthly Average Snow Depth (inches)	Period of Snow Depth Record (years)
PERRY OK US	**5.6**	**0.2**	98
MARSHALL OK US	1.9	0.1	63

Table 12: Cool Season Maximum Monthly Average Snow Depth for Texas

Texas			
Station Name	Maximum Monthly Average Snow Depth (mm)	Maximum Monthly Average Snow Depth (inches)	Period of Snow Depth Record (years)
BORGER TX US	**10.5**	**0.4**	65
DUMAS TX US	8.9	0.3	77
STRATFORD TX US	7.0	0.3	92
BOYS RANCH TX US	5.4	0.2	38
GRUVER TX US	4.4	0.2	73
HARTLEY 4 ESE TX US	2.0	0.1	68
CONLEN TX US	1.0	0.0	69

Table 13: Cool Season Maximum Monthly Average Snow Depth for Colorado

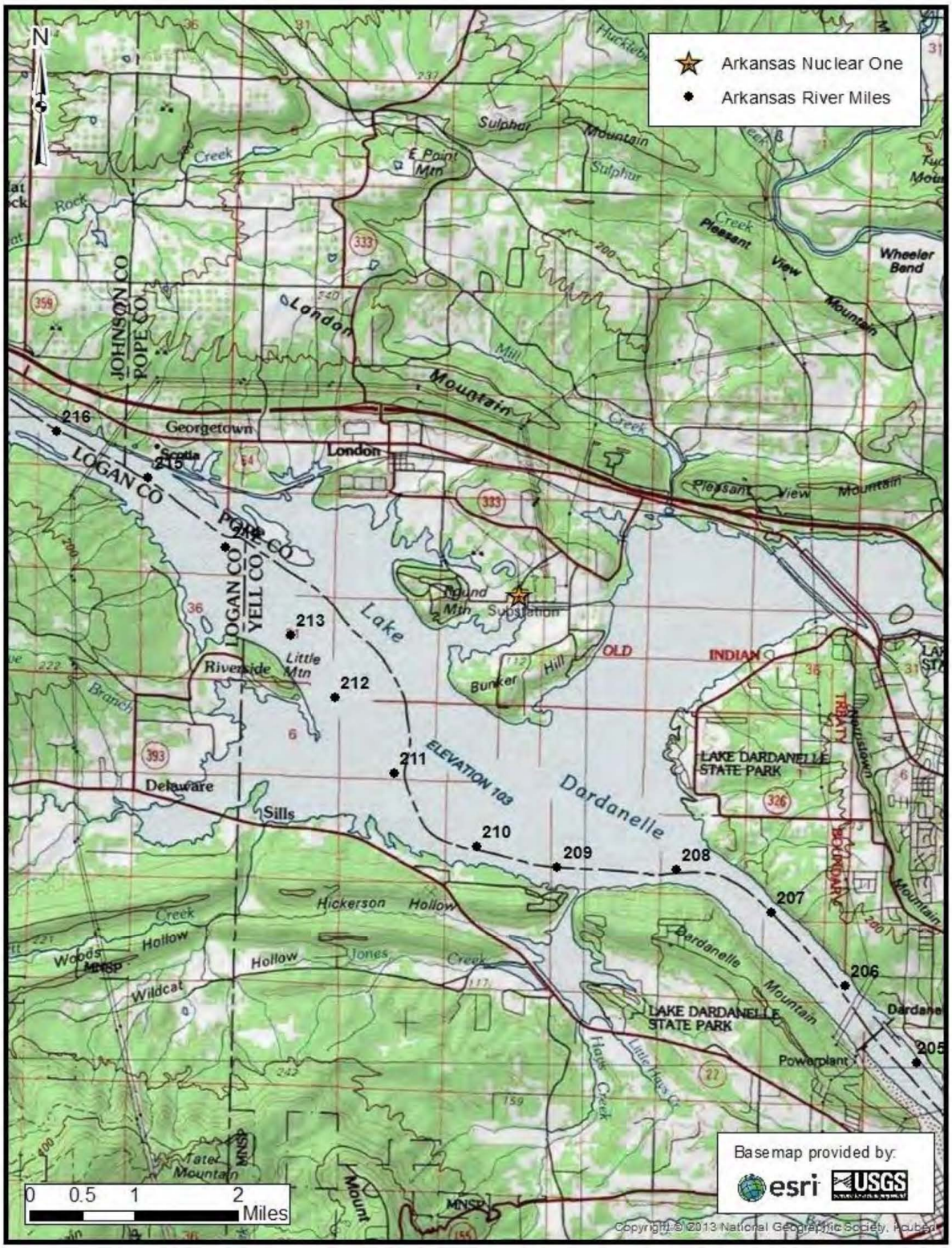
Colorado			
Station Name	Maximum Monthly Average Snow Depth (mm)	Maximum Monthly Average Snow Depth (inches)	Period of Snow Depth Record (years)
ROCKY FORD 2 SE CO US	**17.6**	**0.7**	75
LA JUNTA MUNICIPAL AIRPORT CO US	**17.6**	**0.7**	57
FOWLER 1 SE CO US	**17.3**	**0.7**	76
PUEBLO MEMORIAL AIRPORT CO US	14.5	0.6	60
TACONY 13 SE CO US	13.2	0.5	58
CHERAW 1 N CO US	10.5	0.4	20
ORDWAY 2 ENE CO US	5.3	0.2	67

Table 14: Cool Season Maximum Monthly Average Snow Depth for New Mexico

New Mexico			
Station Name	Maximum Monthly Average Snow Depth (mm)	Maximum Monthly Average Snow Depth (inches)	Period of Snow Depth Record (years)
SPRINGER NM US	**30.5**	**1.2**	109
PASAMONTE NM US	12.6	0.5	82
MOSQUERO 1 NE NM US	10.9	0.4	88
ABBOTT NM US	10.5	0.4	95
BELL RANCH NM US	8.4	0.3	105

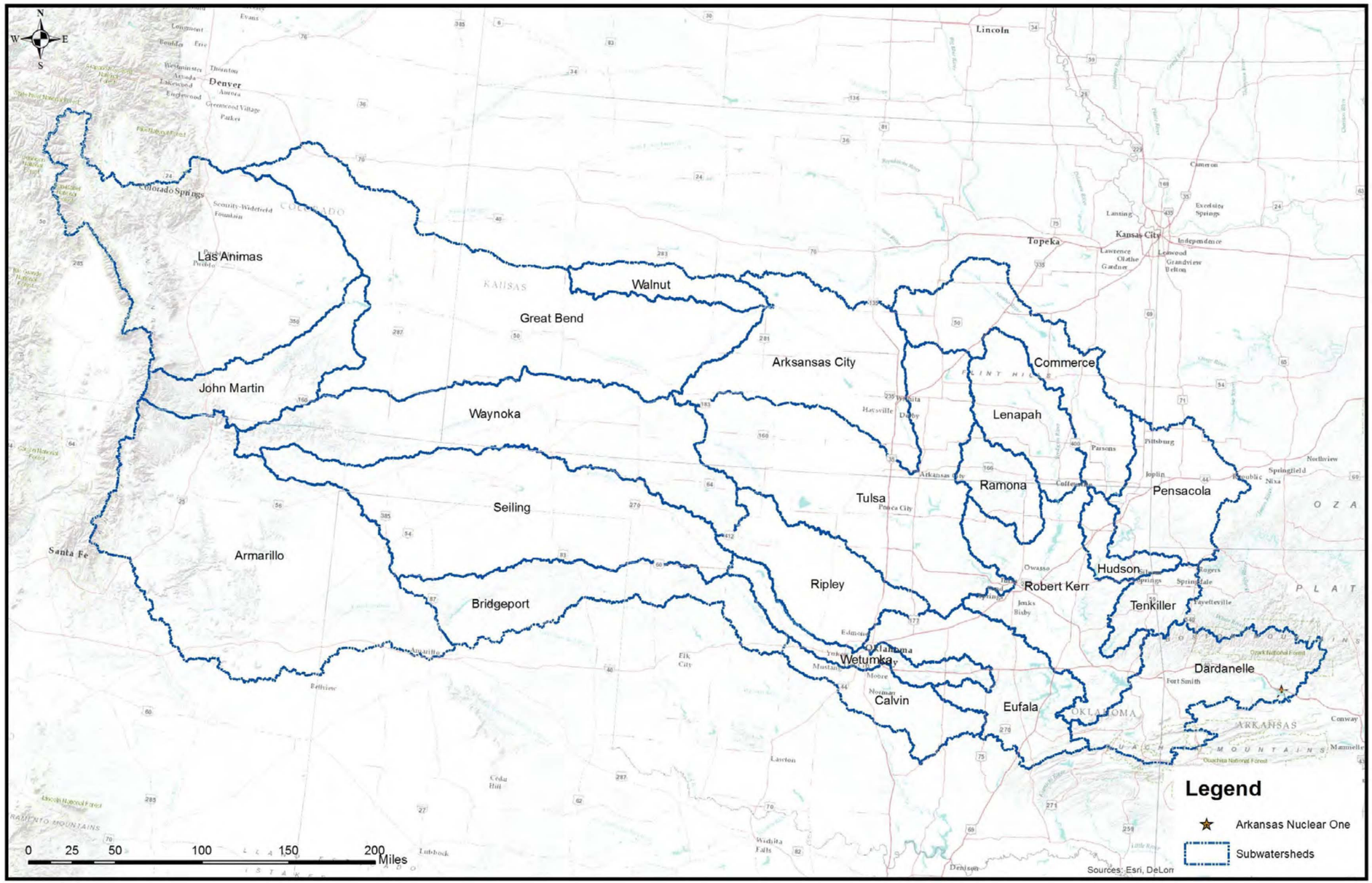
FIGURES

Figure 1: Site Locus Map



Any illegible text or features in this figure are not pertinent to the technical purposes of this document.

Figure 2: Subwatershed Map



Any illegible text or features in this figure are not pertinent to the technical purposes of this document

Figure 3: 1-hour PMP – Incremental Hyetograph

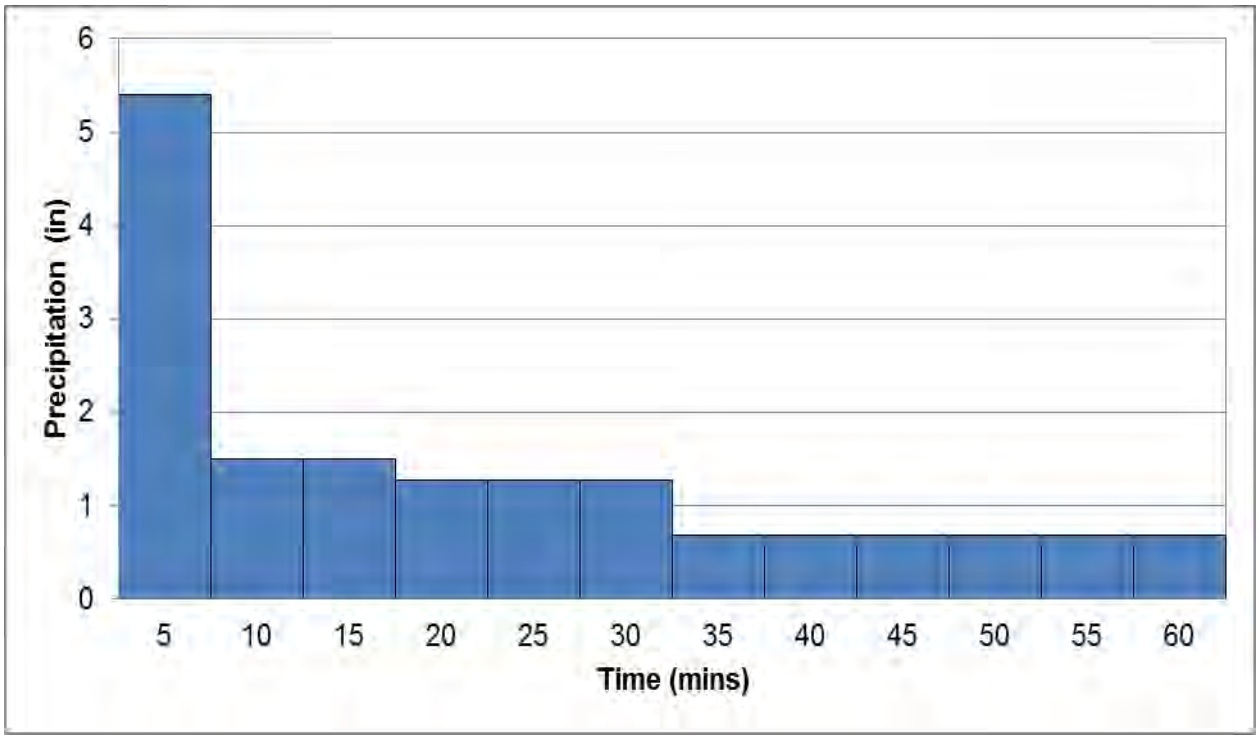


Figure 4: 6-hour PMP – Incremental Hyetograph

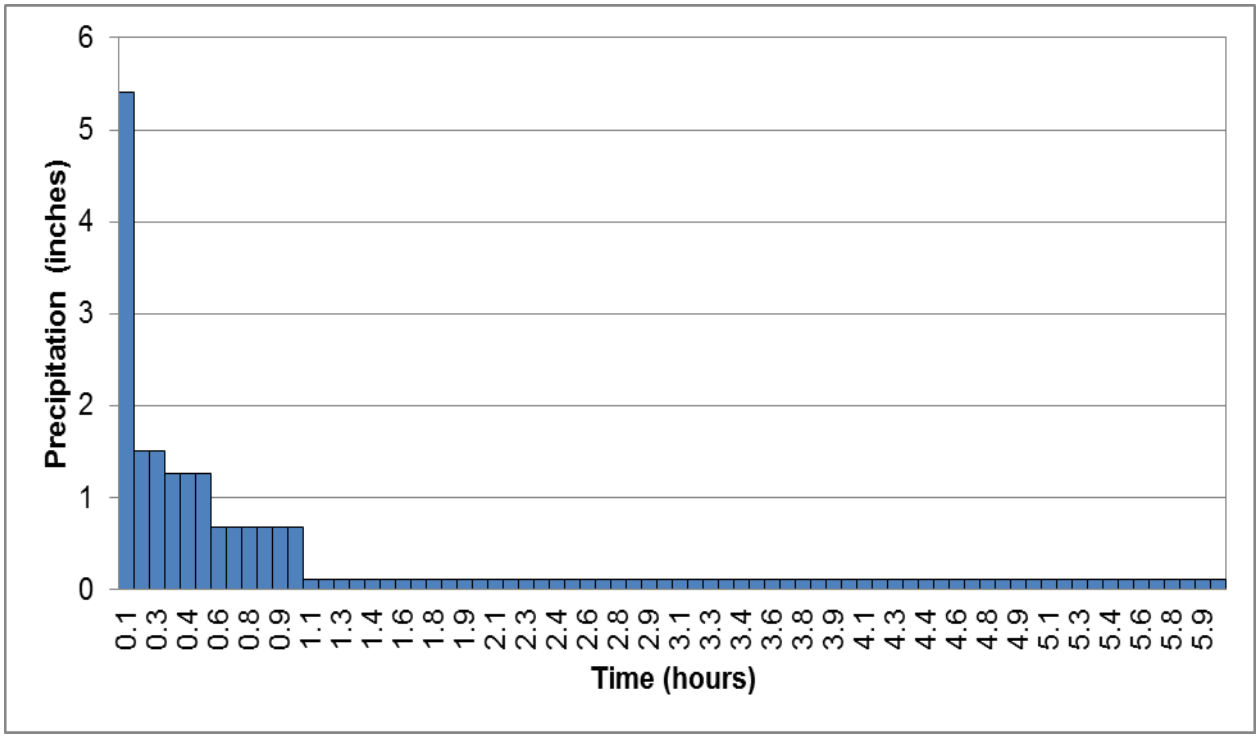
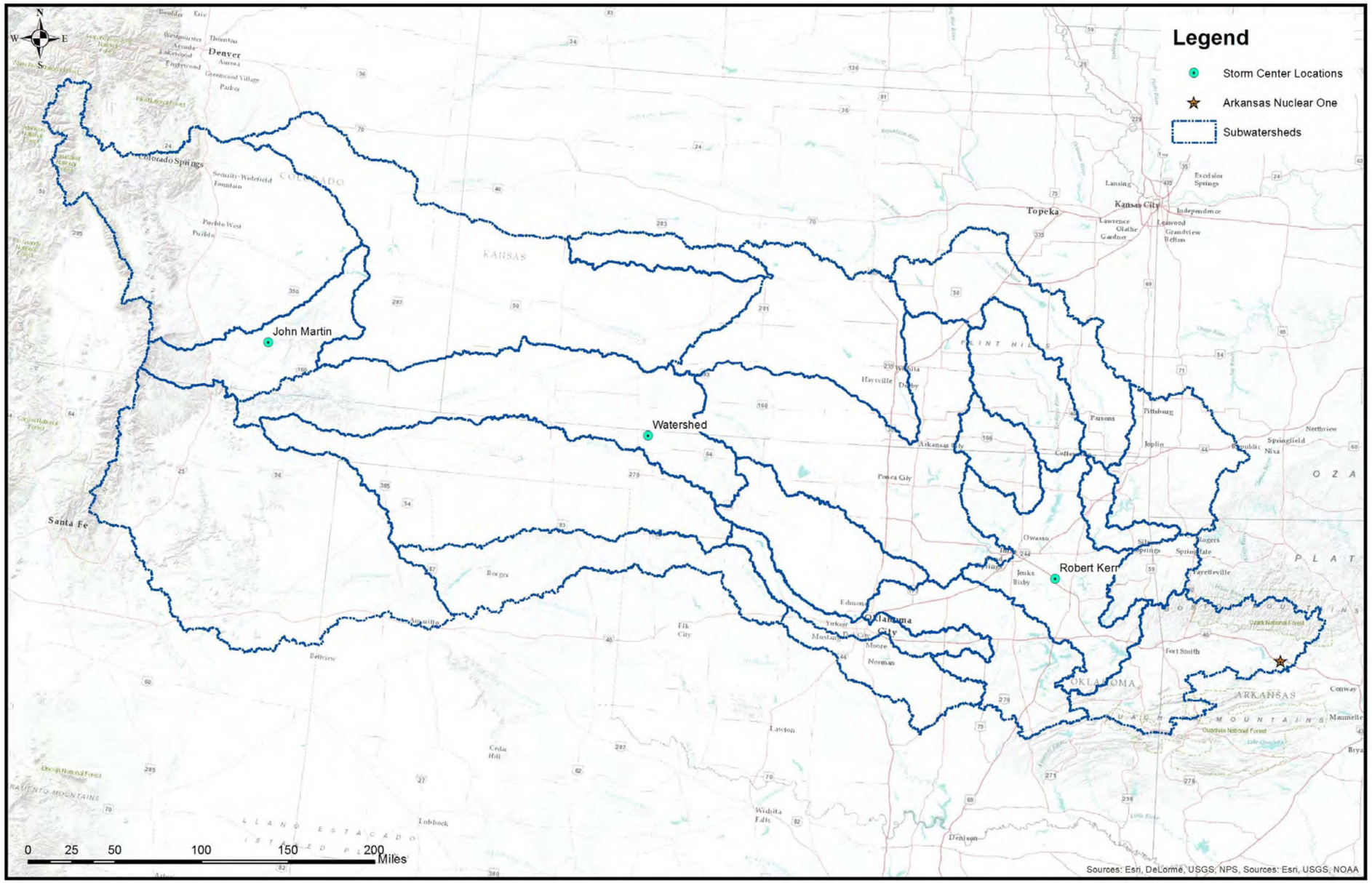
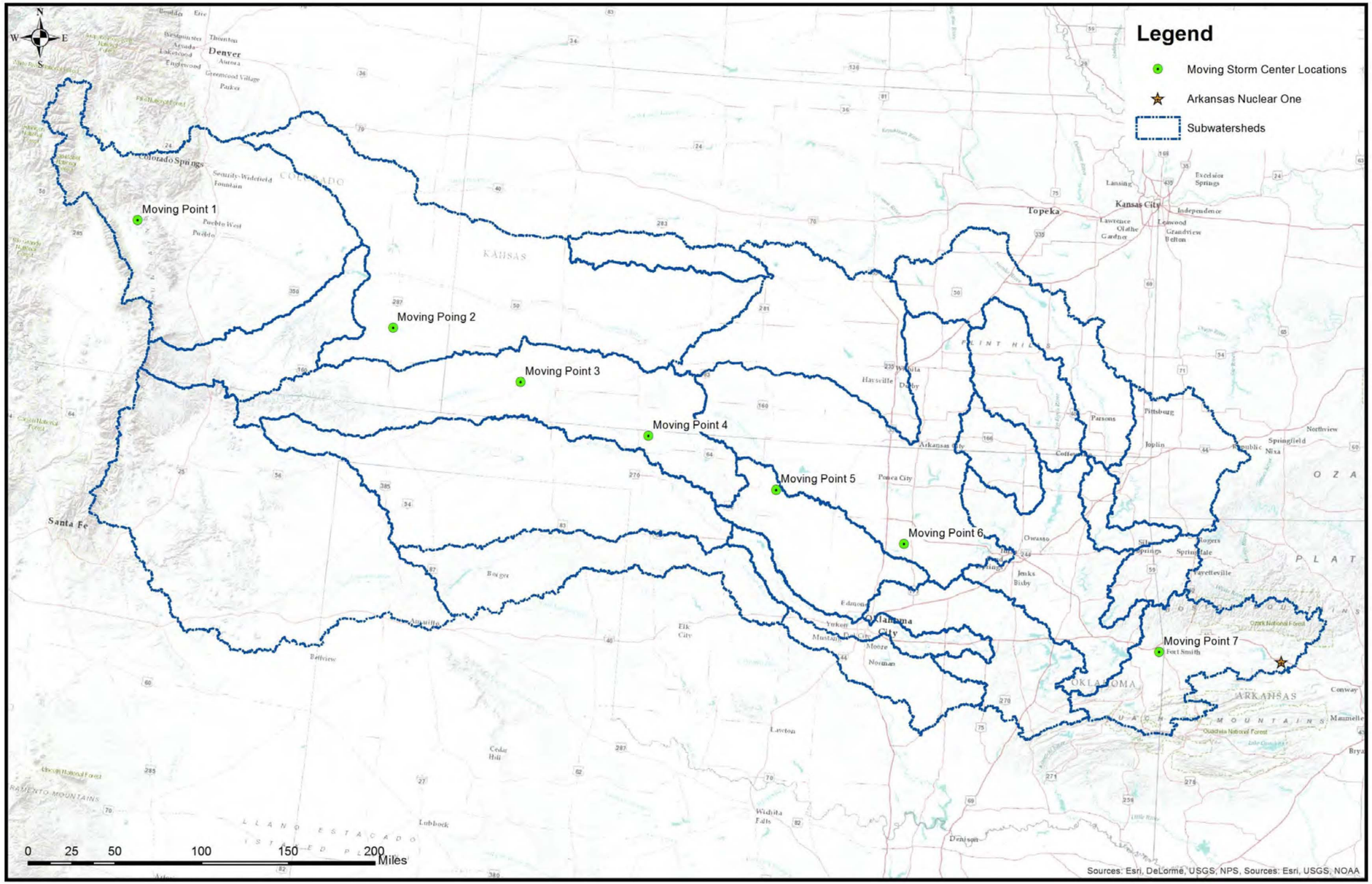


Figure 5: Stationary Storm Center Locations



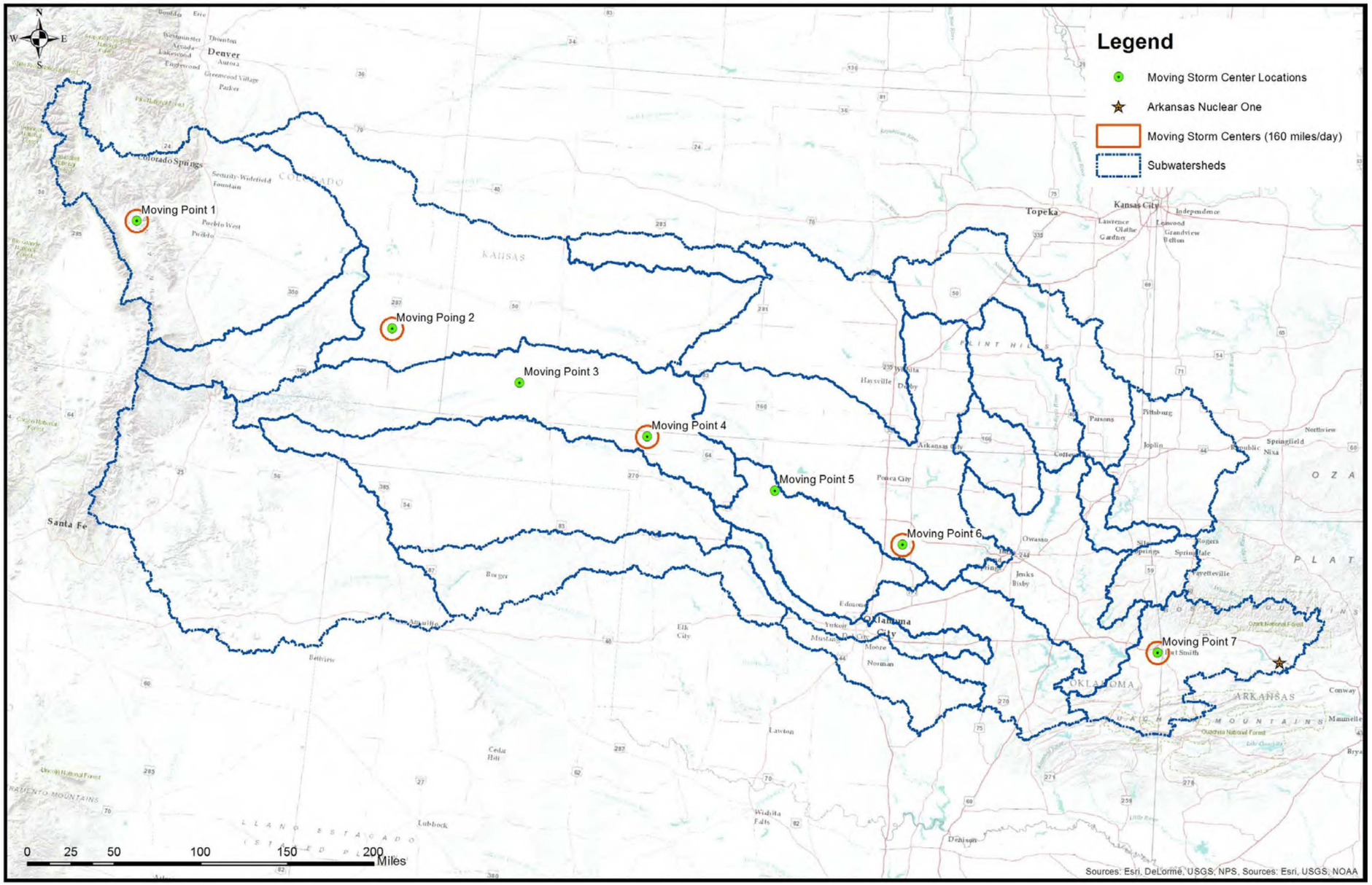
Any illegible text or features in this figure are not pertinent to the technical purposes of this document

Figure 6: Moving Storm Center Locations



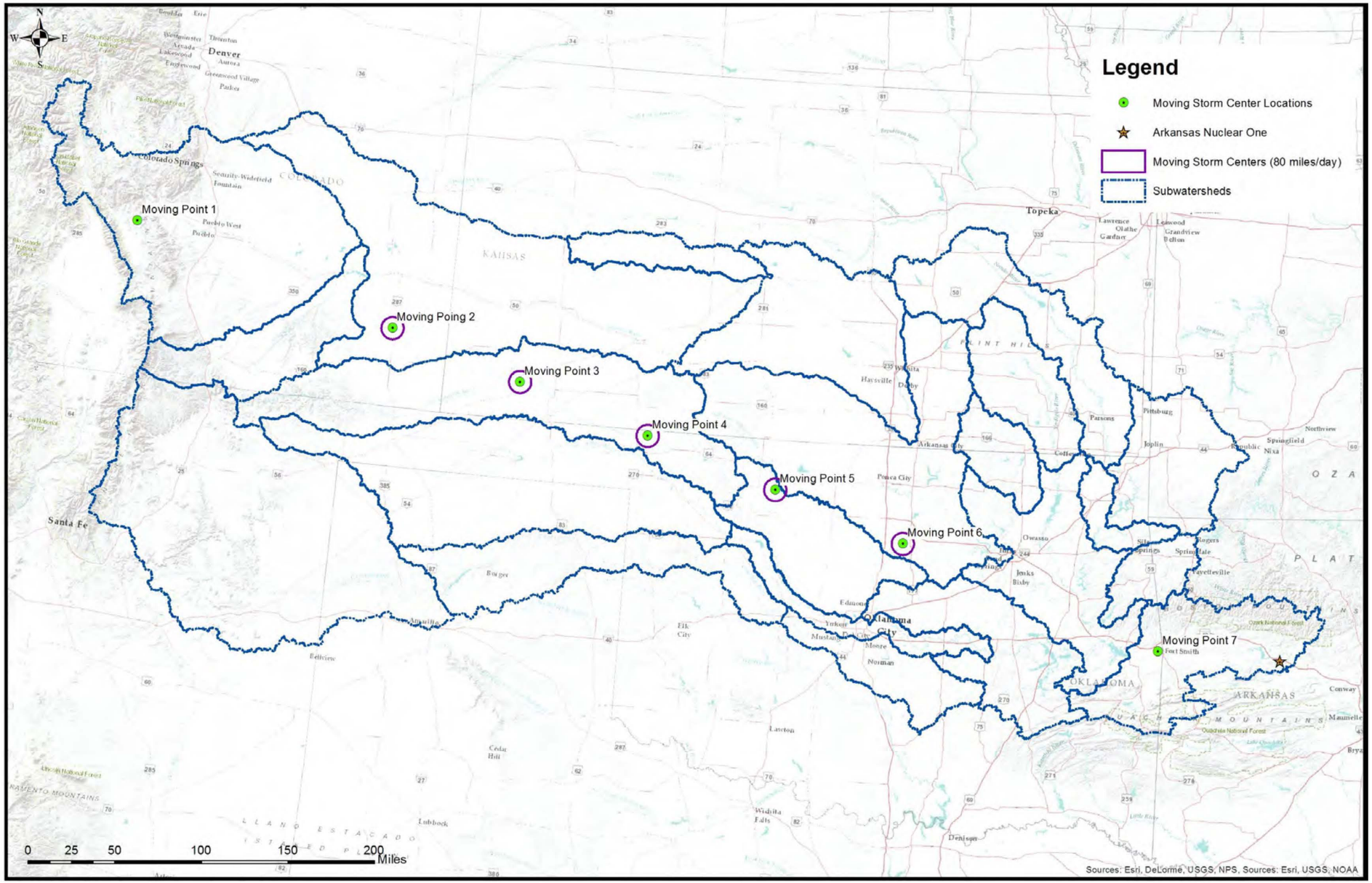
Any illegible text or features in this figure are not pertinent to the technical purposes of this document

Figure 7: Moving Storm Center Locations – 160 Miles per Day



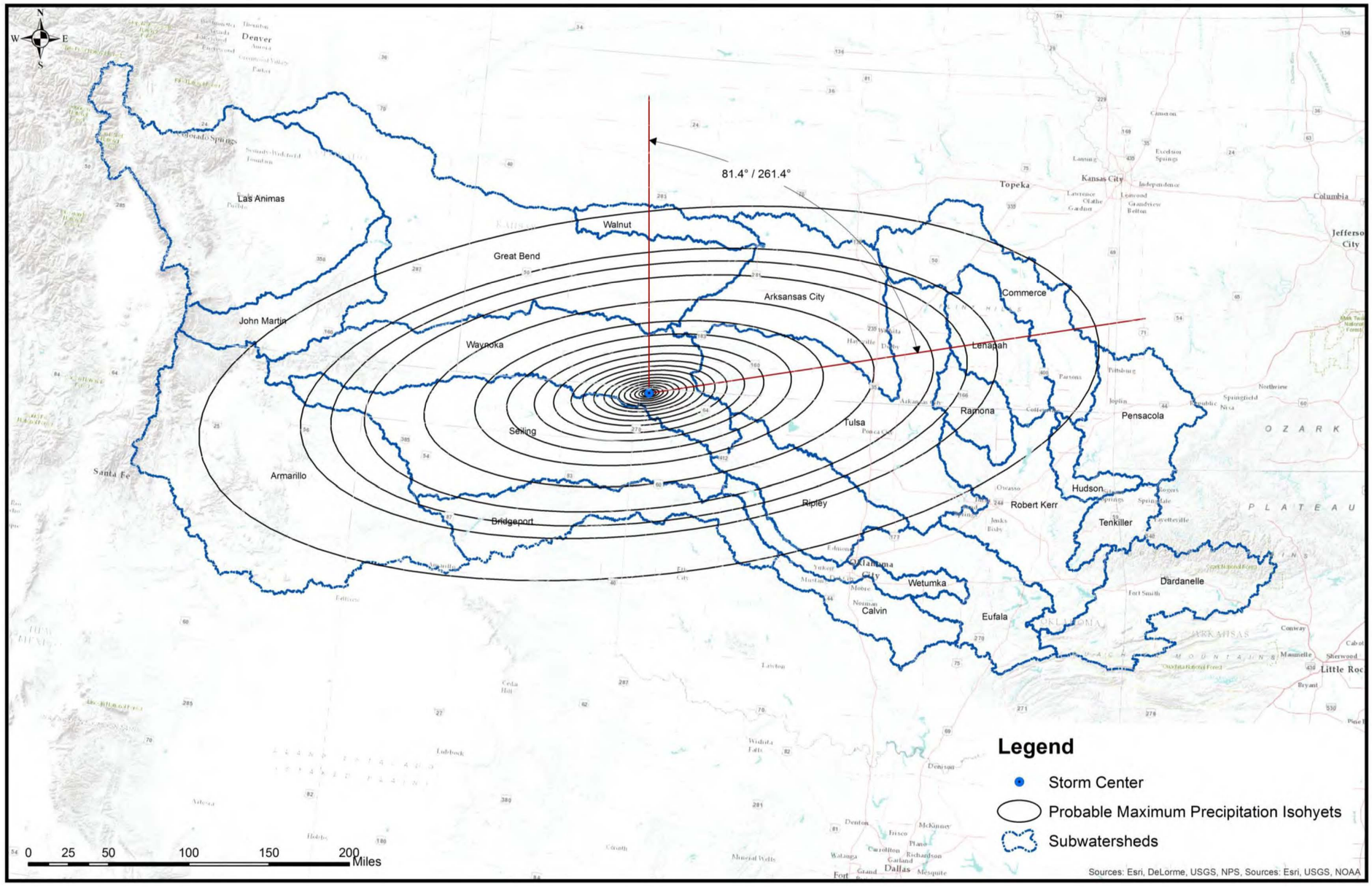
Any illegible text or features in this figure are not pertinent to the technical purposes of this document

Figure 8: Moving Storm Center Locations – 80 Miles per Day



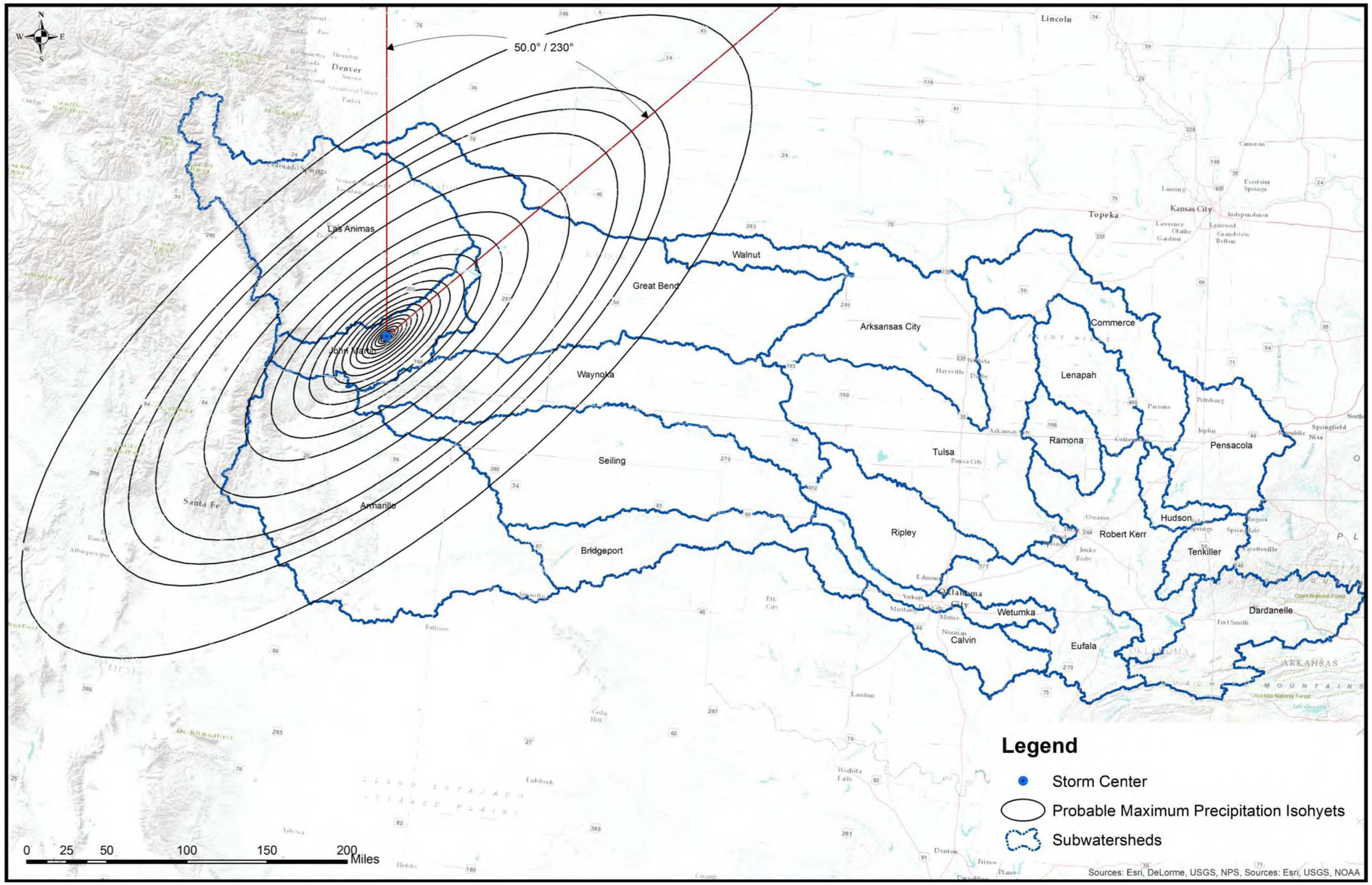
Any illegible text or features in this figure are not pertinent to the technical purposes of this document

Figure 9: Stationary PMP at Watershed Centroid Isohyet Orientation



Any illegible text or features in this figure are not pertinent to the technical purposes of this document

Figure 10: Stationary PMP at John Martin Subwatershed Centroid Isohyet Orientation



Any illegible text or features in this figure are not pertinent to the technical purposes of this document

Figure 11: Stationary PMP at Robert Kerr Subwatershed Centroid Isohyet Orientation

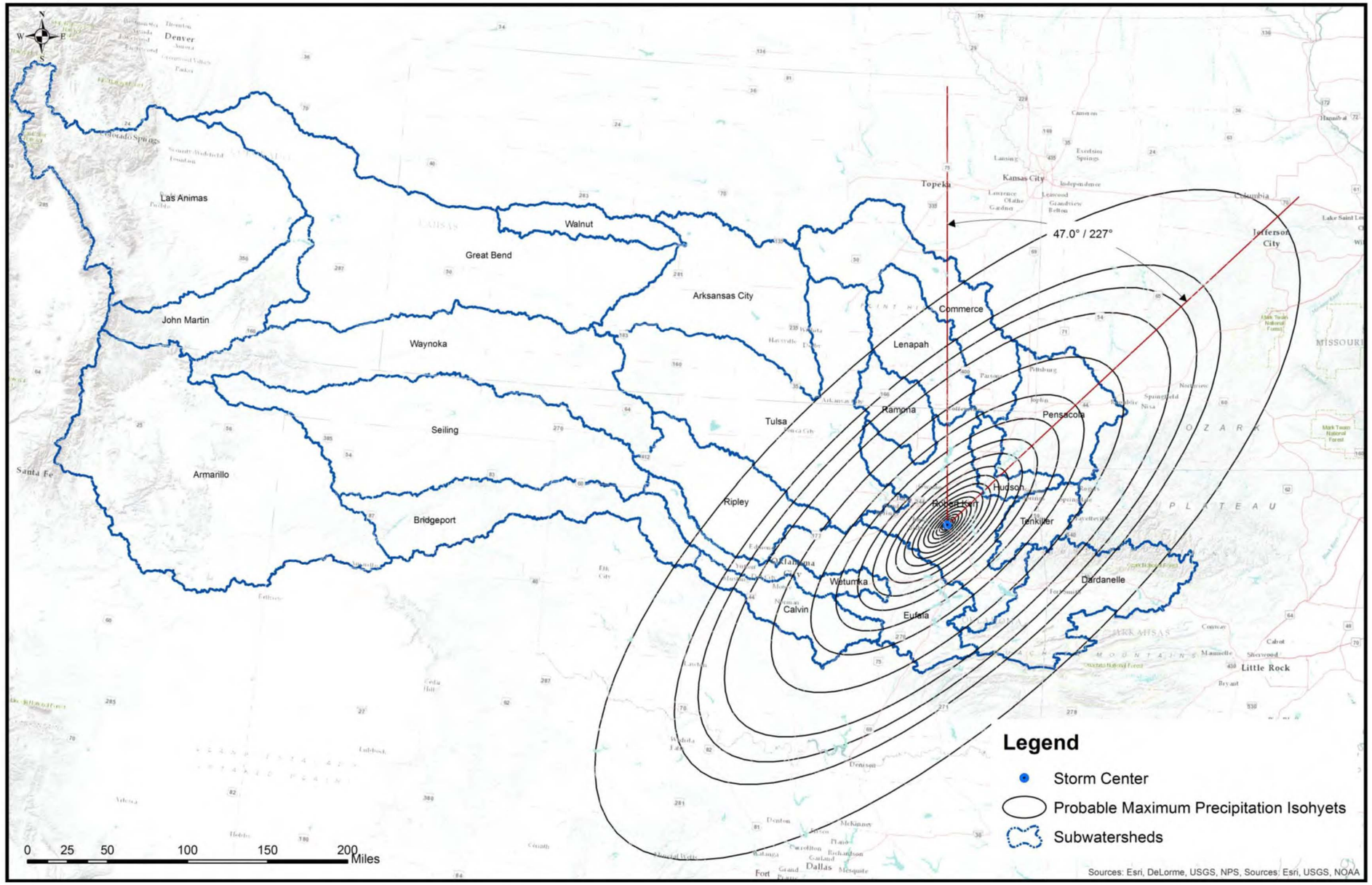


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Figure 12: Moving PMP (160 miles per day) Isohyet Orientation

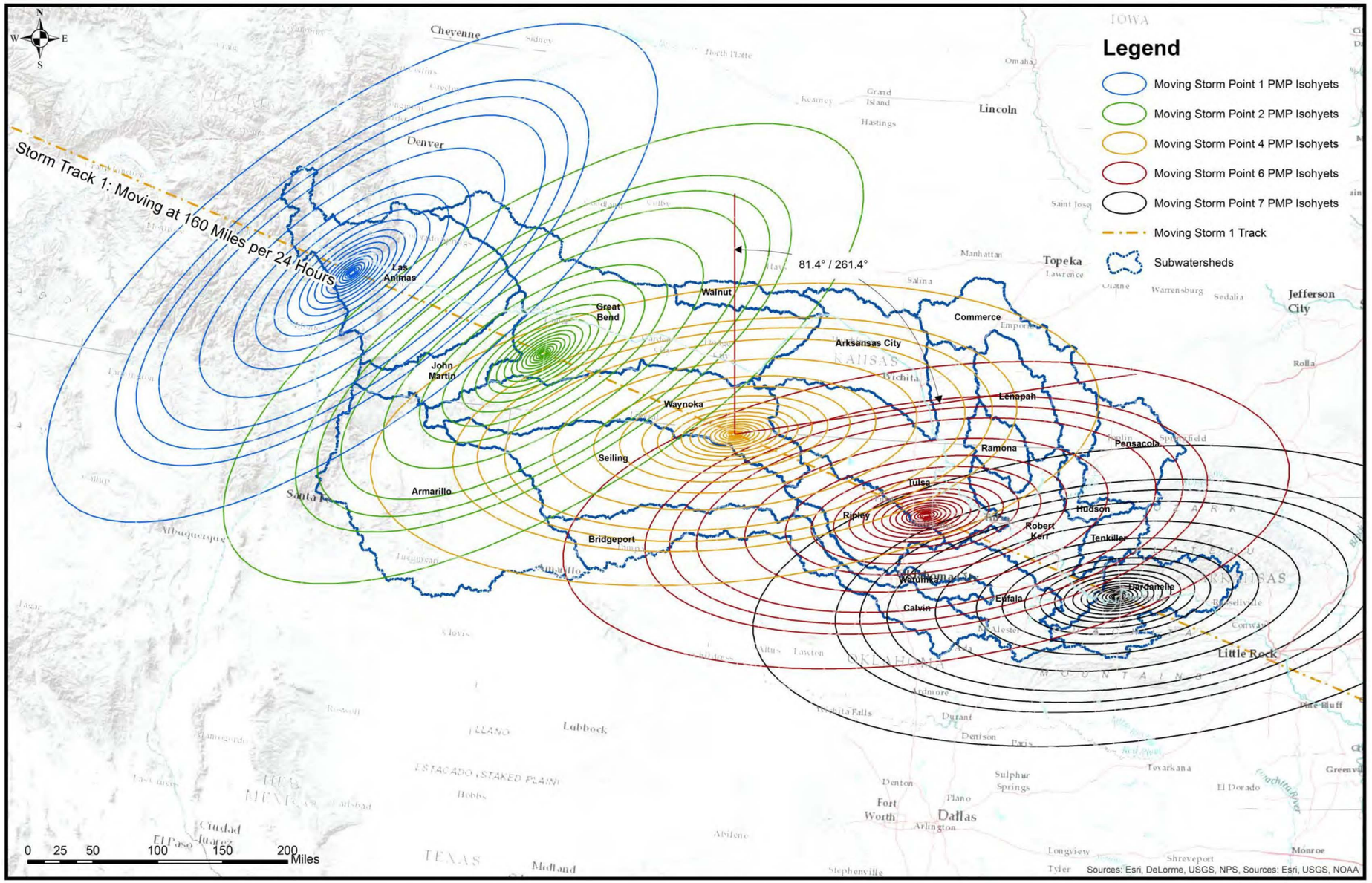

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Figure 13: Moving PMP (160 miles per day) Point 1 Centroid Isohyet Orientation

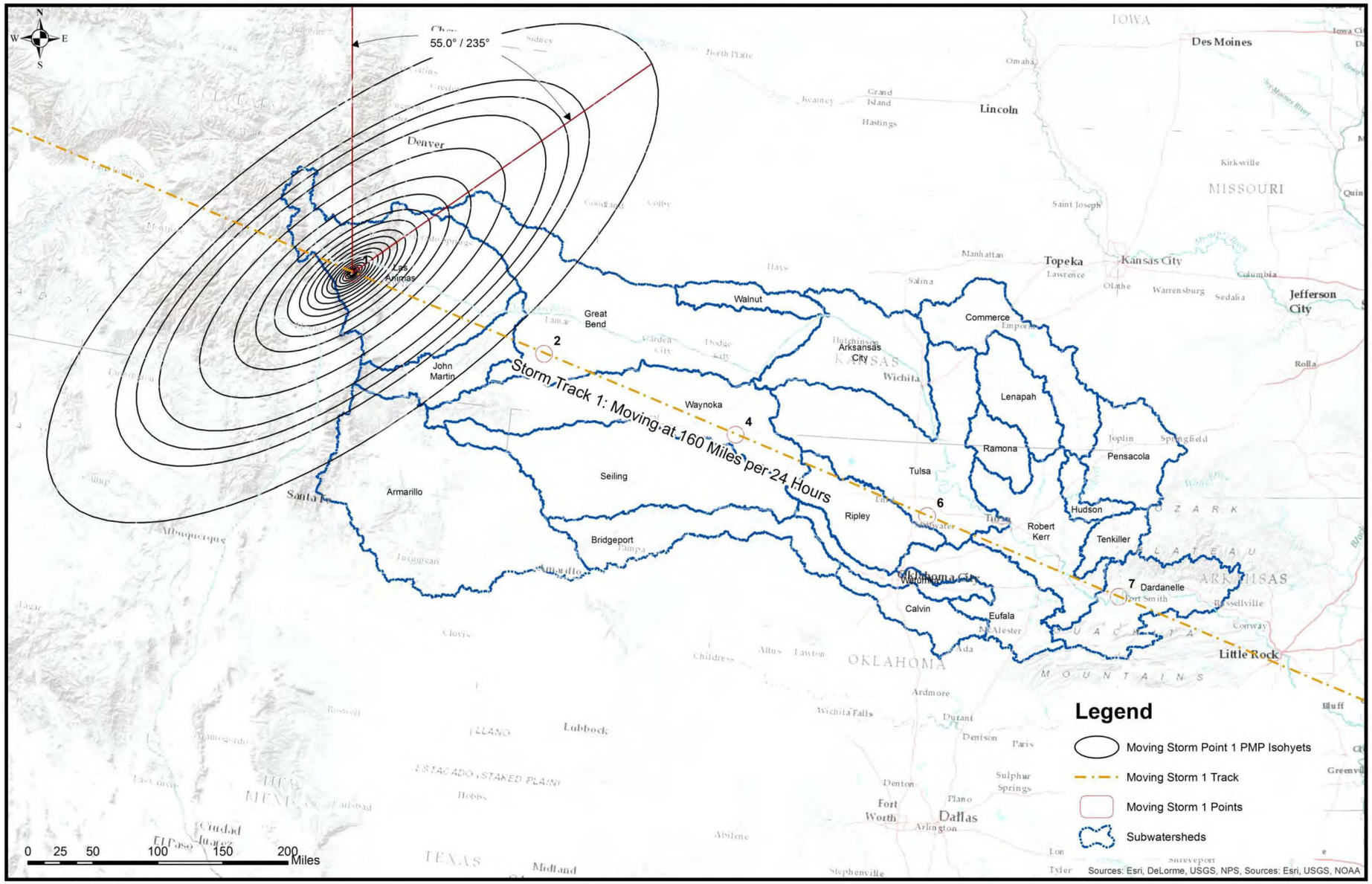

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Figure 14: Moving PMP (160 miles per day) Point 2 Centroid Isohyet Orientation

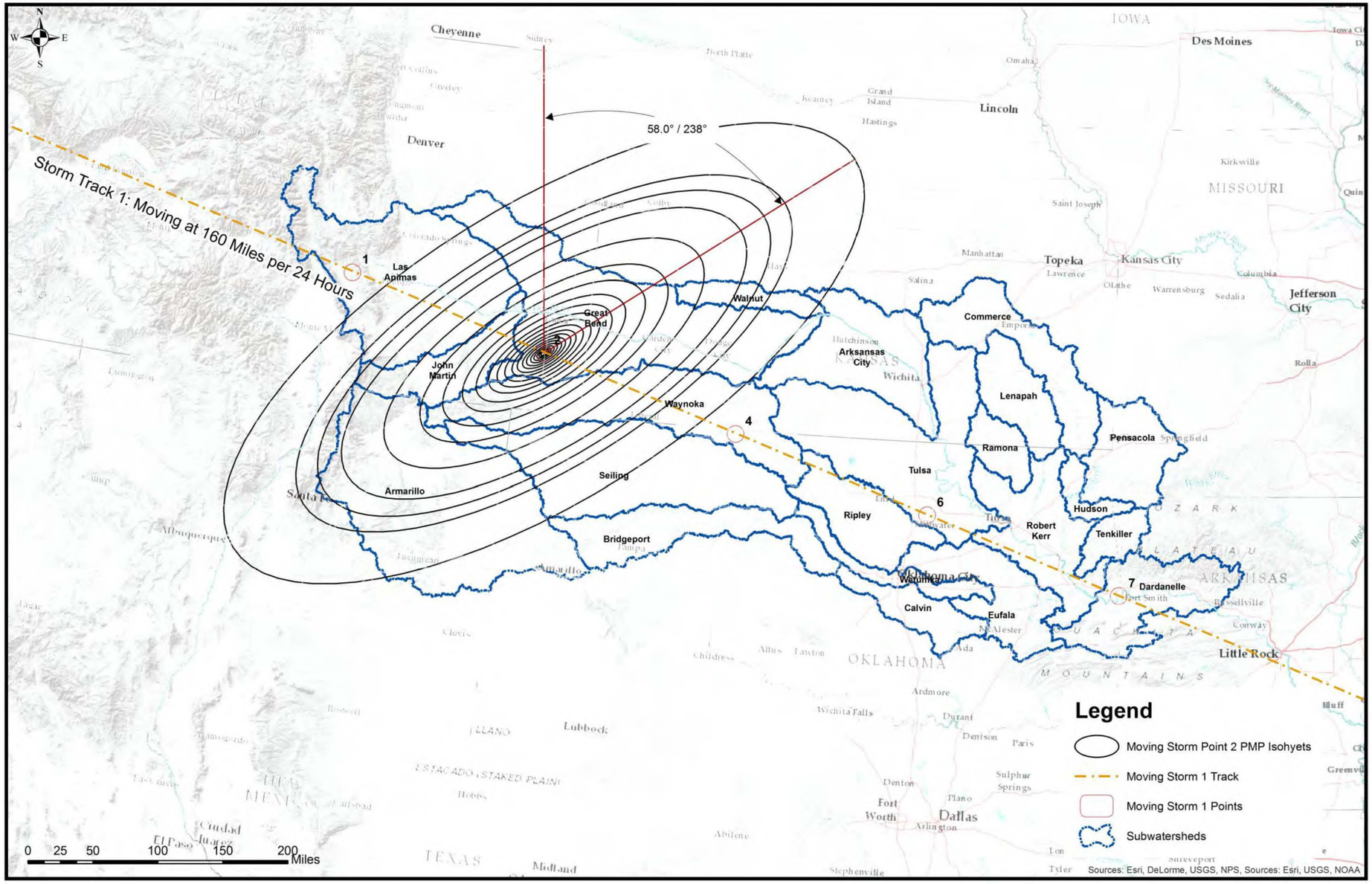

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Figure 15: Moving PMP (160 miles per day) Point 4 Centroid Isohyet Orientation

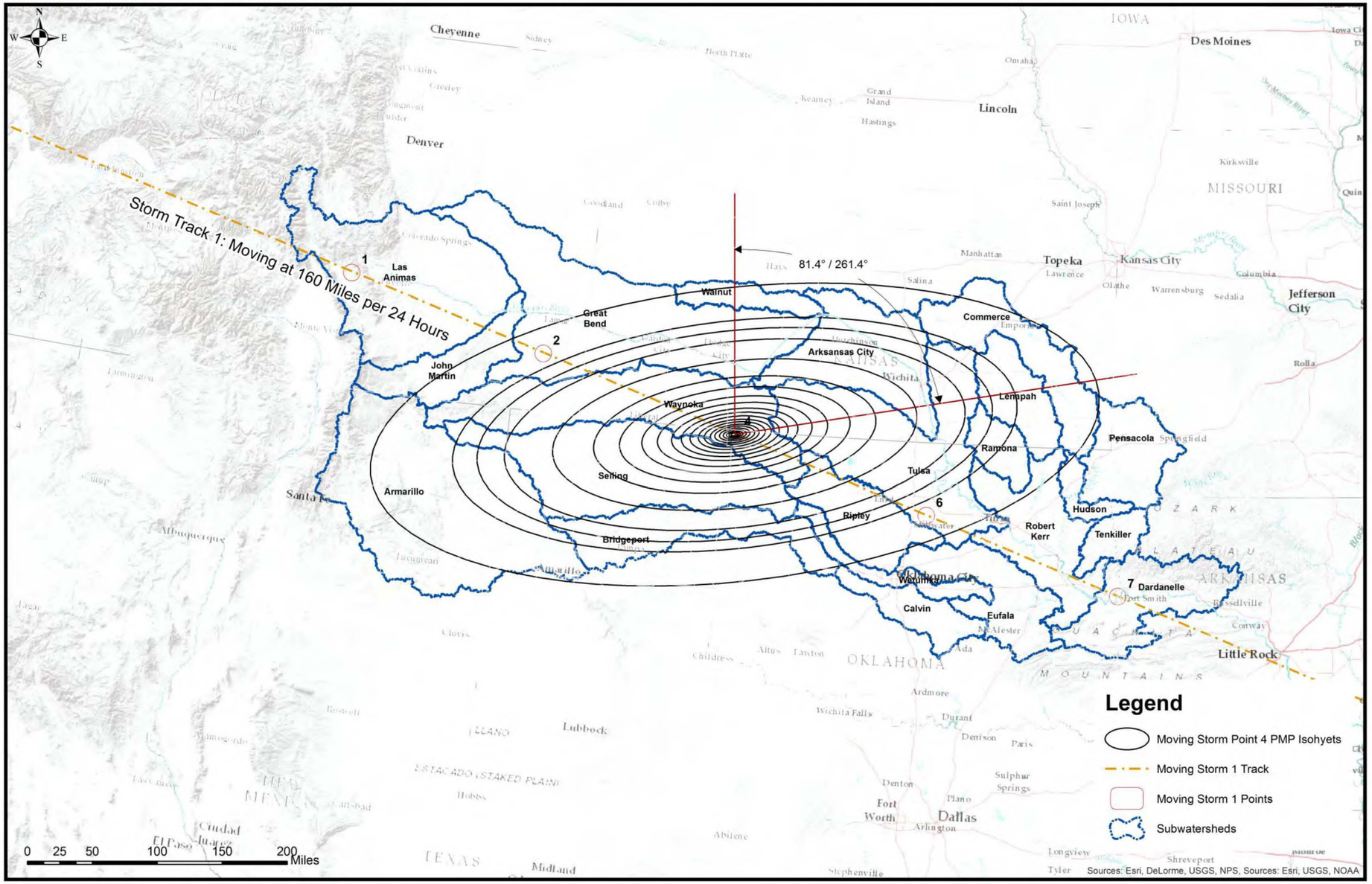

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Figure 16: Moving PMP (160 miles per day) Point 6 Centroid Isohyet Orientation

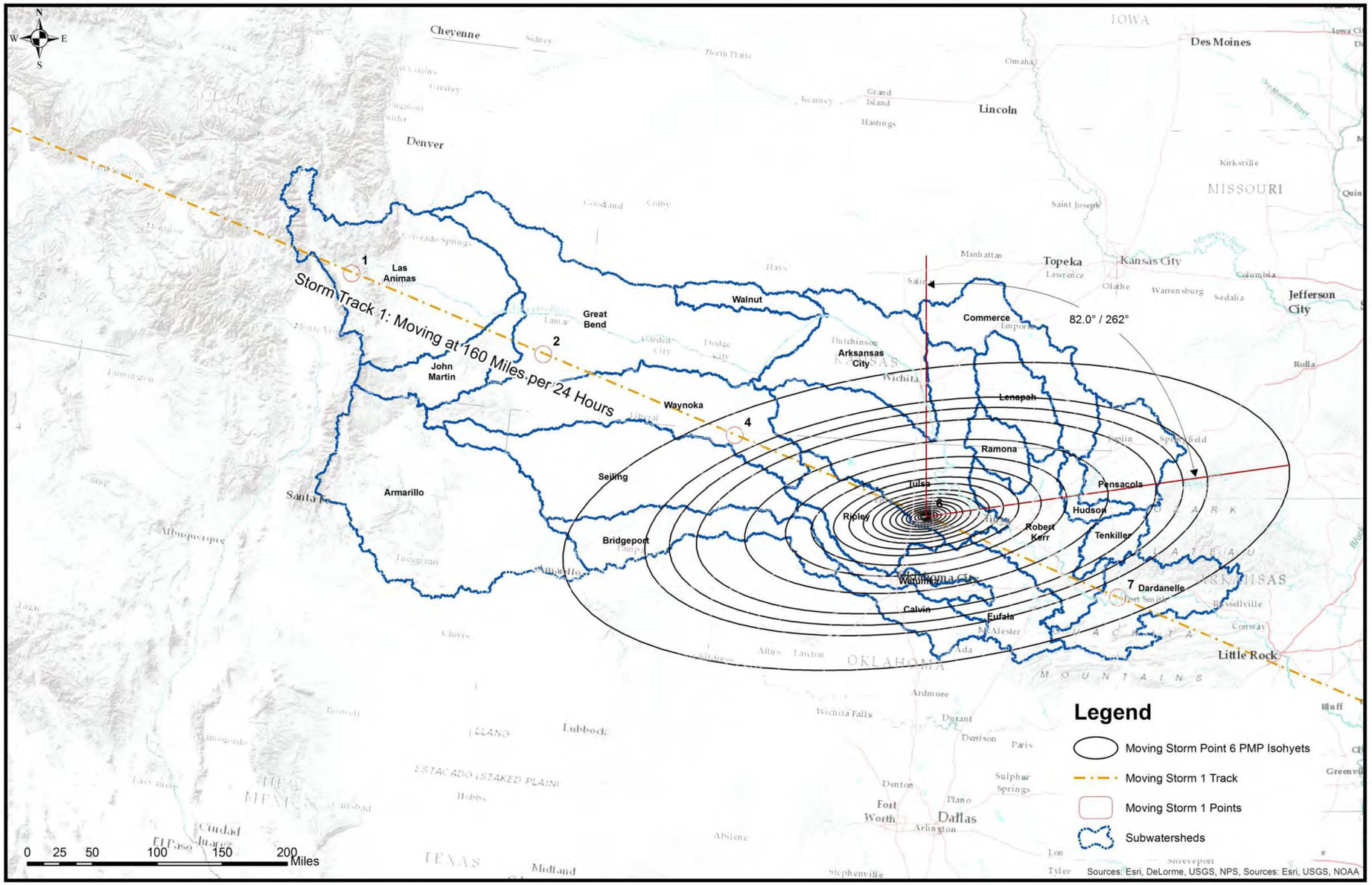

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Figure 17: Moving PMP (160 miles per day) Point 7 Centroid Isohyet Orientation

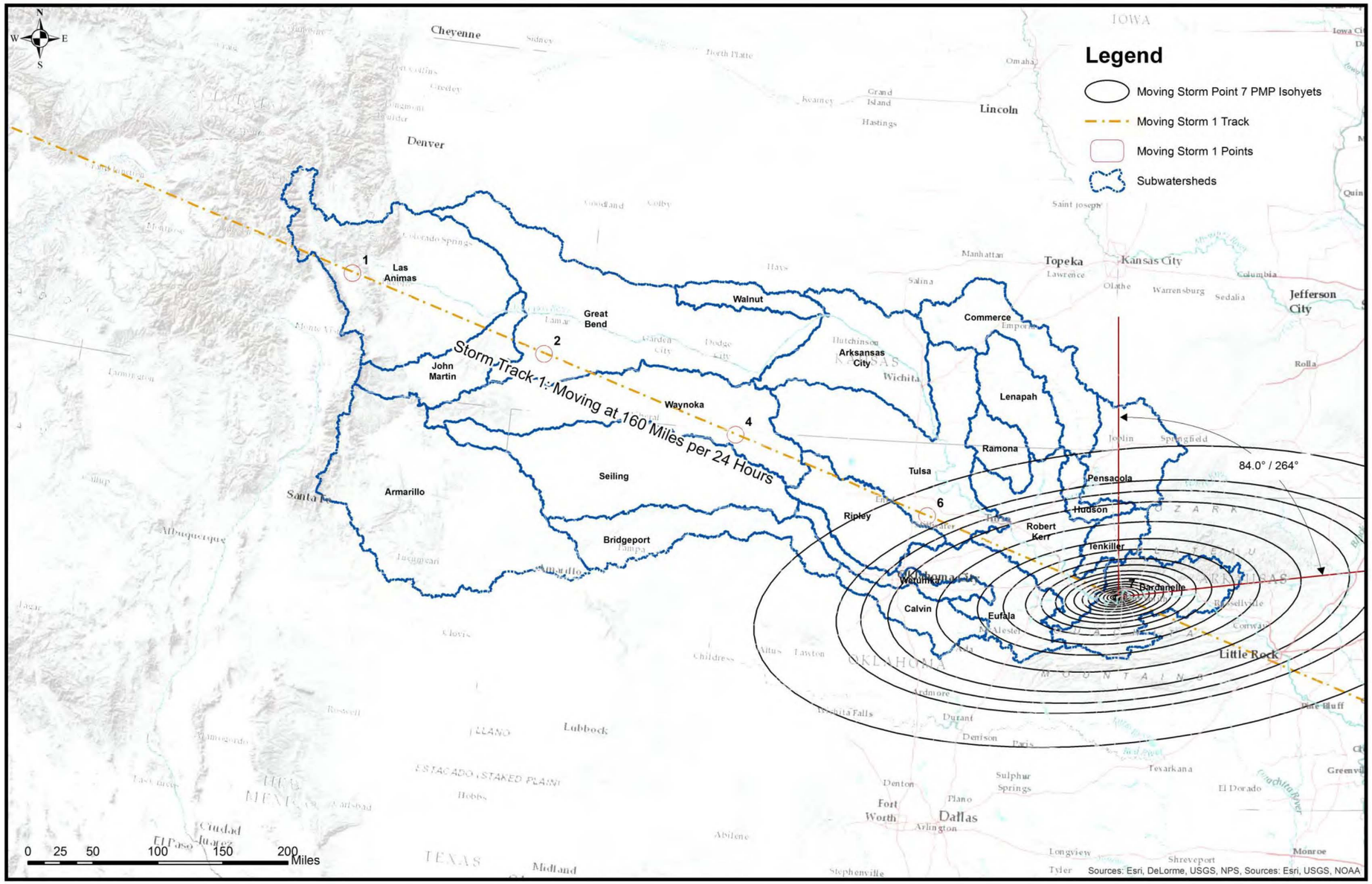

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Figure 18: Moving PMP (80 miles per day) Isohyet Orientation

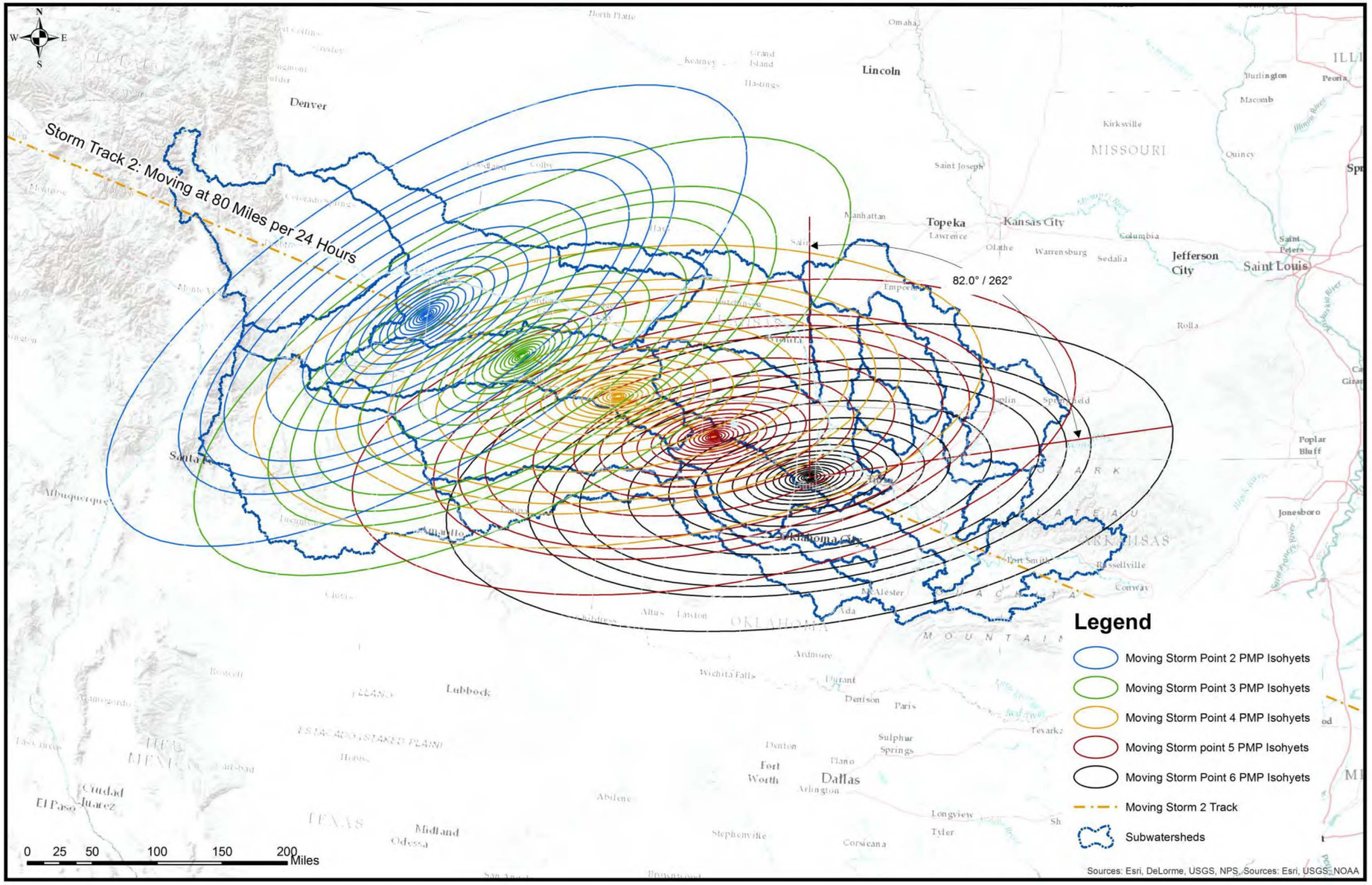

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Figure 19: Moving PMP (80 miles per day) Point 2 Centroid Isohyet Orientation

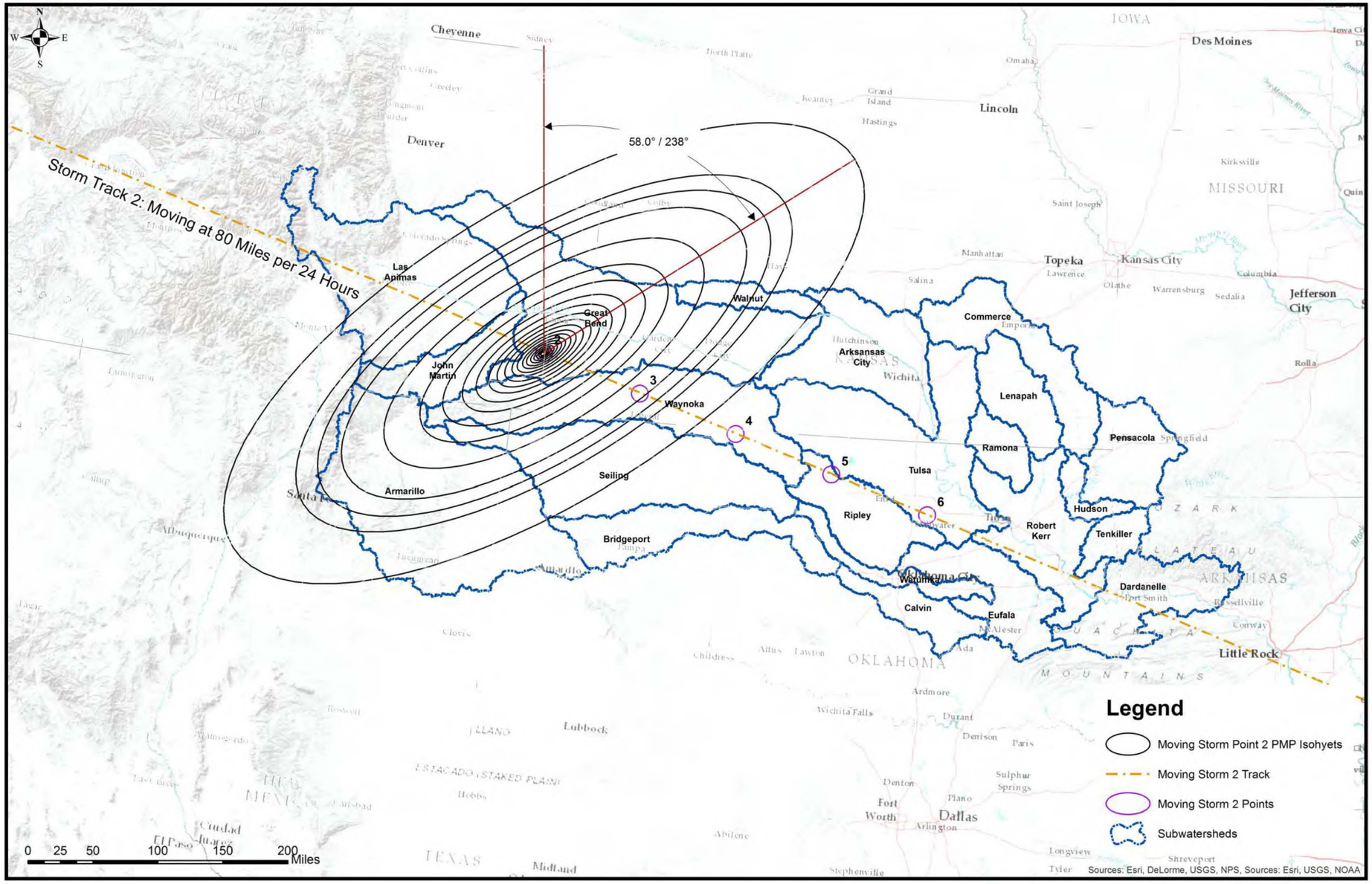

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Figure 20: Moving PMP (80 miles per day) Point 3 Centroid Isohyet Orientation

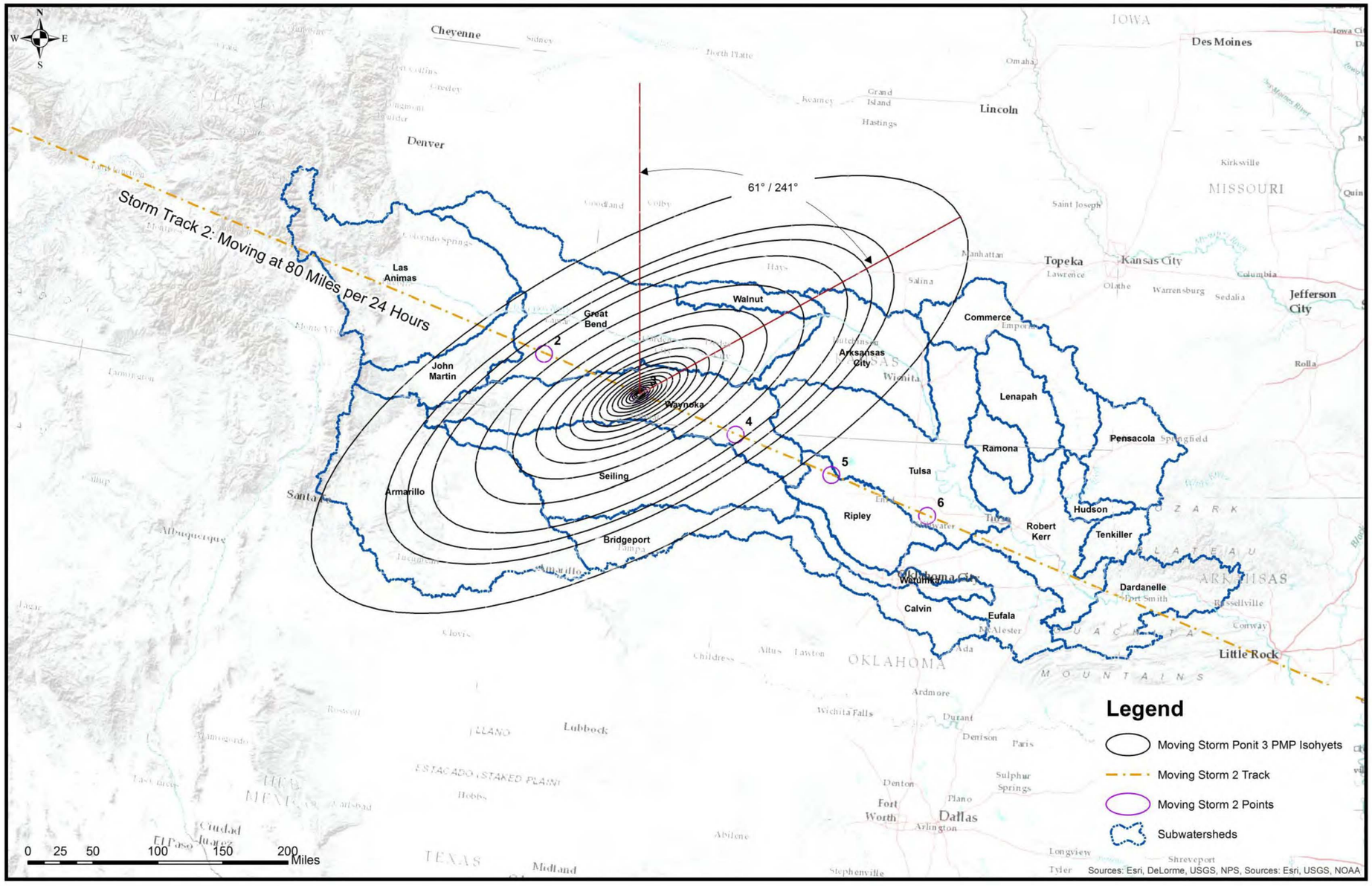

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Figure 21: Moving PMP (80 miles per day) Point 4 Centroid Isohyet Orientation

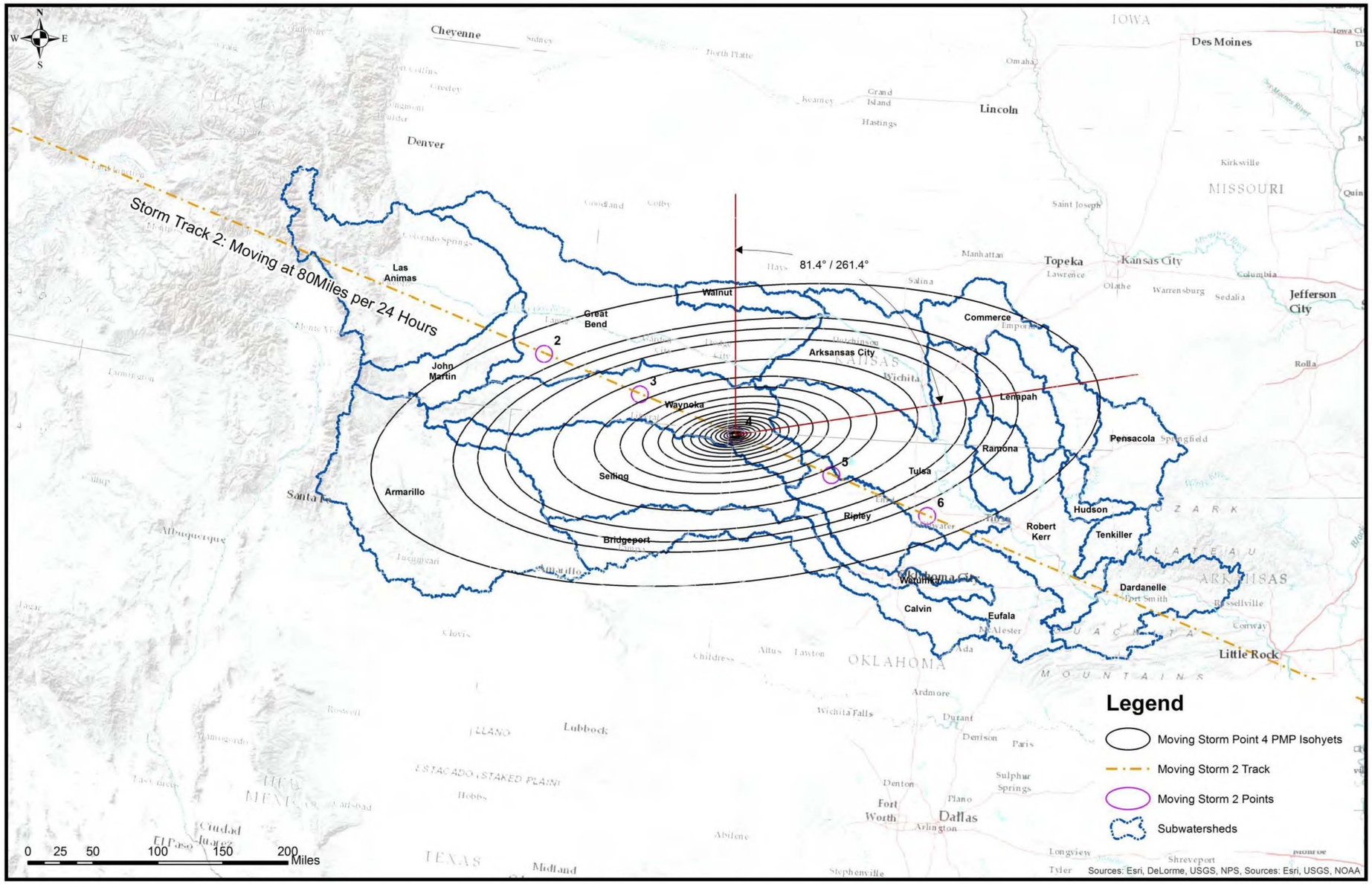

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Figure 22: Moving PMP (80 miles per day) Point 5 Centroid Isohyet Orientation

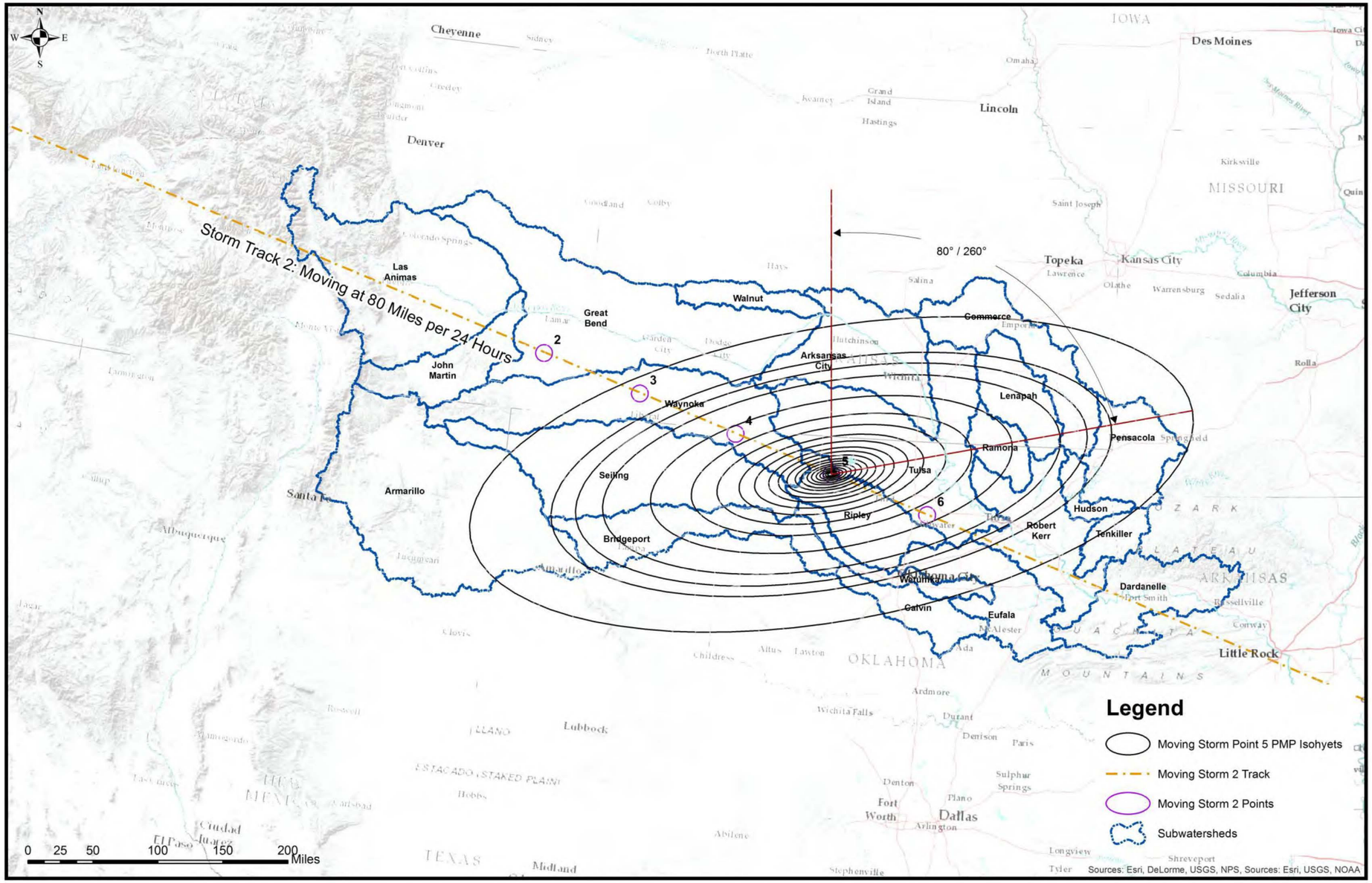

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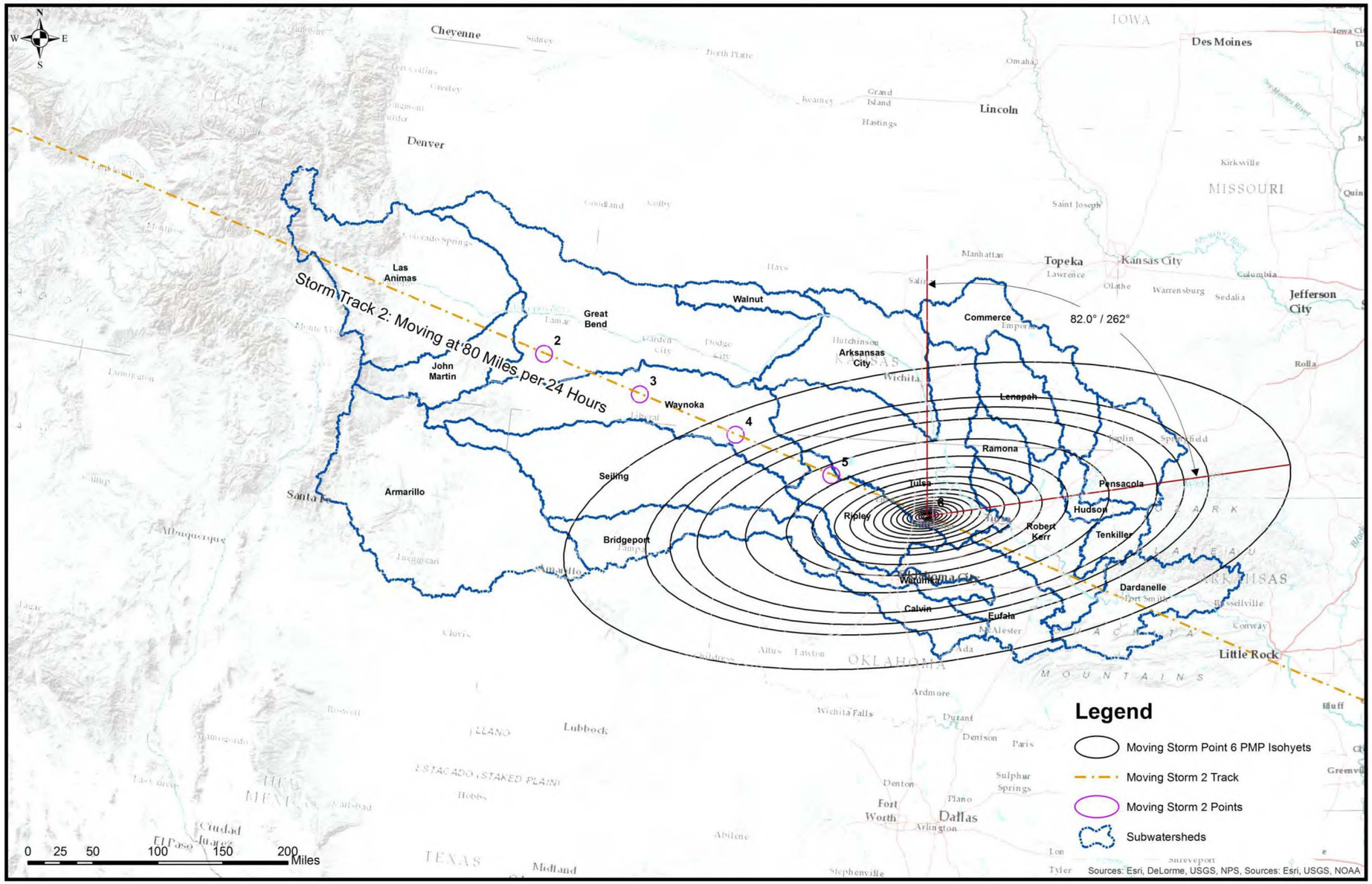
Figure 23: Moving PMP (80 miles per day) Point 6 Centroid Isohyet Orientation



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APPENDIX A: PROBABLE MAXIMUM PRECIPITATION AND LOCAL INTENSE PRECIPITATION ANALYSIS FOR ARKANSAS NUCLEAR ONE

Note: Due to the size of the data in this appendix, the information has been archived in the AREVA file management system, ColdStor.

The path to the file is:

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APPENDIX B: FIGURES FROM HYDROMETEOROLOGICAL REPORT NO.52

Note: Due to the size of the data in this appendix, the information has been archived in the AREVA file management system, ColdStor.

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APPENDIX C: AVERAGE 6-HOUR INCREMENTAL PMP SPREADSHEETS

Note: Due to the size of the data in this appendix, the information has been archived in the AREVA file management system, ColdStor.

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APPENDIX D: EXTRAPOLATED PERCENTAGE OF 6-HOUR PMP INCREMENT HMR-52 BASED NOMOGRAPHS AND TABLES

Figure D1 - Nomograph for 1st 6-hr PMP Increment

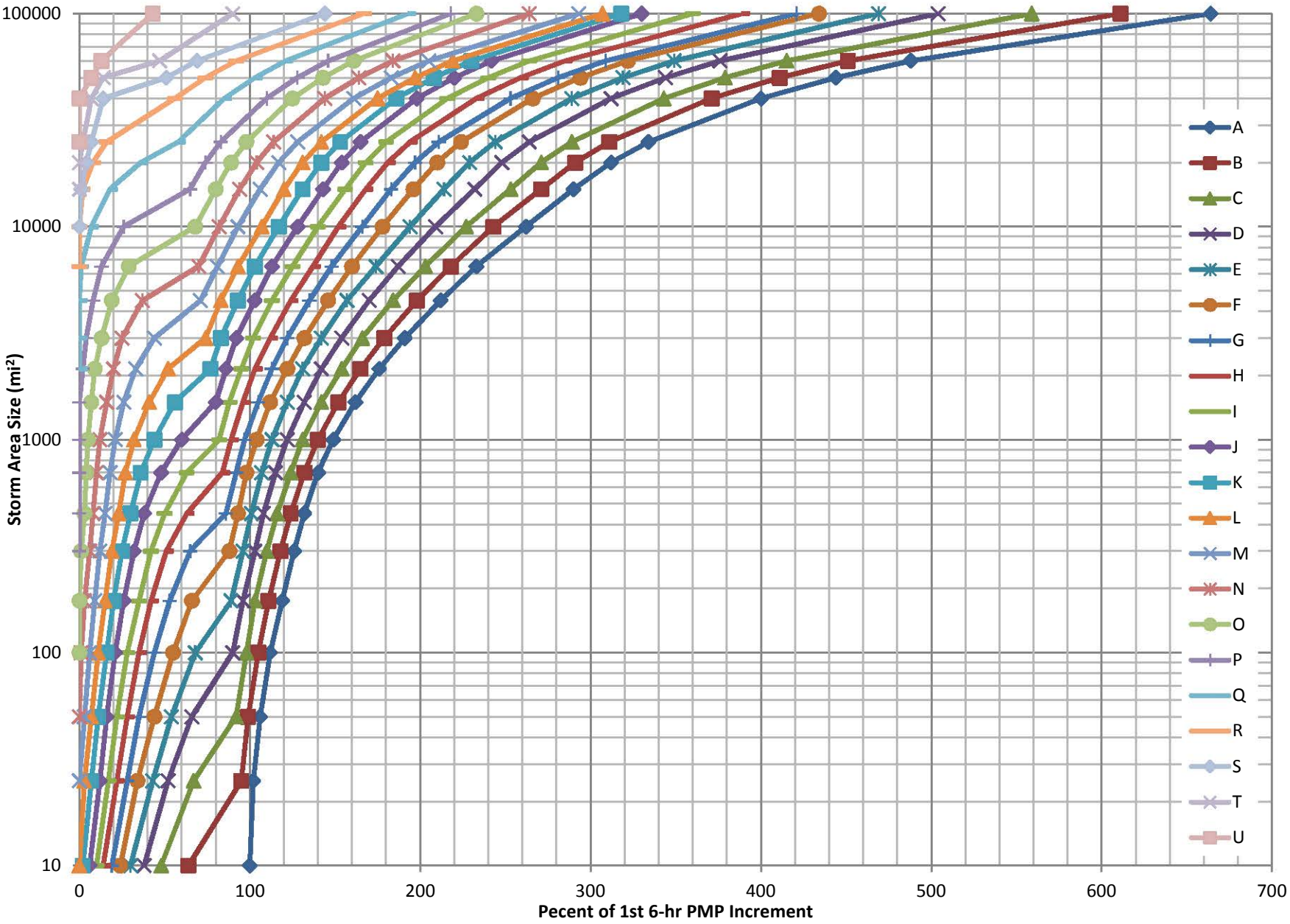


Figure D2 - Nomograph for 2nd 6-hr PMP Increment

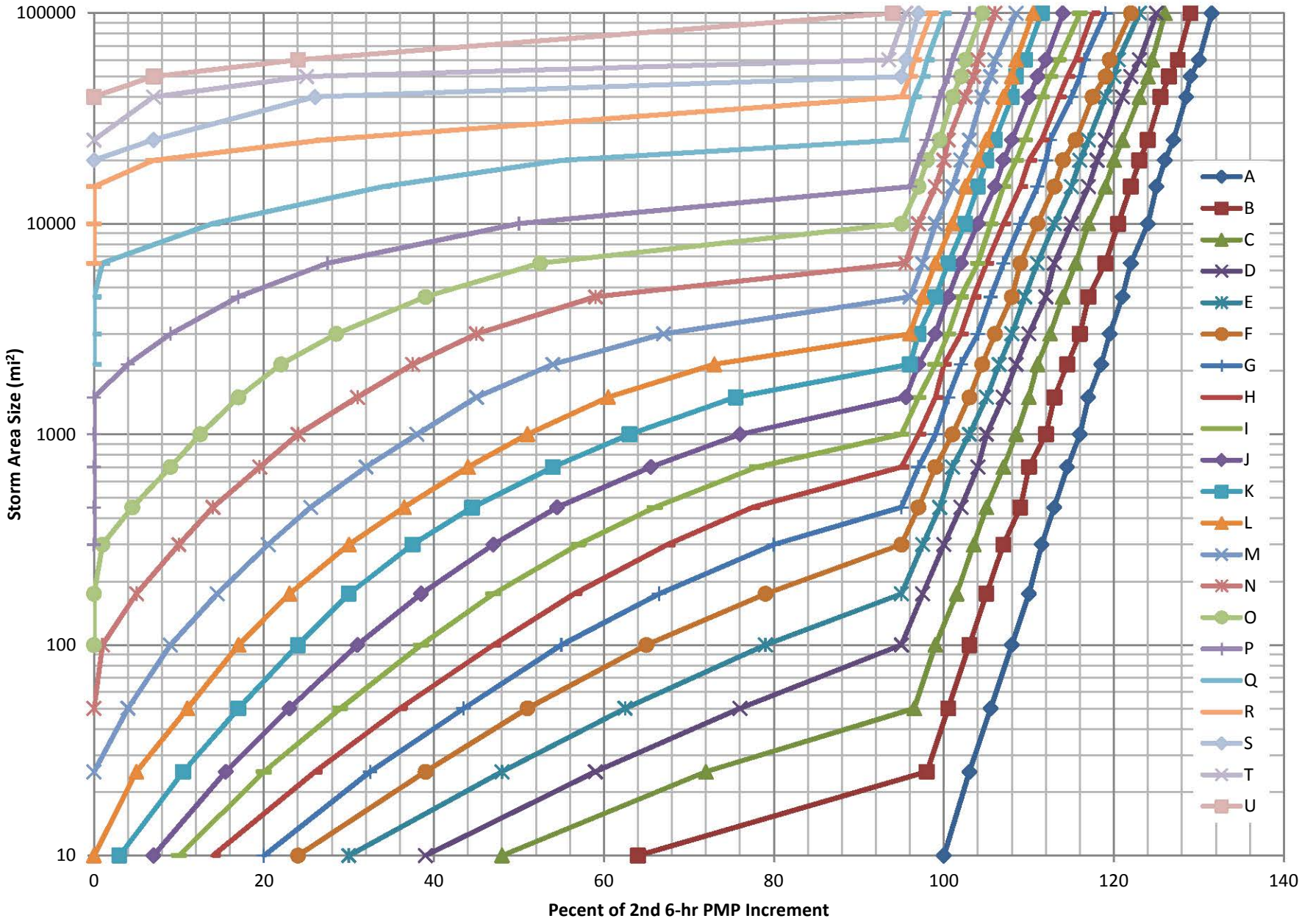


Figure D3 - Nomograph for 3rd 6-hr PMP Increment

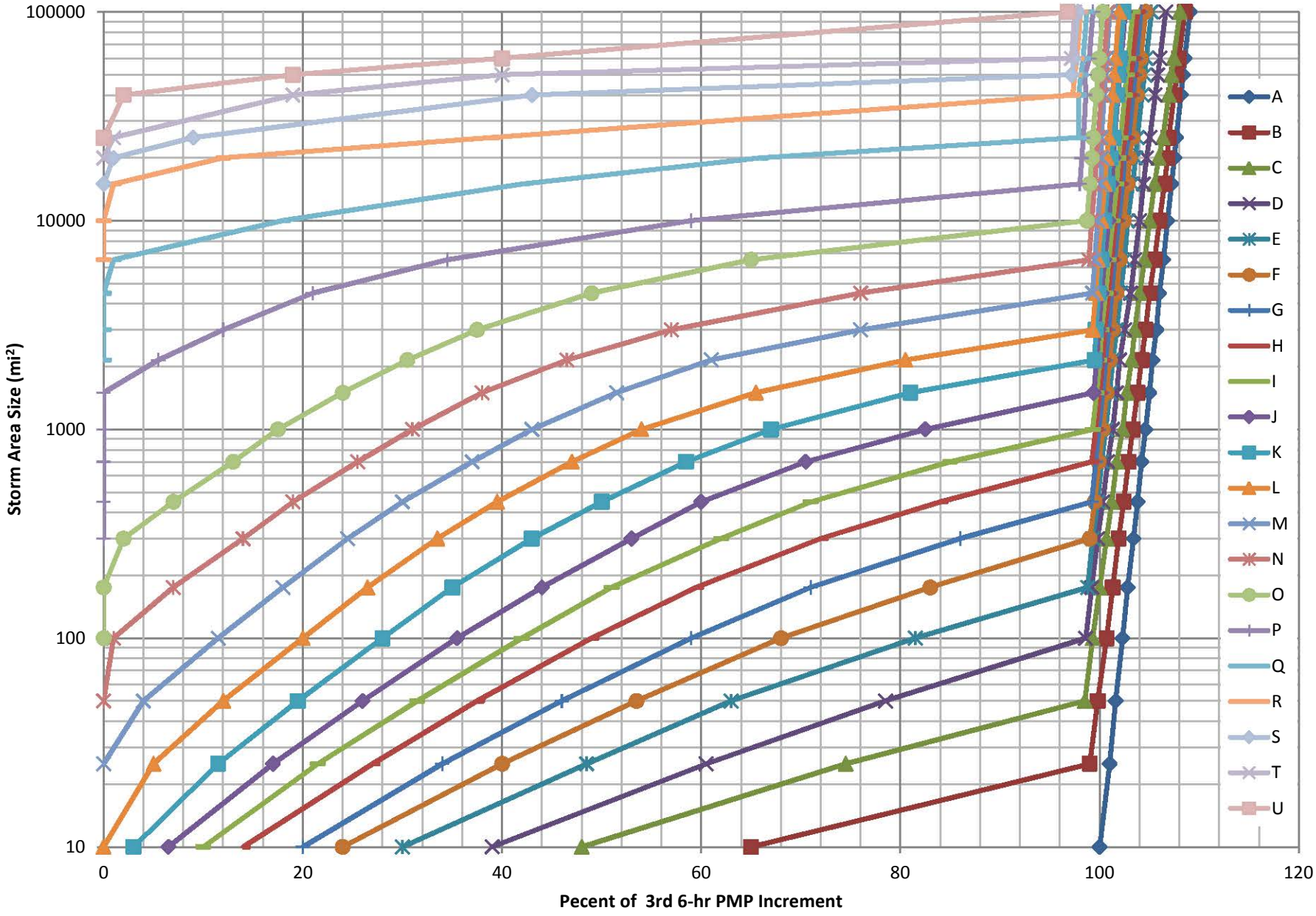
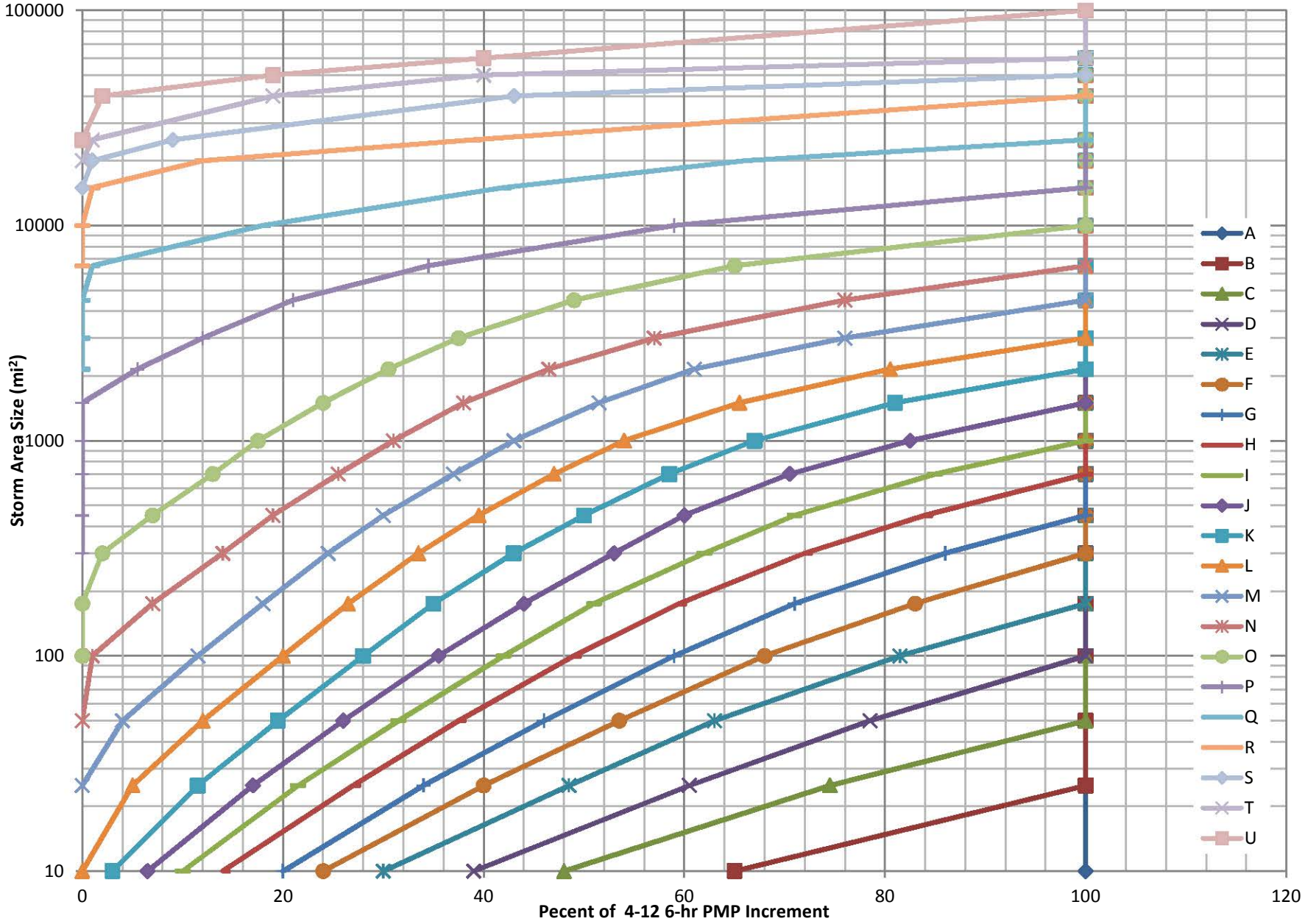


Figure D4 - Nomograph for 4-12 6-hr PMP Increment



		Percentage of 1st 6-Hour PMP Increment Values										
Isohyet Area Size (mi2)	Isohyet	Storm Area Size (mi^2)										
		10	25	50	100	175	300	450	700	1000	1500	2150
10	A	100	102	106	112	119	126	132	140	149	162	176
25	B	64	95	99	105	111	118	124	132	140	152	165
50	C	48	67	92	98	103	110	116	124	131	142	154
100	D	38	52	66	90	96	103	108	115	122	132	142
175	E	30	43	54	68	89	96	101	107	113	122	131
300	F	24	34	44	55	66	88	93	98	104	112	122
450	G	19	28	35	44	53	65	86	92	97	105	113
700	H	14	22	28	35	42	51	63	84	89	96	103
1,000	I	10	17	22	28	35	42	50	63	82	88	95
1,500	J	6	12	16	21	26	32	38	48	60	80	86
2,150	K	2	7	11	16	20	25	30	36	44	56	77
3,000	L	0	3	7	11	15	19	23	27	32	41	52
4,500	M		0	3	6	9	12	15	18	21	26	33
6,500	N			0	1	3	6	8	10	12	16	20
10,000	O				0	0	1	3	4	5	7	9
15,000	P						0	0	0	0	0	2
25,000	Q											0
40,000	R											
50,000	S											
60,000	T											
100,000	U											

		Percentage of 1st 6-Hour PMP Increment Values										
Isohyet Area Size (mi2)	Isohyet	Storm Area Size (mi2)										
		3000	4500	6500	10000	15000	20000	25000	40000	50000	60000	100000
10	A	191	212	233	262	290	312	334	400	444	488	664
25	B	179	198	218	243	271	291	311	371	411	451	611
50	C	166	184	203	227	253	271	289	343	379	415	559
100	D	154	170	187	209	232	248	264	312	344	376	504
175	E	142	157	174	194	214	229	244	289	319	349	469
300	F	132	146	160	178	196	210	224	266	294	322	434
450	G	122	135	148	166	183	197	211	253	281	309	421
700	H	112	124	137	152	168	181	194	233	259	285	389
1,000	I	102	113	125	140	156	168	180	216	240	264	360
1,500	J	92	103	113	128	143	154	165	198	220	242	330
2,150	K	83	93	103	117	131	142	153	186	208	230	318
3,000	L	74	83	93	107	120	131	142	175	197	219	307
4,500	M	44	71	81	93	106	117	128	161	183	205	293
6,500	N	25	37	70	82	94	104	114	144	164	184	264
10,000	O	13	19	29	68	80	89	98	125	143	161	233
15,000	P	4	8	13	26	65	74	83	110	128	146	218
25,000	Q	0	0	1	7	18	36	58	85	103	121	193
40,000	R			0	0	2	8	16	56	74	92	167
50,000	S				0	1	4	7	14	51	69	144
60,000	T					0	0	2	7	14	47	90
100,000	U							0	0	7	13	43

		Percentage of 2nd 6-Hour PMP Increment Values										
Isohyet Area Size (mi2)	Isohyet	Storm Area Size (mi^2)										
		10	25	50	100	175	300	450	700	1000	1500	2150
10	A	100	103	105.5	108	110	111.5	113	114.5	116	117	118.5
25	B	64	98	100.5	103	105	107	109	110	112	113	114.5
50	C	48	72	96.5	99	101.5	103.5	105	107	108.5	110	111
100	D	39	59	76	95	97.5	100	102	104	105	107	108.5
175	E	30	48	62.5	79	95	97.5	99.5	101	103	105	106.5
300	F	24	39	51	65	79	95	97	99	101	103	104.5
450	G	20	32.5	43.5	55	66.5	80	95	97	99	100.5	102
700	H	14	26	36	47	56.5	67.5	77.5	95	97	99	100
1,000	I	10	20	29	38.5	47	57	66	78	95	97	99
1,500	J	7	15.5	23	31	38.5	47	54.5	65.5	76	95.5	97
2,150	K	3	10.5	17	24	30	37.5	44.5	54	63	75.5	96
3,000	L	0	5	11	17	23	30	36.5	44	51	60.5	73
4,500	M		0	4	9	14.5	20.5	25.5	32	38	45	54
6,500	N			0	1	5	10	14	19.5	24	31	37.5
10,000	O				0	0	1	4.5	9	12.5	17	22
15,000	P						0	0	0	0	0	4
25,000	Q											0
40,000	R											
50,000	S											
60,000	T											
100,000	U											

		Percentage of 2nd 6-Hour PMP Increment Values										
Isohyet Area Size (mi2)	Isohyet	Storm Area Size (mi^2)										
		3000	4500	6500	10000	15000	20000	25000	40000	50000	60000	100000
10	A	119.5	121	122	124	125	126	127	128.5	129	130	131.5
25	B	116	117	119	120.5	122	123	124	125.5	126.5	127.5	129
50	C	112.5	114	115.5	117	119	120	121	123	124	124.5	126
100	D	110	112	113	115	117	118	119	121	122	123	125
175	E	108	109.5	111	113	115	116	117	119	120	120.5	123
300	F	106	108	109	111	113	114	115.5	117.5	119	119.5	122
450	G	104	105.5	107	109	111	112	112.5	115	116	116.5	119
700	H	102	103.5	105	107	109	110	111.5	113.5	114.5	115.5	117.5
1,000	I	100.5	102	104	105.5	107	108.5	109.5	111.5	112.5	113.5	116
1,500	J	99	100.5	102	104	106	107	108	110	111	112	114
2,150	K	97	99	100.5	102.5	104	105	106	108	108.5	109.5	111.5
3,000	L	96	97.5	99	101	102.5	104	105	107	108	108.5	110.5
4,500	M	67	96	97.5	99	101	102	103	104.5	105.5	106	108.5
6,500	N	45	59	95.5	97	99	100	100.5	102.5	103.5	104	106
10,000	O	28.5	39	52.5	95	97	98	99.5	101	102	102.5	104.5
15,000	P	9	17	27.5	50	96	97	98	99.5	100.5	101	103
25,000	Q	0	0	1	14	34	55	95	96.5	97.5	98	100
40,000	R			0	0	0	7	27.0	95	96	96.5	98.5
50,000	S						0	7	26	95	95.5	97
60,000	T							0	7	25	93.5	95.5
100,000	U								0	7	24	94

		Percentage of 3rd 6-Hour PMP Increment Values									
Isohyet Area Size		Storm Area Size (mi^2)									
(mi2)	Isohyet	25	50	100	175	300	450	700	1000	1500	2150
10	A	101	101.6	102.3	102.8	103.4	103.8	104.2	104.6	105	105.3
25	B	99	99.8	100.7	101.3	101.9	102.4	102.9	103.3	103.8	104.2
50	C	74.5	98.5	99.3	100	100.7	101.2	101.7	102.3	102.7	103.2
100	D	60.5	78.5	98.6	99.2	99.8	100.3	100.8	101.3	101.7	102
175	E	48.5	63	81.5	98.8	99.3	99.8	100.2	100.6	101	101.3
300	F	40	53.5	68	83	99	99.5	99.9	100.3	100.7	101
450	G	34	46	59	71	86	99.2	99.6	99.9	100.3	100.6
700	H	27	37.5	49	59.5	72	84	99.2	99.6	100	100.3
1,000	I	21.5	31.5	42	51	62	71	85	99.3	99.7	100
1,500	J	17	26	35.5	44	53	60	70.5	82.5	99.4	99.7
2,150	K	11.5	19.5	28	35	43	50	58.5	67	81	99.5
3,000	L	5	12	20	26.5	33.5	39.5	47	54	65.5	80.5
4,500	M	0	4	11.5	18	24.5	30	37	43	51.5	61
6,500	N		0	1	7	14	19	25.5	31	38	46.5
10,000	O			0	0	2	7	13	17.5	24	30.5
15,000	P					0	0	0	0	0	5.5
25,000	Q										0
40,000	R										
50,000	S										
60,000	T										
100,000	U										

		Percentage of 3rd 6-Hour PMP Increment Values										
Isohyet Area Size		Storm Area Size (mi^2)										
(mi2)	Isohyet	3000	4500	6500	10000	15000	20000	25000	40000	50000	60000	100000
10	A	105.7	106	106.4	106.8	107.2	107.5	107.7	108.1	108.4	108.5	109.1
25	B	104.6	105	105.5	106	106.5	106.8	106.9	107.5	107.7	107.9	108.5
50	C	103.5	104	104.5	105	105.5	105.9	106.4	106.9	107.2	107.4	108.1
100	D	102.5	103.1	103.5	104	104.4	104.7	105.0	105.6	105.8	106.0	106.6
175	E	101.7	102.1	102.5	102.8	103.3	103.6	103.8	104.3	104.5	104.7	105.2
300	F	101.3	101.7	102	102.4	102.8	103	103.3	103.7	104.0	104.1	104.6
450	G	100.9	101.2	101.5	101.9	102.3	102.5	102.9	103.3	103.5	103.7	104.1
700	H	100.5	100.9	101.2	101.6	102	102.2	102.6	103.0	103.2	103.4	103.8
1,000	I	100.2	100.6	100.9	101.3	101.7	101.9	102.1	102.5	102.7	102.9	103.3
1,500	J	99.9	100.2	100.5	100.9	101.2	101.4	101.5	101.8	102.0	102.2	102.6
2,150	K	99.6	99.9	100.2	100.5	100.8	101.1	101.4	101.8	101.9	102.1	102.4
3,000	L	99.3	99.6	99.8	100.2	100.5	100.7	100.9	101.3	101.4	101.6	102.0
4,500	M	76	99.3	99.5	99.8	100.1	100.2	100.2	100.4	100.6	100.7	101.0
6,500	N	57	76	98.9	99.2	99.5	99.7	99.8	100.2	100.3	100.5	100.8
10,000	O	37.5	49	65	98.7	99	99.2	99.3	99.7	99.8	99.9	100.3
15,000	P	12	21	34.5	59	98	98.2	98.4	98.6	98.5	99.0	99.3
25,000	Q	0	0	1	18	42	66	97.9	97.9	98.1	98.3	98.7
40,000	R			0	0	1	12	39	97.3	97.5	97.7	98.1
50,000	S					0	1	9.0	43.0	97.2	97.4	97.8
60,000	T						0	1	19	40	97.2	97.5
100,000	U							0	2	19	40	96.8

		Percentage of 4th - 12th 6-Hour PMP Increment Values										
Isohyet Area Size (mi2)	Isohyet	Storm Area Size (mi^2)										
		10	25	50	100	175	300	450	700	1000	1500	2150
10	A	100	100	100	100	100	100	100	100	100	100	100
25	B	65	100	100	100	100	100	100	100	100	100	100
50	C	48	74.5	100	100	100	100	100	100	100	100	100
100	D	39	60.5	78.5	100	100	100	100	100	100	100	100
175	E	30	48.5	63	81.5	100	100	100	100	100	100	100
300	F	24	40	53.5	68	83	100	100	100	100	100	100
450	G	20	34	46	59	71	86	100	100	100	100	100
700	H	14	27	37.5	49	59.5	72	84	100	100	100	100
1,000	I	10	21.5	31.5	42	51	62	71	85	100	100	100
1,500	J	6.5	17	26	35.5	44	53	60	70.5	82.5	100	100
2,150	K	3	11.5	19.5	28	35	43	50	58.5	67	81	100
3,000	L	0	5	12	20	26.5	33.5	39.5	47	54	65.5	80.5
4,500	M		0	4	11.5	18	24.5	30	37	43	51.5	61
6,500	N			0	1	7	14	19	25.5	31	38	46.5
10,000	O				0	0	2	7	13	17.5	24	30.5
15,000	P						0	0	0	0	0	5.5
25,000	Q											0
40,000	R											
50,000	S											
60,000	T											
100,000	U											

		Percentage of 4th - 12th 6-Hour PMP Increment Values										
Isohyet Area Size (mi2)	Isohyet	Storm Area Size (mi^2)										
		3000	4500	6500	10000	15000	20000	25000	40000	50000	60000	100000
10	A	100	100	100	100	100	100	100	100	100	100	100
25	B	100	100	100	100	100	100	100	100	100	100	100
50	C	100	100	100	100	100	100	100	100	100	100	100
100	D	100	100	100	100	100	100	100	100	100	100	100
175	E	100	100	100	100	100	100	100	100	100	100	100
300	F	100	100	100	100	100	100	100	100	100	100	100
450	G	100	100	100	100	100	100	100	100	100	100	100
700	H	100	100	100	100	100	100	100	100	100	100	100
1,000	I	100	100	100	100	100	100	100	100	100	100	100
1,500	J	100	100	100	100	100	100	100	100	100	100	100
2,150	K	100	100	100	100	100	100	100	100	100	100	100
3,000	L	100	100	100	100	100	100	100	100	100	100	100
4,500	M	76	100	100	100	100	100	100	100	100	100	100
6,500	N	57	76	100	100	100	100	100	100	100	100	100
10,000	O	37.5	49	65	100	100	100	100	100	100	100	100
15,000	P	12	21	34.5	59	100	100	100	100	100	100	100
25,000	Q	0	0	1	18	42	66	100.0	100	100	100	100
40,000	R			0	0	1	12	39	100.0	100	100	100
50,000	S					0	1	9	43	100	100	100
60,000	T						0	1	19	40	100	100
100,000	U							0	2	19	40	100

APPENDIX E: FIGURE 16, 18, 19 AND 20, TABLE 15, 16, 17 AND 18, HYDROMETEOROLOGICAL REPORT NO.52

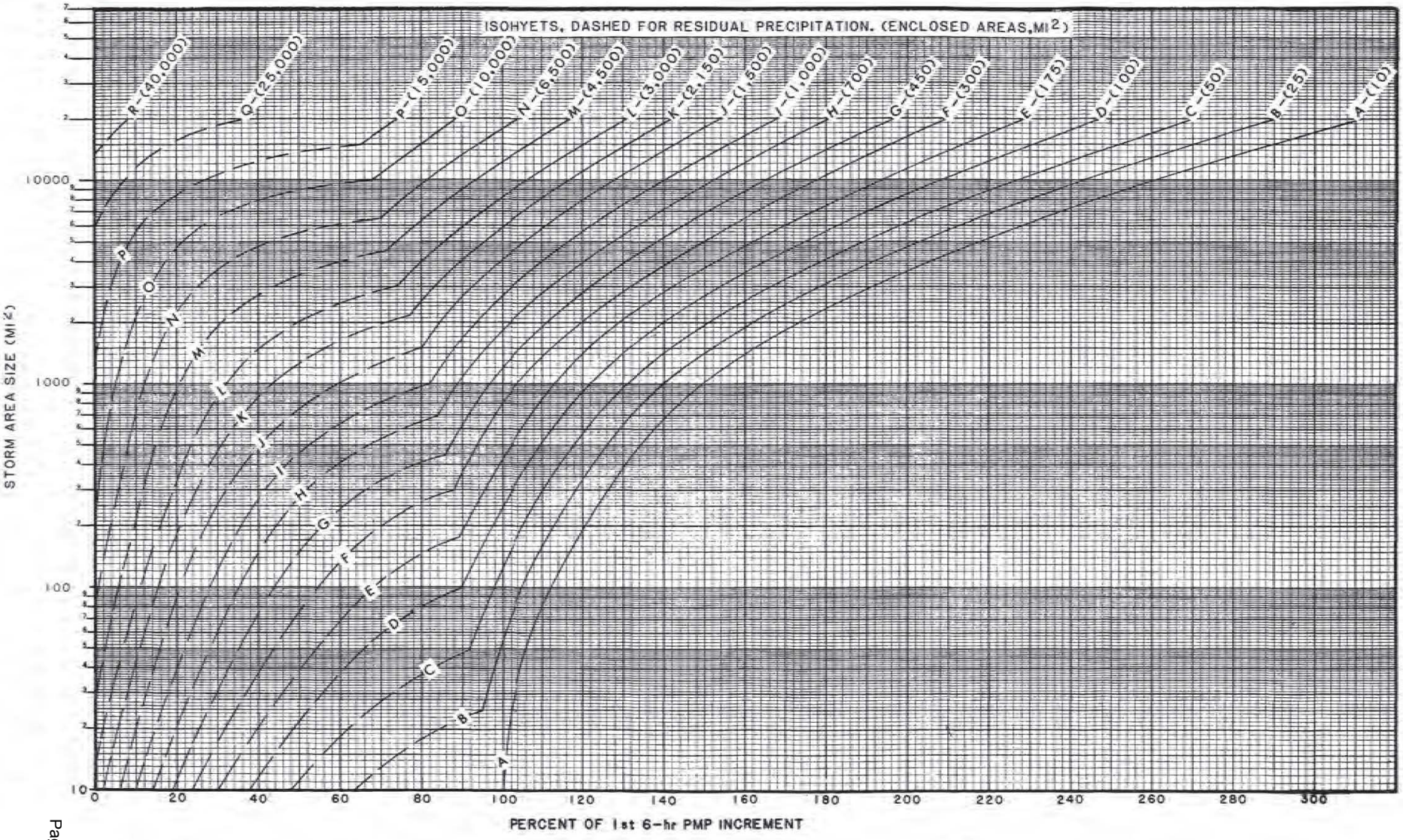


Figure 16.—Nomogram for the 1st 6-hr PMP increment and for standard isohyet area sizes between 10 and 40,000 mi^2.

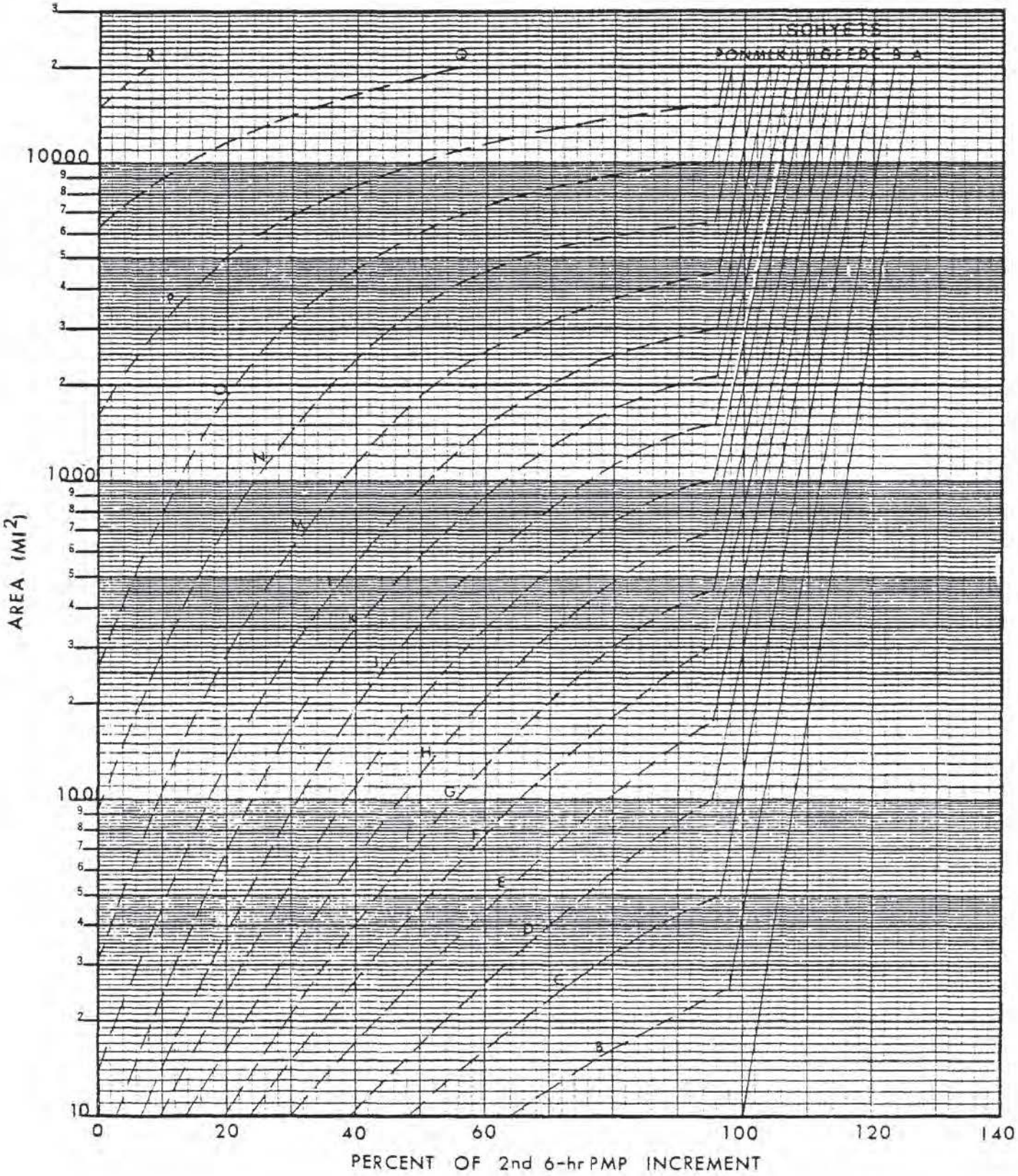


Figure 18.—Nomogram for the 2nd 6-hr PMP increment and for standard isohyet area sizes between 10 and 40,000 mi^2.

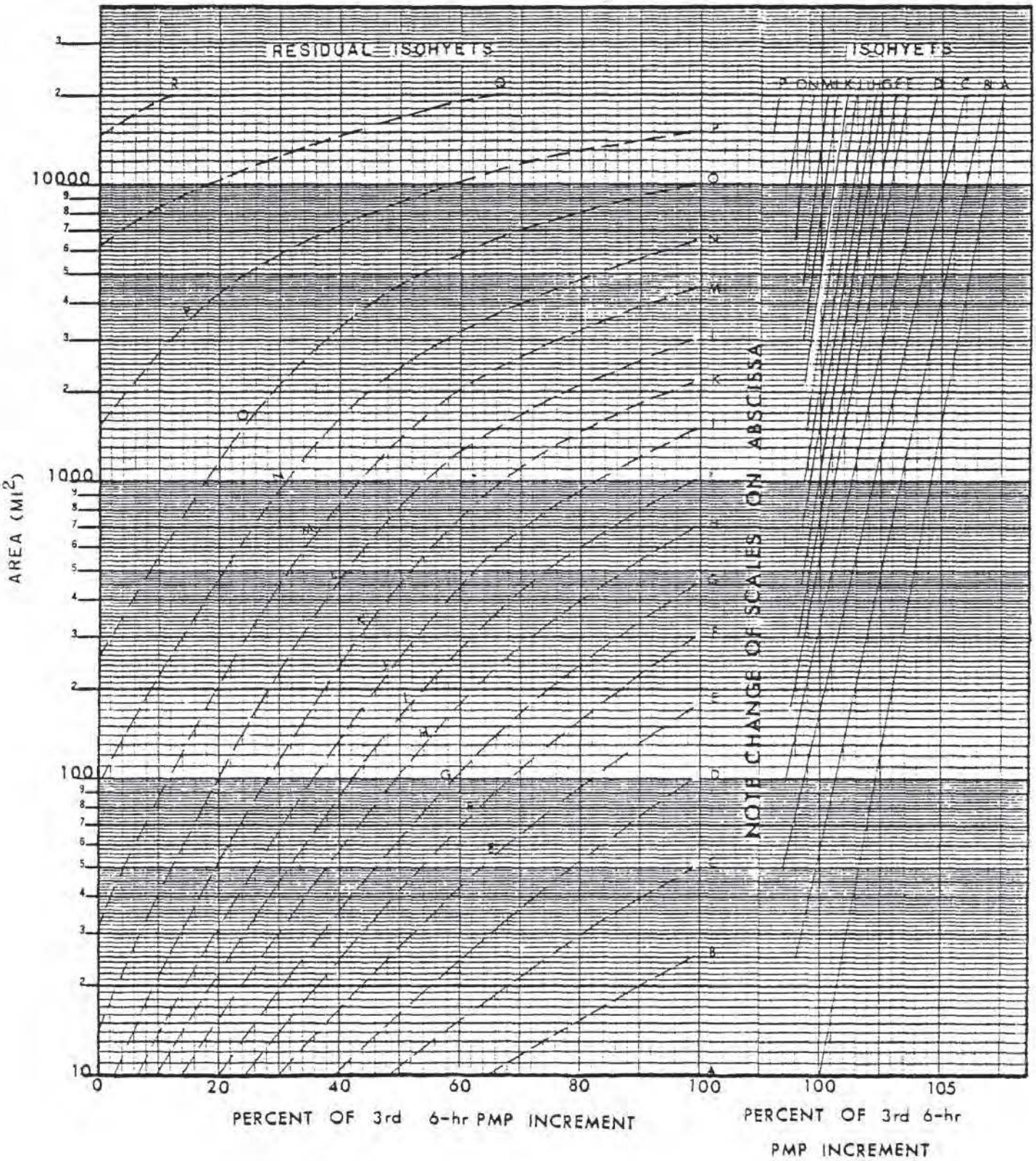


Figure 19.—Nomogram for the 3rd 6-hr PMP increment and for standard isohyet area sizes between 10 and 40,000 mi^2.

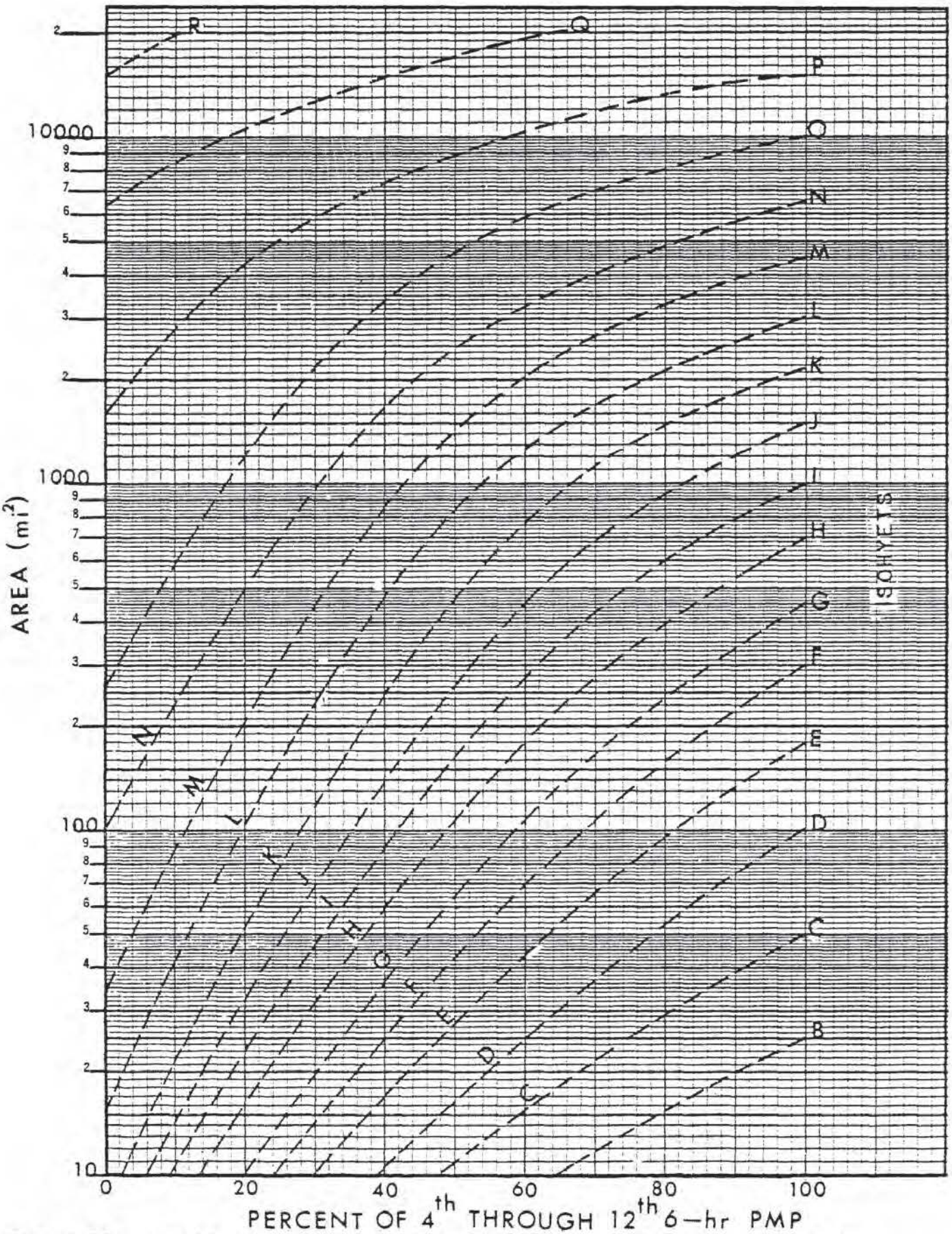


Figure 20.—Nomograms for the 4th through 12th 6-hr PMP increments and for standard isohyet area sizes between 10 and 40,000 mi^2.

Table 15.--1st 6-hr nomogram values at selected area sizes

Isohyet	Storm Area (mi^2) size											
	10	17	25	35	50	75	100	140	175	220	300	360
A	100*	101	102	104	106	109	112	116	119	122	126	129
B	64	78	95*	97	99	102	105	108	111	114	118	121
C	48	58	67	77	92*	95	98	101	103	106	110	113
D	38	46	52	59	66	77	90*	93	96	99	103	105
E	30	37	43	48	54	62	68	78	89*	92	96	98
F	24	30	34	39	44	50	55	61	66	73	88*	90
G	19	24	28	32	35	40	44	49	53	58	65	73
H	14	19	22	25	28	32	35	39	42	46	51	56
I	10	14	17	19	22	26	28	32	34	37	42	45
J	6	9	12	14	16	19	21	24	26	28	32	35
K	2	5	7	9	11	14	16	18	20	22	25	27
L	0	1	3	5	7	9	11	13	15	17	19	21
M		0	0	1	3	5	6	8	9	10	12	13
N				0	0	0	1	2	3	4	6	7
O							0	0	0	0	1	2
P											0	0

*Indicates cusp.

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Table 15.--1st 6-hr nomogram values at selected area sizes - Continued

Isohyet	Storm area (mi^2) size											
	450	560	700	850	1000	1200	1500	1800	2150	2600	3000	3800
A	132	136	140	145	149	155	162	169	176	184	191	203
B	124	128	132	136	140	145	152	158	165	172	179	189
C	116	120	124	128	131	136	142	147	154	160	166	176
D	108	111	115	119	122	126	132	137	142	148	154	163
E	101	104	107	110	113	116	122	126	131	137	142	150
F	93	95	98	101	104	107	112	117	122	127	132	140
G	86*	89	92	94	97	100	105	108	113	118	122	130
H	63	72	84*	87	89	92	96	99	103	108	112	119
I	50	56	63	72	82*	85	88	91	95	99	102	108
J	38	43	48	54	60	68	80*	83	86	89	92	98
K	30	33	36	40	44	49	56	64	77*	80	83	89
L	23	25	27	30	32	35	41	46	52	62	74*	79
M	15	16	18	19	21	23	26	29	33	38	44	56
N	8	9	10	11	12	14	16	18	20	22	25	31
O	3	3	4	4	5	6	7	8	9	11	13	15
P	0	0	0	0	0	0	0	1	2	3	4	6
Q								0	0	0	0	0

*Indicates cusp

Table 15.--1st 6-hr nomogram values at selected area sizes - Continued

Isohyet	Storm area (mi^2) size								
	4500	5500	6500	8000	10000	12000	15000	18000	20000
A	212	223	233	247	262	274	290	304	312
B	198	209	218	230	243	255	271	283	291
C	184	194	203	214	227	238	253	264	271
D	170	180	187	198	209	219	232	242	248
E	157	166	174	183	194	203	214	224	229
F	146	153	160	169	178	186	196	205	210
G	135	142	148	157	166	174	183	192	197
H	124	131	137	144	152	159	168	176	181
I	113	119	125	132	140	147	156	164	168
J	103	108	113	120	128	135	143	150	154
K	93	98	103	110	117	123	131	138	142
L	83	88	93	99	107	113	120	127	131
M	71*	76	81	87	93	99	106	113	117
N	37	48	70*	75	82	87	94	101	104
O	19	23	29	40	68*	73	80	86	89
P	8	10	13	18	26	38	65*	71	74
Q	0	0	1	3	7	11	18	28	36
R			0	0	0	0	2	6	8
S							0	0	0

*Indicates cusp

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Table 16.--2nd 6-hr nomogram values at selected area sizes

Isohyet	Storm area (mi^2) size											
	10	17	25	35	50	75	100	140	175	220	300	360
A	100*	102	103	104	105.5	107	108	109	110	110.5	111.5	112
B	64	81.5	98*	99	100.5	102	103	104	105	106	107	108
C	48	61	72	82	96.5*	98	99	100.5	101.5	102.5	103.5	104
D	39	50	59	66.5	76	86	95*	96.5	97.5	98.5	100	101
E	30	40	48	54.5	62.5	72	79	88	95*	96	97.5	98.5
F	24	32	39	44.5	51	59.5	65	73	79	85	95*	96
G	20	27	32.5	37.5	43.5	50	55	62	66.5	72	80	85
H	14	20.5	26	30.5	36	42	47	52.5	56.5	61	67.5	72
I	10	15.5	20	24	29	34.5	38.5	43.5	47	51	57	61
J	7	12	15.5	19	23	27.5	31	35	38.5	42	47	50
K	3	7	10.5	13.5	17	21	24	27.5	30	33	37.5	40.5
L	0	1.5	5	7.5	11	14.5	17	20.5	23	26	30	33
M		0	0	1	4	7	9	12	14.5	17	20.5	23
N				0	0	0	1	3.5	5	7.5	10	12
O							0	0	0	0	1	3
P											0	0

*Indicates cusp

Table 16.--2nd 6-hr nomogram values at selected area sizes - Continued

Isohyet	Storm area (mi^2) size											
	450	560	700	850	1000	1200	1500	1800	2150	2600	3000	380
A	113	114	114.5	115	116	116.5	117	118	118.5	119	119.5	120.5
B	109	109.5	110	111	112	112.5	113	114	114.5	115.5	116	117
C	105	106	107	107.5	108.5	109	110	110.5	111	112	112.5	113.5
D	102	102.5	104	104.5	105	106	107	108	108.5	109.5	110	111
E	99.5	100.5	101	102	103	104	105	105.5	106.5	107	108	109
F	97	98	99	100	101	102	103	104	104.5	105.5	106	107
G	95*	96	97	98	99	99.5	100.5	101.5	102	103	104	105
H	77.5	85	95*	96	97	97.5	99	99.5	100	101	102	103
I	66	71.5	78	85	95*	96	97	98	99	99.5	100.5	101.5
J	54.5	60	65.5	71	76	82.5	95.5*	96	97	98	99	100
K	44.5	49	54	58.5	63	68	75.5	83	96*	96.5	97	98
L	36.5	40	44	48	51	55	60.5	66	73	83	96*	97
M	25.5	28.5	32	35	38	41	45	49.5	54	60.5	67	81
N	14	17	19.5	22	24	27	31	34	37.5	41.5	45	52.5
O	4.5	6.5	9	11	12.5	14.5	17	19.5	22	25.5	28.5	34
P	0	0	0	0	0	0	0	1.5	4	7	9	13.5
Q								0	0	0	0	0

*Indicates cusp

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Table 16.--2nd 6-hr nomogram values at selected area sizes - Continued

Isohyet	Storm area (mi^2) size								
	4500	5500	6500	8000	10000	12000	15000	18000	20000
A	121	122	122	123	124	124.5	125	126	126
B	117	118	119	120	120.5	121	122	122.5	123
C	114	115	115.5	116.5	117	118	119	119.5	120
D	112	112.5	113	114	115	116	117	118	118
E	109.5	110.5	111	112	113	114	115	116	116
F	108	108.5	109	110	111	112	113	113.5	114
G	105.5	106.5	107	108	109	110	111	112	112
H	103.5	104.5	105	106	107	108	109	110	110
I	102	103	104	104.5	105.5	106.5	107	108	108.5
J	100.5	101.5	102	103	104	105	106	106.5	107
K	99	100	100.5	101.5	102.5	103	104	105	105
L	97.5	98.5	99	100	101	102	102.5	103.5	104
M	96*	97	97.5	98.5	99	100	101	102	102
N	59	72.5	95.5*	96	97	98	99	99.5	100
O	39	46	52.5	66	95*	96	97	97.5	98
P	17	22	27.5	37	50	64	96*	96.5	97
Q	0	0	1	6	14	21	34	47	55
R		0		0	0	0	0	4.5	7
S									0

*Indicates cusp

Table 17.--3rd 6-hr nomogram values at selected area sizes

Isohyet	Storm area (mi^2) size											
	10	17	25	35	50	75	100	140	175	220	300	360
A	100*	100.6	101	101.3	101.6	102	102.3	102.6	102.8	103.1	103.4	103.6
B	65	83.5	99*	99.4	99.8	100.3	100.7	101	101.3	101.5	101.9	102.1
C	48	63	74.5	85.5	98.5*	99	99.3	99.7	100	100.3	100.7	100.9
D	39	51	60.5	69	78.5	90	98.6*	99	99.2	99.5	99.8	100.1
E	30	40	48.5	55.5	63	73.5	81.5	92	98.8*	99	99.3	99.5
F	24	33	40	46.5	53.5	61.5	68	76.5	83	89	99.0*	99.2
G	20	28	34	39.5	46	53	59	66	71	77	86	92
H	14	21	27	32.5	37.5	44	49	55	59.5	64	72	76.5
I	10	16.5	21.5	26.5	31.5	37.5	42	47.5	51	55.5	62	66
J	6.5	12.5	17	21	26	31.5	35.5	40.5	44	47.5	53	56
K	3	7.5	11.5	15	19.5	24.5	28	32.5	35	38.5	43	46
L	0	1.5	5	8.5	12	16.5	20	24	26.5	29.5	33.5	36
M		0	0	1	4	8.5	11.5	15	18	20.5	24.5	27
N				0	0	0	1	4.5	7	10	14	16
O							0	0	0	0	2	4
P											0	0

*Indicates cusp

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Table 17.--3rd 6-hr nomogram values at selected area sizes - Continued

Isohyet	Storm area (mi^2) size											
	450	560	700	850	1000	1200	1500	1800	2150	2600	3000	3800
A	103.8	104	104.2	104.4	104.6	104.7	105	105.2	105.3	105.5	105.7	105.8
B	102.4	102.7	102.9	103.2	103.3	103.5	103.8	104	104.2	104.4	104.6	104.8
C	101.2	101.5	101.7	102	102.3	102.5	102.7	102.9	103.2	103.4	103.5	103.8
D	100.3	100.6	100.8	101.1	101.3	101.5	101.7	102	102	102.4	102.5	102.8
E	99.8	100	100.2	100.4	100.6	100.8	101	101.2	101.3	101.5	101.7	101.9
F	99.5	99.7	99.9	100.1	100.3	100.4	100.7	100.8	101	101.2	101.3	101.5
G	99.2*	99.4	99.6	99.7	99.9	100	100.3	100.4	100.6	100.7	100.9	101.1
H	84	91	99.2*	99.4	99.6	99.7	100	100.1	100.3	100.4	100.5	100.7
I	71	77.5	85	92	99.3*	99.5	99.7	99.8	100	100.1	100.2	100.5
J	60	64.5	70.5	76.5	82.5	89.5	99.4*	99.5	99.7	99.8	99.9	100.1
K	50	54	58.5	62.5	67	72.5	81	89	99.5*	99.5	99.6	99.8
L	39.5	43	47	50.5	54	58.5	65.5	72.5	80.5	90.5	99.3*	99.5
M	30	33	37	40	43	46.5	51.5	56.5	61	69	76	88.5
N	19	22.5	25.5	28.5	31	34	38	42	46.5	52	57	67
O	7	10	13	15.5	17.5	20.5	24	27	30.5	34	37.5	43.5
P	0	0	0	0	0	0	0	2.5	5.5	9	12	16.5
Q									0	0	0	0

*Indicates cusp

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Table 17.--3rd 6-hr nomogram values at selected area sizes - Continued

Isohyet	Storm area (mi^2) size								
	4500	5500	6500	8000	10000	12000	15000	18000	20000
A	106	106.2	106.4	106.6	106.8	107	107.2	107.4	107.5
B	105	105.3	105.5	105.7	106	106.2	106.5	106.7	106.8
C	104	104.3	104.5	104.8	105	105.3	105.5	105.8	105.9
D	103.1	103.2	103.5	103.7	104	104.2	104.4	104.6	104.7
E	102.1	102.3	102.5	102.7	102.8	103	103.3	103.5	103.6
F	101.7	101.8	102	102.2	102.4	102.6	102.8	103	103
G	101.2	101.4	101.5	101.7	101.9	102.1	102.3	102.4	102.5
H	100.9	101.1	101.2	101.4	101.6	101.8	102	102.2	102.2
I	100.6	100.8	100.9	101.1	101.3	101.5	101.7	101.8	101.9
J	100.2	100.4	100.5	100.7	100.9	101	101.2	101.3	101.4
K	99.9	100	100.2	100.3	100.5	100.7	100.8	101	101.1
L	99.6	99.7	99.8	100	100.2	100.3	100.5	100.6	100.7
M	99.3*	99.4	99.5	99.6	99.8	99.9	100.1	100.2	100.2
N	76	88	98.9*	99	99.2	99.3	99.5	99.6	99.7
O	49	57	65	79	98.7*	98.8	99	99.1	99.2
P	21	27.5	34.5	44.5	59	71.5	98*	98.7	98.2
Q	0	0	1	8	18	27.5	42	54.5	66
R			0	0	0	0	1	7.5	12
S							0	0	0

*Indicates cusp

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Table 18.--4th to 12th 6-hr nomogram values at selected area sizes

Tsohyet	Storm area (mi^2) size											
	10	17	25	35	50	75	100	140	175	220	300	360
A	100											
B	65	83.5	100									
C	48	62.5	74.5	86	100							
D	39	50.5	60.5	68.5	78.5	89.5	100					
E	30	40	48.5	55	63	73	81.5	91	100			
F	24	33	40	46	53.5	61.5	68	76.5	83	89	100	
G	20	27.5	34	39	46	53	59	65.5	71	77	86	91.5
H	14	21	27	31.5	37.5	44	49	55	58.5	64	72	77
I	10	16	21.5	26	31.5	37	42	47.5	51	55	62	65.5
J	6.5	12	17	21	26	31	35.5	40	44	47	53	55.5
K	3	7.5	11.5	15	19.5	24	28	32	35	38.5	43	46
L	0	0.5	5	8.5	12	16	20	23.5	26.5	29	33.5	36
M		0	0	0.5	4	8.5	11.5	15	18	20.5	24.5	27
N				0	0	0	1	4	7	9.5	14	16
O							0	0	0	0	2	4
P											0	0

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Table 18.—4th to 12th- 6-hr nomogram values at selected area sizes - Continued

Isohyet	Storm area (mi^2) size											
	450	560	700	850	1000	1200	1500	1800	2150	2600	3000	3800
A												
B												
C												
D												
E												
F												
G	100											
H	84	91	100									
I	71	77.5	85	92	100							
J	60	64.5	70.5	77	82.5	89.5	100					
K	50	53.5	58.5	62	67	72	81	89	100			
L	39.5	43	47	50.5	54	58.5	65.5	72.5	80.5	90	100	
M	30	33	37	40	43	46.5	51.5	56	61	69	76	88.5
N	19	22	25.5	28	31	33.5	38	41.5	46.5	51.5	57	67
O	7	9.5	13	15	17.5	20	24	26.5	30.5	33.5	37.5	43.5
P	0	0	0	0	0	0	0	2.5	5.5	9	12	17
Q							0	0	0	0	0	

Table 18.--4th to 12th 6-hr-nomogram values at selected area sizes - Continued

Isohyet	Storm area (mi^2) size								
	4500	5500	6500	8000	10000	12000	15000	18000	20000
A									
B									
C									
D									
E									
F									
G									
H									
I									
J									
K									
L									
M	100								
N	76	88	100						
O	49	56.5	65	79	100				
P	21	27	34.5	44	59	71	100		
Q	0	0	1	8	18	27	42	54	66
R			0	0	0	0	1	7	12
S							0	0	0

APPENDIX F: AVERAGE MONTHLY SNOW DEPTH

Note: Due to the size of the data in this appendix, the information has been archived in the AREVA file management system, ColdStor.

The path to the file is:

\cold\General-Access\32\32-9000000\32-9207374-000\official

APPENDIX G: SOFTWARE VERIFICATION

This example calculation, selected for the software certification, is consistent with the intended software application for Flood Hazard Re-evaluation projects. The computer software certification analysis was performed by the Applied Weather Associates' (AWA) employee Douglas Hultstrand on the following AWA workstation used for the calculation on January 3, 2014:

- Operating System: Community enterprise Operating System (CentOS)
- Version: 6.3
- Computer Name: Irene
- Processor: Intel(R) Xeon(R) CPU E5530 @ 2.40 GHz
- Memory: 12 GB
- Hard Drives: 6 TB, 2-Drives with 3TB each

The software is maintained on a designated computer as a executable Perl and R scripts to prevent unauthorized editing. Access to the computer is password protected to restrict access and/or code modification/deletion. Passwords are selected by each employee. Applied Weather Associates maintains the computer software on the following designated computer.

Computer Name	Program Name
Irene	Storm Precipitation Analysis System (SPAS) Version 9.5

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
60806	BRIDGEPORT W CT	NCDC	41.1667	-73.1333	-999	2.89	3.84	H
61093	CANDLEWOOD L CT	NCDC	41.4833	-73.4667	-999	8.26	4.6	H
63446	HARTFORD CT	NCDC	41.7667	-72.7	-999	9.47	4.42	H
63451	HARTFORD CT	NCDC	41.7667	-72.6667	-999	7.85	4.16	H
63456	HARTFORD WSO CT	NCDC	41.9333	-72.6833	-999	14.4	4.03	H
63857	JEWETT CITY CT	NCDC	41.6333	-71.9	-999	3.22	4.72	H
64488	MANSFIELD HO PSEUDO CT	NCDC	41.75	-72.1833	-999	6.34	4.26	HP
65018	MOODUS RESER CT	NCDC	41.5	-72.4333	-999	4.82	4.54	H
65273	NEW HAVEN WB CT	NCDC	41.2667	-72.8833	-999	4.2	3.84	H
65445	NORFOLK 2 SW CT	NCDC	41.9667	-73.2167	-999	12.13	4.78	H
66942	ROCKVILLE CT	NCDC	41.8667	-72.4333	-999	8.96	4.53	H
68138	STORRS CT	NCDC	41.8	-72.25	-999	8.1	4.36	H
176905	PORTLAND WSM ME	NCDC	43.65	-70.3167	-999	0.03	3.1	H
190120	AMHERST MA	NCDC	42.4	-72.5333	-999	7.09	4.1	H
190666	BIRCH HILL D MA	NCDC	42.6333	-72.1167	-999	3.52	4.21	H
190736	BLUE HILL MA	NCDC	42.2167	-71.1167	-999	13.76	3.97	H
190770	BOSTON ARPT MA	NCDC	42.3667	-71.0333	-999	12.47	3.47	H
191097	CAMBRIDGE MA	NCDC	42.3833	-71.1167	-999	13	3.55	H
193821	HYANNIS PSEUDO MA	NCDC	41.65	-70.2667	-999	3.09	3.61	HP
193985	KNIGHTVILLE MA	NCDC	42.2833	-72.8667	-999	9.43	4.36	H
195159	NANTUCKET WB MA	NCDC	41.25	-70.0667	-999	2.5	3.85	H
195246	NEW BEDFORD MA	NCDC	41.6333	-70.9333	-999	3.93	4.35	H
196414	PITTSFIELD W MA	NCDC	42.4333	-73.2833	-999	2.92	4.8	H
196681	PROVINCETOWN MA	NCDC	42.0667	-70.2	-999	6.1	3.26	H
196977	ROCKPORT 1 E MA	NCDC	42.65	-70.6	-999	6.63	3.16	H
198101	STATE FARM MA	NCDC	41.95	-70.95	-999	9.68	4.06	H
198159	STERLING 3 N MA	NCDC	42.4667	-71.8	-999	6.51	4.11	H
198843	WASHINGTON 2 MA	NCDC	42.3667	-73.15	-999	5.68	5.05	H
270741	BLACKWATER D NH	NCDC	43.3167	-71.7167	-999	0.15	3.88	H
270998	BRISTOL NH	NCDC	43.6	-71.7167	-999	0.45	3.97	H
271683	CONCORD WSO NH	NCDC	43.2	-71.5167	-999	1.02	3.29	H
272174	DURHAM PSEUDO NH	NCDC	43.1333	-70.9333	-999	2.1	3.41	HP
273182	FRANKLIN FAL NH	NCDC	43.4667	-71.65	-999	0.51	3.91	H
273850	HANOVER NH	NCDC	43.7	-72.2833	-999	0.32	3.75	H
274062	HILLSBORO 2 NH	NCDC	43.1167	-71.9333	-999	1.78	3.91	H
274234	HUDSON NH	NCDC	42.7833	-71.4333	-999	2.91	3.87	H
275013	MACDOWELL DA NH	NCDC	42.9	-71.9833	-999	2.5	4.13	H
275780	NEW DURHAM NH	NCDC	43.4333	-71.1667	-999	0.09	3.8	H
278502	SUNAPEE NH	NCDC	43.3833	-72.0833	-999	0.28	3.83	H
278539	SURRY MOUNTA NH	NCDC	43	-72.3167	-999	1.6	3.97	H
278885	WARREN NH	NCDC	43.9167	-71.8833	-999	0.96	4.11	H
279726	WINCHESTER NH	NCDC	42.7667	-72.3833	-999	2.86	4.17	H
280100	ALLENDALE NJ	NCDC	41.0333	-74.1333	-999	6.25	4.35	H

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
282652	ELIZABETHPOR NJ	NCDC	40.6333	-74.2	-999	1.93	4.23	H
282768	ESSEX FELLS NJ	NCDC	40.8333	-74.3	-999	3.31	4.46	H
283181	FREEHOLD NJ	NCDC	40.25	-74.2833	-999	0.89	4.53	H
283416	GREAT MEADOW NJ	NCDC	40.8667	-74.9167	-999	7.07	4.48	H
283572	HACKENSACK NJ	NCDC	40.8833	-74.05	-999	2.42	4.22	H
283956	HIGHTSTOWN P NJ	NCDC	40.2833	-74.5333	-999	2.28	4.76	H
284260	IRVINGTON NJ	NCDC	40.7167	-74.25	-999	2.51	4.39	H
284627	LAKEWOOD 2 E NJ	NCDC	40.1	-74.1833	-999	1.01	4.77	H
284887	LITTLE FALLS NJ	NCDC	40.8833	-74.2333	-999	4.31	4.41	H
284987	LONG BRANCH NJ	NCDC	40.3	-74	-999	0.92	5.04	H
285244	MARLBORO SCS NJ	NCDC	40.3333	-74.2333	-999	0.77	4.49	H
286026	NEWARK WSO A NJ	NCDC	40.7	-74.1667	-999	2.27	4.16	H
286146	NEW MILFORD NJ	NCDC	40.95	-74.0333	-999	3.13	4.21	H
286560	ORANGE NJ	NCDC	40.7833	-74.2167	-999	2.45	4.43	H
287393	RAHWAY NJ	NCDC	40.6	-74.2667	-999	1.85	4.3	H
288423	SPRINGFIELD NJ	NCDC	40.7167	-74.3	-999	3.22	4.6	H
288883	TRENTON WSO NJ	NCDC	40.2167	-74.7667	-999	2.47	4.46	H
289187	WANAQUE RAYM NJ	NCDC	41.05	-74.3	-999	5.22	4.28	H
289271	WATCHUNG NJ	NCDC	40.6667	-74.4167	-999	3.65	4.55	H
289455	WESTFIELD PSEUDO NJ	NCDC	40.65	-74.35	-999	2.81	4.45	HP
289832	WOODCLIFF LA NJ	NCDC	41.0167	-74.05	-999	3.24	4.34	H
300042	ALBANY WSFO NY	NCDC	42.75	-73.8	-999	0.51	3.66	H
300047	ALBANY WB CITY NY	NCDC	42.65	-73.75	-999	0.63	3.82	H
300862	BRENTWOOD NY	NCDC	40.7833	-73.25	-999	1.56	4.27	H
301207	CARMEL 1 SW PSEUDO NY	NCDC	41.4167	-73.7	-999	6.9	4.5	HP
301708	CONKLINGVILL PSEUDO NY	NCDC	43.3167	-73.9333	-999	0.16	3.88	HP
301949	CUTCHOGUE NY	NCDC	41.0167	-72.5	-999	1.21	4.14	H
301987	DAVENPORT NY	NCDC	42.4667	-74.85	-999	2.4	3.53	H
302582	ELLENVILLE PSEUDO NY	NCDC	41.7167	-74.4	-999	5.81	3.91	HP
302953	FORT PLAIN NY	NCDC	42.9333	-74.6167	-999	0.64	3.61	H
303970	HOPE NY	NCDC	43.2833	-74.2	-999	0.07	4.25	H
304424	KINGSTON NY	NCDC	41.9333	-74	-999	5.62	3.81	H
304613	LARCHMONT 2 NY	NCDC	40.95	-73.7667	-999	2.91	4.24	H
305346	MILLERTON NY	NCDC	41.95	-73.5167	-999	8.59	4.35	H
305377	MINEOLA NY	NCDC	40.7333	-73.6333	-999	1.49	3.88	H
305796	NEW YORK AVE NY	NCDC	40.6	-73.9833	-999	1.16	4.16	H
305801	NEW YORK CEN NY	NCDC	40.7833	-73.9667	-999	1.86	4.16	H
305806	NEW YORK UNI NY	NCDC	40.85	-73.9167	-999	1.84	4.2	H
305811	NEW YORK LAG NY	NCDC	40.7667	-73.8667	-999	1.73	4.12	H
305816	NEW YORK WSO NY	NCDC	40.7	-74.0167	-999	1.62	4.12	H
305821	NEW YORK WES NY	NCDC	40.6	-74.1667	-999	1.83	4.21	H
306119	OAKLAND VALL NY	NCDC	41.5	-74.65	-999	8.29	3.99	H
306184	OLD FORGE NY	NCDC	43.7167	-74.9667	-999	0	4.53	H

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
306623	PISECO NY	NCDC	43.45	-74.5333	-999	0	4.86	H
306768	PORT JEFFERS NY	NCDC	40.95	-73.0667	-999	1.52	4.02	H
306825	POUGHKEEPSIE NY	NCDC	41.7167	-73.9333	-999	6.35	3.88	H
306839	PRATTSVILLE NY	NCDC	42.3167	-74.4333	-999	3.65	3.62	H
307134	RIVERHEAD RE NY	NCDC	40.9667	-72.7167	-999	0.92	3.99	H
307497	SCARSDALE NY	NCDC	40.9833	-73.8	-999	3.26	4.3	H
307513	SCHENECTADY NY	NCDC	42.8333	-73.9167	-999	0.4	3.72	H
307549	SCHUYLERVILL NY	NCDC	43.1	-73.5833	-999	0.35	3.97	H
307742	SHRUB OAK PSEUDO NY	NCDC	41.3333	-73.8333	-999	5.82	4.44	HP
307799	SLIDE MOUNTA NY	NCDC	42.0167	-74.4167	-999	5.9	4.94	H
308503	TICONDEROGA NY	NCDC	43.85	-73.4167	-999	0.43	3.69	H
308586	TRIBES HILL NY	NCDC	42.95	-74.2833	-999	0.54	3.59	H
308720	UPTON WB CIT NY	NCDC	40.8667	-72.8833	-999	0	4.25	H
309389	WHITEHALL NY	NCDC	43.55	-73.4	-999	0.05	4.47	H
309400	WHITE PLAINS NY	NCDC	41	-73.7333	-999	3.11	4.22	H
309576	WOODLANDS AR NY	NCDC	41.0167	-73.85	-999	3.45	4.32	H
362160	DINGMANS FER PA	NCDC	41.2167	-74.8667	-999	7.6	3.98	H
370896	BLOCK ISLAND RI	NCDC	41.1667	-71.5833	-999	0.67	3.42	H
375225	NEWPORT WATE RI	NCDC	41.5	-71.3	-999	1.8	3.83	H
376698	PROVIDENCE W RI	NCDC	41.7333	-71.4333	-999	6.13	3.96	H
433400	GRAFTON VT	NCDC	43.1833	-72.6167	-999	0.23	4.42	H
434882	MANCHESTER C VT	NCDC	43.1667	-73.0667	-999	0.29	4.78	H
437152	SEARSBURG ST VT	NCDC	42.8667	-72.9167	-999	1.15	5.1	H
438057	STOCKBRIDGE VT	NCDC	43.8	-72.7833	-999	0	4.95	H
438512	TYSON VT	NCDC	43.4667	-72.7	-999	0.28	4.42	H
438556	UNION VILLAGE PSEUDO VT	NCDC	43.8	-72.2667	-999	0.99	3.88	HP
60120	ANSONIA CT	NCDC	41.3333	-73.0833	-999	5.5	4.28	D
60251	BALTIC CT	NCDC	41.6167	-72.1	-999	4.86	4.69	D
60830	BRISTOL 3 W CT	NCDC	41.6833	-72.9833	-999	11.77	4.74	D
60918	BROOKLYN CT	NCDC	41.8	-71.9333	-999	6.61	4.25	D
60961	BULLS BRIDGECT	NCDC	41.65	-73.4833	-999	7.38	4.32	D
60973	BURLINGTON CT	NCDC	41.8	-72.9333	-999	15.84	4.79	D
61488	COCKAPONSET CT	NCDC	41.4667	-72.5167	-999	4.87	4.53	D
61499	COLCHEDTER CT	NCDC	41.5833	-72.3333	-999	5.1	4.5	D
61715	CREAM HILL CT	NCDC	41.9	-73.3167	-999	9.56	4.63	D
61762	DANBURY CT	NCDC	41.3833	-73.4667	-999	6.09	4.52	D
61798	DAWSON LAKE CT	NCDC	41.3667	-72.9833	-999	6.66	4.27	D
61844	DERBY SHELTOCT	NCDC	41.3167	-73.0833	-999	6.14	4.25	D
62169	EAST HAVEN CT	NCDC	41.2833	-72.8667	-999	4.4	3.86	D
62288	EASTON RESERCT	NCDC	41.2333	-73.25	-999	6.66	4.29	D
62658	FALLS VILLAGCT	NCDC	41.95	-73.3667	-999	10.08	4.41	D
63207	GROTON CT	NCDC	41.35	-72.05	-999	2.32	4.5	D
63583	HEMLOCKS RESCT	NCDC	41.2333	-73.2667	-999	6.47	4.34	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
63905	KENT CT	NCDC	41.7333	-73.5	-999	7.15	4.57	D
63989	LAKE KONOMOCCT	NCDC	41.4	-72.1833	-999	2.87	4.75	D
64096	LAUREL RESERCT	NCDC	41.1667	-73.55	-999	5.57	4.3	D
64443	MANCHEDTER CT	NCDC	41.7667	-72.4833	-999	7.37	4.51	D
64488	MANSFIELD HOCT	NCDC	41.75	-72.1833	-999	7.24	4.26	D
64599	MEAD POND RECT	NCDC	41.2	-73.5167	-999	5.93	4.38	D
64767	MIDDLETOWN 4CT	NCDC	41.55	-72.7167	-999	6.36	4.4	D
64790	MILFORD CT	NCDC	41.2	-73.0833	-999	3.92	3.86	D
64933	MOHAWK RANGECT	NCDC	41.8333	-73.3	-999	10.43	4.71	D
65077	MOUNT CARMELCT	NCDC	41.4	-72.9	-999	5.53	4.29	D
65131	NATHAN HALE CT	NCDC	41.7667	-72.35	-999	7.16	4.51	D
65309	NEW LONDON CT	NCDC	41.35	-72.1	-999	1.8	4.54	D
65510	NORTH BRANFOCT	NCDC	41.3333	-72.7667	-999	4.78	4.06	D
65641	NORTH GUILFOCT	NCDC	41.3833	-72.7167	-999	4.8	4.29	D
65892	NORWALK CT	NCDC	41.1333	-73.45	-999	5.16	4.12	D
65905	NORWICH 5 SWCT	NCDC	41.5	-72.15	-999	4.03	4.81	D
66131	PACHAUG FORECT	NCDC	41.5833	-71.85	-999	3.62	4.7	D
66597	PROSPECT CT	NCDC	41.5	-72.95	-999	7.44	4.64	D
66645	PUTNAM CT	NCDC	41.9	-71.9167	-999	7.89	4.36	D
66966	ROCKY RIVER CT	NCDC	41.5833	-73.4333	-999	9.06	4.66	D
67002	ROUND POND CT	NCDC	41.3	-73.5333	-999	5.5	4.64	D
67109	SALISBURY CT	NCDC	41.9833	-73.45	-999	12.54	4.6	D
67157	SAUGATUCK RECT	NCDC	41.25	-73.35	-999	7.03	4.45	D
67373	SHEPAUG DAM CT	NCDC	41.7167	-73.3	-999	10.85	4.74	D
67432	SHUTTLE MEADCT	NCDC	41.65	-72.8167	-999	9.11	4.47	D
67946	STAFFORD SPRCT	NCDC	41.9667	-72.3	-999	8.92	4.48	D
67969	STAMFORD CT	NCDC	41.0667	-73.5	-999	4.62	4.16	D
68065	STEVENSON DACT	NCDC	41.3833	-73.1667	-999	6.95	4.41	D
68488	TRAP FALLS RCT	NCDC	41.2833	-73.15	-999	5.76	4.27	D
69007	WEPAWAUG RESCT	NCDC	41.3	-73.0333	-999	3.32	4.16	D
69067	WEDTBROOK CT	NCDC	41.3	-72.4333	-999	2.23	4.35	D
69508	WHIGVILLE RECT	NCDC	41.7333	-72.95	-999	13.36	4.77	D
69592	WILLIMANTIC CT	NCDC	41.7167	-72.2333	-999	6.25	4.3	D
69759	WOLCOTT RESECT	NCDC	41.6167	-72.95	-999	10.76	4.81	D
69783	WOODBURY 3 WCT	NCDC	41.5667	-73.2667	-999	9.55	4.73	D
173800	HIRAM 2 S ME	NCDC	43.85	-70.8	-999	0.13	3.56	D
176900	PORTLAND ME	NCDC	43.6667	-70.25	-999	0.04	3.12	D
177479	SANFORD 2 NNME	NCDC	43.4667	-70.7833	-999	0.59	3.61	D
179314	WEDT BUXTON ME	NCDC	43.7	-70.6167	-999	0.08	3.44	D
190049	ADAMS MA	NCDC	42.65	-73.1	-999	2.15	4.66	D
190190	ASHBURNHAM MA	NCDC	42.65	-71.8833	-999	4.1	4.39	D
190218	ASHLAND MA	NCDC	42.25	-71.4667	-999	12.56	4.01	D
190257	ATHOL MA	NCDC	42.5833	-72.2167	-999	4.78	4.43	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
190551	BEECHWOOD MA	NCDC	42.2167	-70.8167	-999	13.02	4.34	D
190562	BELCHERTOWN MA	NCDC	42.2833	-72.35	-999	13.69	4.68	D
190860	BROCKTON MA	NCDC	42.0833	-71.0167	-999	11.74	4.19	D
191425	CHEDTER MA	NCDC	42.2833	-72.9833	-999	9.64	5.71	D
191436	CHEDTERFIELDMA	NCDC	42.4	-72.85	-999	7.43	4.65	D
191561	CLINTON MA	NCDC	42.4	-71.6833	-999	9.51	4.26	D
191582	COHASSET MA	NCDC	42.2667	-70.8333	-999	11.04	4.17	D
192451	EAST WAREHAMMA	NCDC	41.7667	-70.6667	-999	5.01	4.02	D
192501	EDGARTOWN MA	NCDC	41.3833	-70.5167	-999	2.45	3.74	D
192642	FALL RIVER MA	NCDC	41.7167	-71.1333	-999	4.66	4.03	D
192806	FITCHBURG MA	NCDC	42.5667	-71.7667	-999	4.6	3.89	D
192997	FRANKLIN MA	NCDC	42.0833	-71.4167	-999	12.67	4.34	D
193052	GARDNER MA	NCDC	42.5833	-71.9833	-999	4.5	4.3	D
193401	HARDWICK MA	NCDC	42.35	-72.2	-999	10.39	4.61	D
193471	HATCHVILLE MA	NCDC	41.6167	-70.5333	-999	3.37	3.84	D
193505	HAVERHILL MA	NCDC	42.8	-71.0667	-999	2.92	3.43	D
193702	HOLYOKE MA	NCDC	42.2	-72.6	-999	14.98	4.13	D
193713	HOOSAC TUNNEMA	NCDC	42.6833	-72.9667	-999	3.44	4.46	D
193772	HUBBARDSTON MA	NCDC	42.4833	-72.0167	-999	4.13	4.43	D
193821	HYANNIS MA	NCDC	41.65	-70.2667	-999	3.33	3.61	D
193876	IPSWICH MA	NCDC	42.6667	-70.8667	-999	8.17	3.32	D
194105	LAWRENCE MA	NCDC	42.7	-71.1667	-999	5.77	3.41	D
194449	MANSFIELD MA	NCDC	42.05	-71.2	-999	13.03	4.27	D
194711	MIDDLEBORO MA	NCDC	41.8833	-70.9167	-999	5.61	4.04	D
194744	MIDDLETON MA	NCDC	42.6	-71.0167	-999	7.64	3.54	D
194771	MILLBURY MA	NCDC	42.1833	-71.75	-999	11.44	4.09	D
194903	MONTAGUE CITMA	NCDC	42.5833	-72.5667	-999	3.68	4.04	D
195285	NEWBURYPORT MA	NCDC	42.8333	-70.9167	-999	3.6	3.32	D
195306	NEW SALEM MA	NCDC	42.4667	-72.35	-999	7.5	4.99	D
196251	PELHAM MA	NCDC	42.3833	-72.4	-999	7.68	4.78	D
196262	PEMBROKE MA	NCDC	42.0167	-70.8167	-999	9.7	3.91	D
196311	PERU MA	NCDC	42.45	-73.0667	-999	4.81	4.87	D
196322	PETERSHAM 3 MA	NCDC	42.5333	-72.1833	-999	6.35	4.61	D
196425	PLAINFIELD MA	NCDC	42.5167	-72.9167	-999	6.28	4.65	D
196486	PLYMOUTH MA	NCDC	41.9833	-70.7	-999	7.49	3.77	D
196699	QUABBIN INTAMA	NCDC	42.3667	-72.2833	-999	8.06	4.59	D
196938	ROCHEDTER MA	NCDC	41.7833	-70.9167	-999	5.12	4.16	D
197124	SALEM CG AIRMA	NCDC	42.5333	-70.8667	-999	7.68	3.49	D
197190	SANDWICH MA	NCDC	41.7667	-70.5	-999	3.4	3.81	D
197293	SEGREGANSET MA	NCDC	41.8333	-71.1167	-999	7.85	4.07	D
197370	SHELBURNE FAMA	NCDC	42.6	-72.7333	-999	4.67	4.11	D
197692	SOUTH EGREMOMA	NCDC	42.15	-73.4167	-999	8.92	4.5	D
198046	SPRINGFIELD MA	NCDC	42.1167	-72.5833	-999	16.59	3.84	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
198301	SWAMPSCOTT MA	NCDC	42.4667	-70.9	-999	8.77	3.5	D
198367	TAUNTON MA	NCDC	41.9	-71.0667	-999	10.31	4.07	D
198573	TULLY DAM MA	NCDC	42.6333	-72.2167	-999	3.5	4.37	D
198755	WALPOLE MA	NCDC	42.1833	-71.25	-999	15.61	4.08	D
198793	WARE MA	NCDC	42.2667	-72.25	-999	14.43	4.56	D
199136	WEDT CUMMINGMA	NCDC	42.4833	-72.9667	-999	5.1	4.75	D
199371	WEDT OTIS MA	NCDC	42.1667	-73.15	-999	10.2	4.75	D
199382	CHICOPEE FALMA	NCDC	42.2	-72.5333	-999	12.81	4.16	D
199442	WEDT RUTLANDMA	NCDC	42.3667	-71.9833	-999	9.51	4.44	D
199770	WINCHENDON MA	NCDC	42.7	-72.05	-999	3.57	4.54	D
199923	WORCEDTER WSMA	NCDC	42.2667	-71.8667	-999	11.44	4.1	D
270834	BOW GARVINS NH	NCDC	43.1667	-71.5167	-999	1.29	3.33	D
271099	CAMPTON NH	NCDC	43.8667	-71.6333	-999	2.28	4.15	D
271339	CENTER HARBONH	NCDC	43.7167	-71.4667	-999	2.65	4.09	D
271552	CLAREMONT NH	NCDC	43.3833	-72.35	-999	0.59	3.77	D
272174	DURHAM NH	NCDC	43.1333	-70.9333	-999	2.12	3.41	D
272284	EAST DEERINGNH	NCDC	43.0667	-71.7	-999	1.77	3.81	D
273024	FITZWILLIAM NH	NCDC	42.75	-72.1833	-999	3.31	4.26	D
273359	GILMANTON NH	NCDC	43.4167	-71.4167	-999	0.09	4.06	D
273530	GRAFTON NH	NCDC	43.5667	-71.95	-999	0.83	3.73	D
274399	KEENE NH	NCDC	42.9167	-72.2833	-999	1.99	3.96	D
275072	MANCHEDTER NH	NCDC	43	-71.4667	-999	2.22	3.64	D
275412	MILFORD NH	NCDC	42.8333	-71.65	-999	2.67	3.86	D
275712	NASHUA 2 NNWNH	NCDC	42.7833	-71.4833	-999	3.16	3.9	D
275868	NEWPORT NH	NCDC	43.3667	-72.1667	-999	0.31	3.67	D
276697	PETERBORO 2 NH	NCDC	42.85	-71.95	-999	2.74	4.24	D
276945	PLYMOUTH 2 ENH	NCDC	43.75	-71.65	-999	2.1	4.05	D
277967	SOUTH DANBURNH	NCDC	43.4833	-71.8833	-999	1.04	4.14	D
278194	SOUTH WEARE NH	NCDC	43.0667	-71.7167	-999	1.88	3.86	D
278741	TROY NH	NCDC	42.8167	-72.1833	-999	2.36	4.21	D
278855	WALPOLE 2 NH	NCDC	43.0833	-72.4333	-999	0.4	3.76	D
279318	WEDT LEBANONNH	NCDC	43.6333	-72.3167	-999	0.1	3.71	D
279676	WILMOT NH	NCDC	43.45	-71.9167	-999	0.54	4.09	D
279940	WOODSTOCK NH	NCDC	43.9833	-71.6833	-999	0.86	4.51	D
280721	BELMAR NJ	NCDC	40.1667	-74.0333	-999	1.11	4.9	D
280907	BOONTON 2 SENJ	NCDC	40.9	-74.4	-999	3.07	4.21	D
280978	BRANCHVILLE NJ	NCDC	41.15	-74.75	-999	7.41	4.21	D
281211	BURLINGTON NJ	NCDC	40.0833	-74.8667	-999	2.16	4.78	D
281327	CANISTEAR RENJ	NCDC	41.1167	-74.5	-999	7.69	4.22	D
281335	CANOE BROOK NJ	NCDC	40.75	-74.35	-999	3.48	4.65	D
281582	CHARLOTTEBURNJ	NCDC	41.0333	-74.4333	-999	6.73	4.47	D
281749	CLINTON NJ	NCDC	40.6333	-74.9167	-999	5.73	4.29	D
282644	ELIZABETH NJ	NCDC	40.6667	-74.2333	-999	2.25	4.29	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
283029	FLEMINGTON 1NJ	NCDC	40.5167	-74.85	-999	4.73	4.23	D
283516	GREENWOOD LANJ	NCDC	41.1333	-74.3333	-999	5.05	4.29	D
283951	HIGHTSTOWN 1NJ	NCDC	40.2833	-74.5167	-999	1.7	4.76	D
284339	JERSEY CITY NJ	NCDC	40.7333	-74.05	-999	0.9	4.13	D
284635	LAMBERTVILLENJ	NCDC	40.3667	-74.95	-999	4.1	4.32	D
285003	LONG VALLEY NJ	NCDC	40.7833	-74.7833	-999	5.74	4.76	D
285197	MANVILLE NJ	NCDC	40.55	-74.5667	-999	4.43	4.4	D
285503	MIDLAND PARKNJ	NCDC	40.9833	-74.15	-999	6.04	4.33	D
285769	MORRIS PLAINNJ	NCDC	40.8333	-74.5	-999	4.92	4.44	D
286062	NEW BRUNSWICNJ	NCDC	40.4667	-74.4333	-999	2.41	4.42	D
286177	NEWTON NJ	NCDC	41.05	-74.75	-999	7.64	4.39	D
286460	OAK RIDGE RENJ	NCDC	41.0333	-74.5	-999	6.61	4.4	D
286775	PATERSON NJ	NCDC	40.9	-74.15	-999	4.92	4.31	D
287079	PLAINFIELD NJ	NCDC	40.6	-74.4	-999	3.32	4.39	D
287328	PRINCETON WANJ	NCDC	40.3333	-74.6667	-999	1.7	4.61	D
287825	RUNYON NJ	NCDC	40.4333	-74.3333	-999	1.62	4.42	D
287869	SANDY HOOK LNJ	NCDC	40.4667	-74.0167	-999	0.53	4.21	D
288194	SOMERVILLE NJ	NCDC	40.5833	-74.6167	-999	3.8	4.45	D
288402	SPLIT ROCK PNJ	NCDC	40.9667	-74.4667	-999	3.94	4.35	D
288644	SUSSEX NJ	NCDC	41.2167	-74.6	-999	8.1	4.07	D
288878	TRENTON 2 NJ	NCDC	40.2333	-74.7667	-999	2.77	4.45	D
289455	WEDTFIELD NJ	NCDC	40.65	-74.35	-999	3.1	4.45	D
300063	ALCOVE DAM NY	NCDC	42.4667	-73.9333	-999	1.93	3.31	D
300136	AMAWALK NY	NCDC	41.2833	-73.75	-999	6.76	4.43	D
300167	ANDES NY	NCDC	42.2	-74.7833	-999	5.08	3.79	D
300237	ARENA NY	NCDC	42.1	-74.7333	-999	5.37	3.78	D
300254	ARKVILLE NY	NCDC	42.15	-74.6167	-999	2.68	3.63	D
300351	BABYLON NY	NCDC	40.7	-73.3167	-999	0.5	4.19	D
300368	BAKERS MILLSNY	NCDC	43.6167	-74.0333	-999	0	4.22	D
300393	BALSAM LAKE NY	NCDC	42.0333	-74.6	-999	4.66	4.73	D
300668	BIG MOOSE 3 NY	NCDC	43.8167	-74.8667	-999	0	4.71	D
300799	BOVINA NY	NCDC	42.2667	-74.7333	-999	4.75	3.82	D
300808	BOYDS CORNERNY	NCDC	41.45	-73.7333	-999	8.1	4.54	D
300889	BRIDGEHAMPTONY	NCDC	40.95	-72.3	-999	1.16	3.93	D
300929	BROADALBIN NY	NCDC	43.0833	-74.1667	-999	0.58	3.92	D
301065	BUSHNELLSVILNY	NCDC	42.1667	-74.4	-999	5	4	D
301079	BUTTERNUT BRNY	NCDC	41.9167	-74.6667	-999	5.46	4.61	D
301093	CAIRO NY	NCDC	42.3167	-74.0167	-999	3.15	3.06	D
301207	CARMEL 1 SW NY	NCDC	41.4167	-73.7	-999	7.19	4.5	D
301436	CHERRY VALLENY	NCDC	42.8167	-74.7333	-999	0.85	4.14	D
301521	CLARYVILLE NY	NCDC	41.9167	-74.5667	-999	5.33	4.44	D
301589	COBLESKILL NY	NCDC	42.6667	-74.5	-999	1.15	3.36	D
301615	COLD BROOK NY	NCDC	42.0167	-74.2667	-999	6.22	4.04	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
301708	CONKLINGVILLNY	NCDC	43.3167	-73.9333	-999	0.17	3.88	D
301713	CONKLINGVILLNY	NCDC	43.3167	-73.9167	-999	0.19	3.88	D
301752	COOPERSTOWN NY	NCDC	42.7	-74.9167	-999	0.97	3.93	D
301850	CRAIGIE CLAINY	NCDC	41.9667	-74.8667	-999	4.82	4.05	D
301896	CROSS RIVER NY	NCDC	41.2667	-73.6833	-999	4.59	4.3	D
301904	CROTON FALLSNY	NCDC	41.35	-73.6667	-999	7.07	4.37	D
301912	CROTON LAKE NY	NCDC	41.2333	-73.8	-999	5.35	4.42	D
302036	DELHI NY	NCDC	42.2667	-74.9167	-999	5.74	3.71	D
302129	DOBBS FERRY NY	NCDC	41.0167	-73.8667	-999	3.48	4.3	D
302137	DOLGEVILLE NY	NCDC	43.0833	-74.7667	-999	0.4	3.96	D
302164	DOWNSVILLE NY	NCDC	42.0833	-75	-999	5.94	4.07	D
302234	EAGLE BAY NY	NCDC	43.7667	-74.8167	-999	0	4.59	D
302282	EAST BRANCH NY	NCDC	41.4	-73.5833	-999	6.33	4.47	D
302362	EAST JEWETT NY	NCDC	42.25	-74.1833	-999	3.75	3.83	D
302517	EDGEWOOD NY	NCDC	42.1333	-74.2333	-999	4.15	4.79	D
302562	ELKA PARK NY	NCDC	42.1667	-74.1667	-999	4.38	4.66	D
302582	ELLENVILLE NY	NCDC	41.7167	-74.4	-999	8.14	3.91	D
302666	EPHRATAH NY	NCDC	43.0167	-74.5333	-999	0.42	4.09	D
302760	FARMINGDALE NY	NCDC	40.75	-73.4333	-999	1.76	4.08	D
302964	FORT SCHUYLENY	NCDC	40.8	-73.8	-999	1.8	4.13	D
303076	FROST VALLEYNY	NCDC	41.9667	-74.5167	-999	5.46	4.9	D
303251	GLENFORD NY	NCDC	42.0167	-74.1333	-999	3.95	4.04	D
303259	GLENHAM NY	NCDC	41.5167	-73.9333	-999	7.75	4.18	D
303284	GLENS FALLS NY	NCDC	43.3333	-73.7333	-999	0.35	4.31	D
303299	GLENS FALLS NY	NCDC	43.2833	-73.6667	-999	0.37	3.75	D
303319	GLOVERSVILLENY	NCDC	43.05	-74.35	-999	0.5	4.21	D
303324	GLOVERSVILLENY	NCDC	43.1	-74.4333	-999	1.18	4.5	D
303360	GRAFTON NY	NCDC	42.7833	-73.4667	-999	0.33	4.69	D
303365	GRAHAMSVILLENY	NCDC	41.85	-74.55	-999	6.06	4.4	D
303373	GRAND GORGE NY	NCDC	42.3667	-74.4833	-999	3.87	3.58	D
303567	HALCOTT CENTNY	NCDC	42.2	-74.4833	-999	4.84	3.82	D
303781	HEMPSTEAD GANY	NCDC	40.7167	-73.6333	-999	1.62	3.88	D
303786	HEMPSTEAD MANY	NCDC	40.6833	-73.6667	-999	1.27	3.91	D
303839	HIGH FALLS NY	NCDC	41.8333	-74.1333	-999	7.63	3.91	D
303864	HIGHMOUNT NY	NCDC	42.15	-74.4833	-999	5.3	3.48	D
304024	HUDSON NY	NCDC	42.25	-73.7833	-999	3.5	3.9	D
304102	INDIAN LAKE NY	NCDC	43.75	-74.2833	-999	0.05	3.93	D
304111	INGHAMS NY	NCDC	43.0667	-74.7667	-999	0.41	3.92	D
304182	JACKSONBURG NY	NCDC	43.0167	-74.9167	-999	0.45	3.84	D
304271	JOHNSONVILLENY	NCDC	42.9167	-73.5167	-999	0.24	4.12	D
304472	KORTRIGHT NY	NCDC	42.4	-74.8	-999	4.82	3.64	D
304486	LACKAWACK NY	NCDC	41.7833	-74.4	-999	8.81	4.27	D
304525	LAKE DELAWARNY	NCDC	42.25	-74.9	-999	6.79	3.76	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
304533	LAKE HILL NY	NCDC	42.0667	-74.1833	-999	3.4	4.43	D
304563	LAKE RONKONKNY	NCDC	40.8333	-73.1333	-999	0.93	4.37	D
304706	LEWBEACH NY	NCDC	41.95	-74.8333	-999	6.01	4.06	D
304723	LEXINGTON 1 NY	NCDC	42.2333	-74.3333	-999	4.84	3.76	D
304731	LIBERTY 1 NENY	NCDC	41.8167	-74.75	-999	7.5	4.36	D
304791	LITTLE FALLSNY	NCDC	43.0667	-74.8667	-999	0.41	3.83	D
304796	LITTLE FALLSNY	NCDC	43.0333	-74.8667	-999	0.47	3.83	D
305032	MANORKILL NY	NCDC	42.3833	-74.3167	-999	3.23	3.67	D
305120	MARY SMITH NY	NCDC	42.05	-74.8167	-999	5.15	3.95	D
305231	MECHANICVILLNY	NCDC	42.8833	-73.6833	-999	0.52	4.02	D
305291	MIDDLEBURG NY	NCDC	42.6	-74.3333	-999	1.53	3.2	D
305310	MIDDLETOWN NY	NCDC	41.45	-74.4333	-999	5.7	3.98	D
305334	MILLBROOK NY	NCDC	41.85	-73.6167	-999	7.89	4.21	D
305426	MOHONK LAKE NY	NCDC	41.7667	-74.15	-999	9.05	4.29	D
305435	MONGAUP VALLNY	NCDC	41.6667	-74.7833	-999	6.56	3.97	D
305560	MOUNT LEBANONY	NCDC	42.4667	-73.4667	-999	2.74	4.7	D
305671	NEVERSINK NY	NCDC	41.8333	-74.65	-999	6.12	4.32	D
305711	NEWCOMB 4 WNNY	NCDC	43.9833	-74.2333	-999	0.11	3.98	D
305743	NEW KINGSTONNY	NCDC	42.2333	-74.6833	-999	5.02	3.83	D
305804	NEW YORK LAUNY	NCDC	40.7333	-73.9333	-999	1.96	4.12	D
306062	NORTHVILLE NY	NCDC	43.2167	-74.1667	-999	0.31	4.18	D
306111	OAK HILL NY	NCDC	42.4	-74.15	-999	3.6	3.38	D
306229	ONEONTA 3 SENY	NCDC	42.45	-75	-999	2.12	3.69	D
306275	ORIENT 2 E NY	NCDC	41.15	-72.2667	-999	1.08	4.26	D
306426	PARKSTON NY	NCDC	41.9	-74.8167	-999	5.01	4.19	D
306479	PEEKAMOOSE NY	NCDC	41.9333	-74.3833	-999	6.1	4.41	D
306567	PHOENICIA NY	NCDC	42.0833	-74.3167	-999	5.02	3.95	D
306674	PLEASANTVILLNY	NCDC	41.15	-73.7667	-999	4.26	4.43	D
306774	PORT JERVIS NY	NCDC	41.3833	-74.6833	-999	8.3	3.74	D
306817	POUGHKEEPSIENY	NCDC	41.6833	-73.9333	-999	6.84	3.9	D
306820	POUGHKEEPSIENY	NCDC	41.6333	-73.8833	-999	7.67	3.92	D
306848	PREDTON HOLLNY	NCDC	42.4333	-74.2	-999	2.58	3.48	D
306999	RELAY NY	NCDC	42.3167	-74.6333	-999	4.54	3.84	D
307115	RIFTON 1 N NY	NCDC	41.85	-74.05	-999	6.22	3.82	D
307317	ROXBURY NY	NCDC	42.2833	-74.5667	-999	4.6	3.69	D
307405	SALEM NY	NCDC	43.1667	-73.3167	-999	0.36	3.91	D
307413	SALISBURY NY	NCDC	43.15	-74.85	-999	0.2	4.6	D
307484	SARATOGA SPRNY	NCDC	42.9833	-73.7333	-999	0.5	4.01	D
307505	SCHAGHTICOKENY	NCDC	42.9	-73.6	-999	0.3	4.05	D
307524	SCHROON LAKENY	NCDC	43.8667	-73.7333	-999	0	4.65	D
307544	SCHUYLERVILLNY	NCDC	43.1167	-73.5833	-999	0.43	3.96	D
307568	SCOTIA NY	NCDC	42.8167	-73.9833	-999	0.55	3.75	D
307596	SEAGER NY	NCDC	42.05	-74.55	-999	4.4	4.92	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
307721	SHOKAN BROWNNY	NCDC	41.95	-74.2167	-999	5.54	4.03	D
307742	SHRUB OAK NY	NCDC	41.3333	-73.8333	-999	6.71	4.44	D
307818	SMITHS BASINNY	NCDC	43.35	-73.5	-999	0.33	4.07	D
308080	SPECULATOR NY	NCDC	43.5	-74.3667	-999	0	4.15	D
308096	SPENCERTOWN NY	NCDC	42.3333	-73.55	-999	2.41	4.48	D
308104	SPIER FALLS NY	NCDC	43.2333	-73.75	-999	0.82	4.07	D
308138	SPRITE CREEKNY	NCDC	43.1333	-74.6667	-999	0.34	4.36	D
308160	STAMFORD NY	NCDC	42.4	-74.6167	-999	3.34	3.68	D
308232	STEWART FIELNY	NCDC	41.5	-74.1	-999	8.82	3.86	D
308240	STEWARTS LANNY	NCDC	43.1333	-74.6	-999	0.38	4.49	D
308352	SUNDOWN NY	NCDC	41.8833	-74.4667	-999	5.85	4.42	D
308403	TANNERSVILLENY	NCDC	42.1833	-74.1667	-999	4.27	4.02	D
308432	TERRY CLOVE NY	NCDC	42.1333	-74.9	-999	4.78	4.04	D
308523	TITICUS NY	NCDC	41.3333	-73.65	-999	5.94	4.36	D
308749	VALHALLA 2 ENY	NCDC	41.0667	-73.7667	-999	3.36	4.27	D
308967	WARWICK NY	NCDC	41.2667	-74.3667	-999	3.87	4.14	D
309178	WEDTERLO NY	NCDC	42.5167	-74.05	-999	1.9	3.69	D
309237	WEDT KILL NY	NCDC	42.2	-74.3833	-999	4.91	4.18	D
309292	WEDT POINT NY	NCDC	41.3833	-73.9667	-999	4.86	4.48	D
309311	WEDT SHOKAN NY	NCDC	41.95	-74.3167	-999	6.3	4.21	D
309413	WHITE POND NY	NCDC	41.5	-73.75	-999	8.71	4.48	D
309512	WINDHAM NORTNY	NCDC	42.35	-74.2833	-999	3.76	3.8	D
309516	WINDHAM 2 E NY	NCDC	42.3	-74.2167	-999	4.79	3.85	D
365470	MATAMORAS PA	NCDC	41.3667	-74.7	-999	8.22	3.75	D
430563	BENNINGTON 2VT	NCDC	42.9167	-73.2167	-999	0.3	4.21	D
430660	BETHEL VT	NCDC	43.8333	-72.6333	-999	0	4.29	D
431243	CAVENDISH VT	NCDC	43.3833	-72.6	-999	0.52	4.18	D
431360	CHELSEA 2 S VT	NCDC	43.95	-72.45	-999	0.01	4.1	D
431433	CHITTENDEN VT	NCDC	43.7	-72.95	-999	0	4.93	D
431580	CORNWALL VT	NCDC	43.9667	-73.2	-999	0	4.19	D
431786	DORSET 1 S VT	NCDC	43.25	-73.1	-999	0.64	4.76	D
435029	MAYS MILL VT	NCDC	42.7333	-72.7333	-999	3.84	4.53	D
436712	RANDOLPH VT	NCDC	43.9333	-72.6667	-999	0.03	4.35	D
436746	READING HILLVT	NCDC	43.5167	-72.5667	-999	0.27	4.57	D
436761	READSBORO 1 VT	NCDC	42.75	-72.9333	-999	2.65	4.66	D
436893	ROCHEDTER VT	NCDC	43.8833	-72.8167	-999	0.11	5.07	D
437098	SALISBURY VT	NCDC	43.9	-73.1	-999	0.02	4.25	D
437401	SOMERSET VT	NCDC	42.9667	-72.95	-999	0.44	5.49	D
437617	SOUTH LONDONVT	NCDC	43.1833	-72.8167	-999	0.33	4.49	D
437954	SPRINGFIELD VT	NCDC	43.2667	-72.45	-999	0	3.9	D
438438	TOWNSHEND VT	NCDC	43.0333	-72.6667	-999	0.42	4.32	D
438556	UNION VILLAGVT	NCDC	43.8	-72.2667	-999	0.02	3.88	D
438600	VERNON VT	NCDC	42.7667	-72.5167	-999	3.45	4.31	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
438747	WARDSBORO VT	NCDC	43.05	-72.7833	-999	1.26	5.39	D
439329	WEDT HARTFORVT	NCDC	43.7167	-72.4167	-999	0	3.85	D
439691	WHITE RIVER VT	NCDC	43.65	-72.3167	-999	0.46	3.71	D
439984	WOODSTOCK VT	NCDC	43.6333	-72.5167	-999	0.31	3.82	D
99991	PSEUDO1 MA	NCDC	42.17	-72.885	1148	18.39	4.69	S
99992	PSEUDO2 MA	NCDC	42.187	-72.957	1033	17.24	4.84	S
99993	PSEUDO3 MA	NCDC	41.996	-72.829	298	17.25	4.35	S
99994	PSEUDO4 MA	NCDC	42.179	-72.84	646	18.5	4.56	S
99995	PSEUDO5 MA	NCDC	42.17	-72.776	396	18.34	4.43	S
99996	PSEUDO6 MA	NCDC	42.185	-72.777	396	17.41	4.44	S
99997	PSEUDO7 MA	NCDC	42.19	-72.859	396	17.62	4.53	S
99998	PSEUDO8 MA	NCDC	42.191	-72.93	1496	17.46	4.89	S
99999	PSEUDO9 MA	NCDC	42.175	-72.97	1233	17.16	4.85	S
99910	PSEUDO10MA	NCDC	42.125	-72.951	1099	17.14	4.73	S
99911	PSEUDO11MA	NCDC	42.146	-72.884	1207	18.32	4.68	S
99912	PSEUDO12MA	NCDC	42.073	-72.898	1099	17.18	4.14	S
99913	PSEUDO13MA	NCDC	42.103	-72.832	830	18.22	4.4	S
99914	PSEUDO14MA	NCDC	42.09	-72.762	216	18.23	4.35	S
99915	PSEUDO15MA	NCDC	42.147	-72.729	196	18.29	4.37	S
99916	PSEUDO16MA	NCDC	42.038	-72.859	590	17.19	4.24	S
99917	PSEUDO17MA	NCDC	41.996	-72.818	298	17.25	4.35	S
99918	PSEUDO18MA	NCDC	42.019	-72.747	229	17.34	4.19	S
99919	PSEUDO19MA	NCDC	42.063	-72.716	298	17.29	4.19	S
99920	PSEUDO20MA	NCDC	42.108	-72.684	196	17.24	4.24	S
99921	PSEUDO21MA	NCDC	42.14	-72.693	272	17.3	4.33	S
60227	BROOKFIELD MA	NCDC	42.22	-72.1	656	17.02	4.29	S
60227	MILLIS MA	NCDC	42.17	-71.35	170	13.76	4.16	S
60227	BAKERSVILLE CT	NCDC	41.8333	-73.0333	757	15.39	4.91	S
68441	TORRINGTON 2 CT	NCDC	41.8	-73.1333	721	15.65	5.03	S
69174	WEST HARTLAN CT	NCDC	42	-72.9667	1049	14.43	4.45	S
190801	BOYLSTON MA	NCDC	42.35	-71.7167	597	9.59	4.24	S
195077	MOUNT WACHUSMA	NCDC	42.4833	-71.8833	1249	4.23	4.38	S
196644	PRINCETON MA	NCDC	42.45	-71.8667	948	4.18	4.24	S
272136	DUBLIN NH	NCDC	42.9167	-72.0667	1748	2.59	4.31	S
302291	EASTCHESTER NY	NCDC	40.9333	-73.8	98	2.51	4.25	S
68364	THOMPSONVILL CT	NCDC	42	-72.6	85	14.87	3.95	S
69162	WEST HARTFOR CT	NCDC	41.75	-72.7833	298	11.4	4.95	S
69544	WHITNEY LAKE CT	NCDC	41.3333	-72.9167	111	3.97	4.01	S
191447	CHESTNUT HILL MA	NCDC	42.3333	-71.15	147	11.91	3.61	S
191589	COLDBROOK MA	NCDC	42.3833	-72.05	915	8.01	4.49	S
192975	FRAMINGHAM MA	NCDC	42.2833	-71.4167	173	9.91	3.97	S
193270	GROTON MA	NCDC	42.6	-71.5833	308	4.93	3.98	S
196676	PROVINCETOWN MA	NCDC	42.05	-70.2333	-98	3.54	3.3	S

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
197627	SOUTHBRIDGE MA	NCDC	42.05	-72.0833	787	11.34	4.24	S
199928	WORCESTER MA	NCDC	42.3	-71.8167	629	12.07	4.15	S
270910	BRADFORD NH	NCDC	43.25	-71.9667	797	0.25	4.49	S
271048	BUCKS CORNER NH	NCDC	43.7333	-71.9833	1584	1.23	4.25	S
272427	EASTMAN FALLS NH	NCDC	43.45	-71.6667	449	0.15	3.9	S
274475	LAKEPORT NH	NCDC	43.55	-71.4667	488	0.98	3.86	S
274480	LAKEPORT 2 NH	NCDC	43.55	-71.4833	505	0.91	3.84	S
275150	MARLOW NH	NCDC	43.1167	-72.2	1187	0.61	3.85	S
276980	PORTSMOUTH NH	NCDC	43.0667	-70.7833	49	2.51	3.41	S
278081	SOUTH LYNDEB NH	NCDC	42.8833	-71.7833	652	2.39	3.86	S
278606	TAMWORTH NH	NCDC	43.8667	-71.2667	574	0.66	4.26	S
279474	WEST RUMNEY NH	NCDC	43.8	-71.85	597	1.49	4	S
279740	WINDHAM NH	NCDC	42.7833	-71.3167	282	2.77	3.72	S
279865	WOLFEBORO FANH	NCDC	43.5833	-71.2	541	0.93	3.79	S
281472	CEDAR GROVE NJ	NCDC	40.8667	-74.2167	298	2.33	4.43	S
285071	MACOPIN INTA NJ	NCDC	41.0167	-74.4	606	5.49	4.48	S
285597	MILTON NJ	NCDC	41.0167	-74.5333	908	3.78	4.44	S
287545	RIDGEFIELD NJ	NCDC	40.8333	-74.0167	6	2.41	4.21	S
287587	RINGWOOD NJ	NCDC	41.1333	-74.2667	423	4.01	4.26	S
300159	AMSTERDAM LO NY	NCDC	42.9167	-74.1333	298	0.3	3.75	S
300511	BEDFORD HILL NY	NCDC	41.2333	-73.7167	396	3.73	4.33	S
301144	CANAJOHARIE NY	NCDC	42.9167	-74.5833	419	0.62	3.62	S
303289	GLENS FALLS NY	NCDC	43.3167	-73.65	331	0.66	3.69	S
303294	GLENS FALLS NY	NCDC	43.35	-73.6167	328	0.86	3.64	S
303916	HOFFMEISTER NY	NCDC	43.3833	-74.7167	1998	0.04	5.1	S
305283	MIDDLE BRANC NY	NCDC	41.3833	-73.65	321	7.28	4.39	S
306301	OSSINING SIN NY	NCDC	41.15	-73.8667	-98	3.51	4.19	S
306441	PATCHOGUE NY	NCDC	40.7667	-73.0167	16	0.52	4.45	S
307633	SETAUKET NY	NCDC	40.95	-73.1	-98	1.68	4.01	S
308902	WALDEN 2 NE NY	NCDC	41.5667	-74.1667	400	7.05	3.66	S
363200	GEORGE SCHOOL PA	NCDC	40.2167	-74.9333	137	3	4.66	S
370576	AUSTIN RI	NCDC	41.6	-71.65	518	4.43	4.35	S
374266	KINGSTON RI	NCDC	41.4833	-71.5333	164	2.78	4.34	S
430499	BELLOWS FALL VT	NCDC	43.1333	-72.45	488	0.18	3.83	S
436335	PERU VT	NCDC	43.2333	-72.9	1696	0.21	5.18	S
436717	RANDOLPH CEN VT	NCDC	43.95	-72.6	1299	0.23	4.39	S
436995	RUTLAND VT	NCDC	43.6	-72.9667	580	0.43	4.17	S
437142	SEARSBURG PO VT	NCDC	42.9	-73	2165	0.64	5.21	S
439477	WESTON 1 S VT	NCDC	43.2833	-72.7833	1499	0.36	4.78	S
439735	WHITINGHAM VT	NCDC	42.7833	-72.9167	1623	1.72	4.6	S
439764	WILDER VT	NCDC	43.6667	-72.3	354	0.33	3.73	S
68436	TORRINGTON CT	NCDC	41.8	-73.1167	577	12.33	5.05	S
198580	TURNERS FALL MA	NCDC	42.6167	-72.55	200	5.63	4.06	S

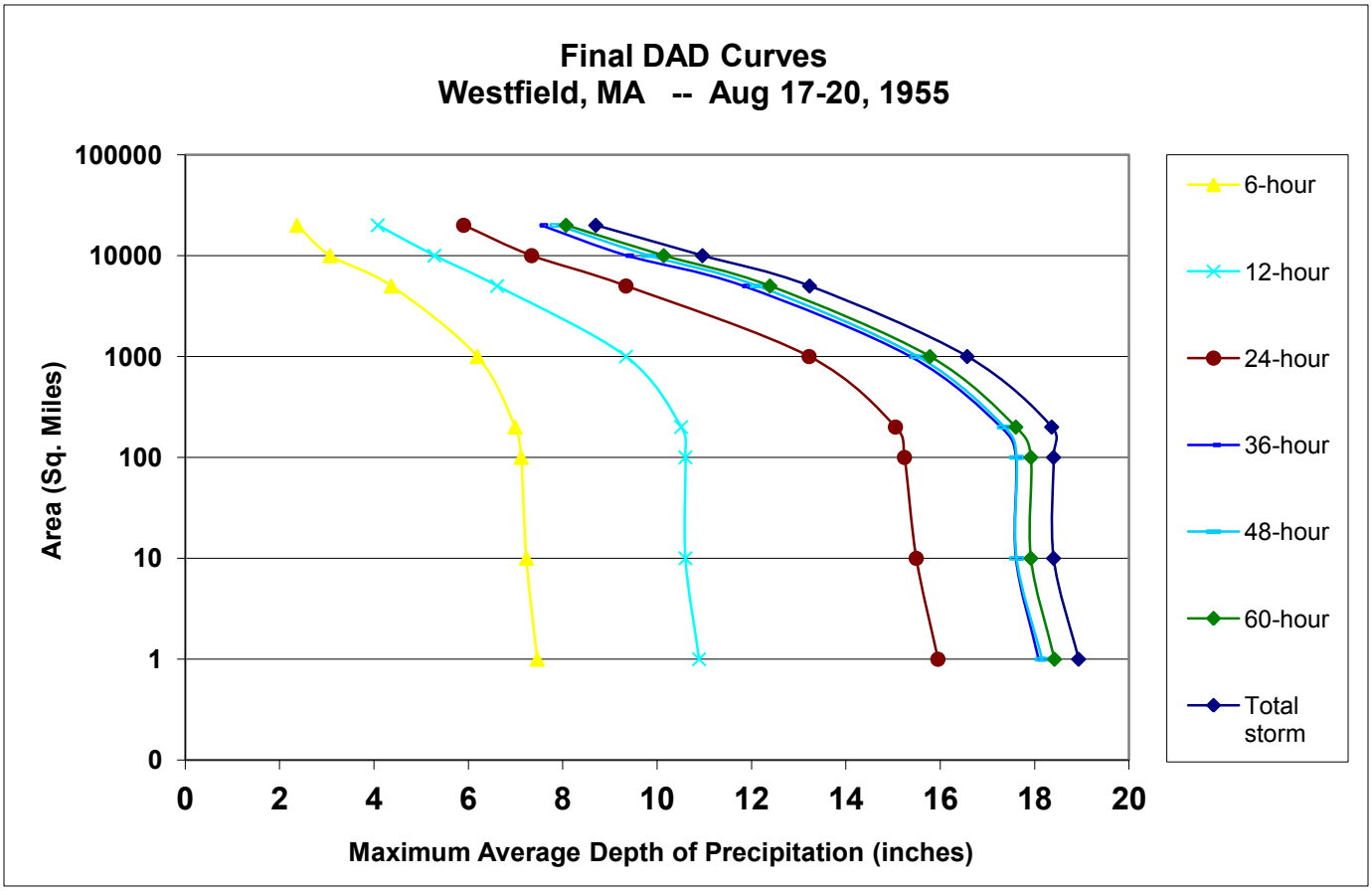
Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
194760	MILFORD MA	NCDC	42.1667	-71.5167	334	14.51	4.13	S
198030	SPOT POND MA	NCDC	42.45	-71.0833	246	13.14	3.56	S
69568	WIGWAM RESER CT	NCDC	41.6667	-73.1333	597	10.94	4.82	S
193549	HEATH MA	NCDC	42.6667	-72.8167	1587	3.6	4.53	S

OUTPUT

Depth-Area-Duration results

MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)

		Duration (hours)						
Area in Sq. Mi.		6	12	24	36	48	60	total
1.000		7.5	10.9	16.0	18.1	18.2	18.4	18.9
10.000		7.2	10.6	15.5	17.6	17.6	17.9	18.4
100.000		7.1	10.6	15.2	17.6	17.6	17.9	18.4
200.000		7.0	10.5	15.1	17.3	17.4	17.6	18.4
1000.000		6.2	9.3	13.2	15.4	15.5	15.8	16.6
5000.000		4.4	6.6	9.3	11.8	12.1	12.4	13.2
10000.000		3.1	5.3	7.3	9.4	9.8	10.1	11.0
20000.000		2.4	4.1	5.9	7.5	7.9	8.1	8.7



NWS Results

		Duration (hours)						
Area in Sq. Mi.		6	12	24	36	48	60	total
10.000		7.8	11.1	16.4	18.9	19.4	19.4	19.4
100.000		7.6	10.5	14.6	18.1	18.8	19.0	19.0
200.000		7.4	10.2	14.2	17.6	18.2	18.4	18.4
1000.000		6.2	9.2	12.4	15.9	16.2	16.4	16.4
5000.000		4.0	6.3	9.5	12.1	12.6	13.0	13.0
10000.000		3.1	5.0	8.0	10.0	10.6	10.8	10.8
20000.000		2.1	3.6	6.3	7.9	8.3	8.5	8.5

% Difference

		Duration (hours)						
Area (sq. mi.)		6	12	24	36	48	60	total
10		-7%	-5%	-6%	-7%	-9%	-8%	-5%
100		-6%	1%	4%	-3%	-6%	-6%	-3%
200		-6%	3%	6%	-2%	-5%	-4%	0%
1000		0%	2%	7%	-3%	-4%	-4%	1%
5000		9%	5%	-2%	-2%	-4%	-5%	2%
10000		-1%	6%	-8%	-7%	-7%	-6%	1%
20000		13%	13%	-6%	-5%	-5%	-5%	2%

APPENDIX H: SPAS SOFTWARE CERTIFICATION

Computer Program Certification

QA Project:	Flood Hazard Re-evaluation Project
GZA Project No:	01.0171705.00
Program Name:	Storm Precipitation Analysis System (SPAS)
Principal Use:	Calculation of Precipitation Depth Area Duration Relationship

Revision/Version	Prepared by/Date	Reviewed by/Date
0	12/23/13 David Leone (Responsible Engineer)	12/23/13 Chad Cox (Supervisor)

Program Capability/Intended Use:

SPAS was developed for use in producing Depth-Area-Duration values for Probable Maximum Precipitation (PMP) analyses. The intended use (application) of SPAS for this project is calculating the storm precipitation depth-area-duration information induced by historic storms for incorporation into the site-specific PMP calculation at NGS.

Supplier and Evidence of Accuracy:

SPAS is supplied by AWA located in Monument, Colorado SPAS 9.5 is determined to be accurate for its intended use in calculating storm-precipitation depth-area-duration data to support calculation of the Probable Maximum Precipitation (PMP) for External Flood Margin Assessments. This determination was made by comparison of results from benchmark (NWS) calculations and AWA calculations using SPAS 9.5.

User Manual, Program Listing and Documentation:

The SPAS 9.5 User Manual is filed with the project records. The source code is not readily available or distributed by the originator.

Error Resolution:

There are currently no known deficiencies of the model. However there are inherent degrees of uncertainty in each of the data inputs (precipitation gauge data, basemap and radar data). SPAS is designed to leverage the strengths of each input, while minimizing their weaknesses to produce accurate results. Subversion, an open source software version control system, is used to log code edits and store the SPAS source code in an organized framework.

Software Applicability Statement and Project Specific Information:

SPAS 9.5 computer software is determined to be accurate for its intended use in calculating storm-precipitation depth-area-duration data to support calculation of the Probable Maximum Precipitation (PMP) at Flood Hazard Re-evaluation Project sites.

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1.0 PROGRAM CAPABILITY / INTENDED USE

SPAS was originally developed by AWA and METSTAT, Inc. in 2002 (Reference 1) for use in producing Depth-Area-Duration (DAD) data for Probable Maximum Precipitation (PMP) analyses. SPAS utilizes precipitation gauge data, "basemaps" and radar data (when available) to produce gridded precipitation at time intervals as short as 5-minutes, at spatial scales as fine as 1 km^2 and a variety of other customizable outputs. SPAS output has many applications including, but not limited to: hydrologic model calibration/validation, flood event reconstruction, storm water runoff analysis, forensic cases and PMP studies. Detailed SPAS-computed precipitation data allow hydrologists to accurately model runoff from basins, particularly when the precipitation is unevenly distributed over the drainage basin or when rain gauge data is limited or not available.

The intended use (application) of SPAS is to calculate the storm precipitation DAD information caused by historic storms for incorporation into site-specific PMP calculation for Flood Hazard Re-evaluation Project sites.

2.0 PURPOSE

The purpose of this Computer Program Certification is to document that SPAS 9.5 is an acceptable computer software program for its intended use in calculating storm precipitation DAD information associated with historic precipitation events for Flood Hazard Re-evaluation Project sites, in accordance with AREVA's Controlled Document No.0402-01 (Rev.43, dated September 2012). The certification methodology, documentation and results of the SPAS 9.5 certification are presented below.

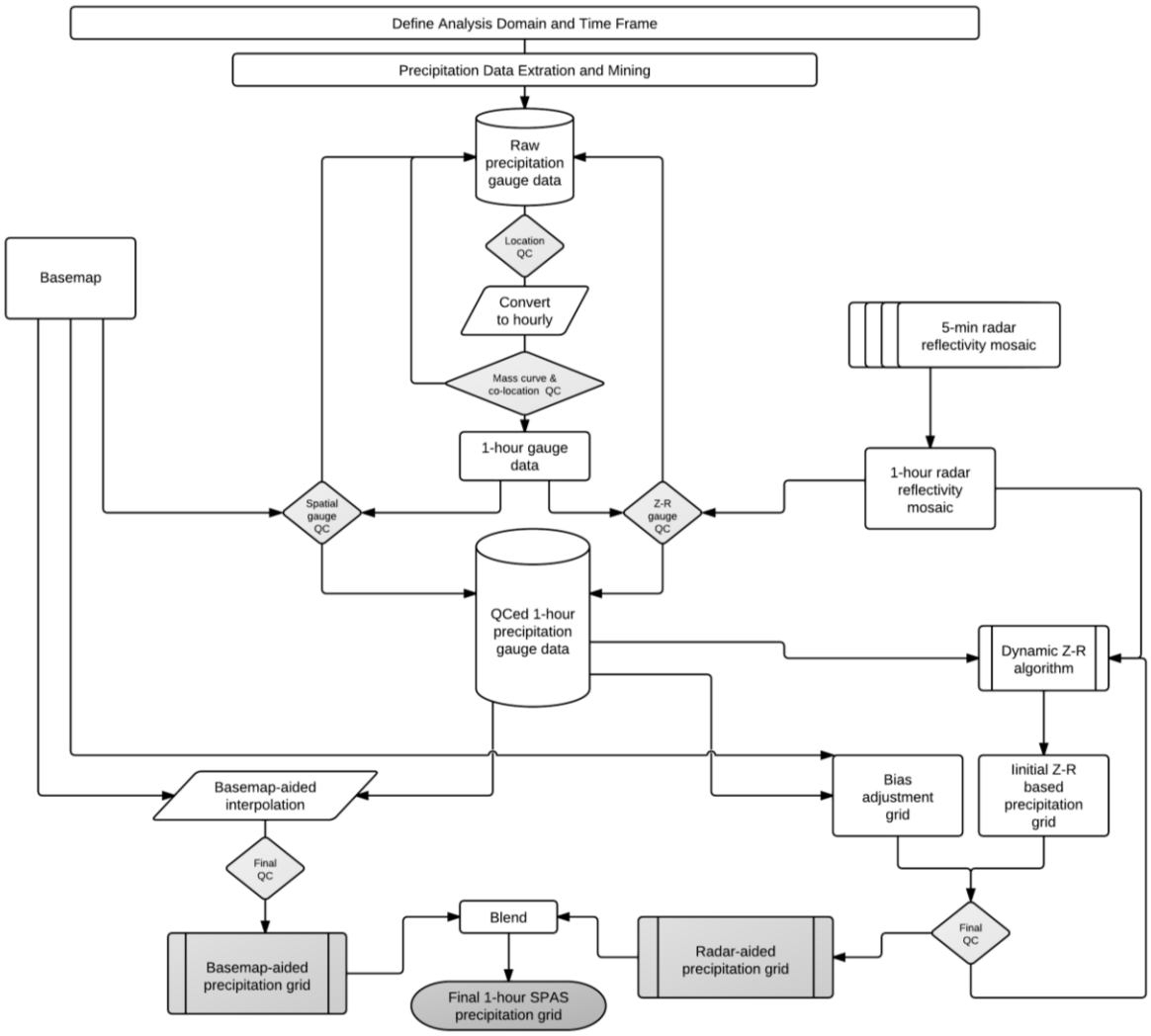
3.0 METHODOLOGY

A summary of the general SPAS processes are shown in the flow chart in Figure 1. SPAS requires input in the form of precipitation gage data over a user-defined (longitude and latitude) rectangular SPAS geographic model domain and a user-defined temporal range. SPAS also utilizes, but does not require, a user-input "basemap" consisting of an independent grid of a spatially distributed weather or climate variable for governing the spatial patterns of the hourly precipitation. The basemap also governs the spatial resolution of the final SPAS grids, unless radar data is available/used which is then used to establish the spatial resolution. Note that a basemap is not required as the hourly precipitation patterns can be based on a station characteristics and an inverse distance weighting technique (discussed in more detail in Reference 1). SPAS DADs are computed using the procedures outlined by the National Weather Service Technical Paper 1 (1946).

To perform the certification of the DAD simulation, a computer analysis was performed using the SPAS program on the August 1955 Westfield, Massachusetts storm. The principal components of the SPAS model are: data extraction, quality control, conversion of daily precipitation data into estimated hourly data, hourly and total storm precipitation grids/maps and storm-centered DAD analysis results. The results are compared to DAD analyses previously conducted by the NWS (Attachment 1, Reference 2).

Upon achieving a good agreement between the calculated results and the benchmark calculation, the accuracy of the software is verified and validated.

Figure 1: SPAS Flow Chart



4.0 INPUTS

Input to SPAS included (Attachment 2):

1. Rainfall data from various precipitation sources (see Attachment 2), official government entities used regularly listed below:
   a. National Climatic Data Center
   b. National Weather Service
2. Basemap:
   a. PRISM Mean (1971-2000) August precipitation (Reference 3)

5.0 RESULTS

Attachment 1 presents the NWS DAD analysis published in Reference 2. Attachment 2 presents the SPAS input/output developed by AWA.

Comparison of SPAS DAD output in Attachment 2 to NWS DAD analyses in Attachment 1 shows that the results are similar, as shown below in Table 1:

Table 1: Percent difference [(AWA-NWS)/NWS] between the AWA DAD results and those published by the NWS for the 1955 Westfield, Massachusetts storm

	Duration (hours)						
Area (sq. mi.)	**6**	**12**	**24**	**36**	**48**	**60**	**total**
10	-7%	-5%	-6%	-7%	-9%	-8%	-5%
100	-6%	1%	4%	-3%	-6%	-6%	-3%
200	-6%	3%	6%	-2%	-5%	-4%	0%
1000	0%	2%	7%	-3%	-4%	-4%	1%
5000	9%	5%	-2%	-2%	-4%	-5%	2%
10000	-1%	6%	-8%	-7%	-7%	-6%	1%
20000	13%	13%	-6%	-5%	-5%	-5%	2%

In AWA's opinion, the comparison of the results indicates acceptable consistency and accuracy. Therefore, the SPAS 9.5 software is determined to be acceptably accurate for its intended use in calculating storm-precipitation depth-area-duration data to support calculation of the Probable Maximum Precipitation for Flood Hazard Re-evaluation Project sites.

6.0 HEC-HMS 3.5 USER'S MANUAL / DOCUMENTATION

The SPAS 9.5 User Manual is filed with the project records. The source code is not readily available or distributed by the originator.

7.0 KNOWN DEFICIENCIES

There are currently no known deficiencies of the model. However there are inherent degrees of uncertainty in each of the data inputs (precipitation gauge data and basemap). SPAS is designed to leverage the strengths of each input, while minimizing their weaknesses to produce accurate results. Subversion, an open source software version control system, is used to log code edits and store the SPAS source code in an organized framework; Subversion also allows for organized versioning of SPAS.

8.0 PROGRAM ACCESS/SECURITY

This example calculation, selected for the software certification, is consistent with the intended software application Flood Hazard Re-evaluation projects. The computer software certification analysis was performed by AWA's employee Douglas Hultstrand on the AWA workstation used for the calculation on January 3, 2014.

The software is maintained on designated computers as an executable file to prevent unauthorized editing. Access to each computer is password protected to restrict access and deletion. The computer software resides on designated computers at the offices of METSTAT, Inc. in Windsor, Colorado, which co-owns and operates SPAS in partnership with Applied Weather Associates.

9.0 REFERENCES

1. Technical Documentation for SPAS Program Version 9.5, September 2011.

2. National Weather Service and U.S. Army Corps of Engineers, Hydrometeorological Report No. 51, Probable Maximum Precipitation Estimates, United States East of the 105th Meridian, 1978.

3. Oregon State University, PRISM Climate Group rainfall data, http://www.prism.oregonstate.edu/.

ATTACHMENT 1 BENCHMARK CALCULATION - HMR-51 DEPTH-AREA-DURATION DATA

HYDROMETEOROLOGICAL REPORT NO. 51

Probable Maximum Precipitation Estimates, United States East of the 105th Meridian

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

Washington, D C
June 1978

Storm Index No.	Storm Assignment No.	Date
1	OR 9-19	9/10-13/1878
2	SA 1-1	5/30-6/1/1889
3	MR 4-3	6/4-7/1896
4	UMV 1-2	7/18-22/1897
6	NA 1-7B	7/26-29/1897
7	GM 3-4	6/27-7/1/1899
8	LMV 2-5	4/15-18/1900
11	GL 4-9	10/7-11/1903
13	GL 2-12	6/3-8/1905
14	UMV 2-5	6/9-10/1905
16	MR 5-13	6/6-8/1906
17	GM 3-14	8/4-6/1906
20	SW 1-11	10/19-24/1908
22	UMV 1-11A	7/18-23/1909
26	LMV 3-19	3/24-28/1914
29	GL 2-16	8/31-9/1/1914
31	SA 2-9	7/13-17/1916
33	GM 5-15B	9/15-17/1919
36	MR 4-21	6/17-21/1921
37	GM 4-12	9/8-10/1921
38	MR 4-23	9/27-10/1/1923
42	MR 4-24	9/17-19/1926
44	NA 1-17	11/2-4/1927
47	LMV 2-20	3/11-16/1929
49	GM 5-1	6/30-7/2/1932
50	NA 1-20A	9/16-17/1932
51	NA 1-20B	9/16-17/1932
53	SW 2-11	4/3-4/1934
54	LMV 4-21	5/16-20/1935
55	MR 3-28A	5/30-31/1935
56	- -	5/30-31/1935
57	GM 5-20	5/31/1935
59	NA 1-27	7/6-10/1935
65	- -	6/19-20/1939
67	MR 4-5	6/3-4/1940
68	NA 2-4	9/1/1940
69	SW 2-18	9/2-6/1940
71	UMV 1-22	8/28-31/1941
74	OR 9-23	7/17-18/1942
76	SA 1-28A	10/11-17/1942
77	SW 2-20	5/6-12/1943
78	MR 6-15	6/10-13/1944
80	MR 7-2B	8/12-16/1946
82	- -	6/23-24/1948
85	SA 5-8	9/3-7/1950
86	MR 10-2	7/9-13/1951
87	MR 10-8	6/7/1953
88	SW 3-22	6/23-28/1954
90	ONT 10-54	10/14-15/1954
91	NA 2-22A	8/17-20/1955
93	QUE 8-57	8/3-4/1957
96	SW 3-23	6/13-20/1965
97	SW 3-24	9/19-24/1967
99	NA 2-23	8/19-20/1969
100	NA 2-24A	6/19-23/1972

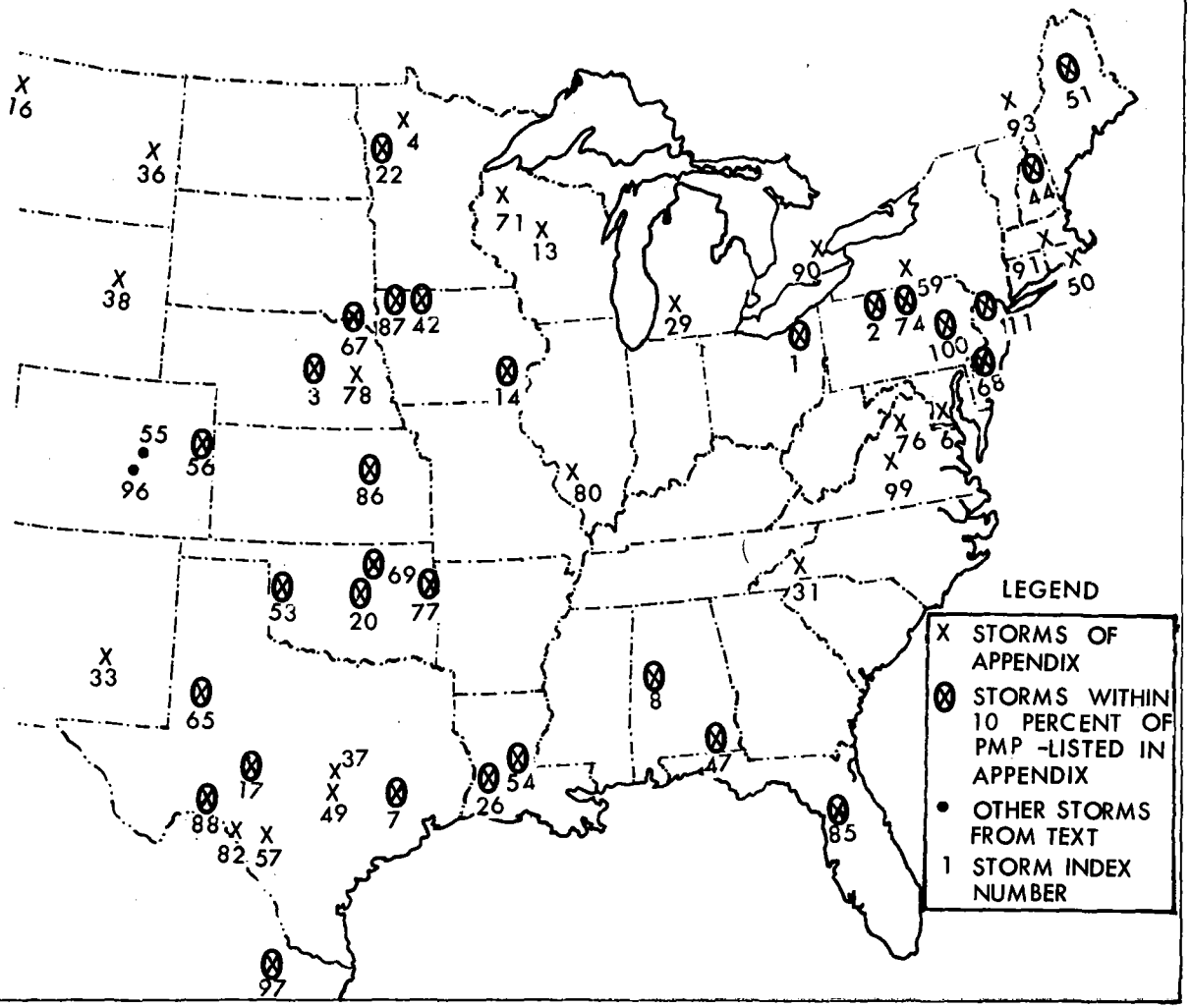


Figure 1.--Location of storms. [Storms of appendix (section 2.2.1), others mentioned in text (sections 2.4.5 and 3.2.3), and those within 10 percent of PMP (section 4.1)]

APPENDIX -- MAXIMUM OBSERVED AREAL RAINFALL FOR IMPORTANT STORMS

The following is a list of observed maximum rainfall depths of the most important storms for selected area sizes and durations. Other information shown are:

a. Storm index number. Used in this report for identification purposes.

b. Storm assignment number (enclosed in parenthesis). This number is assigned by Corps of Engineers or Atmospheric Environment Service, Canada, for storm identification. Those storms without a storm assignment number refer to unofficial rainfall data acquired by the Hydrometeorological Branch.

c. Date of storm.

d. Location of storm rainfall center.

e. In-place moisture adjustment of the storm.

The location of the rainfall centers, with storm index numbers, are shown in figure 1.

Conversions from English to the metric system for these tables:

1 in. = 25.4 mm

1 mi^2 = 2.59 km^2

APPENDIX - - IMPORTANT STORMS

STORM INDEX NO. 91 (NA 2-22A) DATE 8/17-20/1955
RAINFALL CENTER WESTFIELD,MA MOIST.ADJ.=110

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

AREA SQ.MI.	DURATION OF RAINFALL IN HOURS 6	12	18	24	30	36	48	60
10	7.8	11.1	13.0	16.4	18.5	18.9	19.4	19.4
100	7.6	10.5	11.6	14.6	17.6	18.1	18.8	19.0
200	7.4	10.2	11.4	14.2	17.1	17.6	18.2	18.4
1000	6.2	9.2	10.2	12.4	15.4	15.9	16.2	16.4
5000	4.0	6.3	7.9	9.5	11.7	12.1	12.6	13.0
10000	3.1	5.0	6.5	8.0	9.7	10.0	10.6	10.8
20000	2.1	3.6	4.9	6.3	7.6	7.9	8.3	8.5

STORM INDEX NO. 99 (NA 2-23) DATE 8/19-20/1969
RAINFALL CENTER TYRO,VA MOIST.ADJ.=105

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

AREA SQ.MI.	DURATION OF RAINFALL IN HOURS 6	12	18
10	14.2	25.4	25.4
100	12.9	21.7	21.7
200	11.7	19.6	19.6
1000	8.1	13.5	13.5
5000	4.4	7.5	8.0
10000	3.3	5.8	6.3

STORM INDEX NO. 93 (QUE 8-57) DATE 8/3-4/1957
RAINFALL CENTER ST.PIERRE BAPTISTE,CANADA MOIST.ADJ.=121

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

AREA SQ.MI.	DURATION OF RAINFALL IN HOURS 6	12	18
100	8.4	8.6	8.7
200	7.5	7.6	7.8
1000	4.4	5.2	5.4
5000	2.4	3.1	3.3

STORM INDEX NO.100 (NA 2-24A) DATE 6/19-23/1972
RAINFALL CENTER ZERBE,PA MOIST.ADJ.=121

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

AREA SQ.MI.	DURATION OF RAINFALL IN HOURS 6	12	18	24	30	36	48	60	72	96
10	8.0	11.9	13.3	14.3	15.8	16.9	17.8	18.3	18.5	18.6
100	7.1	10.9	12.5	13.7	15.3	16.0	16.7	17.3	17.4	17.5
200	6.6	10.4	12.0	13.4	15.0	15.6	16.3	16.8	16.9	17.0
1000	5.3	8.9	10.5	12.3	13.8	14.4	14.9	15.2	15.3	15.4
5000	3.8	6.8	8.4	10.0	11.2	12.0	12.6	12.9	13.0	13.2
10000	3.2	5.7	7.3	8.7	9.9	10.5	11.3	11.7	11.8	12.0
20000	2.5	4.4	6.0	7.3	8.3	8.9	9.9	10.4	10.5	10.7
50000	1.6	2.8	4.1	5.1	5.9	6.6	7.7	8.4	8.6	8.8

STORM INDEX NO. 97 (SW 3-24) DATE 9/19-24/1967
RAINFALL CENTER SOMBRERETILLO,MEXICO MOIST.ADJ.=116

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

AREA SQ.MI.	DURATION OF RAINFALL IN HOURS 6	12	18	24	30	36	48	60	72	96
10	9.2	12.2	15.2	18.7	21.8	24.8	26.2	32.0	32.0	32.5
100	7.3	10.4	13.2	17.6	20.7	21.7	23.9	30.0	30.0	30.9
200	6.7	9.7	12.3	16.4	19.2	20.3	23.0	28.8	28.8	29.9
1000	5.3	7.9	10.0	11.9	14.4	16.8	20.3	23.8	25.1	26.0
5000	3.7	5.8	7.6	8.9	10.8	13.1	17.2	19.2	20.7	21.7
10000	3.1	4.9	6.5	7.8	9.5	11.4	15.2	17.3	18.5	20.0
20000	2.4	4.0	5.4	6.7	8.1	9.8	13.0	15.0	16.3	18.2
50000	1.4	2.7	3.9	5.1	6.3	7.6	9.9	11.9	13.2	15.6

* U. S. GOVERNMENT PRINTING OFFICE : 1980 311-046/188

ATTACHMENT 2 SPAS INPUT / OUTPUT

SPAS operated with two primary inputs: precipitation gauge data and a "basemap."

Precipitation Gauge Data

Precipitation gauge data are developed from official, publically available data from National Climatic Data Center (NCDC) TD-3240, NCDC TD-3206 (pre-1948) and NCDC TD-3200 (1948 through present). For brevity, full precipitation data sets are not provided herein but can be obtained from the National Climatic Data Center using the station identification, names, and dates provided herein.

"Basemap"

"Basemaps" are independent grids of spatially distributed weather or climate variables that are used to govern the spatial patterns of the hourly precipitation, particularly in complex terrain. In this case, the basemap was the 800m resolution PRISM (Parameter-elevation Regressions on Independent Slopes Model) mean (1971-2000) August precipitation grid. The PRISM basemap was downloaded from http://www.prism.oregonstate.edu/ (Reference 3).

INPUT

Station precipitation data, where:

Stid = Station ID
Name = Station name
Source = Source or Provider of the data
Lat = Latitude (decimal degrees)
Lon = Longitude (decimal degrees)
Elev = Elevation (feet)
Precip = Total storm precipitation (inches)
BaseMap = Basemap (Mean August Precipitation)
Type = Station type
- H: Hourly (hourly reporting)
- HP: Hourly pseudo (hourly reporting, yet used for timing only; co-located daily or supplemental gauge used for magnitude)
- D: Daily (regular daily observations with known observation time)
- S: Supplemental (unknown observation time)

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
60806	BRIDGEPORT W CT	NCDC	41.1667	-73.1333	-999	2.89	3.84	H
61093	CANDLEWOOD L CT	NCDC	41.4833	-73.4667	-999	8.26	4.6	H
63446	HARTFORD CT	NCDC	41.7667	-72.7	-999	9.47	4.42	H
63451	HARTFORD CT	NCDC	41.7667	-72.6667	-999	7.85	4.16	H
63456	HARTFORD WSO CT	NCDC	41.9333	-72.6833	-999	14.4	4.03	H
63857	JEWETT CITY CT	NCDC	41.6333	-71.9	-999	3.22	4.72	H
64488	MANSFIELD HO PSEUDO CT	NCDC	41.75	-72.1833	-999	6.34	4.26	HP
65018	MOODUS RESER CT	NCDC	41.5	-72.4333	-999	4.82	4.54	H
65273	NEW HAVEN WB CT	NCDC	41.2667	-72.8833	-999	4.2	3.84	H
65445	NORFOLK 2 SW CT	NCDC	41.9667	-73.2167	-999	12.13	4.78	H
66942	ROCKVILLE CT	NCDC	41.8667	-72.4333	-999	8.96	4.53	H
68138	STORRS CT	NCDC	41.8	-72.25	-999	8.1	4.36	H
176905	PORTLAND WSM ME	NCDC	43.65	-70.3167	-999	0.03	3.1	H
190120	AMHERST MA	NCDC	42.4	-72.5333	-999	7.09	4.1	H
190666	BIRCH HILL D MA	NCDC	42.6333	-72.1167	-999	3.52	4.21	H
190736	BLUE HILL MA	NCDC	42.2167	-71.1167	-999	13.76	3.97	H
190770	BOSTON ARPT MA	NCDC	42.3667	-71.0333	-999	12.47	3.47	H
191097	CAMBRIDGE MA	NCDC	42.3833	-71.1167	-999	13	3.55	H
193821	HYANNIS PSEUDO MA	NCDC	41.65	-70.2667	-999	3.09	3.61	HP
193985	KNIGHTVILLE MA	NCDC	42.2833	-72.8667	-999	9.43	4.36	H
195159	NANTUCKET WB MA	NCDC	41.25	-70.0667	-999	2.5	3.85	H
195246	NEW BEDFORD MA	NCDC	41.6333	-70.9333	-999	3.93	4.35	H
196414	PITTSFIELD W MA	NCDC	42.4333	-73.2833	-999	2.92	4.8	H
196681	PROVINCETOWN MA	NCDC	42.0667	-70.2	-999	6.1	3.26	H
196977	ROCKPORT 1 E MA	NCDC	42.65	-70.6	-999	6.63	3.16	H
198101	STATE FARM MA	NCDC	41.95	-70.95	-999	9.68	4.06	H
198159	STERLING 3 N MA	NCDC	42.4667	-71.8	-999	6.51	4.11	H
198843	WASHINGTON 2 MA	NCDC	42.3667	-73.15	-999	5.68	5.05	H
270741	BLACKWATER D NH	NCDC	43.3167	-71.7167	-999	0.15	3.88	H
270998	BRISTOL NH	NCDC	43.6	-71.7167	-999	0.45	3.97	H
271683	CONCORD WSO NH	NCDC	43.2	-71.5167	-999	1.02	3.29	H
272174	DURHAM PSEUDO NH	NCDC	43.1333	-70.9333	-999	2.1	3.41	HP
273182	FRANKLIN FAL NH	NCDC	43.4667	-71.65	-999	0.51	3.91	H
273850	HANOVER NH	NCDC	43.7	-72.2833	-999	0.32	3.75	H
274062	HILLSBORO 2 NH	NCDC	43.1167	-71.9333	-999	1.78	3.91	H
274234	HUDSON NH	NCDC	42.7833	-71.4333	-999	2.91	3.87	H
275013	MACDOWELL DA NH	NCDC	42.9	-71.9833	-999	2.5	4.13	H
275780	NEW DURHAM NH	NCDC	43.4333	-71.1667	-999	0.09	3.8	H
278502	SUNAPEE NH	NCDC	43.3833	-72.0833	-999	0.28	3.83	H
278539	SURRY MOUNTA NH	NCDC	43	-72.3167	-999	1.6	3.97	H
278885	WARREN NH	NCDC	43.9167	-71.8833	-999	0.96	4.11	H
279726	WINCHESTER NH	NCDC	42.7667	-72.3833	-999	2.86	4.17	H
280100	ALLENDALE NJ	NCDC	41.0333	-74.1333	-999	6.25	4.35	H

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
282652	ELIZABETHPOR NJ	NCDC	40.6333	-74.2	-999	1.93	4.23	H
282768	ESSEX FELLS NJ	NCDC	40.8333	-74.3	-999	3.31	4.46	H
283181	FREEHOLD NJ	NCDC	40.25	-74.2833	-999	0.89	4.53	H
283416	GREAT MEADOW NJ	NCDC	40.8667	-74.9167	-999	7.07	4.48	H
283572	HACKENSACK NJ	NCDC	40.8833	-74.05	-999	2.42	4.22	H
283956	HIGHTSTOWN P NJ	NCDC	40.2833	-74.5333	-999	2.28	4.76	H
284260	IRVINGTON NJ	NCDC	40.7167	-74.25	-999	2.51	4.39	H
284627	LAKEWOOD 2 E NJ	NCDC	40.1	-74.1833	-999	1.01	4.77	H
284887	LITTLE FALLS NJ	NCDC	40.8833	-74.2333	-999	4.31	4.41	H
284987	LONG BRANCH NJ	NCDC	40.3	-74	-999	0.92	5.04	H
285244	MARLBORO SCS NJ	NCDC	40.3333	-74.2333	-999	0.77	4.49	H
286026	NEWARK WSO A NJ	NCDC	40.7	-74.1667	-999	2.27	4.16	H
286146	NEW MILFORD NJ	NCDC	40.95	-74.0333	-999	3.13	4.21	H
286560	ORANGE NJ	NCDC	40.7833	-74.2167	-999	2.45	4.43	H
287393	RAHWAY NJ	NCDC	40.6	-74.2667	-999	1.85	4.3	H
288423	SPRINGFIELD NJ	NCDC	40.7167	-74.3	-999	3.22	4.6	H
288883	TRENTON WSO NJ	NCDC	40.2167	-74.7667	-999	2.47	4.46	H
289187	WANAQUE RAYM NJ	NCDC	41.05	-74.3	-999	5.22	4.28	H
289271	WATCHUNG NJ	NCDC	40.6667	-74.4167	-999	3.65	4.55	H
289455	WESTFIELD PSEUDO NJ	NCDC	40.65	-74.35	-999	2.81	4.45	HP
289832	WOODCLIFF LA NJ	NCDC	41.0167	-74.05	-999	3.24	4.34	H
300042	ALBANY WSFO NY	NCDC	42.75	-73.8	-999	0.51	3.66	H
300047	ALBANY WB CITY NY	NCDC	42.65	-73.75	-999	0.63	3.82	H
300862	BRENTWOOD NY	NCDC	40.7833	-73.25	-999	1.56	4.27	H
301207	CARMEL 1 SW PSEUDO NY	NCDC	41.4167	-73.7	-999	6.9	4.5	HP
301708	CONKLINGVILL PSEUDO NY	NCDC	43.3167	-73.9333	-999	0.16	3.88	HP
301949	CUTCHOGUE NY	NCDC	41.0167	-72.5	-999	1.21	4.14	H
301987	DAVENPORT NY	NCDC	42.4667	-74.85	-999	2.4	3.53	H
302582	ELLENVILLE PSEUDO NY	NCDC	41.7167	-74.4	-999	5.81	3.91	HP
302953	FORT PLAIN NY	NCDC	42.9333	-74.6167	-999	0.64	3.61	H
303970	HOPE NY	NCDC	43.2833	-74.2	-999	0.07	4.25	H
304424	KINGSTON NY	NCDC	41.9333	-74	-999	5.62	3.81	H
304613	LARCHMONT 2 NY	NCDC	40.95	-73.7667	-999	2.91	4.24	H
305346	MILLERTON NY	NCDC	41.95	-73.5167	-999	8.59	4.35	H
305377	MINEOLA NY	NCDC	40.7333	-73.6333	-999	1.49	3.88	H
305796	NEW YORK AVE NY	NCDC	40.6	-73.9833	-999	1.16	4.16	H
305801	NEW YORK CEN NY	NCDC	40.7833	-73.9667	-999	1.86	4.16	H
305806	NEW YORK UNI NY	NCDC	40.85	-73.9167	-999	1.84	4.2	H
305811	NEW YORK LAG NY	NCDC	40.7667	-73.8667	-999	1.73	4.12	H
305816	NEW YORK WSO NY	NCDC	40.7	-74.0167	-999	1.62	4.12	H
305821	NEW YORK WES NY	NCDC	40.6	-74.1667	-999	1.83	4.21	H
306119	OAKLAND VALL NY	NCDC	41.5	-74.65	-999	8.29	3.99	H
306184	OLD FORGE NY	NCDC	43.7167	-74.9667	-999	0	4.53	H

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
306623	PISECO NY	NCDC	43.45	-74.5333	-999	0	4.86	H
306768	PORT JEFFERS NY	NCDC	40.95	-73.0667	-999	1.52	4.02	H
306825	POUGHKEEPSIE NY	NCDC	41.7167	-73.9333	-999	6.35	3.88	H
306839	PRATTSVILLE NY	NCDC	42.3167	-74.4333	-999	3.65	3.62	H
307134	RIVERHEAD RE NY	NCDC	40.9667	-72.7167	-999	0.92	3.99	H
307497	SCARSDALE NY	NCDC	40.9833	-73.8	-999	3.26	4.3	H
307513	SCHENECTADY NY	NCDC	42.8333	-73.9167	-999	0.4	3.72	H
307549	SCHUYLERVILL NY	NCDC	43.1	-73.5833	-999	0.35	3.97	H
307742	SHRUB OAK PSEUDO NY	NCDC	41.3333	-73.8333	-999	5.82	4.44	HP
307799	SLIDE MOUNTA NY	NCDC	42.0167	-74.4167	-999	5.9	4.94	H
308503	TICONDEROGA NY	NCDC	43.85	-73.4167	-999	0.43	3.69	H
308586	TRIBES HILL NY	NCDC	42.95	-74.2833	-999	0.54	3.59	H
308720	UPTON WB CIT NY	NCDC	40.8667	-72.8833	-999	0	4.25	H
309389	WHITEHALL NY	NCDC	43.55	-73.4	-999	0.05	4.47	H
309400	WHITE PLAINS NY	NCDC	41	-73.7333	-999	3.11	4.22	H
309576	WOODLANDS AR NY	NCDC	41.0167	-73.85	-999	3.45	4.32	H
362160	DINGMANS FER PA	NCDC	41.2167	-74.8667	-999	7.6	3.98	H
370896	BLOCK ISLAND RI	NCDC	41.1667	-71.5833	-999	0.67	3.42	H
375225	NEWPORT WATE RI	NCDC	41.5	-71.3	-999	1.8	3.83	H
376698	PROVIDENCE W RI	NCDC	41.7333	-71.4333	-999	6.13	3.96	H
433400	GRAFTON VT	NCDC	43.1833	-72.6167	-999	0.23	4.42	H
434882	MANCHESTER C VT	NCDC	43.1667	-73.0667	-999	0.29	4.78	H
437152	SEARSBURG ST VT	NCDC	42.8667	-72.9167	-999	1.15	5.1	H
438057	STOCKBRIDGE VT	NCDC	43.8	-72.7833	-999	0	4.95	H
438512	TYSON VT	NCDC	43.4667	-72.7	-999	0.28	4.42	H
438556	UNION VILLAGE PSEUDO VT	NCDC	43.8	-72.2667	-999	0.99	3.88	HP
60120	ANSONIA CT	NCDC	41.3333	-73.0833	-999	5.5	4.28	D
60251	BALTIC CT	NCDC	41.6167	-72.1	-999	4.86	4.69	D
60830	BRISTOL 3 W CT	NCDC	41.6833	-72.9833	-999	11.77	4.74	D
60918	BROOKLYN CT	NCDC	41.8	-71.9333	-999	6.61	4.25	D
60961	BULLS BRIDGECT	NCDC	41.65	-73.4833	-999	7.38	4.32	D
60973	BURLINGTON CT	NCDC	41.8	-72.9333	-999	15.84	4.79	D
61488	COCKAPONSET CT	NCDC	41.4667	-72.5167	-999	4.87	4.53	D
61499	COLCHEDTER CT	NCDC	41.5833	-72.3333	-999	5.1	4.5	D
61715	CREAM HILL CT	NCDC	41.9	-73.3167	-999	9.56	4.63	D
61762	DANBURY CT	NCDC	41.3833	-73.4667	-999	6.09	4.52	D
61798	DAWSON LAKE CT	NCDC	41.3667	-72.9833	-999	6.66	4.27	D
61844	DERBY SHELTOCT	NCDC	41.3167	-73.0833	-999	6.14	4.25	D
62169	EAST HAVEN CT	NCDC	41.2833	-72.8667	-999	4.4	3.86	D
62288	EASTON RESERCT	NCDC	41.2333	-73.25	-999	6.66	4.29	D
62658	FALLS VILLAGCT	NCDC	41.95	-73.3667	-999	10.08	4.41	D
63207	GROTON CT	NCDC	41.35	-72.05	-999	2.32	4.5	D
63583	HEMLOCKS RESCT	NCDC	41.2333	-73.2667	-999	6.47	4.34	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
63905	KENT CT	NCDC	41.7333	-73.5	-999	7.15	4.57	D
63989	LAKE KONOMOCCT	NCDC	41.4	-72.1833	-999	2.87	4.75	D
64096	LAUREL RESERCT	NCDC	41.1667	-73.55	-999	5.57	4.3	D
64443	MANCHEDTER CT	NCDC	41.7667	-72.4833	-999	7.37	4.51	D
64488	MANSFIELD HOCT	NCDC	41.75	-72.1833	-999	7.24	4.26	D
64599	MEAD POND RECT	NCDC	41.2	-73.5167	-999	5.93	4.38	D
64767	MIDDLETOWN 4CT	NCDC	41.55	-72.7167	-999	6.36	4.4	D
64790	MILFORD CT	NCDC	41.2	-73.0833	-999	3.92	3.86	D
64933	MOHAWK RANGECT	NCDC	41.8333	-73.3	-999	10.43	4.71	D
65077	MOUNT CARMELCT	NCDC	41.4	-72.9	-999	5.53	4.29	D
65131	NATHAN HALE CT	NCDC	41.7667	-72.35	-999	7.16	4.51	D
65309	NEW LONDON CT	NCDC	41.35	-72.1	-999	1.8	4.54	D
65510	NORTH BRANFOCT	NCDC	41.3333	-72.7667	-999	4.78	4.06	D
65641	NORTH GUILFOCT	NCDC	41.3833	-72.7167	-999	4.8	4.29	D
65892	NORWALK CT	NCDC	41.1333	-73.45	-999	5.16	4.12	D
65905	NORWICH 5 SWCT	NCDC	41.5	-72.15	-999	4.03	4.81	D
66131	PACHAUG FORECT	NCDC	41.5833	-71.85	-999	3.62	4.7	D
66597	PROSPECT CT	NCDC	41.5	-72.95	-999	7.44	4.64	D
66645	PUTNAM CT	NCDC	41.9	-71.9167	-999	7.89	4.36	D
66966	ROCKY RIVER CT	NCDC	41.5833	-73.4333	-999	9.06	4.66	D
67002	ROUND POND CT	NCDC	41.3	-73.5333	-999	5.5	4.64	D
67109	SALISBURY CT	NCDC	41.9833	-73.45	-999	12.54	4.6	D
67157	SAUGATUCK RECT	NCDC	41.25	-73.35	-999	7.03	4.45	D
67373	SHEPAUG DAM CT	NCDC	41.7167	-73.3	-999	10.85	4.74	D
67432	SHUTTLE MEADCT	NCDC	41.65	-72.8167	-999	9.11	4.47	D
67946	STAFFORD SPRCT	NCDC	41.9667	-72.3	-999	8.92	4.48	D
67969	STAMFORD CT	NCDC	41.0667	-73.5	-999	4.62	4.16	D
68065	STEVENSON DACT	NCDC	41.3833	-73.1667	-999	6.95	4.41	D
68488	TRAP FALLS RCT	NCDC	41.2833	-73.15	-999	5.76	4.27	D
69007	WEPAWAUG RESCT	NCDC	41.3	-73.0333	-999	3.32	4.16	D
69067	WEDTBROOK CT	NCDC	41.3	-72.4333	-999	2.23	4.35	D
69508	WHIGVILLE RECT	NCDC	41.7333	-72.95	-999	13.36	4.77	D
69592	WILLIMANTIC CT	NCDC	41.7167	-72.2333	-999	6.25	4.3	D
69759	WOLCOTT RESECT	NCDC	41.6167	-72.95	-999	10.76	4.81	D
69783	WOODBURY 3 WCT	NCDC	41.5667	-73.2667	-999	9.55	4.73	D
173800	HIRAM 2 S ME	NCDC	43.85	-70.8	-999	0.13	3.56	D
176900	PORTLAND ME	NCDC	43.6667	-70.25	-999	0.04	3.12	D
177479	SANFORD 2 NNME	NCDC	43.4667	-70.7833	-999	0.59	3.61	D
179314	WEDT BUXTON ME	NCDC	43.7	-70.6167	-999	0.08	3.44	D
190049	ADAMS MA	NCDC	42.65	-73.1	-999	2.15	4.66	D
190190	ASHBURNHAM MA	NCDC	42.65	-71.8833	-999	4.1	4.39	D
190218	ASHLAND MA	NCDC	42.25	-71.4667	-999	12.56	4.01	D
190257	ATHOL MA	NCDC	42.5833	-72.2167	-999	4.78	4.43	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
190551	BEECHWOOD MA	NCDC	42.2167	-70.8167	-999	13.02	4.34	D
190562	BELCHERTOWN MA	NCDC	42.2833	-72.35	-999	13.69	4.68	D
190860	BROCKTON MA	NCDC	42.0833	-71.0167	-999	11.74	4.19	D
191425	CHEDTER MA	NCDC	42.2833	-72.9833	-999	9.64	5.71	D
191436	CHEDTERFIELDMA	NCDC	42.4	-72.85	-999	7.43	4.65	D
191561	CLINTON MA	NCDC	42.4	-71.6833	-999	9.51	4.26	D
191582	COHASSET MA	NCDC	42.2667	-70.8333	-999	11.04	4.17	D
192451	EAST WAREHAMMA	NCDC	41.7667	-70.6667	-999	5.01	4.02	D
192501	EDGARTOWN MA	NCDC	41.3833	-70.5167	-999	2.45	3.74	D
192642	FALL RIVER MA	NCDC	41.7167	-71.1333	-999	4.66	4.03	D
192806	FITCHBURG MA	NCDC	42.5667	-71.7667	-999	4.6	3.89	D
192997	FRANKLIN MA	NCDC	42.0833	-71.4167	-999	12.67	4.34	D
193052	GARDNER MA	NCDC	42.5833	-71.9833	-999	4.5	4.3	D
193401	HARDWICK MA	NCDC	42.35	-72.2	-999	10.39	4.61	D
193471	HATCHVILLE MA	NCDC	41.6167	-70.5333	-999	3.37	3.84	D
193505	HAVERHILL MA	NCDC	42.8	-71.0667	-999	2.92	3.43	D
193702	HOLYOKE MA	NCDC	42.2	-72.6	-999	14.98	4.13	D
193713	HOOSAC TUNNEMA	NCDC	42.6833	-72.9667	-999	3.44	4.46	D
193772	HUBBARDSTON MA	NCDC	42.4833	-72.0167	-999	4.13	4.43	D
193821	HYANNIS MA	NCDC	41.65	-70.2667	-999	3.33	3.61	D
193876	IPSWICH MA	NCDC	42.6667	-70.8667	-999	8.17	3.32	D
194105	LAWRENCE MA	NCDC	42.7	-71.1667	-999	5.77	3.41	D
194449	MANSFIELD MA	NCDC	42.05	-71.2	-999	13.03	4.27	D
194711	MIDDLEBORO MA	NCDC	41.8833	-70.9167	-999	5.61	4.04	D
194744	MIDDLETON MA	NCDC	42.6	-71.0167	-999	7.64	3.54	D
194771	MILLBURY MA	NCDC	42.1833	-71.75	-999	11.44	4.09	D
194903	MONTAGUE CITMA	NCDC	42.5833	-72.5667	-999	3.68	4.04	D
195285	NEWBURYPORT MA	NCDC	42.8333	-70.9167	-999	3.6	3.32	D
195306	NEW SALEM MA	NCDC	42.4667	-72.35	-999	7.5	4.99	D
196251	PELHAM MA	NCDC	42.3833	-72.4	-999	7.68	4.78	D
196262	PEMBROKE MA	NCDC	42.0167	-70.8167	-999	9.7	3.91	D
196311	PERU MA	NCDC	42.45	-73.0667	-999	4.81	4.87	D
196322	PETERSHAM 3 MA	NCDC	42.5333	-72.1833	-999	6.35	4.61	D
196425	PLAINFIELD MA	NCDC	42.5167	-72.9167	-999	6.28	4.65	D
196486	PLYMOUTH MA	NCDC	41.9833	-70.7	-999	7.49	3.77	D
196699	QUABBIN INTAMA	NCDC	42.3667	-72.2833	-999	8.06	4.59	D
196938	ROCHEDTER MA	NCDC	41.7833	-70.9167	-999	5.12	4.16	D
197124	SALEM CG AIRMA	NCDC	42.5333	-70.8667	-999	7.68	3.49	D
197190	SANDWICH MA	NCDC	41.7667	-70.5	-999	3.4	3.81	D
197293	SEGREGANSET MA	NCDC	41.8333	-71.1167	-999	7.85	4.07	D
197370	SHELBURNE FAMA	NCDC	42.6	-72.7333	-999	4.67	4.11	D
197692	SOUTH EGREMOMA	NCDC	42.15	-73.4167	-999	8.92	4.5	D
198046	SPRINGFIELD MA	NCDC	42.1167	-72.5833	-999	16.59	3.84	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
198301	SWAMPSCOTT MA	NCDC	42.4667	-70.9	-999	8.77	3.5	D
198367	TAUNTON MA	NCDC	41.9	-71.0667	-999	10.31	4.07	D
198573	TULLY DAM MA	NCDC	42.6333	-72.2167	-999	3.5	4.37	D
198755	WALPOLE MA	NCDC	42.1833	-71.25	-999	15.61	4.08	D
198793	WARE MA	NCDC	42.2667	-72.25	-999	14.43	4.56	D
199136	WEDT CUMMINGMA	NCDC	42.4833	-72.9667	-999	5.1	4.75	D
199371	WEDT OTIS MA	NCDC	42.1667	-73.15	-999	10.2	4.75	D
199382	CHICOPEE FALMA	NCDC	42.2	-72.5333	-999	12.81	4.16	D
199442	WEDT RUTLANDMA	NCDC	42.3667	-71.9833	-999	9.51	4.44	D
199770	WINCHENDON MA	NCDC	42.7	-72.05	-999	3.57	4.54	D
199923	WORCEDTER WSMA	NCDC	42.2667	-71.8667	-999	11.44	4.1	D
270834	BOW GARVINS NH	NCDC	43.1667	-71.5167	-999	1.29	3.33	D
271099	CAMPTON NH	NCDC	43.8667	-71.6333	-999	2.28	4.15	D
271339	CENTER HARBONH	NCDC	43.7167	-71.4667	-999	2.65	4.09	D
271552	CLAREMONT NH	NCDC	43.3833	-72.35	-999	0.59	3.77	D
272174	DURHAM NH	NCDC	43.1333	-70.9333	-999	2.12	3.41	D
272284	EAST DEERINGNH	NCDC	43.0667	-71.7	-999	1.77	3.81	D
273024	FITZWILLIAM NH	NCDC	42.75	-72.1833	-999	3.31	4.26	D
273359	GILMANTON NH	NCDC	43.4167	-71.4167	-999	0.09	4.06	D
273530	GRAFTON NH	NCDC	43.5667	-71.95	-999	0.83	3.73	D
274399	KEENE NH	NCDC	42.9167	-72.2833	-999	1.99	3.96	D
275072	MANCHEDTER NH	NCDC	43	-71.4667	-999	2.22	3.64	D
275412	MILFORD NH	NCDC	42.8333	-71.65	-999	2.67	3.86	D
275712	NASHUA 2 NNWNH	NCDC	42.7833	-71.4833	-999	3.16	3.9	D
275868	NEWPORT NH	NCDC	43.3667	-72.1667	-999	0.31	3.67	D
276697	PETERBORO 2 NH	NCDC	42.85	-71.95	-999	2.74	4.24	D
276945	PLYMOUTH 2 ENH	NCDC	43.75	-71.65	-999	2.1	4.05	D
277967	SOUTH DANBURNH	NCDC	43.4833	-71.8833	-999	1.04	4.14	D
278194	SOUTH WEARE NH	NCDC	43.0667	-71.7167	-999	1.88	3.86	D
278741	TROY NH	NCDC	42.8167	-72.1833	-999	2.36	4.21	D
278855	WALPOLE 2 NH	NCDC	43.0833	-72.4333	-999	0.4	3.76	D
279318	WEDT LEBANONNH	NCDC	43.6333	-72.3167	-999	0.1	3.71	D
279676	WILMOT NH	NCDC	43.45	-71.9167	-999	0.54	4.09	D
279940	WOODSTOCK NH	NCDC	43.9833	-71.6833	-999	0.86	4.51	D
280721	BELMAR NJ	NCDC	40.1667	-74.0333	-999	1.11	4.9	D
280907	BOONTON 2 SENJ	NCDC	40.9	-74.4	-999	3.07	4.21	D
280978	BRANCHVILLE NJ	NCDC	41.15	-74.75	-999	7.41	4.21	D
281211	BURLINGTON NJ	NCDC	40.0833	-74.8667	-999	2.16	4.78	D
281327	CANISTEAR RENJ	NCDC	41.1167	-74.5	-999	7.69	4.22	D
281335	CANOE BROOK NJ	NCDC	40.75	-74.35	-999	3.48	4.65	D
281582	CHARLOTTEBURNJ	NCDC	41.0333	-74.4333	-999	6.73	4.47	D
281749	CLINTON NJ	NCDC	40.6333	-74.9167	-999	5.73	4.29	D
282644	ELIZABETH NJ	NCDC	40.6667	-74.2333	-999	2.25	4.29	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
283029	FLEMINGTON 1NJ	NCDC	40.5167	-74.85	-999	4.73	4.23	D
283516	GREENWOOD LANJ	NCDC	41.1333	-74.3333	-999	5.05	4.29	D
283951	HIGHTSTOWN 1NJ	NCDC	40.2833	-74.5167	-999	1.7	4.76	D
284339	JERSEY CITY NJ	NCDC	40.7333	-74.05	-999	0.9	4.13	D
284635	LAMBERTVILLENJ	NCDC	40.3667	-74.95	-999	4.1	4.32	D
285003	LONG VALLEY NJ	NCDC	40.7833	-74.7833	-999	5.74	4.76	D
285197	MANVILLE NJ	NCDC	40.55	-74.5667	-999	4.43	4.4	D
285503	MIDLAND PARKNJ	NCDC	40.9833	-74.15	-999	6.04	4.33	D
285769	MORRIS PLAINNJ	NCDC	40.8333	-74.5	-999	4.92	4.44	D
286062	NEW BRUNSWICNJ	NCDC	40.4667	-74.4333	-999	2.41	4.42	D
286177	NEWTON NJ	NCDC	41.05	-74.75	-999	7.64	4.39	D
286460	OAK RIDGE RENJ	NCDC	41.0333	-74.5	-999	6.61	4.4	D
286775	PATERSON NJ	NCDC	40.9	-74.15	-999	4.92	4.31	D
287079	PLAINFIELD NJ	NCDC	40.6	-74.4	-999	3.32	4.39	D
287328	PRINCETON WANJ	NCDC	40.3333	-74.6667	-999	1.7	4.61	D
287825	RUNYON NJ	NCDC	40.4333	-74.3333	-999	1.62	4.42	D
287869	SANDY HOOK LNJ	NCDC	40.4667	-74.0167	-999	0.53	4.21	D
288194	SOMERVILLE NJ	NCDC	40.5833	-74.6167	-999	3.8	4.45	D
288402	SPLIT ROCK PNJ	NCDC	40.9667	-74.4667	-999	3.94	4.35	D
288644	SUSSEX NJ	NCDC	41.2167	-74.6	-999	8.1	4.07	D
288878	TRENTON 2 NJ	NCDC	40.2333	-74.7667	-999	2.77	4.45	D
289455	WEDTFIELD NJ	NCDC	40.65	-74.35	-999	3.1	4.45	D
300063	ALCOVE DAM NY	NCDC	42.4667	-73.9333	-999	1.93	3.31	D
300136	AMAWALK NY	NCDC	41.2833	-73.75	-999	6.76	4.43	D
300167	ANDES NY	NCDC	42.2	-74.7833	-999	5.08	3.79	D
300237	ARENA NY	NCDC	42.1	-74.7333	-999	5.37	3.78	D
300254	ARKVILLE NY	NCDC	42.15	-74.6167	-999	2.68	3.63	D
300351	BABYLON NY	NCDC	40.7	-73.3167	-999	0.5	4.19	D
300368	BAKERS MILLSNY	NCDC	43.6167	-74.0333	-999	0	4.22	D
300393	BALSAM LAKE NY	NCDC	42.0333	-74.6	-999	4.66	4.73	D
300668	BIG MOOSE 3 NY	NCDC	43.8167	-74.8667	-999	0	4.71	D
300799	BOVINA NY	NCDC	42.2667	-74.7333	-999	4.75	3.82	D
300808	BOYDS CORNERNY	NCDC	41.45	-73.7333	-999	8.1	4.54	D
300889	BRIDGEHAMPTONY	NCDC	40.95	-72.3	-999	1.16	3.93	D
300929	BROADALBIN NY	NCDC	43.0833	-74.1667	-999	0.58	3.92	D
301065	BUSHNELLSVILNY	NCDC	42.1667	-74.4	-999	5	4	D
301079	BUTTERNUT BRNY	NCDC	41.9167	-74.6667	-999	5.46	4.61	D
301093	CAIRO NY	NCDC	42.3167	-74.0167	-999	3.15	3.06	D
301207	CARMEL 1 SW NY	NCDC	41.4167	-73.7	-999	7.19	4.5	D
301436	CHERRY VALLENY	NCDC	42.8167	-74.7333	-999	0.85	4.14	D
301521	CLARYVILLE NY	NCDC	41.9167	-74.5667	-999	5.33	4.44	D
301589	COBLESKILL NY	NCDC	42.6667	-74.5	-999	1.15	3.36	D
301615	COLD BROOK NY	NCDC	42.0167	-74.2667	-999	6.22	4.04	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
301708	CONKLINGVILLNY	NCDC	43.3167	-73.9333	-999	0.17	3.88	D
301713	CONKLINGVILLNY	NCDC	43.3167	-73.9167	-999	0.19	3.88	D
301752	COOPERSTOWN NY	NCDC	42.7	-74.9167	-999	0.97	3.93	D
301850	CRAIGIE CLAINY	NCDC	41.9667	-74.8667	-999	4.82	4.05	D
301896	CROSS RIVER NY	NCDC	41.2667	-73.6833	-999	4.59	4.3	D
301904	CROTON FALLSNY	NCDC	41.35	-73.6667	-999	7.07	4.37	D
301912	CROTON LAKE NY	NCDC	41.2333	-73.8	-999	5.35	4.42	D
302036	DELHI NY	NCDC	42.2667	-74.9167	-999	5.74	3.71	D
302129	DOBBS FERRY NY	NCDC	41.0167	-73.8667	-999	3.48	4.3	D
302137	DOLGEVILLE NY	NCDC	43.0833	-74.7667	-999	0.4	3.96	D
302164	DOWNSVILLE NY	NCDC	42.0833	-75	-999	5.94	4.07	D
302234	EAGLE BAY NY	NCDC	43.7667	-74.8167	-999	0	4.59	D
302282	EAST BRANCH NY	NCDC	41.4	-73.5833	-999	6.33	4.47	D
302362	EAST JEWETT NY	NCDC	42.25	-74.1833	-999	3.75	3.83	D
302517	EDGEWOOD NY	NCDC	42.1333	-74.2333	-999	4.15	4.79	D
302562	ELKA PARK NY	NCDC	42.1667	-74.1667	-999	4.38	4.66	D
302582	ELLENVILLE NY	NCDC	41.7167	-74.4	-999	8.14	3.91	D
302666	EPHRATAH NY	NCDC	43.0167	-74.5333	-999	0.42	4.09	D
302760	FARMINGDALE NY	NCDC	40.75	-73.4333	-999	1.76	4.08	D
302964	FORT SCHUYLENY	NCDC	40.8	-73.8	-999	1.8	4.13	D
303076	FROST VALLEYNY	NCDC	41.9667	-74.5167	-999	5.46	4.9	D
303251	GLENFORD NY	NCDC	42.0167	-74.1333	-999	3.95	4.04	D
303259	GLENHAM NY	NCDC	41.5167	-73.9333	-999	7.75	4.18	D
303284	GLENS FALLS NY	NCDC	43.3333	-73.7333	-999	0.35	4.31	D
303299	GLENS FALLS NY	NCDC	43.2833	-73.6667	-999	0.37	3.75	D
303319	GLOVERSVILLENY	NCDC	43.05	-74.35	-999	0.5	4.21	D
303324	GLOVERSVILLENY	NCDC	43.1	-74.4333	-999	1.18	4.5	D
303360	GRAFTON NY	NCDC	42.7833	-73.4667	-999	0.33	4.69	D
303365	GRAHAMSVILLENY	NCDC	41.85	-74.55	-999	6.06	4.4	D
303373	GRAND GORGE NY	NCDC	42.3667	-74.4833	-999	3.87	3.58	D
303567	HALCOTT CENTNY	NCDC	42.2	-74.4833	-999	4.84	3.82	D
303781	HEMPSTEAD GANY	NCDC	40.7167	-73.6333	-999	1.62	3.88	D
303786	HEMPSTEAD MANY	NCDC	40.6833	-73.6667	-999	1.27	3.91	D
303839	HIGH FALLS NY	NCDC	41.8333	-74.1333	-999	7.63	3.91	D
303864	HIGHMOUNT NY	NCDC	42.15	-74.4833	-999	5.3	3.48	D
304024	HUDSON NY	NCDC	42.25	-73.7833	-999	3.5	3.9	D
304102	INDIAN LAKE NY	NCDC	43.75	-74.2833	-999	0.05	3.93	D
304111	INGHAMS NY	NCDC	43.0667	-74.7667	-999	0.41	3.92	D
304182	JACKSONBURG NY	NCDC	43.0167	-74.9167	-999	0.45	3.84	D
304271	JOHNSONVILLENY	NCDC	42.9167	-73.5167	-999	0.24	4.12	D
304472	KORTRIGHT NY	NCDC	42.4	-74.8	-999	4.82	3.64	D
304486	LACKAWACK NY	NCDC	41.7833	-74.4	-999	8.81	4.27	D
304525	LAKE DELAWARNY	NCDC	42.25	-74.9	-999	6.79	3.76	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
304533	LAKE HILL NY	NCDC	42.0667	-74.1833	-999	3.4	4.43	D
304563	LAKE RONKONKNY	NCDC	40.8333	-73.1333	-999	0.93	4.37	D
304706	LEWBEACH NY	NCDC	41.95	-74.8333	-999	6.01	4.06	D
304723	LEXINGTON 1 NY	NCDC	42.2333	-74.3333	-999	4.84	3.76	D
304731	LIBERTY 1 NENY	NCDC	41.8167	-74.75	-999	7.5	4.36	D
304791	LITTLE FALLSNY	NCDC	43.0667	-74.8667	-999	0.41	3.83	D
304796	LITTLE FALLSNY	NCDC	43.0333	-74.8667	-999	0.47	3.83	D
305032	MANORKILL NY	NCDC	42.3833	-74.3167	-999	3.23	3.67	D
305120	MARY SMITH NY	NCDC	42.05	-74.8167	-999	5.15	3.95	D
305231	MECHANICVILLNY	NCDC	42.8833	-73.6833	-999	0.52	4.02	D
305291	MIDDLEBURG NY	NCDC	42.6	-74.3333	-999	1.53	3.2	D
305310	MIDDLETOWN NY	NCDC	41.45	-74.4333	-999	5.7	3.98	D
305334	MILLBROOK NY	NCDC	41.85	-73.6167	-999	7.89	4.21	D
305426	MOHONK LAKE NY	NCDC	41.7667	-74.15	-999	9.05	4.29	D
305435	MONGAUP VALLNY	NCDC	41.6667	-74.7833	-999	6.56	3.97	D
305560	MOUNT LEBANONY	NCDC	42.4667	-73.4667	-999	2.74	4.7	D
305671	NEVERSINK NY	NCDC	41.8333	-74.65	-999	6.12	4.32	D
305711	NEWCOMB 4 WNNY	NCDC	43.9833	-74.2333	-999	0.11	3.98	D
305743	NEW KINGSTONNY	NCDC	42.2333	-74.6833	-999	5.02	3.83	D
305804	NEW YORK LAUNY	NCDC	40.7333	-73.9333	-999	1.96	4.12	D
306062	NORTHVILLE NY	NCDC	43.2167	-74.1667	-999	0.31	4.18	D
306111	OAK HILL NY	NCDC	42.4	-74.15	-999	3.6	3.38	D
306229	ONEONTA 3 SENY	NCDC	42.45	-75	-999	2.12	3.69	D
306275	ORIENT 2 E NY	NCDC	41.15	-72.2667	-999	1.08	4.26	D
306426	PARKSTON NY	NCDC	41.9	-74.8167	-999	5.01	4.19	D
306479	PEEKAMOOSE NY	NCDC	41.9333	-74.3833	-999	6.1	4.41	D
306567	PHOENICIA NY	NCDC	42.0833	-74.3167	-999	5.02	3.95	D
306674	PLEASANTVILLNY	NCDC	41.15	-73.7667	-999	4.26	4.43	D
306774	PORT JERVIS NY	NCDC	41.3833	-74.6833	-999	8.3	3.74	D
306817	POUGHKEEPSIENY	NCDC	41.6833	-73.9333	-999	6.84	3.9	D
306820	POUGHKEEPSIENY	NCDC	41.6333	-73.8833	-999	7.67	3.92	D
306848	PREDTON HOLLNY	NCDC	42.4333	-74.2	-999	2.58	3.48	D
306999	RELAY NY	NCDC	42.3167	-74.6333	-999	4.54	3.84	D
307115	RIFTON 1 N NY	NCDC	41.85	-74.05	-999	6.22	3.82	D
307317	ROXBURY NY	NCDC	42.2833	-74.5667	-999	4.6	3.69	D
307405	SALEM NY	NCDC	43.1667	-73.3167	-999	0.36	3.91	D
307413	SALISBURY NY	NCDC	43.15	-74.85	-999	0.2	4.6	D
307484	SARATOGA SPRNY	NCDC	42.9833	-73.7333	-999	0.5	4.01	D
307505	SCHAGHTICOKENY	NCDC	42.9	-73.6	-999	0.3	4.05	D
307524	SCHROON LAKENY	NCDC	43.8667	-73.7333	-999	0	4.65	D
307544	SCHUYLERVILLNY	NCDC	43.1167	-73.5833	-999	0.43	3.96	D
307568	SCOTIA NY	NCDC	42.8167	-73.9833	-999	0.55	3.75	D
307596	SEAGER NY	NCDC	42.05	-74.55	-999	4.4	4.92	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
307721	SHOKAN BROWNNY	NCDC	41.95	-74.2167	-999	5.54	4.03	D
307742	SHRUB OAK NY	NCDC	41.3333	-73.8333	-999	6.71	4.44	D
307818	SMITHS BASINNY	NCDC	43.35	-73.5	-999	0.33	4.07	D
308080	SPECULATOR NY	NCDC	43.5	-74.3667	-999	0	4.15	D
308096	SPENCERTOWN NY	NCDC	42.3333	-73.55	-999	2.41	4.48	D
308104	SPIER FALLS NY	NCDC	43.2333	-73.75	-999	0.82	4.07	D
308138	SPRITE CREEKNY	NCDC	43.1333	-74.6667	-999	0.34	4.36	D
308160	STAMFORD NY	NCDC	42.4	-74.6167	-999	3.34	3.68	D
308232	STEWART FIELNY	NCDC	41.5	-74.1	-999	8.82	3.86	D
308240	STEWARTS LANNY	NCDC	43.1333	-74.6	-999	0.38	4.49	D
308352	SUNDOWN NY	NCDC	41.8833	-74.4667	-999	5.85	4.42	D
308403	TANNERSVILLENY	NCDC	42.1833	-74.1667	-999	4.27	4.02	D
308432	TERRY CLOVE NY	NCDC	42.1333	-74.9	-999	4.78	4.04	D
308523	TITICUS NY	NCDC	41.3333	-73.65	-999	5.94	4.36	D
308749	VALHALLA 2 ENY	NCDC	41.0667	-73.7667	-999	3.36	4.27	D
308967	WARWICK NY	NCDC	41.2667	-74.3667	-999	3.87	4.14	D
309178	WEDTERLO NY	NCDC	42.5167	-74.05	-999	1.9	3.69	D
309237	WEDT KILL NY	NCDC	42.2	-74.3833	-999	4.91	4.18	D
309292	WEDT POINT NY	NCDC	41.3833	-73.9667	-999	4.86	4.48	D
309311	WEDT SHOKAN NY	NCDC	41.95	-74.3167	-999	6.3	4.21	D
309413	WHITE POND NY	NCDC	41.5	-73.75	-999	8.71	4.48	D
309512	WINDHAM NORTNY	NCDC	42.35	-74.2833	-999	3.76	3.8	D
309516	WINDHAM 2 E NY	NCDC	42.3	-74.2167	-999	4.79	3.85	D
365470	MATAMORAS PA	NCDC	41.3667	-74.7	-999	8.22	3.75	D
430563	BENNINGTON 2VT	NCDC	42.9167	-73.2167	-999	0.3	4.21	D
430660	BETHEL VT	NCDC	43.8333	-72.6333	-999	0	4.29	D
431243	CAVENDISH VT	NCDC	43.3833	-72.6	-999	0.52	4.18	D
431360	CHELSEA 2 S VT	NCDC	43.95	-72.45	-999	0.01	4.1	D
431433	CHITTENDEN VT	NCDC	43.7	-72.95	-999	0	4.93	D
431580	CORNWALL VT	NCDC	43.9667	-73.2	-999	0	4.19	D
431786	DORSET 1 S VT	NCDC	43.25	-73.1	-999	0.64	4.76	D
435029	MAYS MILL VT	NCDC	42.7333	-72.7333	-999	3.84	4.53	D
436712	RANDOLPH VT	NCDC	43.9333	-72.6667	-999	0.03	4.35	D
436746	READING HILLVT	NCDC	43.5167	-72.5667	-999	0.27	4.57	D
436761	READSBORO 1 VT	NCDC	42.75	-72.9333	-999	2.65	4.66	D
436893	ROCHEDTER VT	NCDC	43.8833	-72.8167	-999	0.11	5.07	D
437098	SALISBURY VT	NCDC	43.9	-73.1	-999	0.02	4.25	D
437401	SOMERSET VT	NCDC	42.9667	-72.95	-999	0.44	5.49	D
437617	SOUTH LONDONVT	NCDC	43.1833	-72.8167	-999	0.33	4.49	D
437954	SPRINGFIELD VT	NCDC	43.2667	-72.45	-999	0	3.9	D
438438	TOWNSHEND VT	NCDC	43.0333	-72.6667	-999	0.42	4.32	D
438556	UNION VILLAGVT	NCDC	43.8	-72.2667	-999	0.02	3.88	D
438600	VERNON VT	NCDC	42.7667	-72.5167	-999	3.45	4.31	D

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
438747	WARDSBORO VT	NCDC	43.05	-72.7833	-999	1.26	5.39	D
439329	WEDT HARTFORVT	NCDC	43.7167	-72.4167	-999	0	3.85	D
439691	WHITE RIVER VT	NCDC	43.65	-72.3167	-999	0.46	3.71	D
439984	WOODSTOCK VT	NCDC	43.6333	-72.5167	-999	0.31	3.82	D
99991	PSEUDO1 MA	NCDC	42.17	-72.885	1148	18.39	4.69	S
99992	PSEUDO2 MA	NCDC	42.187	-72.957	1033	17.24	4.84	S
99993	PSEUDO3 MA	NCDC	41.996	-72.829	298	17.25	4.35	S
99994	PSEUDO4 MA	NCDC	42.179	-72.84	646	18.5	4.56	S
99995	PSEUDO5 MA	NCDC	42.17	-72.776	396	18.34	4.43	S
99996	PSEUDO6 MA	NCDC	42.185	-72.777	396	17.41	4.44	S
99997	PSEUDO7 MA	NCDC	42.19	-72.859	396	17.62	4.53	S
99998	PSEUDO8 MA	NCDC	42.191	-72.93	1496	17.46	4.89	S
99999	PSEUDO9 MA	NCDC	42.175	-72.97	1233	17.16	4.85	S
99910	PSEUDO10MA	NCDC	42.125	-72.951	1099	17.14	4.73	S
99911	PSEUDO11MA	NCDC	42.146	-72.884	1207	18.32	4.68	S
99912	PSEUDO12MA	NCDC	42.073	-72.898	1099	17.18	4.14	S
99913	PSEUDO13MA	NCDC	42.103	-72.832	830	18.22	4.4	S
99914	PSEUDO14MA	NCDC	42.09	-72.762	216	18.23	4.35	S
99915	PSEUDO15MA	NCDC	42.147	-72.729	196	18.29	4.37	S
99916	PSEUDO16MA	NCDC	42.038	-72.859	590	17.19	4.24	S
99917	PSEUDO17MA	NCDC	41.996	-72.818	298	17.25	4.35	S
99918	PSEUDO18MA	NCDC	42.019	-72.747	229	17.34	4.19	S
99919	PSEUDO19MA	NCDC	42.063	-72.716	298	17.29	4.19	S
99920	PSEUDO20MA	NCDC	42.108	-72.684	196	17.24	4.24	S
99921	PSEUDO21MA	NCDC	42.14	-72.693	272	17.3	4.33	S
60227	BROOKFIELD MA	NCDC	42.22	-72.1	656	17.02	4.29	S
60227	MILLIS MA	NCDC	42.17	-71.35	170	13.76	4.16	S
60227	BAKERSVILLE CT	NCDC	41.8333	-73.0333	757	15.39	4.91	S
68441	TORRINGTON 2 CT	NCDC	41.8	-73.1333	721	15.65	5.03	S
69174	WEST HARTLAN CT	NCDC	42	-72.9667	1049	14.43	4.45	S
190801	BOYLSTON MA	NCDC	42.35	-71.7167	597	9.59	4.24	S
195077	MOUNT WACHUSMA	NCDC	42.4833	-71.8833	1249	4.23	4.38	S
196644	PRINCETON MA	NCDC	42.45	-71.8667	948	4.18	4.24	S
272136	DUBLIN NH	NCDC	42.9167	-72.0667	1748	2.59	4.31	S
302291	EASTCHESTER NY	NCDC	40.9333	-73.8	98	2.51	4.25	S
68364	THOMPSONVILL CT	NCDC	42	-72.6	85	14.87	3.95	S
69162	WEST HARTFOR CT	NCDC	41.75	-72.7833	298	11.4	4.95	S
69544	WHITNEY LAKE CT	NCDC	41.3333	-72.9167	111	3.97	4.01	S
191447	CHESTNUT HILL MA	NCDC	42.3333	-71.15	147	11.91	3.61	S
191589	COLDBROOK MA	NCDC	42.3833	-72.05	915	8.01	4.49	S
192975	FRAMINGHAM MA	NCDC	42.2833	-71.4167	173	9.91	3.97	S
193270	GROTON MA	NCDC	42.6	-71.5833	308	4.93	3.98	S
196676	PROVINCETOWN MA	NCDC	42.05	-70.2333	-98	3.54	3.3	S

Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
197627	SOUTHBRIDGE MA	NCDC	42.05	-72.0833	787	11.34	4.24	S
199928	WORCESTER MA	NCDC	42.3	-71.8167	629	12.07	4.15	S
270910	BRADFORD NH	NCDC	43.25	-71.9667	797	0.25	4.49	S
271048	BUCKS CORNER NH	NCDC	43.7333	-71.9833	1584	1.23	4.25	S
272427	EASTMAN FALLS NH	NCDC	43.45	-71.6667	449	0.15	3.9	S
274475	LAKEPORT NH	NCDC	43.55	-71.4667	488	0.98	3.86	S
274480	LAKEPORT 2 NH	NCDC	43.55	-71.4833	505	0.91	3.84	S
275150	MARLOW NH	NCDC	43.1167	-72.2	1187	0.61	3.85	S
276980	PORTSMOUTH NH	NCDC	43.0667	-70.7833	49	2.51	3.41	S
278081	SOUTH LYNDEB NH	NCDC	42.8833	-71.7833	652	2.39	3.86	S
278606	TAMWORTH NH	NCDC	43.8667	-71.2667	574	0.66	4.26	S
279474	WEST RUMNEY NH	NCDC	43.8	-71.85	597	1.49	4	S
279740	WINDHAM NH	NCDC	42.7833	-71.3167	282	2.77	3.72	S
279865	WOLFEBORO FANH	NCDC	43.5833	-71.2	541	0.93	3.79	S
281472	CEDAR GROVE NJ	NCDC	40.8667	-74.2167	298	2.33	4.43	S
285071	MACOPIN INTA NJ	NCDC	41.0167	-74.4	606	5.49	4.48	S
285597	MILTON NJ	NCDC	41.0167	-74.5333	908	3.78	4.44	S
287545	RIDGEFIELD NJ	NCDC	40.8333	-74.0167	6	2.41	4.21	S
287587	RINGWOOD NJ	NCDC	41.1333	-74.2667	423	4.01	4.26	S
300159	AMSTERDAM LO NY	NCDC	42.9167	-74.1333	298	0.3	3.75	S
300511	BEDFORD HILL NY	NCDC	41.2333	-73.7167	396	3.73	4.33	S
301144	CANAJOHARIE NY	NCDC	42.9167	-74.5833	419	0.62	3.62	S
303289	GLENS FALLS NY	NCDC	43.3167	-73.65	331	0.66	3.69	S
303294	GLENS FALLS NY	NCDC	43.35	-73.6167	328	0.86	3.64	S
303916	HOFFMEISTER NY	NCDC	43.3833	-74.7167	1998	0.04	5.1	S
305283	MIDDLE BRANC NY	NCDC	41.3833	-73.65	321	7.28	4.39	S
306301	OSSINING SIN NY	NCDC	41.15	-73.8667	-98	3.51	4.19	S
306441	PATCHOGUE NY	NCDC	40.7667	-73.0167	16	0.52	4.45	S
307633	SETAUKET NY	NCDC	40.95	-73.1	-98	1.68	4.01	S
308902	WALDEN 2 NE NY	NCDC	41.5667	-74.1667	400	7.05	3.66	S
363200	GEORGE SCHOOL PA	NCDC	40.2167	-74.9333	137	3	4.66	S
370576	AUSTIN RI	NCDC	41.6	-71.65	518	4.43	4.35	S
374266	KINGSTON RI	NCDC	41.4833	-71.5333	164	2.78	4.34	S
430499	BELLOWS FALL VT	NCDC	43.1333	-72.45	488	0.18	3.83	S
436335	PERU VT	NCDC	43.2333	-72.9	1696	0.21	5.18	S
436717	RANDOLPH CEN VT	NCDC	43.95	-72.6	1299	0.23	4.39	S
436995	RUTLAND VT	NCDC	43.6	-72.9667	580	0.43	4.17	S
437142	SEARSBURG PO VT	NCDC	42.9	-73	2165	0.64	5.21	S
439477	WESTON 1 S VT	NCDC	43.2833	-72.7833	1499	0.36	4.78	S
439735	WHITINGHAM VT	NCDC	42.7833	-72.9167	1623	1.72	4.6	S
439764	WILDER VT	NCDC	43.6667	-72.3	354	0.33	3.73	S
68436	TORRINGTON CT	NCDC	41.8	-73.1167	577	12.33	5.05	S
198580	TURNERS FALL MA	NCDC	42.6167	-72.55	200	5.63	4.06	S

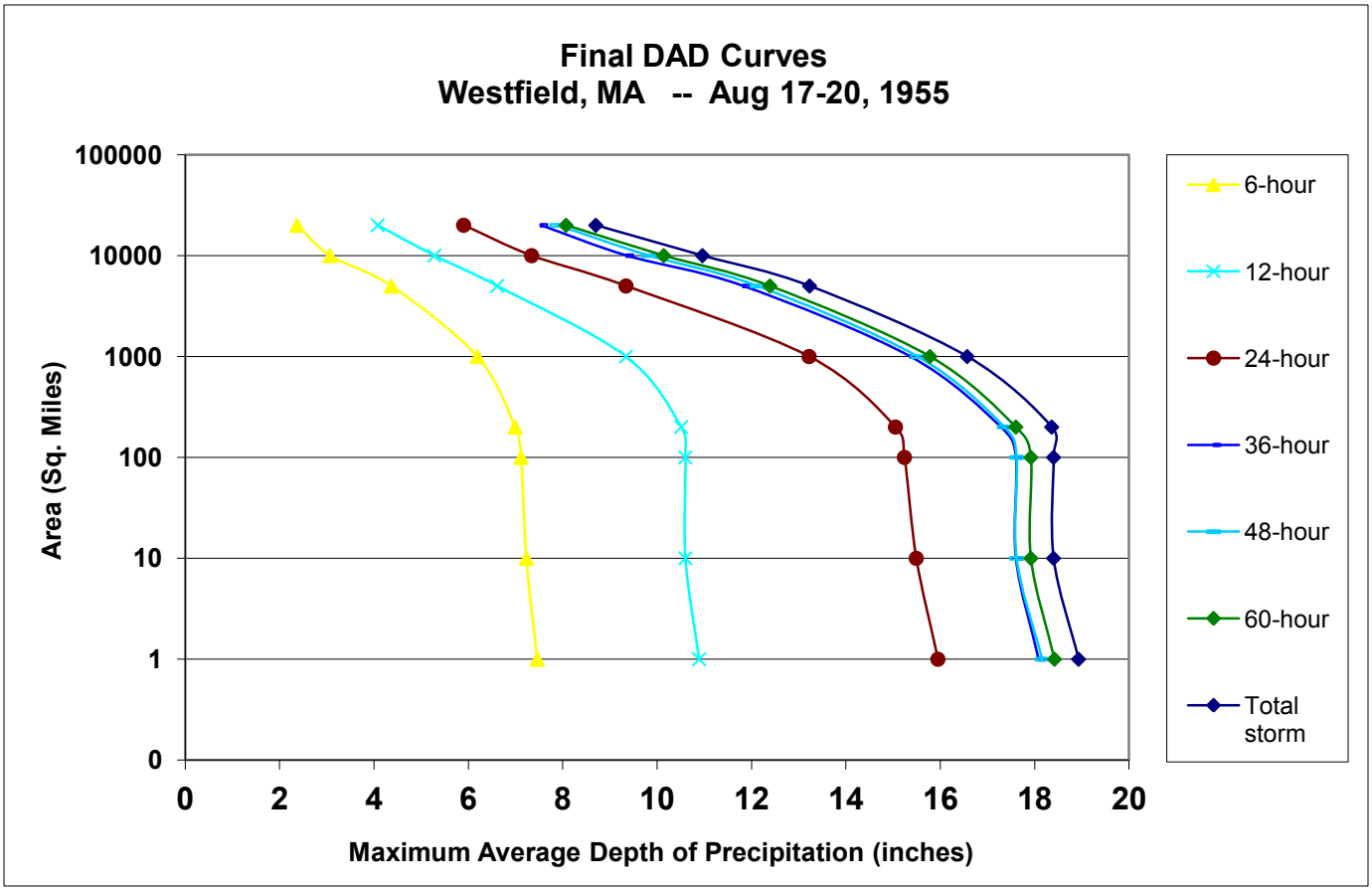
Stid	Name	Source	Lat	Lon	Elev	Precip	BaseMap	Type
194760	MILFORD MA	NCDC	42.1667	-71.5167	334	14.51	4.13	S
198030	SPOT POND MA	NCDC	42.45	-71.0833	246	13.14	3.56	S
69568	WIGWAM RESER CT	NCDC	41.6667	-73.1333	597	10.94	4.82	S
193549	HEATH MA	NCDC	42.6667	-72.8167	1587	3.6	4.53	S

OUTPUT

Depth-Area-Duration results

MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)

		Duration (hours)						
Area in Sq. Mi.		6	12	24	36	48	60	total
1.000		7.5	10.9	16.0	18.1	18.2	18.4	18.9
10.000		7.2	10.6	15.5	17.6	17.6	17.9	18.4
100.000		7.1	10.6	15.2	17.6	17.6	17.9	18.4
200.000		7.0	10.5	15.1	17.3	17.4	17.6	18.4
1000.000		6.2	9.3	13.2	15.4	15.5	15.8	16.6
5000.000		4.4	6.6	9.3	11.8	12.1	12.4	13.2
10000.000		3.1	5.3	7.3	9.4	9.8	10.1	11.0
20000.000		2.4	4.1	5.9	7.5	7.9	8.1	8.7



NWS Results

		Duration (hours)						
Area in Sq. Mi.		6	12	24	36	48	60	total
10.000		7.8	11.1	16.4	18.9	19.4	19.4	19.4
100.000		7.6	10.5	14.6	18.1	18.8	19.0	19.0
200.000		7.4	10.2	14.2	17.6	18.2	18.4	18.4
1000.000		6.2	9.2	12.4	15.9	16.2	16.4	16.4
5000.000		4.0	6.3	9.5	12.1	12.6	13.0	13.0
10000.000		3.1	5.0	8.0	10.0	10.6	10.8	10.8
20000.000		2.1	3.6	6.3	7.9	8.3	8.5	8.5

% Difference

		Duration (hours)						
Area (sq. mi.)		6	12	24	36	48	60	total
10		-7%	-5%	-6%	-7%	-9%	-8%	-5%
100		-6%	1%	4%	-3%	-6%	-6%	-3%
200		-6%	3%	6%	-2%	-5%	-4%	0%
1000		0%	2%	7%	-3%	-4%	-4%	1%
5000		9%	5%	-2%	-2%	-4%	-5%	2%
10000		-1%	6%	-8%	-7%	-7%	-6%	1%
20000		13%	13%	-6%	-5%	-5%	-5%	2%

APPENDIX I: DEPTH-AREA-DURATION TABLES

Note: Due to the size of the data in this appendix, the information has been archived in the AREVA file management system, ColdStor.

The path to the file is:

\cold\General-Access\32\32-9000000\32-9207374-000\official

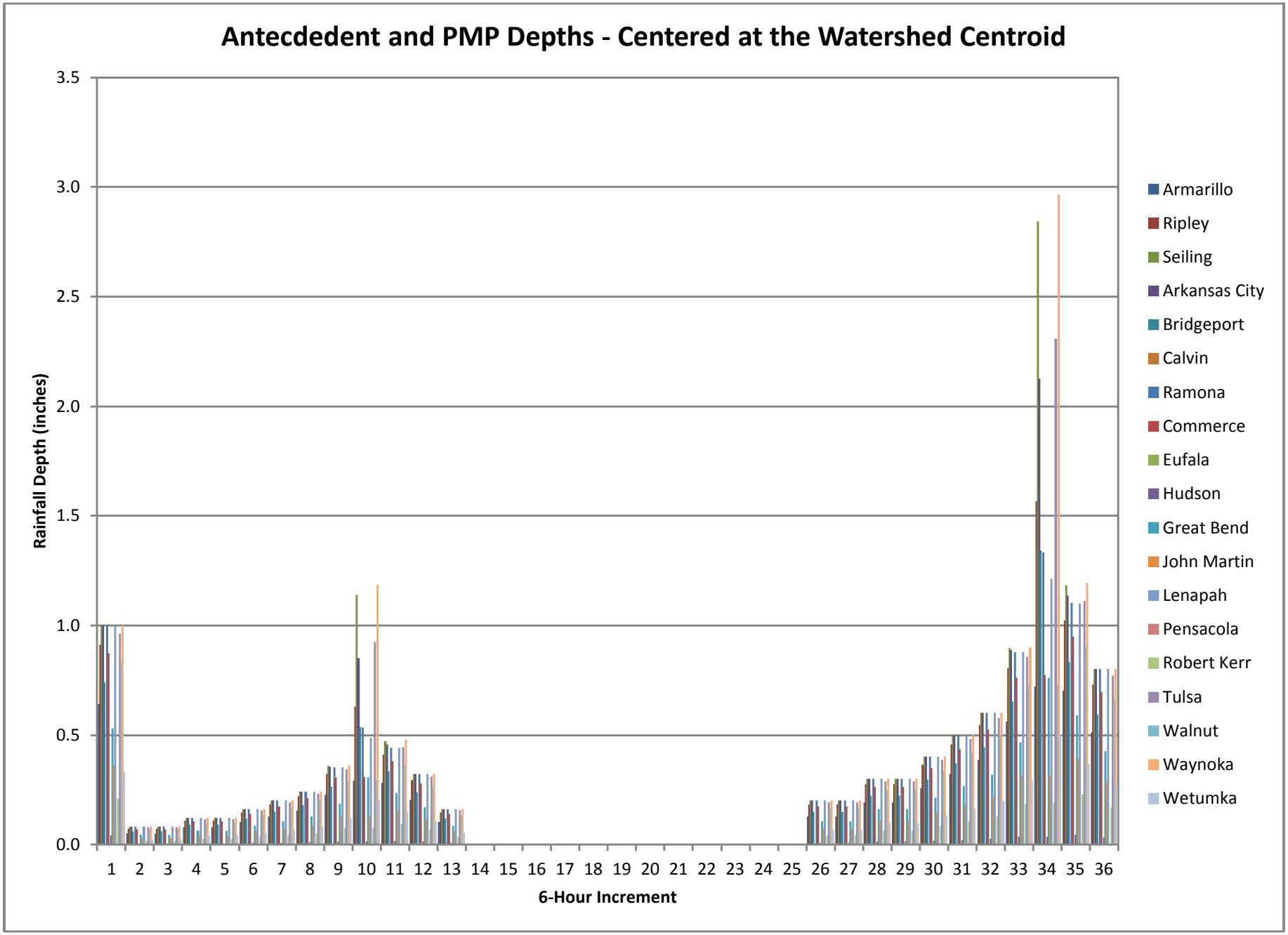
APPENDIX J: PROBABLE MAXIMUM PRECIPITATION HYETOGRAPHS

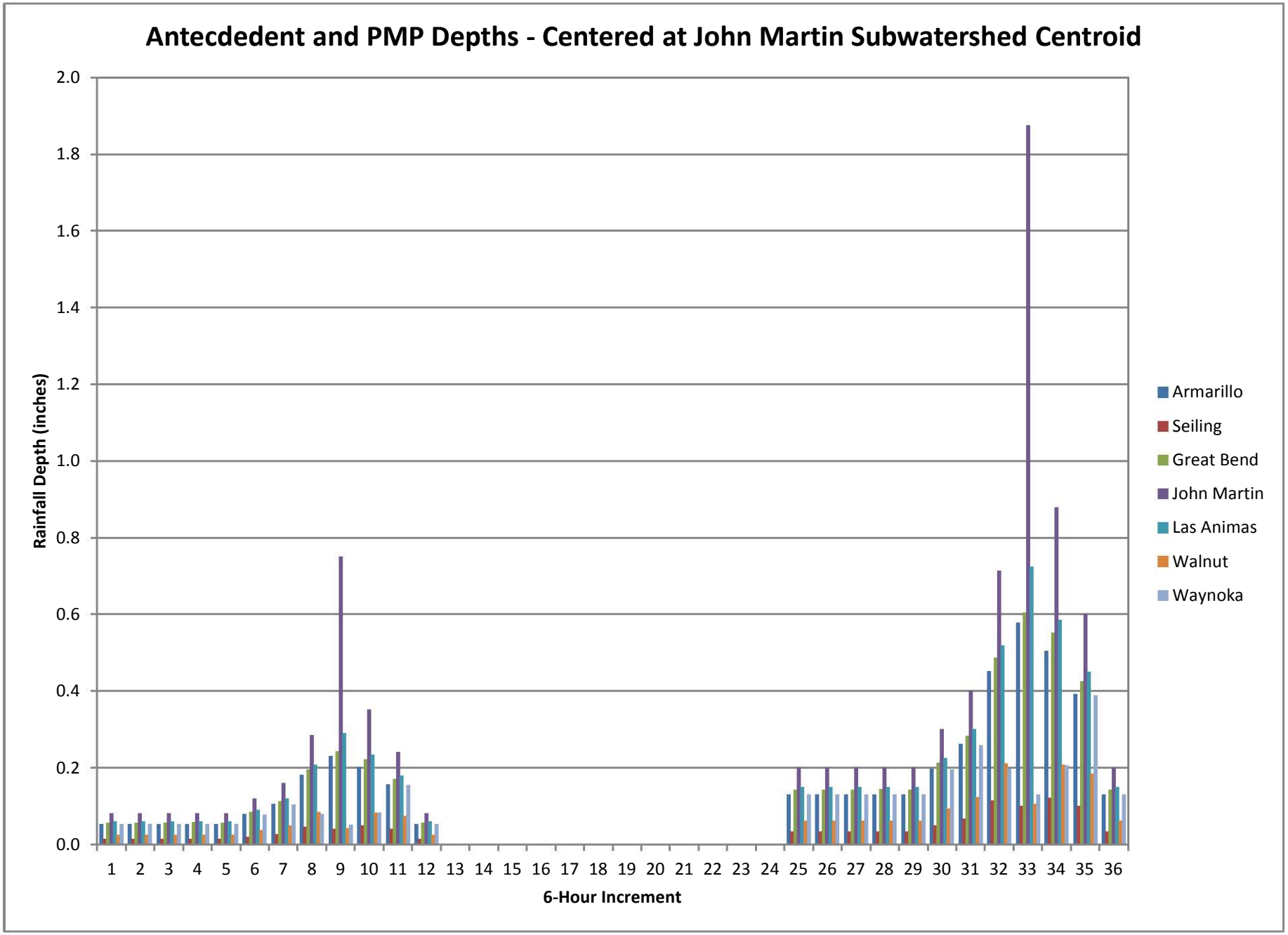
STATIONARY PMP HYETOGRAPHS

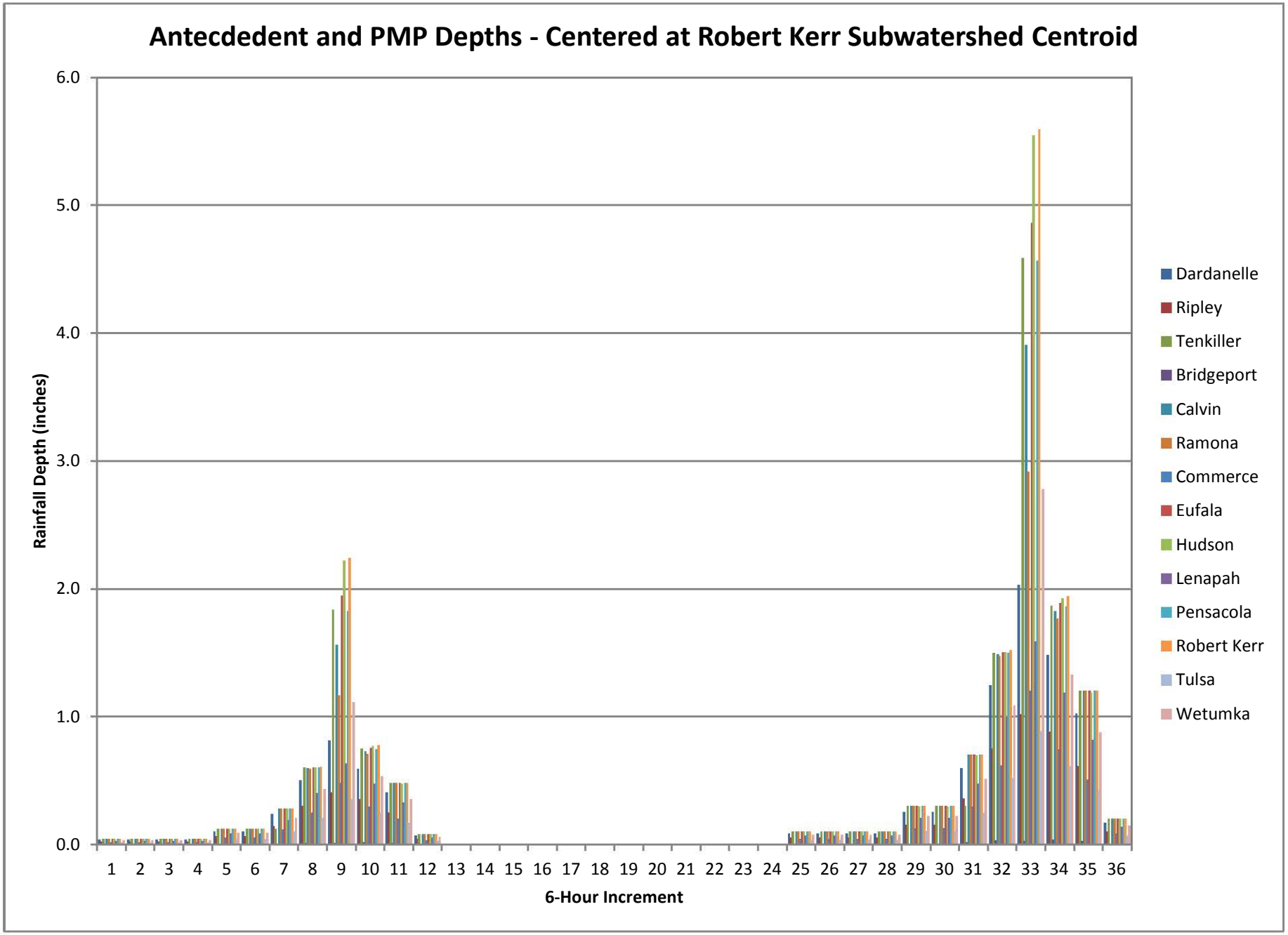
Antecedent and PMP Depths (inches) - PMP Centered at Watershed Centroid																			
Hour	Armarillo	Ripley	Seiling	Arkansas City	Bridgeport	Calvin	Ramona	Commerce	Eufala	Hudson	Great Bend	John Martin	Lenapah	Pensacola	Robert Kerr	Tulsa	Walnut	Waynoka	Wetumka
6	0.64	0.91	1.00	1.00	0.74	0.001	1.00	0.87	0.003	0.040	0.53	0.36	1.00	0.003	0.21	0.96	0.83	1.00	0.33
12	0.05	0.07	0.08	0.08	0.06	0.000	0.08	0.07	0.000	0.003	0.04	0.03	0.08	0.000	0.02	0.08	0.07	0.08	0.03
18	0.05	0.07	0.08	0.08	0.06	0.000	0.08	0.07	0.000	0.003	0.04	0.03	0.08	0.000	0.02	0.08	0.07	0.08	0.03
24	0.08	0.11	0.12	0.12	0.09	0.000	0.12	0.10	0.000	0.005	0.06	0.04	0.12	0.000	0.03	0.12	0.10	0.12	0.04
30	0.08	0.11	0.12	0.12	0.09	0.000	0.12	0.10	0.000	0.005	0.06	0.04	0.12	0.000	0.03	0.12	0.10	0.12	0.04
36	0.10	0.15	0.16	0.16	0.12	0.000	0.16	0.14	0.000	0.006	0.08	0.06	0.16	0.000	0.03	0.15	0.13	0.16	0.05
42	0.13	0.18	0.20	0.20	0.15	0.000	0.20	0.17	0.001	0.008	0.11	0.07	0.20	0.001	0.04	0.19	0.17	0.20	0.07
48	0.15	0.22	0.24	0.24	0.18	0.000	0.24	0.21	0.001	0.010	0.13	0.09	0.24	0.001	0.05	0.23	0.20	0.24	0.08
54	0.22	0.32	0.36	0.35	0.26	0.000	0.35	0.30	0.001	0.014	0.19	0.13	0.35	0.001	0.07	0.34	0.29	0.36	0.12
60	0.29	0.63	1.14	0.85	0.54	0.000	0.53	0.31	0.001	0.014	0.30	0.13	0.48	0.001	0.08	0.92	0.29	1.19	0.20
66	0.28	0.41	0.47	0.45	0.33	0.000	0.44	0.38	0.001	0.017	0.23	0.16	0.44	0.001	0.09	0.44	0.36	0.48	0.15
72	0.20	0.29	0.32	0.32	0.24	0.000	0.32	0.28	0.001	0.013	0.17	0.12	0.32	0.001	0.07	0.31	0.27	0.32	0.11
78	0.10	0.15	0.16	0.16	0.12	0.000	0.16	0.14	0.000	0.006	0.08	0.06	0.16	0.000	0.03	0.15	0.13	0.16	0.05
84	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
90	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
96	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
102	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
108	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
114	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
126	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
132	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
138	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
144	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
150	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00
156	0.13	0.18	0.20	0.20	0.15	0.000	0.20	0.17	0.001	0.008	0.11	0.07	0.20	0.001	0.04	0.19	0.17	0.20	0.07
162	0.13	0.18	0.20	0.20	0.15	0.000	0.20	0.17	0.001	0.008	0.11	0.07	0.20	0.001	0.04	0.19	0.17	0.20	0.07
168	0.19	0.27	0.30	0.30	0.22	0.000	0.30	0.26	0.001	0.012	0.16	0.11	0.30	0.001	0.06	0.29	0.25	0.30	0.10
174	0.19	0.27	0.30	0.30	0.22	0.000	0.30	0.26	0.001	0.012	0.16	0.11	0.30	0.001	0.06	0.29	0.25	0.30	0.10
180	0.26	0.36	0.40	0.40	0.30	0.000	0.40	0.35	0.001	0.016	0.21	0.14	0.40	0.001	0.08	0.38	0.33	0.40	0.13
186	0.32	0.46	0.50	0.50	0.37	0.001	0.50	0.44	0.002	0.020	0.27	0.18	0.50	0.002	0.11	0.48	0.42	0.50	0.17
192	0.38	0.55	0.60	0.60	0.44	0.001	0.60	0.52	0.002	0.024	0.32	0.22	0.60	0.002	0.13	0.58	0.50	0.60	0.20
198	0.56	0.80	0.90	0.88	0.65	0.001	0.88	0.76	0.003	0.035	0.47	0.31	0.88	0.003	0.18	0.85	0.73	0.90	0.29
204	0.72	1.57	2.84	2.12	1.34	0.001	1.33	0.77	0.003	0.035	0.76	0.31	1.21	0.003	0.19	2.31	0.73	2.96	0.50
210	0.70	1.02	1.18	1.14	0.83	0.001	1.10	0.95	0.003	0.044	0.59	0.39	1.10	0.003	0.23	1.11	0.90	1.19	0.37
216	0.51	0.73	0.80	0.80	0.59	0.001	0.80	0.70	0.002	0.032	0.42	0.29	0.80	0.002	0.17	0.77	0.66	0.80	0.26
	0.26	0.36	0.40	0.40	0.30	0.000	0.40	0.35	0.001	0.016	0.21	0.14	0.40	0.001	0.08	0.38	0.33	0.40	0.13
	6.48	10.00	12.67	11.58	8.23	0.01	10.42	8.50	0.03	0.39	5.60	3.51	10.24	0.03	2.06	11.53	8.09	12.86	3.53
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Antecedent and PMP Depths (inches) - PMP Centered at John Martin Subwatershed Centroid							
Hour	Armarillo	Seiling	Great Bend	John Martin	Las Animas	Walnut	Waynoka
6	0.05	0.01	0.06	0.08	0.06	0.02	0.05
12	0.05	0.01	0.06	0.08	0.06	0.02	0.05
18	0.05	0.01	0.06	0.08	0.06	0.02	0.05
24	0.05	0.01	0.06	0.08	0.06	0.02	0.05
30	0.05	0.01	0.06	0.08	0.06	0.02	0.05
36	0.08	0.02	0.08	0.12	0.09	0.04	0.08
42	0.10	0.03	0.11	0.16	0.12	0.05	0.10
48	0.18	0.05	0.19	0.29	0.21	0.08	0.08
54	0.23	0.04	0.24	0.75	0.29	0.04	0.05
60	0.20	0.05	0.22	0.35	0.23	0.08	0.08
66	0.16	0.04	0.17	0.24	0.18	0.07	0.16
72	0.05	0.01	0.06	0.08	0.06	0.02	0.05
78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00
96	0.00	0.00	0.00	0.00	0.00	0.00	0.00
102	0.00	0.00	0.00	0.00	0.00	0.00	0.00
108	0.00	0.00	0.00	0.00	0.00	0.00	0.00
114	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00
126	0.00	0.00	0.00	0.00	0.00	0.00	0.00
132	0.00	0.00	0.00	0.00	0.00	0.00	0.00
138	0.00	0.00	0.00	0.00	0.00	0.00	0.00
144	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150	0.13	0.03	0.14	0.20	0.15	0.06	0.13
156	0.13	0.03	0.14	0.20	0.15	0.06	0.13
162	0.13	0.03	0.14	0.20	0.15	0.06	0.13
168	0.13	0.03	0.14	0.20	0.15	0.06	0.13
174	0.13	0.03	0.14	0.20	0.15	0.06	0.13
180	0.20	0.05	0.21	0.30	0.22	0.09	0.19
186	0.26	0.07	0.28	0.40	0.30	0.12	0.26
192	0.45	0.11	0.49	0.71	0.52	0.21	0.20
198	0.58	0.10	0.61	1.87	0.72	0.11	0.13
204	0.50	0.12	0.55	0.88	0.59	0.21	0.21
210	0.39	0.10	0.42	0.60	0.45	0.18	0.39
216	0.13	0.03	0.14	0.20	0.15	0.06	0.13

Antecedent and PMP Depths (inches) - PMP Centered at Robert Kerr Subwatershed Centroid														
Hour	Dardanelle	Ripley	Tenkiller	Bridgeport	Calvin	Ramona	Commerce	Eufala	Hudson	Lenapah	Pensacola	Robert Kerr	Tulsa	Wetumka
6	0.03	0.02	0.04	0.00	0.04	0.04	0.02	0.04	0.04	0.03	0.04	0.04	0.01	0.03
12	0.03	0.02	0.04	0.00	0.04	0.04	0.02	0.04	0.04	0.03	0.04	0.04	0.01	0.03
18	0.03	0.02	0.04	0.00	0.04	0.04	0.02	0.04	0.04	0.03	0.04	0.04	0.01	0.03
24	0.03	0.02	0.04	0.00	0.04	0.04	0.02	0.04	0.04	0.03	0.04	0.04	0.01	0.03
30	0.10	0.06	0.12	0.00	0.12	0.12	0.05	0.12	0.12	0.08	0.12	0.12	0.04	0.09
36	0.10	0.06	0.12	0.00	0.12	0.12	0.05	0.12	0.12	0.08	0.12	0.12	0.04	0.09
42	0.24	0.14	0.12	0.01	0.28	0.28	0.12	0.28	0.28	0.19	0.28	0.28	0.10	0.20
48	0.50	0.30	0.60	0.01	0.59	0.59	0.25	0.60	0.60	0.40	0.60	0.61	0.21	0.43
54	0.81	0.41	1.84	0.01	1.56	1.16	0.48	1.94	2.22	0.63	1.83	2.24	0.35	1.11
60	0.59	0.35	0.75	0.01	0.73	0.71	0.30	0.75	0.77	0.47	0.75	0.78	0.25	0.53
66	0.41	0.24	0.48	0.01	0.48	0.48	0.20	0.48	0.48	0.33	0.48	0.48	0.17	0.35
72	0.07	0.04	0.08	0.00	0.08	0.08	0.03	0.08	0.08	0.05	0.08	0.08	0.03	0.06
78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
108	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
114	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
126	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
132	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
138	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
144	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150	0.09	0.05	0.10	0.00	0.10	0.10	0.04	0.10	0.10	0.07	0.10	0.10	0.04	0.07
156	0.09	0.05	0.10	0.00	0.10	0.10	0.04	0.10	0.10	0.07	0.10	0.10	0.04	0.07
162	0.09	0.05	0.10	0.00	0.10	0.10	0.04	0.10	0.10	0.07	0.10	0.10	0.04	0.07
168	0.09	0.05	0.10	0.00	0.10	0.10	0.04	0.10	0.10	0.07	0.10	0.10	0.04	0.07
174	0.26	0.15	0.30	0.01	0.30	0.30	0.13	0.30	0.30	0.20	0.30	0.30	0.11	0.22
180	0.26	0.15	0.30	0.01	0.30	0.30	0.13	0.30	0.30	0.20	0.30	0.30	0.11	0.22
186	0.59	0.36	0.30	0.01	0.70	0.70	0.29	0.70	0.69	0.48	0.70	0.70	0.25	0.51
192	1.25	0.75	1.50	0.03	1.49	1.47	0.62	1.50	1.50	1.00	1.50	1.52	0.51	1.08
198	2.03	1.02	4.59	0.03	3.91	2.91	1.20	4.86	5.55	1.58	4.56	5.60	0.88	2.78
204	1.48	0.88	1.87	0.03	1.82	1.76	0.74	1.89	1.92	1.18	1.86	1.94	0.61	1.33
210	1.02	0.61	1.20	0.02	1.20	1.20	0.50	1.20	1.19	0.82	1.20	1.20	0.42	0.88
216	0.17	0.10	0.20	0.00	0.20	0.20	0.08	0.20	0.20	0.14	0.20	0.20	0.07	0.15


Antecdedent and PMP Depths - Centered at the Watershed Centroid
Rainfall Depth (inches)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
6-Hour Increment
Armarillo
Ripley
Seiling
Arkansas City
Bridgeport
Calvin
Ramona
Commerce
Eufala
Hudson
Great Bend
John Martin
Lenapah
Pensacola
Robert Kerr
Tulsa
Walnut
Waynoka
Wetumka


Antecdedent and PMP Depths - Centered at John Martin Subwatershed Centroid
Rainfall Depth (inches)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
6-Hour Increment
Armarillo
Seiling
Great Bend
John Martin
Las Animas
Walnut
Waynoka


Antecdedent and PMP Depths - Centered at Robert Kerr Subwatershed Centroid
Rainfall Depth (inches)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
6-Hour Increment
Dardanelle
Ripley
Tenkiller
Bridgeport
Calvin
Ramona
Commerce
Eufala
Hudson
Lenapah
Pensacola
Robert Kerr
Tulsa
Wetumka

MOVING STORM 1: 160 MILES/DAY HYETOGRAPHS

PMP Depth (inches) - Moving Storm Point 1																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.49	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
54	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.56	1.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60	0.00	0.62	0.00	0.00	0.00	0.00	0.00	0.64	0.00	0.62	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PMP Depth (inches) - Moving Storm Point 2																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.04	0.05	0.04	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.05	0.05	0.00
12	0.04	0.05	0.04	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.05	0.05	0.00
18	0.07	0.09	0.07	0.00	0.00	0.00	0.00	0.09	0.00	0.10	0.09	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09	0.09	0.00
24	0.07	0.09	0.07	0.00	0.00	0.00	0.00	0.09	0.00	0.10	0.09	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09	0.09	0.00
30	0.07	0.09	0.07	0.00	0.00	0.00	0.00	0.09	0.00	0.10	0.09	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09	0.09	0.00
36	0.14	0.18	0.14	0.00	0.00	0.00	0.00	0.19	0.00	0.20	0.18	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.18	0.19	0.00
42	0.21	0.28	0.21	0.00	0.00	0.00	0.00	0.28	0.00	0.30	0.26	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.27	0.28	0.00
48	0.55	0.72	0.55	0.00	0.00	0.00	0.00	0.75	0.00	0.80	0.69	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.71	0.75	0.00
54	0.27	0.74	0.27	0.00	0.00	0.00	0.00	1.26	0.00	1.38	0.63	0.00	0.00	0.00	0.00	0.00	0.64	0.00	0.00	0.70	1.10	0.00
60	0.53	0.78	0.53	0.00	0.00	0.00	0.00	0.86	0.00	0.91	0.74	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.76	0.84	0.00
66	0.42	0.55	0.42	0.00	0.00	0.00	0.00	0.57	0.00	0.60	0.53	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.54	0.57	0.00
72	0.07	0.09	0.07	0.00	0.00	0.00	0.00	0.09	0.00	0.10	0.09	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09	0.09	0.00

PMP Depth (inches) - Moving Storm Point 4																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
12	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
18	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
24	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
30	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40
36	0.50	0.50	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50
42	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60
48	0.88	0.88	0.88	0.87	0.87	0.00	0.87	0.88	0.87	0.87	0.00	0.88	0.87	0.88	0.88	0.87	0.90	0.00	0.89	0.87	0.90	0.88
54	2.12	1.13	1.81	0.87	0.89	0.00	0.87	1.43	0.87	0.87	0.00	1.21	0.87	1.33	1.72	0.90	2.84	0.00	2.40	0.87	2.96	1.52
60	1.14	1.10	1.12	1.09	1.09	0.00	1.09	1.11	1.09	1.09	0.00	1.10	1.09	1.10	1.12	1.09	1.18	0.00	1.16	1.09	1.19	1.11
66	0.80	0.80	0.80	0.80	0.80	0.00	0.80	0.80	0.80	0.80	0.00	0.80	0.80	0.80	0.80	0.80	0.80	0.00	0.80	0.80	0.80	0.80
72	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40

Note: Shaded cells indicate the 6-hour increments selected to compile final moving PMP hyetograph.

PMP Depth (inches) - Moving Storm Point 4																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
12	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
18	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
24	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
30	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40
36	0.50	0.50	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50
42	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60
48	0.88	0.88	0.88	0.87	0.87	0.00	0.87	0.88	0.87	0.87	0.00	0.88	0.87	0.88	0.88	0.87	0.90	0.00	0.89	0.87	0.90	0.88
54	2.12	1.13	1.81	0.87	0.89	0.00	0.87	1.43	0.87	0.87	0.00	1.21	0.87	1.33	1.72	0.90	2.84	0.00	2.40	0.87	2.96	1.52
60	1.14	1.10	1.12	1.09	1.09	0.00	1.09	1.11	1.09	1.09	0.00	1.10	1.09	1.10	1.12	1.09	1.18	0.00	1.16	1.09	1.19	1.11
66	0.80	0.80	0.80	0.80	0.80	0.00	0.80	0.80	0.80	0.80	0.00	0.80	0.80	0.80	0.80	0.80	0.80	0.00	0.80	0.80	0.80	0.80
72	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40

PMP Depth (inches) - Moving Storm Point 6																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.00	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.05
12	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.00	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.05
18	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10
24	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.00	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20
30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.00	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30
36	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.00	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40
42	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.00	0.00	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60
48	1.66	1.65	1.67	1.67	1.66	1.65	1.68	0.00	1.68	0.00	0.00	1.66	1.67	1.69	1.71	1.69	1.66	1.67	1.69	0.00	1.66	1.69
54	1.83	1.33	2.73	2.94	2.36	1.46	3.29	0.00	4.08	0.00	0.00	2.42	3.19	4.11	5.42	4.09	2.18	3.47	3.89	0.00	2.11	4.27
60	1.69	1.68	1.73	1.74	1.71	1.68	1.76	0.00	1.79	0.00	0.00	1.71	1.74	1.80	1.90	1.81	1.71	1.75	1.81	0.00	1.70	1.81
66	1.10	1.10	1.10	1.10	1.10	1.10	1.10	0.00	1.10	0.00	0.00	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	0.00	1.10	1.10
72	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.00	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30

PMP Depth (inches) - Moving Storm Point 7																						
Moving PMP	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.00	0.00	0.15	0.15	0.15	0.15	0.15	0.00	0.15	0.00	0.00	0.15	0.15	0.15	0.15	0.15	0.00	0.15	0.15	0.00	0.00	0.15
12	0.00	0.00	0.15	0.15	0.15	0.15	0.15	0.00	0.15	0.00	0.00	0.15	0.15	0.15	0.15	0.15	0.00	0.15	0.15	0.00	0.00	0.15
18	0.00	0.00	0.15	0.15	0.15	0.15	0.15	0.00	0.15	0.00	0.00	0.15	0.15	0.15	0.15	0.15	0.00	0.15	0.15	0.00	0.00	0.15
24	0.00	0.00	0.15	0.15	0.15	0.15	0.15	0.00	0.15	0.00	0.00	0.15	0.15	0.15	0.15	0.15	0.00	0.15	0.15	0.00	0.00	0.15
30	0.00	0.00	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.00	0.00	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.00	0.00	0.20
36	0.00	0.00	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.00	0.00	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.00	0.00	0.30
42	0.00	0.00	0.50	0.50	0.50	0.50	0.50	0.00	0.50	0.00	0.00	0.50	0.50	0.50	0.50	0.50	0.00	0.50	0.50	0.00	0.00	0.50
48	0.00	0.00	1.65	1.67	1.65	1.73	1.69	0.00	1.66	0.00	0.00	1.65	1.66	1.65	1.65	1.69	0.00	1.69	1.66	0.00	0.00	1.67
54	0.00	0.00	1.33	3.50	1.33	6.07	4.35	0.00	2.59	0.00	0.00	1.33	1.85	1.33	1.62	3.83	0.00	4.40	1.85	0.00	0.00	3.05
60	0.00	0.00	1.70	1.78	1.70	1.97	1.84	0.00	1.74	0.00	0.00	1.70	1.71	1.70	1.70	1.82	0.00	1.84	1.71	0.00	0.00	1.76
66	0.00	0.00	1.30	1.30	1.30	1.30	1.30	0.00	1.30	0.00	0.00	1.30	1.30	1.30	1.30	1.30	0.00	1.30	1.30	0.00	0.00	1.30
72	0.00	0.00	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.00	0.00	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.00	0.00	0.20

Note: Shaded cells indicate the 6-hour increments selected to compile final moving PMP hyetograph.

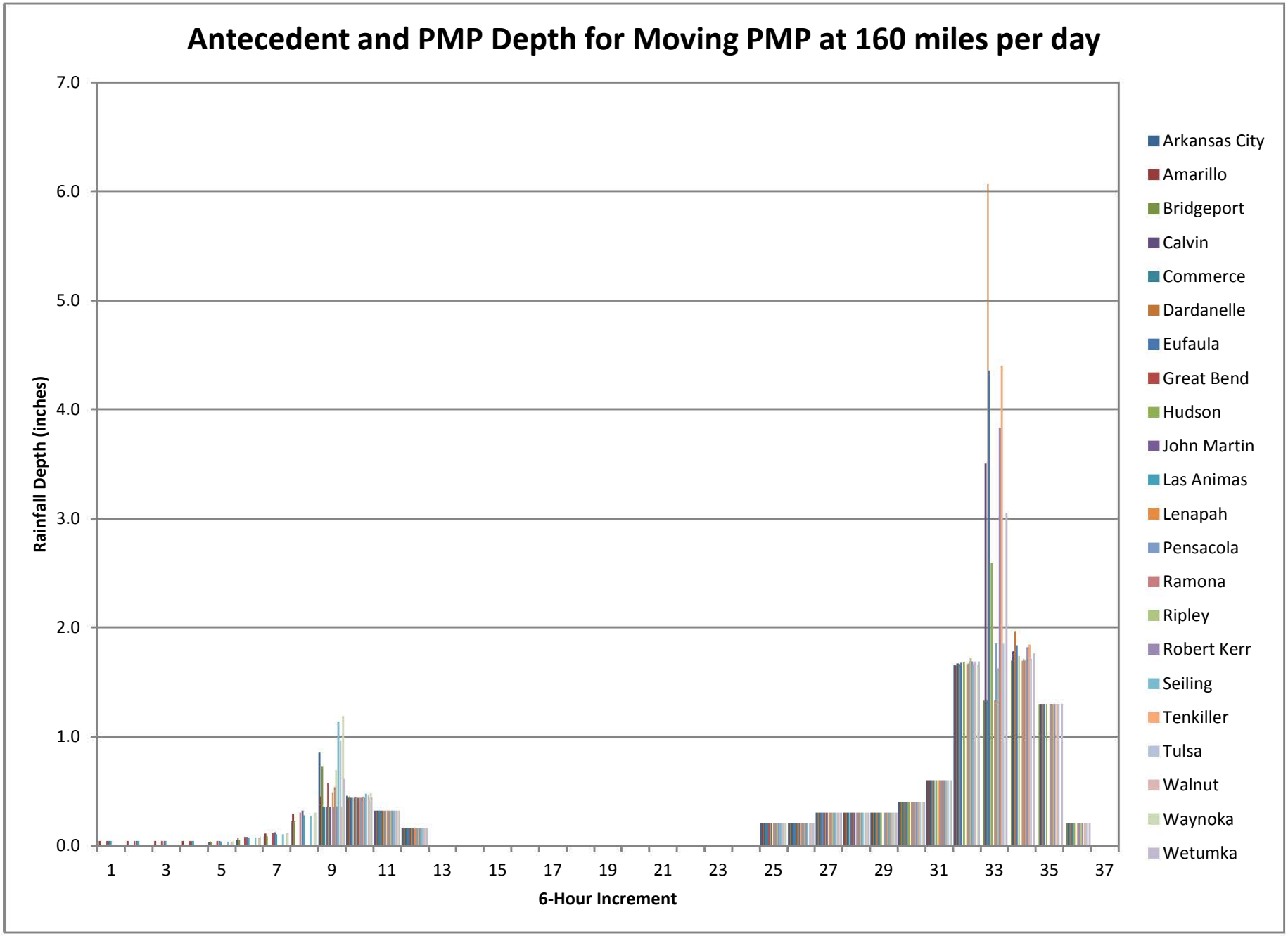
Antecedent and PMP Depths (inches) - Moving PMP at 160 miles per day

Hour	Amarillo	Arkansas City	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.04	0.03	0.03	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.04	0.04	0.00
36	0.07	0.06	0.06	0.00	0.00	0.00	0.00	0.08	0.00	0.08	0.07	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.07	0.08	0.00
42	0.11	0.08	0.08	0.00	0.00	0.00	0.00	0.11	0.00	0.12	0.11	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.11	0.11	0.00
48	0.29	0.22	0.22	0.00	0.00	0.00	0.00	0.30	0.00	0.32	0.28	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.28	0.30	0.00
54	0.45	0.85	0.73	0.35	0.36	0.00	0.35	0.57	0.35	0.35	0.00	0.48	0.35	0.53	0.69	0.36	1.14	0.00	0.96	0.35	1.19	0.61
60	0.44	0.45	0.45	0.44	0.44	0.00	0.44	0.44	0.44	0.44	0.00	0.44	0.44	0.44	0.45	0.44	0.47	0.00	0.46	0.44	0.48	0.44
66	0.32	0.32	0.32	0.32	0.32	0.00	0.32	0.32	0.32	0.32	0.00	0.32	0.32	0.32	0.32	0.32	0.32	0.00	0.32	0.32	0.32	0.32
72	0.16	0.16	0.16	0.16	0.16	0.00	0.16	0.16	0.16	0.16	0.00	0.16	0.16	0.16	0.16	0.16	0.16	0.00	0.16	0.16	0.16	0.16
78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
108	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
114	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
126	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
132	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
138	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
144	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
156	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
162	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
168	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
174	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.00	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30
180	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.00	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40
186	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.00	0.00	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60
192	1.65	1.66	1.67	1.67	1.66	1.65	1.68	0.00	1.68	0.00	0.00	1.66	1.67	1.69	1.71	1.69	1.66	1.67	1.69	0.00	1.66	1.69
198	0.00	0.00	1.33	3.50	1.33	6.07	4.35	0.00	2.59	0.00	0.00	1.33	1.85	1.33	1.62	3.83	0.00	4.40	1.85	0.00	0.00	3.05
204	0.00	0.00	1.70	1.78	1.70	1.97	1.84	0.00	1.74	0.00	0.00	1.70	1.71	1.70	1.70	1.82	0.00	1.84	1.71	0.00	0.00	1.76
210	0.00	0.00	1.30	1.30	1.30	1.30	1.30	0.00	1.30	0.00	0.00	1.30	1.30	1.30	1.30	1.30	0.00	1.30	1.30	0.00	0.00	1.30
216	0.00	0.00	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.00	0.00	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.00	0.00	0.20

Subwatershed	Point 1	Point 2	Point 4	Point 6	Point 7
Amarillo	0.09	0.80	0.64	0.02	0.00
Arkansas City	0.00	0.01	1.00	0.24	0.00
Bridgeport	0.00	0.001	0.74	0.97	0.09
Calvin	0.00	0.00	0.001	1.00	1.00
Commerce	0.00	0.00	0.87	0.37	0.01
Dardanelle	0.00	0.00	0.00	0.55	1.00
Eufaula	0.00	0.00	0.003	0.94	1.00
Great Bend	0.21	0.93	0.53	0.00	0.00
Hudson	0.00	0.00	0.04	1.00	0.99
John Martin	0.72	1.00	0.36	0.00	0.00
Las Animas	1.00	0.56	0.00	0.00	0.00
Lenapah	0.00	0.00	1.00	0.84	0.002
Pensacola	0.00	0.00	0.003	1.00	0.60
Ramona	0.00	0.00	1.00	1.00	0.22
Ripley	0.00	0.00	0.91	1.00	0.54
Robert Kerr	0.00	0.00	0.21	1.00	0.97
Seiling	0.00	0.51	1.00	0.50	0.00
Tenkiller	0.00	0.00	0.00	1.00	1.00
Tulsa	0.00	0.00	0.96	0.93	0.19
Walnut	0.00	0.97	0.83	0.00	0.00
Waynoka	0.00	0.71	1.00	0.23	0.00
Wetumka	0.00	0.00	0.33	1.00	0.81

Subwatershed Hyetographs - Adjusted for Effective Runoff Area

Hour	Amarillo	Arkansas City	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.03	0.03	0.00
36	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.08	0.04	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.07	0.05	0.00
42	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.12	0.06	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.10	0.08	0.00
48	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.32	0.16	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.27	0.21	0.00
54	0.29	0.85	0.53	0.00	0.31	0.00	0.00	0.31	0.01	0.13	0.00	0.48	0.00	0.53	0.62	0.08	1.14	0.00	0.92	0.29	1.19	0.20
60	0.28	0.45	0.33	0.00	0.38	0.00	0.00	0.24	0.02	0.16	0.00	0.44	0.00	0.44	0.41	0.09	0.47	0.00	0.45	0.36	0.48	0.15
66	0.20	0.32	0.24	0.00	0.28	0.00	0.00	0.17	0.01	0.12	0.00	0.32	0.00	0.32	0.29	0.07	0.32	0.00	0.31	0.26	0.32	0.11
72	0.10	0.16	0.12	0.00	0.14	0.00	0.00	0.09	0.01	0.06	0.00	0.16	0.00	0.16	0.15	0.03	0.16	0.00	0.15	0.13	0.16	0.05
78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
108	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
114	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
126	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
132	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
138	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
144	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150	0.13	0.20	0.15	0.00	0.17	0.00	0.00	0.11	0.01	0.07	0.00	0.20	0.00	0.20	0.18	0.04	0.20	0.00	0.19	0.17	0.20	0.07
156	0.13	0.20	0.15	0.00	0.17	0.00	0.00	0.11	0.01	0.07	0.00	0.20	0.00	0.20	0.18	0.04	0.20	0.00	0.19	0.17	0.20	0.07
162	0.19	0.30	0.22	0.00	0.26	0.00	0.00	0.16	0.01	0.11	0.00	0.30	0.00	0.30	0.27	0.06	0.30	0.00	0.29	0.25	0.30	0.10
168	0.19	0.30	0.22	0.00	0.26	0.00	0.00	0.16	0.01	0.11	0.00	0.30	0.00	0.30	0.27	0.06	0.30	0.00	0.29	0.25	0.30	0.10
174	0.01	0.07	0.29	0.30	0.11	0.16	0.28	0.00	0.30	0.00	0.00	0.25	0.30	0.30	0.30	0.30	0.15	0.30	0.28	0.00	0.07	0.30
180	0.01	0.10	0.39	0.40	0.15	0.22	0.38	0.00	0.40	0.00	0.00	0.34	0.40	0.40	0.40	0.40	0.20	0.40	0.37	0.00	0.09	0.40
186	0.01	0.14	0.58	0.60	0.22	0.33	0.56	0.00	0.60	0.00	0.00	0.51	0.60	0.60	0.60	0.60	0.30	0.60	0.56	0.00	0.14	0.60
192	0.03	0.39	1.62	1.67	0.62	0.90	1.58	0.00	1.68	0.00	0.00	1.40	1.67	1.69	1.71	1.69	0.83	1.67	1.57	0.00	0.38	1.69
198	0.00	0.00	0.12	3.50	0.01	6.07	4.35	0.00	2.56	0.00	0.00	0.00	1.10	0.29	0.88	3.73	0.00	4.40	0.35	0.00	0.00	2.48
204	0.00	0.00	0.16	1.78	0.01	1.97	1.84	0.00	1.72	0.00	0.00	0.00	1.02	0.37	0.92	1.77	0.00	1.84	0.32	0.00	0.00	1.43
210	0.00	0.00	0.12	1.30	0.01	1.30	1.30	0.00	1.28	0.00	0.00	0.00	0.78	0.28	0.70	1.27	0.00	1.30	0.24	0.00	0.00	1.06
216	0.00	0.00	0.02	0.20	0.00	0.20	0.20	0.00	0.20	0.00	0.00	0.00	0.12	0.04	0.11	0.19	0.00	0.20	0.04	0.00	0.00	0.16


Antecedent and PMP Depth for Moving PMP at 160 miles per day
Rainfall Depth (inches)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
37
6-Hour Increment
Arkansas City
Amarillo
Bridgeport
Calvin
Commerce
Dardanelle
Eufaula
Great Bend
Hudson
John Martin
Las Animas
Lenapah
Pensacola
Ramona
Ripley
Robert Kerr
Seiling
Tenkiller
Tulsa
Walnut
Waynoka
Wetumka

MOVING STORM 2: 80 MILES/DAY HYETOGRAPHS

PMP Depth (inches) - Moving Storm Point 2																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.04	0.05	0.04	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.05	0.05	0.00
12	0.04	0.05	0.04	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.05	0.05	0.00
18	0.07	0.09	0.07	0.00	0.00	0.00	0.00	0.09	0.00	0.10	0.09	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09	0.09	0.00
24	0.07	0.09	0.07	0.00	0.00	0.00	0.00	0.09	0.00	0.10	0.09	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09	0.09	0.00
30	0.07	0.09	0.07	0.00	0.00	0.00	0.00	0.09	0.00	0.10	0.09	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09	0.09	0.00
36	0.14	0.18	0.14	0.00	0.00	0.00	0.00	0.19	0.00	0.20	0.18	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.18	0.19	0.00
42	0.21	0.28	0.21	0.00	0.00	0.00	0.00	0.28	0.00	0.30	0.26	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.27	0.28	0.00
48	0.55	0.72	0.55	0.00	0.00	0.00	0.00	0.75	0.00	0.80	0.69	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.71	0.75	0.00
54	0.27	0.74	0.27	0.00	0.00	0.00	0.00	1.26	0.00	1.38	0.63	0.00	0.00	0.00	0.00	0.00	0.64	0.00	0.00	0.70	1.10	0.00
60	0.53	0.78	0.53	0.00	0.00	0.00	0.00	0.86	0.00	0.91	0.74	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.76	0.84	0.00
66	0.42	0.55	0.42	0.00	0.00	0.00	0.00	0.57	0.00	0.60	0.53	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.54	0.57	0.00
72	0.07	0.09	0.07	0.00	0.00	0.00	0.00	0.09	0.00	0.10	0.09	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09	0.09	0.00

PMP Depth (inches) - Moving Storm Point 3																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.09	0.09	0.08	0.00	0.07	0.00	0.00	0.10	0.00	0.08	0.07	0.00	0.00	0.00	0.07	0.00	0.10	0.00	0.08	0.10	0.10	0.00
12	0.09	0.09	0.08	0.00	0.07	0.00	0.00	0.10	0.00	0.08	0.07	0.00	0.00	0.00	0.07	0.00	0.10	0.00	0.08	0.10	0.10	0.00
18	0.18	0.18	0.16	0.00	0.14	0.00	0.00	0.20	0.00	0.17	0.14	0.00	0.00	0.00	0.14	0.00	0.19	0.00	0.16	0.20	0.20	0.00
24	0.18	0.18	0.16	0.00	0.14	0.00	0.00	0.20	0.00	0.17	0.14	0.00	0.00	0.00	0.14	0.00	0.19	0.00	0.16	0.20	0.20	0.00
30	0.18	0.18	0.16	0.00	0.14	0.00	0.00	0.20	0.00	0.17	0.14	0.00	0.00	0.00	0.14	0.00	0.19	0.00	0.16	0.20	0.20	0.00
36	0.35	0.37	0.32	0.00	0.28	0.00	0.00	0.39	0.00	0.34	0.28	0.00	0.00	0.00	0.28	0.00	0.39	0.00	0.33	0.40	0.39	0.00
42	0.35	0.37	0.32	0.00	0.28	0.00	0.00	0.39	0.00	0.34	0.28	0.00	0.00	0.00	0.28	0.00	0.39	0.00	0.33	0.40	0.39	0.00
48	0.65	0.67	0.59	0.00	0.51	0.00	0.00	0.72	0.00	0.62	0.51	0.00	0.00	0.00	0.51	0.00	0.72	0.00	0.60	0.74	0.74	0.00
54	0.75	0.74	0.48	0.00	0.33	0.00	0.00	1.37	0.00	0.45	0.33	0.00	0.00	0.00	0.33	0.00	1.34	0.00	0.54	1.41	1.73	0.00
60	0.78	0.81	0.68	0.00	0.56	0.00	0.00	0.92	0.00	0.72	0.56	0.00	0.00	0.00	0.56	0.00	0.91	0.00	0.70	0.94	0.96	0.00
66	0.71	0.73	0.65	0.00	0.56	0.00	0.00	0.78	0.00	0.67	0.56	0.00	0.00	0.00	0.56	0.00	0.78	0.00	0.65	0.80	0.79	0.00
72	0.18	0.18	0.16	0.00	0.14	0.00	0.00	0.20	0.00	0.17	0.14	0.00	0.00	0.00	0.14	0.00	0.19	0.00	0.16	0.20	0.20	0.00

PMP Depth (inches) - Moving Storm Point 4																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.20	0.20	0.20	0.20	0.20	0.00	0.10	0.10	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
12	0.20	0.20	0.20	0.20	0.20	0.00	0.10	0.10	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
18	0.30	0.30	0.30	0.30	0.30	0.00	0.10	0.10	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
24	0.30	0.30	0.30	0.30	0.30	0.00	0.20	0.20	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
30	0.40	0.40	0.40	0.40	0.40	0.00	0.30	0.30	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40
36	0.50	0.50	0.50	0.50	0.50	0.00	0.30	0.30	0.50	0.50	0.00	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50
42	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60
48	0.88	0.88	0.88	0.87	0.87	0.00	1.26	1.27	0.87	0.87	0.00	0.88	0.87	0.88	0.88	0.87	0.90	0.00	0.89	0.87	0.90	0.88
54	2.12	1.13	1.81	0.87	0.89	0.00	1.20	1.97	0.87	0.87	0.00	1.21	0.87	1.33	1.72	0.90	2.84	0.00	2.40	0.87	2.96	1.52
60	1.14	1.10	1.12	1.09	1.09	0.00	1.42	1.45	1.09	1.09	0.00	1.10	1.09	1.10	1.12	1.09	1.18	0.00	1.16	1.09	1.19	1.11
66	0.80	0.80	0.80	0.80	0.80	0.00	1.00	1.00	0.80	0.80	0.00	0.80	0.80	0.80	0.80	0.80	0.80	0.00	0.80	0.80	0.80	0.80
72	0.40	0.40	0.40	0.40	0.40	0.00	0.30	0.30	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40

PMP Depth (inches) - Moving Storm Point 4																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.20	0.20	0.20	0.20	0.20	0.00	0.10	0.10	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
12	0.20	0.20	0.20	0.20	0.20	0.00	0.10	0.10	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
18	0.30	0.30	0.30	0.30	0.30	0.00	0.10	0.10	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
24	0.30	0.30	0.30	0.30	0.30	0.00	0.20	0.20	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
30	0.40	0.40	0.40	0.40	0.40	0.00	0.30	0.30	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40
36	0.50	0.50	0.50	0.50	0.50	0.00	0.30	0.30	0.50	0.50	0.00	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50
42	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.60
48	0.88	0.88	0.88	0.87	0.87	0.00	1.26	1.27	0.87	0.87	0.00	0.88	0.87	0.88	0.88	0.87	0.90	0.00	0.89	0.87	0.90	0.88
54	2.12	1.13	1.81	0.87	0.89	0.00	1.20	1.97	0.87	0.87	0.00	1.21	0.87	1.33	1.72	0.90	2.84	0.00	2.40	0.87	2.96	1.52
60	1.14	1.10	1.12	1.09	1.09	0.00	1.42	1.45	1.09	1.09	0.00	1.10	1.09	1.10	1.12	1.09	1.18	0.00	1.16	1.09	1.19	1.11
66	0.80	0.80	0.80	0.80	0.80	0.00	1.00	1.00	0.80	0.80	0.00	0.80	0.80	0.80	0.80	0.80	0.80	0.00	0.80	0.80	0.80	0.80
72	0.40	0.40	0.40	0.40	0.40	0.00	0.30	0.30	0.40	0.40	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.40

PMP Depth (inches) - Moving Storm Point 5																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.10	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10
12	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.10	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10
18	0.15	0.15	0.15	0.15	0.15	0.00	0.15	0.15	0.15	0.00	0.00	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.00	0.15	0.15
24	0.25	0.25	0.25	0.25	0.25	0.00	0.25	0.25	0.25	0.00	0.00	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.00	0.25	0.25
30	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.00	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40
36	0.55	0.55	0.55	0.55	0.55	0.00	0.55	0.55	0.55	0.00	0.00	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.00	0.55	0.55
42	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.00	0.00	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60
48	1.17	1.17	1.19	1.17	1.17	0.00	1.17	1.17	1.17	0.00	0.00	1.17	1.17	1.19	1.21	1.17	1.18	1.17	1.20	0.00	1.18	1.18
54	2.10	1.17	3.23	1.39	1.67	0.00	1.67	1.17	1.68	0.00	0.00	2.62	1.34	3.36	4.40	2.09	2.86	1.13	3.79	0.00	2.45	2.37
60	1.36	1.33	1.41	1.33	1.34	0.00	1.34	1.33	1.34	0.00	0.00	1.37	1.33	1.41	1.49	1.36	1.40	1.33	1.45	0.00	1.38	1.38
66	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00
72	0.35	0.35	0.35	0.35	0.35	0.00	0.35	0.35	0.35	0.00	0.00	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.00	0.35	0.35

PMP Depth in inches - Moving Storm Point 6																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.00	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.05
12	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.00	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.05
18	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10
24	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.00	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20
30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.00	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30
36	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.00	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40
42	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.00	0.00	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60
48	1.66	1.65	1.67	1.67	1.66	1.65	1.68	0.00	1.68	0.00	0.00	1.66	1.67	1.69	1.71	1.69	1.66	1.67	1.69	0.00	1.66	1.69
54	1.83	1.33	2.73	2.94	2.36	1.46	3.29	0.00	4.08	0.00	0.00	2.42	3.19	4.11	5.42	4.09	2.18	3.47	3.89	0.00	2.11	4.27
60	1.69	1.68	1.73	1.74	1.71	1.68	1.76	0.00	1.79	0.00	0.00	1.71	1.74	1.80	1.90	1.81	1.71	1.75	1.81	0.00	1.70	1.81
66	1.10	1.10	1.10	1.10	1.10	1.10	1.10	0.00	1.10	0.00	0.00	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	0.00	1.10	1.10
72	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.00	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30

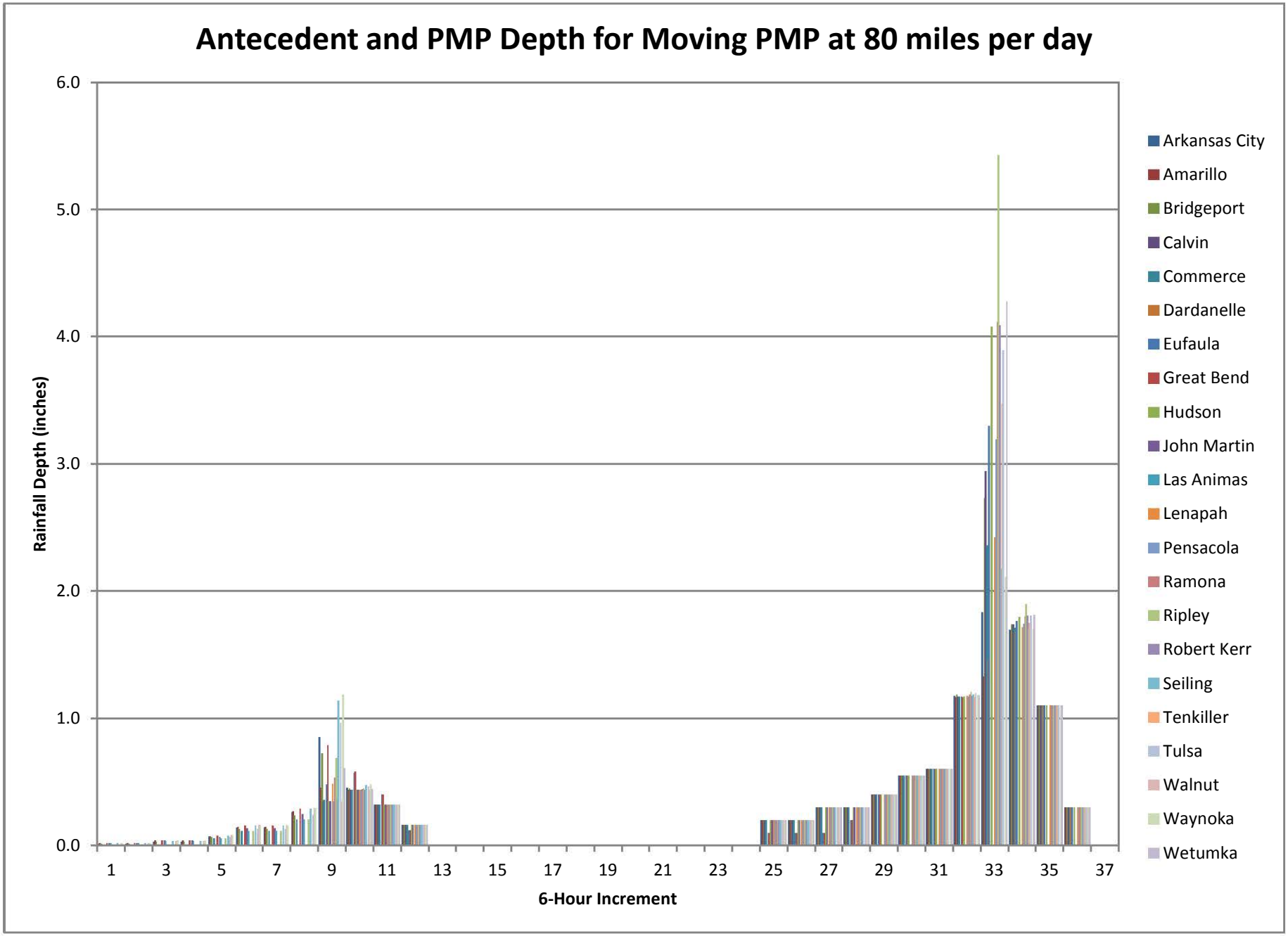
Note: Shaded cells indicate the 6-hour increments selected to compile final moving PMP hyetograph.

Subwatershed Hyetographs																						
Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02	0.02	0.00
12	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02	0.02	0.00
18	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.04	0.04	0.00
24	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.04	0.04	0.00
30	0.07	0.07	0.06	0.00	0.06	0.00	0.00	0.08	0.00	0.07	0.06	0.00	0.00	0.00	0.06	0.00	0.08	0.00	0.07	0.08	0.08	0.00
36	0.14	0.15	0.13	0.00	0.11	0.00	0.00	0.16	0.00	0.13	0.11	0.00	0.00	0.00	0.11	0.00	0.16	0.00	0.13	0.16	0.16	0.00
42	0.14	0.15	0.13	0.00	0.11	0.00	0.00	0.16	0.00	0.13	0.11	0.00	0.00	0.00	0.11	0.00	0.16	0.00	0.13	0.16	0.16	0.00
48	0.26	0.27	0.24	0.00	0.21	0.00	0.00	0.29	0.00	0.25	0.21	0.00	0.00	0.00	0.21	0.00	0.29	0.00	0.24	0.30	0.29	0.00
54	0.85	0.45	0.73	0.35	0.36	0.00	0.48	0.79	0.35	0.35	0.00	0.48	0.35	0.53	0.69	0.36	1.14	0.00	0.96	0.35	1.19	0.61
60	0.45	0.44	0.45	0.44	0.44	0.00	0.57	0.58	0.44	0.44	0.00	0.44	0.44	0.44	0.45	0.44	0.47	0.00	0.46	0.44	0.48	0.44
66	0.32	0.32	0.32	0.32	0.32	0.00	0.40	0.40	0.32	0.32	0.00	0.32	0.32	0.32	0.32	0.32	0.32	0.00	0.32	0.32	0.32	0.32
72	0.16	0.16	0.16	0.16	0.16	0.00	0.12	0.12	0.16	0.16	0.00	0.16	0.16	0.16	0.16	0.16	0.16	0.00	0.16	0.16	0.16	0.16
78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
108	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
114	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
126	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
132	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
138	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
144	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150	0.20	0.20	0.20	0.20	0.20	0.00	0.10	0.10	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
156	0.20	0.20	0.20	0.20	0.20	0.00	0.10	0.10	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20
162	0.30	0.30	0.30	0.30	0.30	0.00	0.10	0.10	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
168	0.30	0.30	0.30	0.30	0.30	0.00	0.20	0.20	0.30	0.30	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30	0.30	0.30
174	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40	0.40	0.00	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.40	0.40
180	0.55	0.55	0.55	0.55	0.55	0.00	0.55	0.55	0.55	0.00	0.00	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.00	0.55	0.55
186	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60	0.60	0.00	0.00	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.00	0.60	0.60
192	1.17	1.17	1.19	1.17	1.17	0.00	1.17	1.17	1.17	0.00	0.00	1.17	1.17	1.19	1.21	1.17	1.18	1.17	1.20	0.00	1.18	1.18
198	1.83	1.33	2.73	2.94	2.36	1.46	3.29	0.00	4.08	0.00	0.00	2.42	3.19	4.11	5.42	4.09	2.18	3.47	3.89	0.00	2.11	4.27
204	1.69	1.68	1.73	1.74	1.71	1.68	1.76	0.00	1.79	0.00	0.00	1.71	1.74	1.80	1.90	1.81	1.71	1.75	1.81	0.00	1.70	1.81
210	1.10	1.10	1.10	1.10	1.10	1.10	1.10	0.00	1.10	0.00	0.00	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	0.00	1.10	1.10
216	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.00	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.00	0.30	0.30

Subwatershed	Point 2	Point 3	Point 4	Point 5	Point 6
Arkansas City	0.01	0.81	1.00	0.84	0.24
Amarillo	0.80	0.94	0.64	0.26	0.02
Bridgeport	0.001	0.62	0.74	1.00	0.97
Calvin	0.00	0.00	0.001	0.40	1.00
Commerce	0.00	0.08	0.87	0.75	0.37
Dardanelle	0.00	0.00	0.00	0.00	0.55
Eufaula	0.00	0.00	0.003	0.41	0.94
Great Bend	0.93	0.81	0.53	0.11	0.00
Hudson	0.00	0.00	0.04	1.00	1.00
John Martin	1.00	0.77	0.36	0.00	0.00
Las Animas	0.56	0.02	0.00	0.00	0.00
Lenapah	0.00	0.00	1.00	1.00	0.84
Pensacola	0.00	0.00	0.003	0.98	1.00
Ramona	0.00	0.00	1.00	1.00	1.00
Ripley	0.00	0.01	0.91	1.00	1.00
Robert Kerr	0.00	0.00	0.21	0.71	1.00
Seiling	0.51	0.94	1.00	0.93	0.50
Tenkiller	0.00	0.00	0.00	0.18	1.00
Tulsa	0.00	0.23	0.96	0.89	0.93
Walnut	0.97	1.00	0.83	0.00	0.00
Waynoka	0.71	0.98	1.00	0.55	0.23
Wetumka	0.00	0.00	0.33	0.91	1.00

Subwatershed Hyetographs - Adjusted for Effective Runoff Area

Hour	Arkansas City	Amarillo	Bridgeport	Calvin	Commerce	Dardanelle	Eufaula	Great Bend	Hudson	John Martin	Las Animas	Lenapah	Pensacola	Ramona	Ripley	Robert Kerr	Seiling	Tenkiller	Tulsa	Walnut	Waynoka	Wetumka
6	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.01	0.00
12	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.01	0.00
18	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.03	0.03	0.00
24	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.03	0.03	0.00
30	0.06	0.07	0.04	0.00	0.00	0.00	0.00	0.06	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.02	0.08	0.08	0.00
36	0.12	0.14	0.08	0.00	0.01	0.00	0.00	0.13	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.03	0.16	0.15	0.00
42	0.12	0.14	0.08	0.00	0.01	0.00	0.00	0.13	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.03	0.16	0.15	0.00
48	0.21	0.25	0.15	0.00	0.02	0.00	0.00	0.24	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.06	0.30	0.29	0.00
54	0.85	0.29	0.53	0.00	0.31	0.00	0.00	0.42	0.01	0.13	0.00	0.48	0.00	0.53	0.62	0.08	1.14	0.00	0.92	0.29	1.19	0.20
60	0.45	0.28	0.33	0.00	0.38	0.00	0.00	0.31	0.02	0.16	0.00	0.44	0.00	0.44	0.41	0.09	0.47	0.00	0.45	0.36	0.48	0.15
66	0.32	0.20	0.24	0.00	0.28	0.00	0.00	0.21	0.01	0.12	0.00	0.32	0.00	0.32	0.29	0.07	0.32	0.00	0.31	0.26	0.32	0.11
72	0.16	0.10	0.12	0.00	0.14	0.00	0.00	0.06	0.01	0.06	0.00	0.16	0.00	0.16	0.15	0.03	0.16	0.00	0.15	0.13	0.16	0.05
78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
108	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
114	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
126	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
132	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
138	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
144	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150	0.20	0.13	0.15	0.00	0.17	0.00	0.00	0.05	0.01	0.07	0.00	0.20	0.00	0.20	0.18	0.04	0.20	0.00	0.19	0.17	0.20	0.07
156	0.20	0.13	0.15	0.00	0.17	0.00	0.00	0.05	0.01	0.07	0.00	0.20	0.00	0.20	0.18	0.04	0.20	0.00	0.19	0.17	0.20	0.07
162	0.30	0.19	0.22	0.00	0.26	0.00	0.00	0.05	0.01	0.11	0.00	0.30	0.00	0.30	0.27	0.06	0.30	0.00	0.29	0.25	0.30	0.10
168	0.30	0.19	0.22	0.00	0.26	0.00	0.00	0.11	0.01	0.11	0.00	0.30	0.00	0.30	0.27	0.06	0.30	0.00	0.29	0.25	0.30	0.10
174	0.34	0.10	0.40	0.16	0.30	0.00	0.17	0.04	0.40	0.00	0.00	0.40	0.39	0.40	0.40	0.29	0.37	0.07	0.36	0.00	0.22	0.36
180	0.46	0.14	0.55	0.22	0.42	0.00	0.23	0.06	0.55	0.00	0.00	0.55	0.54	0.55	0.55	0.39	0.51	0.10	0.49	0.00	0.30	0.50
186	0.50	0.16	0.60	0.24	0.45	0.00	0.25	0.07	0.60	0.00	0.00	0.60	0.59	0.60	0.60	0.43	0.56	0.11	0.53	0.00	0.33	0.54
192	0.98	0.30	1.18	0.47	0.88	0.00	0.48	0.13	1.17	0.00	0.00	1.17	1.15	1.19	1.21	0.84	1.10	0.21	1.06	0.00	0.65	1.07
198	0.44	0.03	2.65	2.94	0.87	0.80	3.10	0.00	4.08	0.00	0.00	2.04	3.19	4.11	5.42	4.09	1.09	3.47	3.63	0.00	0.48	4.27
204	0.40	0.03	1.68	1.74	0.63	0.92	1.66	0.00	1.79	0.00	0.00	1.45	1.74	1.80	1.90	1.81	0.85	1.75	1.68	0.00	0.39	1.81
210	0.26	0.02	1.07	1.10	0.41	0.60	1.03	0.00	1.10	0.00	0.00	0.93	1.10	1.10	1.10	1.10	0.55	1.10	1.03	0.00	0.25	1.10
216	0.07	0.01	0.29	0.30	0.11	0.16	0.28	0.00	0.30	0.00	0.00	0.25	0.30	0.30	0.30	0.30	0.15	0.30	0.28	0.00	0.07	0.30


Antecedent and PMP Depth for Moving PMP at 80 miles per day
Rainfall Depth (inches)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
37
6-Hour Increment
Arkansas City
Amarillo
Bridgeport
Calvin
Commerce
Dardanelle
Eufaula
Great Bend
Hudson
John Martin
Las Animas
Lenapah
Pensacola
Ramona
Ripley
Robert Kerr
Seiling
Tenkiller
Tulsa
Walnut
Waynoka
Wetumka