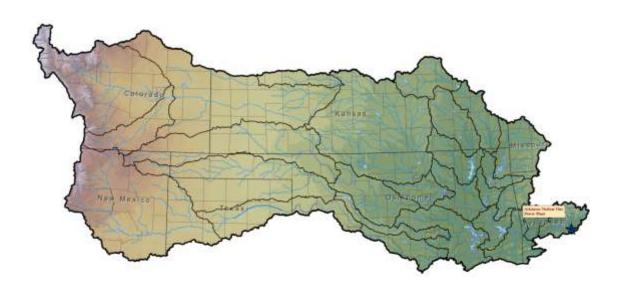




Probable Maximum Precipitation and Local Intense Precipitation Analysis for Arkansas Nuclear One



Prepared for
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

Prepared by

Applied Weather Associates, LLC Monument, Colorado

William D. Kappel, Senior Meteorologist/ Project Manager Geoff A. Muhlestein, GIS/Staff Scientist Douglas M. Hultstrand, Hydrometeorologist Edward M. Tomlinson, PhD, Chief Meteorologist Dana McGlone, Staff Meteorologist Steve Lovisone, Staff Meteorologist Patrice Sutter, Staff Meteorologist

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Executive Summary

Applied Weather Associates (AWA) has completed site-specific Probable Maximum Precipitation (PMP) and Local Intense Precipitation (LIP) analyses for Arkansas Nuclear One (ANO) located along the Arkansas River in the state of Arkansas. The purpose of the study was to determine PMP specific to entire drainage basin affecting the site, approximately 153,000 square miles and LIP values at the ANO site. These analyses analyzed storms throughout all twelve months of the year to produce all-season PMP values, and analyzed thunderstorms and Mesoscale Convective Complexes (MCC) for the LIP analysis over the ANO site location. This study took into account topography, climate and storm types that affect this region which could produce the Probable Maximum Flood (PMF). The calculation of the Probable Maximum Flood is not within the scope of this study.

The ANO drainage basin lies within the domains of National Oceanic and Atmospheric Administration's (NOAA) National Weather Service Hydrometeorological Reports No. 51 (HMR 51) and HMR 55A. The methods and procedures used to derive the PMP and LIP values are similar to other site-specific PMP studies conducted by AWA within the HMR 51 and HMR 55A domains (e.g. Tomlinson 1993, Tomlinson et al 2008, Tomlinson et al 2011, Kappel et al 2012, Tomlinson et al. 2013, Kappel et al. 2013). The approach used in this study is a stormbased approach that utilizes 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, 2009). 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 basin and over the ANO site location. The largest of these rainfall events are selected for detailed analyses.

The basin affecting the ANO site is large and diverse. Therefore, many different storm types affect the overall basin. A gridded system was set up to capture the spatial variability of storms and extreme rainfall amounts across the large basin. In total, 75 storm events were used in the development of the PMP values and 23 storms were used in the LIP analysis. Each of these storms has characteristics of extreme rainfall production that could potentially occur over some part the ANO basin and could potentially influence PMP values at one or more of the area sizes and/or durations analyzed or influence the LIP values at the ANO site.

HMR procedures for maximization, transposition, and elevation moisture adjustments are used with refinements (e.g. average vs. persisting dew points and 1,000 foot transposition limitations). Updated techniques and databases are used in the study to increase accuracy and reliability, while adhering to the basic procedures in the HMRs and in the WMO Manuals. The updated maximum dew point climatology maps that were developed for previous PMP studies was used in the storm maximization and storm transpositioning processes.

For newly analyzed storms, maximization factors were determined using the updated climatologies and storm representative dew point data. A parcel trajectory model (HYSPLIT) (Draxler and Rolph 2003, 2010) was used along with the National Center for Environmental Prediction (NCEP) Reanalysis (Mesinger 2006) database to assist in the determination of storm inflow moisture vectors.

Each storm on the short storm list (the final 78 storm centers used to derive the PMP and 23 used to derive LIP) was maximized, transpositioned, and elevation adjusted to the ANO site and to each of the 22 grid points as appropriate and used to distribute PMP across this large basin. Depth-Area (DA) plots were made for 6-, 12-, 24-, 48-, and 72-hour durations and 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 using storm rainfall values at each grid point and the basin centroid. Depth-Duration (DD) curves were plotted for each duration and envelop curves constructed. The final DD envelop curves provide PMP values for each grid point and the basin centroid. The final step was to spatially interpolate the resulting values using a Geographic Information System (GIS) with manual adjustments to ensure continuity in space and time across the entire basin. The results of this final step allow PMP values for standard durations and area sizes to be determined for any location within the basin.

The PMP values were determined using procedures described in HMR 51. In addition, because the size of the basin is well beyond the 20,000 square mile upper limit in HMRs 51 and 52, the PMP values were determined for area sizes to 100,000 square miles. Further, analysis results were provided to allow for movement of the design storm during PMF calculations, unlike the stationary design storm center provided in HMR 52. Design storm movement allows for a more realistic storm scenario to be used for the application of the PMP values for PMF determination.

GLOSSARY

Adiabat: Curve of thermodynamic change taking place without addition or subtraction of heat. On an adiabatic chart or pseudo-adiabatic diagram, a line showing pressure and temperature changes undergone by air rising or condensation of its water vapor; a line, thus, of constant potential temperature.

Adiabatic: Referring to the process described by adiabat.

Advection: The process of transfer (of an air mass property) by virtue of motion. In particular cases, advection may be confined to either the horizontal or vertical components of the motion. However, the term is often used to signify horizontal transfer only.

Air mass: Extensive body of air approximating horizontal homogeneity, identified as to source region and subsequent modifications.

Average Dew Point: The average dew point value calculated using a simple mathematically running mean over a specific duration of consecutive hours (i.e. 6-hours) at a given station or set of stations. This value is used in the storm maximization calculation as the storm representative dew point.

Barrier: A mountain range that partially blocks the flow of warm humid air from a source of moisture to the basin under study.

Basin centroid: The point at the exact center of the drainage basin as determined through geographical information systems calculations using the basin outline.

Basin shape: The physical outline of the basin as determined from topographic maps, field survey, or GIS.

Cirrus shield: In this study, the area of cirrus cloud that covers a mesoscale convective complex.

Cirrus anvil: The cirrus cloud that is advected downwind from the top of a cumulonimbus cloud.

Cold front: Front where relatively colder air displaces warmer air.

Convective rain: Rainfall caused by the vertical motion of an ascending mass of air that is warmer than the environment and typically forms a cumulonimbus cloud. The horizontal dimension of such a mass of air is generally of the order of 12 miles or less. Convective rain is typically of greater intensity than either of the other two main classes of rainfall (cyclonic and orographic) and is often accompanied by thunder. The term is more particularly used for those cases in which the precipitation covers a large area as a result of the agglomeration of cumulonimbus masses.

Convergence: Horizontal shrinking and vertical stretching of a volume of air, accompanied by net inflow horizontally and internal upward motion.

Cooperative station: A weather observation site where an unpaid observer maintains a climatological station for the National Weather Service.

Cyclone: A distribution of atmospheric pressure in which there is a low central pressure relative to the surroundings. On large-scale weather charts, cyclones are characterized by a system of closed constant pressure lines (isobars), generally approximately circular or oval in form, enclosing a central low-pressure area. Cyclonic circulation is counterclockwise in the northern hemisphere and clockwise in the southern. (That is, the sense of rotation about the local vertical is the same as that of the earth's rotation.)

Depth-Area curve: Curve showing, for a given duration, the relation of maximum average depth to size of area within a storm or storms.

Depth-Area-Duration: The precipitation values derived from Depth-Area and Depth-Duration curves at each time and area size increment analyzed for a PMP evaluation.

Depth-Area-Duration Curve: A curve showing the relation between an averaged areal rainfall depth and the area over which it occurs, for a specified time interval, during a specific rainfall event.

Depth-Area-Duration values: The combination of depth-area and duration-depth relations. Also called depth-duration-area.

Depth-Duration curve: Curve showing, for a given area size, the relation of maximum average depth of precipitation to duration periods within a storm or storms.

Dew point: The temperature to which a given parcel of air must be cooled at constant pressure and constant water vapor content for saturation to occur.

Effective Barrier Height: The height of a barrier determined from elevation analysis that reflects the effect of the barrier on the precipitation process for a storm event. The actual barrier height may be either higher or lower than the effective barrier height.

Envelopment: A process for selecting the largest value from any set of data. In estimating PMP, the maximum and transposed rainfall data are plotted on graph paper, and a smooth curve is drawn through the largest values.

Explicit Transposition: The movement of the rainfall amounts associated with a storm within boundaries of a region throughout which a storm may be transposed with only relatively minor modifications of the observed storm rainfall amounts. The area within the transposition limits has similar, but not identical, climatic and topographic characteristics throughout.

First-order NWS station: A weather station that is either automated, or staffed by employees of the National Weather Service and records observations on a continuous basis.

Front: The interface or transition zone between two air masses of different parameters. The parameters describing the air masses are temperature and dew point.

General storm: A storm event, that produces precipitation over areas in excess of 500-square miles, has a duration longer than 6 hours, and is associated with a major synoptic weather feature.

Gulf Stream Current: A warm, well-defined, swift, relatively narrow, ocean current in the western North Atlantic that originates where the Florida Current and the Antilles Current begin to curve

eastward from the continental slope of Cape Hatteras, North Carolina. East of the Grand Banks, the Gulf Stream meets the cold Labrador Current, and the two flow eastward separated by the cold wall.

HYSPLIT: HYbrid Single-Particle Lagrangian Integrated Trajectory. A complete system for computing parcel trajectories to complex dispersion and deposition simulations using either puff or particle approaches. Gridded meteorological data, on one of three conformal (Polar, Lambert, or Mercator latitude-longitude grid) map projections, are required at regular time intervals. Calculations may be performed sequentially or concurrently on multiple meteorological grids, usually specified from fine to coarse resolution.

Implicit Transpositioning: The process of applying regional, areal, or durational smoothing to eliminate discontinuities resulting from the application of explicit transposition limits for various storms

Isohyets: Lines of equal value of precipitation for a given time interval.

Isohyetal Pattern: The pattern formed by the isohyets of an individual storm.

Isohyetal orientation: The term used to define the orientation of precipitation patterns of major storms when approximated by elliptical patterns of best fit. It is also the orientation (direction from north) of the major axis through the elliptical PMP storm pattern.

Jet Stream: A strong, narrow current concentrated along a quasi-horizontal axis (with respect to the earth's surface) in the upper troposphere or in the lower stratosphere, characterized by strong vertical and lateral wind shears. Along this axis it features at least one velocity maximum (jet streak). Typical jet streams are thousands of kilometers long, hundreds of kilometers wide, and several kilometers deep. Vertical wind shears are on the order of 10 to 20 mph per kilometer of altitude and lateral winds shears are on the order of 10 mph per 100 kilometer of horizontal distance.

Local storm: A storm event that occurs over a small area in a short time period. Precipitation rarely exceeds 6 hours in duration and the area covered by precipitation is less than 500-square miles. Frequently, local storms will last only 1 or 2 hours and precipitation will occur over areas of up to 200-square miles. Precipitation from local storms will be isolated from general-storm rainfall. Often these storms are thunderstorms.

Low Level Jet: A band of strong winds at an atmospheric level well below the high troposphere as contrasted with the jet streams of the upper troposphere.

Mass curve: Curve of cumulative values of precipitation through time.

Mesoscale Convective Complex: For the purposes of this study, a heavy rain-producing storm with horizontal scales of 10 to 1000 kilometers (6 to 625 miles) which includes significant, heavy convective precipitation over short periods of time (hours) during some part of its lifetime.

Mesoscale Convective System: A complex of thunderstorms which becomes organized on a scale larger than the individual thunderstorms, and normally persists for several hours or more. MCSs may be round or linear in shape, and include systems such as tropical cyclones, squall lines, and MCCs (among others). MCS often is used to describe a cluster of thunderstorms that does not satisfy the size, shape, or duration criteria of an MCC.

Mid-latitude frontal system: An assemblage of fronts as they appear on a synoptic chart north of the tropics and south of the polar latitudes. This term is used for a continuous front and its characteristics along its entire extent, its variations of intensity, and any frontal cyclones along it. **Moisture maximization:** The process of adjusting observed precipitation amounts upward based upon the hypothesis of increased moisture inflow to the storm.

Observational day: The 24-hour time period between daily observation times for two consecutive days at cooperative stations, e.g., 6:00PM to 6:00PM.

One-hundred year rainfall event: The point rainfall amount that has a one-percent probability of occurrence in any year. Also referred to as the rainfall amount that on the average occurs once in a hundred years or has a 1 percent chance of occurring in any single year.

Polar front: A semi-permanent, semi-continuous front that separates tropical air masses from polar air masses.

Precipitable water: The total atmospheric water vapor contained in a vertical column of unit cross-sectional area extending between any two specified levels in the atmosphere; commonly expressed in terms of the height to which the liquid water would stand if the vapor were completely condensed and collected in a vessel of the same unit cross-section. The total precipitable water in the atmosphere at a location is that contained in a column or unit cross-section extending from the earth's surface all the way to the "top" of the atmosphere. The 30,000 foot level (approximately 300mb) is considered the top of the atmosphere in this study.

Persisting dew point: The dew point value at a station that has been equaled or exceeded throughout a period. Commonly durations of 12 or 24 hours are used, though other durations may be used at times.

Probable maximum precipitation: Theoretically, the greatest depth of precipitation for a given duration that is physically possible over a given size storm area at a particular geographic location at a certain time of the year.

Probable maximum flood: The flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area.

Pseudo-adiabat: Line on thermodynamic diagram showing the pressure and temperature changes undergone by saturated air rising in the atmosphere, without ice-crystal formation and without exchange of heat with its environment, other than that involved in removal of any liquid water formed by condensation.

Pseudo-adiabatic: Referring to the process described by the pseudo-adiabat.

Rainshadow: The region, on the lee side of a mountain or mountain range, where the precipitation is noticeably less than on the windward side.

PMP storm pattern: The isohyetal pattern that encloses the PMP area, plus the isohyets of residual precipitation outside the PMP portion of the pattern.

Saturation: Upper limit of water-vapor content in a given space; solely a function of temperature.

Short Storm List: The final list of storms used to derive the PMP values.

Spatial distribution: The geographic distribution of precipitation over a drainage according to an idealized storm pattern of the PMP for the storm area.

Storm transposition: The hypothetical transfer, or relocation of storms, from the location where they occurred to other areas where they could occur. The transfer and the mathematical adjustment of storm rainfall amounts from the storm site to another location is termed "explicit transposition." The areal, durational, and regional smoothing done to obtain comprehensive individual drainage estimates and generalized PMP studies is termed "implicit transposition" (WMO, 1986).

Synoptic: Showing the distribution of meteorological elements over an area at a given time, e.g., a synoptic chart. Use in this report also means a weather system that is large enough to be a major feature on large-scale maps (e.g., of the continental U.S.).

Temperature Inversion: An increase in temperature with an increase in height.

Temporal distribution: The time order in which incremental PMP amounts are arranged within a PMP storm.

Tropical Storm: A cyclone of tropical origin that derives its energy from the ocean surface.

Total storm area and total storm duration: The largest area size and longest duration for which depth-area-duration data are available in the records of a major storm rainfall.

Transposition limits: The outer boundaries of the region surrounding an actual storm location where similar, but not identical, meteorological and topographic characteristics occur. The storm can be transpositioned within the transposition limits without modification of the expected storm dynamics and adjustments can be applied to the difference in elevation and moisture availability between the two locations. Transpositioning greatly increases the available data for evaluating the rainfall potential for a given drainage location.

Undercutting: The process of placing an envelopment curve somewhat lower than the highest rainfall amounts on depth-area and depth-duration plots.

Warm front: Front where relatively warmer air replaces colder air.

Warm sector: Sector of warm air bounded on two sides by the cold and warm fronts extending from a center of low pressure.

Acronyms and Abbreviations used in the report

ALERT: Automated Local Evaluation in Real Time

ANO: Arkansas Nuclear One

AWA: Applied Weather Associates, LLC

COCORAHS: Community Collaborative Rain, Hail, and Snow Network

COOP: Cooperative Observer Program

DA: Depth-Area

DAD: Depth-Area-Duration

DD: Depth-Duration

dd: decimal degrees

DND: drop number distribution

DSD: drop size distribution

EPRI: Electric Power Research Institute

F: Fahrenheit

GIS: Geographical Information System

GRASS: Geographic Resource Analysis Support System

HMR: Hydrometeorological Report

HR: Hour

HYSPLIT: Hybrid Single Particle Lagrangian Integrated Trajectory Model

IPCC: Intergovernmental Panel on Climate Change

km: kilometer

MADIS: Meteorological Assimilation Data Ingest System

mb: millibar

MCC: Mesoscale Convective Complex

MCS: Mesoscale Convective System

mph: miles per hour

NCAR: National Center for Atmospheric Research

NCDC: National Climatic Data Center

NCEP: National Centers for Environmental Prediction

NEXRAD: Next Generation Radar

NOAA: National Oceanic and Atmospheric Association

NWS: National Weather Service

PMF: Probable Maximum Flood

PMP: Probable Maximum Precipitation

PW: Precipitable water

RAWS: Remote Automatic Weather Stations

SMC: Spatially based Mass Curve

SPAS: Storm Precipitation and Analysis System

USACE: US Army Corps of Engineers

USGS: United States Geological Survey

WMO: World Meteorological Organization

1. Introduction

This study provides both Probable Maximum Precipitation (PMP) and the Local Intense Precipitation (LIP) values for use in the computation of the Probable Maximum Flood (PMF) for the Arkansas Nuclear One (ANO) basin and location. The site-specific study builds on the previous PMP studies completed by AWA in the region (e.g., Tomlinson 1993, Tomlinson et al 2002-2012, Kappel et al 2011-2013).

1.1 Background

Definitions of PMP are found in most Hydrometeorological Reports (HMRs) published by the National Weather Service (NWS). The definition used in the most recently published HMR is "theoretically, the greatest depth of precipitation for a given duration that is physically possible over a given storm area at a particular geographical location at a certain time of the year." (HMR 59, p. 5). Since the mid-1940s, several government agencies have been developing methods to calculate PMP in various regions of the United States. The NWS (formerly the U.S. Weather Bureau) and the Bureau of Reclamation have been the primary agencies involved in this activity. PMP values from their reports are used to calculate the PMF which, in turn, is often used for the design of significant hydraulic structures.

The generalized PMP studies currently in use in the conterminous United States include HMR 49 (1977) for the Colorado River and Great Basin drainage; HMRs 51 (1978), 52 (1982) and 53 (1980) for the U.S. east of the 105th meridian; HMR 55A (1988) for the area between the Continental Divide and the 103rd meridian; HMR 57 (1994) for the Columbia River Drainage; and HMRs 58 (1998) and 59 (1999) for California. Figure 1.0 shows the coverage of the various HMRs. For the ANO basin, the majority of the region is covered by HMR 51, with areas west of 103° longitude covered by HMR 55A. In addition to these HMRs, numerous Technical Papers and Reports deal with specific subjects concerning precipitation. Examples are NOAA Technical Report NWS 25 (1980) and NOAA Technical Memorandum NWS HYDRO 45 (1995). Topics include maximum observed rainfall amounts; return periods for various rainfall amounts, and specific storm studies. Climatological atlases (Technical Paper No. 40, 1961; NOAA Atlas 2, 1973; and NOAA Atlas 14, 2003) are available for use in determining rainfall amounts for specified return periods for selected regions of the U.S.

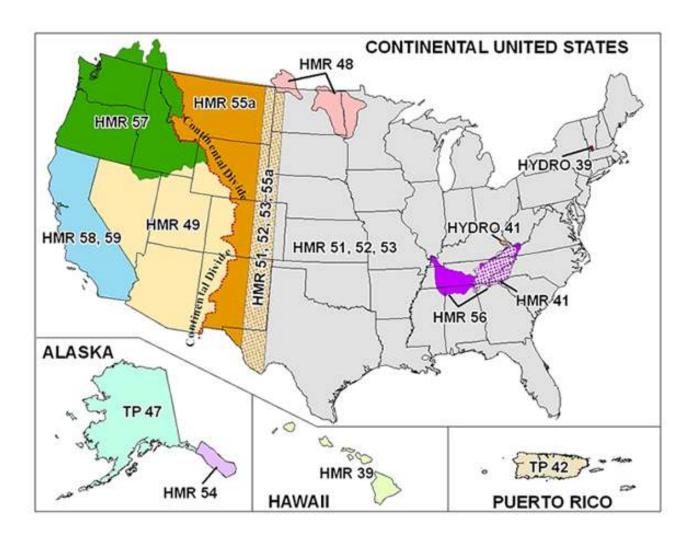


Figure 1.0 Regions covered by current Hydrometeorological Reports.

A number of site-specific and regional PMP studies augment generalized HMRs. These studies are for specific regions or drainage basins within the large areas addressed by HMR 51 and HMR 55A as well as areas covered by other HMRs. The meteorological conditions producing extreme rainfall events vary significantly in different regions within large geographic areas such as the large area covered by the ANO basin. In much of the Midwest, extreme events are usually linked to either Mesoscale Convective Systems (MCSs) or synoptic storms with embedded convection. For the ANO basin, the main storm type leading to PMF level flooding is a synoptic event with embedded convection which moves slowly across the region, generally in a west to east direction. This type of storm provides steady rainfall over long durations and large area sizes, with periods of heavy rainfall over smaller areas. Individual thunderstorms would not lead to PMF level flood across the basin and therefore were not a focus of the overall basin-wide PMP development. Instead, individual thunderstorms and MCSs were the storm type analyzed for the LIP analysis at the ANO site location, as a high intensity, short duration, and localized rainfall over the site would potentially produce the LIP.

The time of year when the storm environment leading to PMP-level rain occurs is during a time of the year when no significant snowpack would be available. In areas of the upper basin where significant snow pack accumulates, significant rainfall that could lead to PMF level flooding at the ANO site does not occur. Therefore, no explicit cool-season PMP values and/or rain-on-snow analyses needed to be completed beyond this quantitative assessment.

Although it provides generalized estimates of PMP values for a large climatologically diverse area, HMR 51 recognizes that studies addressing PMP over specific regions can incorporate more site-specific considerations and provide improved PMP estimates. By periodically reviewing storm data and advances in meteorological concepts, PMP analysts can identify relevant new data and procedures for use in determining PMP values (HMR 51, Section 1.4.1).

As described previously, several site-specific PMP studies have been completed by AWA within the region covered by HMRs 51 and 55A (Figure 1.1). Each of these studies provided PMP values which replaced those from the HMRs. These are examples of PMP studies that explicitly consider the meteorology and topography of the study location along with characteristics of historic extreme storms over climatically similar regions. These regional and site-specific PMP studies have received extensive review and been accepted by the appropriate regulatory agencies. Results have been used in computing the PMF for individual watersheds.



Figure 1.1 Locations of AWA PMP studies as of December 2013.

This report presents details of the ANO PMP study. Section 1 provides an overview of the study. The weather and climate of the upper Midwest and northern Great Plains are discussed in Section 2. Section 3 details the storms types important for PMP development for the basin.

The steps involved with identifying extreme storms are discussed in Section 4 and procedures used to analyze these storms are discussed in Section 5. Discussion on the development of the maximum dew point climatology is provided in Section 6. Adjustments for storm maximization, storm transpositioning, and elevation adjustments are presented in Sections 7 and 8. The final procedure of developing PMP values from the adjusted storm rainfall amounts is provided in Section 9. Section 10 provides information on PMP storm dimensions and movement. Section 11 provides analysis and results of the LIP analysis for the ANO site. PMP results are discussed in Section 12. Section 13 provides discussions related to the sensitivity analysis of the parameters used in the study. The recommended application of results are given in Section 14.

1.2 Objectives

The objective of this study was to perform a PMP analysis to determine reliable estimates of PMP values for the entire ANO basin and LIP analysis to provide the 1-hour 1-square mile PMP value at the ANO site location. The most reliable methods and data currently available have been used, with updated methods, techniques, and data used where appropriate.

1.3 Approach

The approach used in this study follows the same general procedures that were used in the development of the HMRs. These procedures were applied considering the meteorological and topographic characteristics of the basin.

The study maintains as much consistency as possible with the general methods used in HMRs 51 and 55A as well as the numerous site-specific, statewide, and regional AWA PMP studies. Deviations are incorporated where justified by developments in meteorological analyses and available data. The basic approach identifies PMP-type storms that occurred within the central and southern Plains of the United States to the Front Range and mountains of Wyoming, Colorado, and New Mexico east of the Continental Divide. This ensured a sufficiently large region was included in the development of the storm list so that any transpositionable storm that could potentially affect the PMP values at any area size or duration was included.

The moisture content of each of these storms is maximized to provide an estimate of the maximum rainfall for each storm at the location where it occurred. This is accomplished by computing the ratio of the *maximum* amount of atmospheric moisture that could have been entrained into the storm at that time of year to the *actual* atmospheric moisture entrained into the storm as it occurred. After maximization, the storms are transpositioned to each grid point to the extent supportable by similarity of meteorological conditions and topography. Maximized and transpositioned adjusted rainfall values are enveloped at each grid point and then contoured throughout the entire domain to provide PMP estimates for various area sizes and durations at any point within the entire basin. Figure 1.2 shows the flow chart of the major steps in the PMP development process.

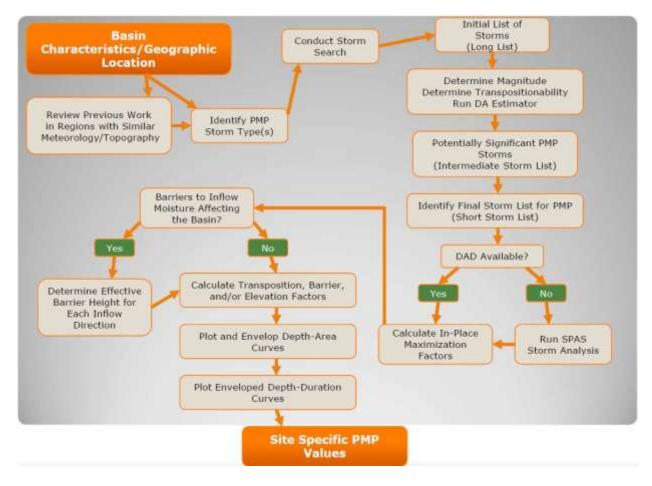


Figure 1.2 Flow chart showing the major steps involved in PMP development.

For some applications, this study applied standard methods (e.g. WMO Operational Hydrology Report No. 1, 1986), while for other applications, improved techniques were used. Advanced computer-based technologies, Weather Service Radar WSR-88D NEXt generation RADar (NEXRAD), and HYSPLIT model trajectories were used for storm analyses along with updated meteorological data sources. Improved technology and data were incorporated into the study when they provided improved reliability, while maintaining as much consistency as possible with previous studies. This approach provides the most complete scientific application compatible with the engineering requirements of consistency and reliability for credible PMP estimates.

Moisture analyses in HMRs 51 and 55A used monthly maximum observed 12-hour persisting dew points to quantify atmospheric moisture. Maximum dew point values used in HMR 51 were provided by *Climatic Atlas of the United States*, published by the Environmental Data Services, Department of Commerce (1968). This study, however, used an updated maximum dew point return frequency analysis developed during several recent and on-going AWA PMP studies. This dew point analysis incorporated data sets with longer periods of record than were available for use in HMRs 51 or 55A. This updated climatology produced 20-, 50-, and 100-year return frequencies for maximum average dew point values for 6-, 12-, and 24-hour

duration periods. GIS was used extensively in the development of the updated maximum dew point climatology maps.

A reanalysis of transposition limits was completed that evaluated the elevation of each storm's isohyetal pattern versus the elevation of each grid point used in this study. It was confirmed from this analysis that storms should not be transpositioned more than +/- 1,000 feet in elevation from their original storm elevations. This same conclusion was found in several other AWA PMP studies in the region (e.g. Tomlinson et al. 2008, Kappel et al. 2013) as well as stated in HMR 51 (Section 2.4.2 c.). This procedure provided explicit guidance and constraints on the regions of influence for individual storms. Appendix F details which storms were ultimately transpositioned to various grid point(s).

As mentioned previously, a set of 22 grid points (Figure 1.3) were placed over the region. The gridded analysis procedure was used with the total adjusted rainfall amounts applied across the grid that not only covers the entire basin, but extended into bordering regions to ensure continuity across the basin boundaries. PMP values were analyzed at each grid point using standard procedures. Envelopment of the largest rainfall totals was applied to ensure spatial and temporal continuity of the final PMP values. Once values were derived for each area size and duration, values were spatially and temporally distributed using GIS technologies and manual adjustments. This process produced the final set of PMP maps for the study. It should be noted that the PMP values over the Front Range and up to the Continental Divide of the Rocky Mountains in Colorado and New Mexico used the least amount of data and analyses. This is because no explicit evaluation and quantification of topography and how it relates to rainfall production was completed as part of this study. However, this has minimal to no effect on the resulting PMF at the ANO site, as any flood resulting from rainfall in these locations would have little to no affect effect on the PMF at the ANO site. Instead, values at the grid points in the mountains (7, 13, 14, 21, and 22) provided spatial and temporal continuity of PMP across the western portion of the basin.

A preferred storm orientation analysis was evaluated using storm isohyetal patterns from storms used in this study and results from previous investigations. In addition, an analysis was completed to determine the potential movement of the PMP storm across the basin over the 72-hour period. This procedure was required because the size of the basin is so large that the stationary PMP design storm in HMR 52 does not appropriately replicate a true PMP-type scenario for the basin. Actual storm events used to provide PMP for this study were used to determine the range of movement that could be expected to occur during extreme rainfall events. Recommendations for orientation constraints and storm movement are made.

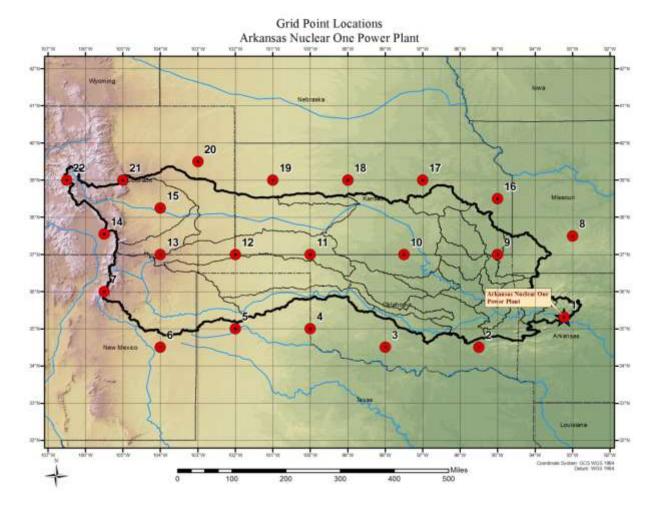


Figure 1.3 Grid points used in the study.

1.4 ANO Location and Description

The drainage basin for the ANO site encompasses the Arkansas River drainage basin, extending from the Continental Divide of Colorado and New Mexico east through northern Texas and the Red River basin to the ANO site location (Figure 1.4). Because this basin extends across a large latitudinal and longitudinal extent, PMP-type storm events can vary across the basin, and any given storm event will not be affecting the entire basin at one time. The large size of the basin and its geographic location have been explicitly evaluated and considered during the study to ensure appropriate PMP development.

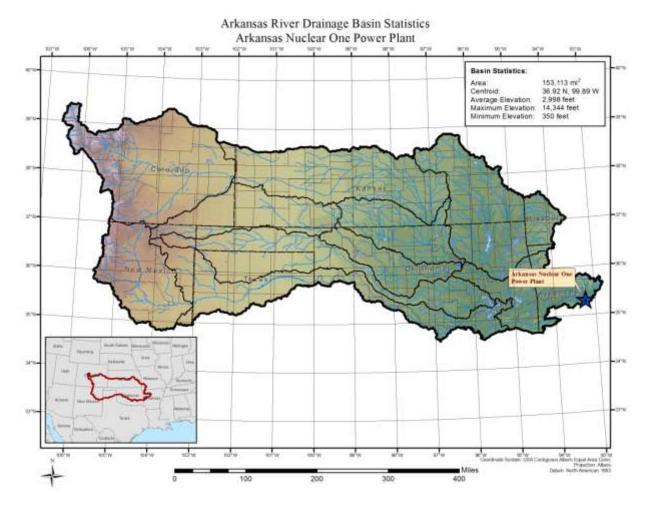


Figure 1.4 ANO regional setting and basin statistics.

Elevations across the basin range from 350 feet along the Arkansas River at the ANO site to over 14,000 feet in Colorado Rockies (Figure 1.6). Elevation changes gradually moving from ANO site west across the basin until reaching eastern Colorado and New Mexico. Elevation gains become dramatic once the Front Range of the Rocky Mountains are reached, generally around 105°W longitude. These elevation changes from east to west within the basin in combination with increased distance from the low-level moisture source (the Gulf of Mexico) create varying storm dynamics and storm types across the basin. Therefore, different storms are used to derive PMP values at various gird points, providing for a significant gradient in PMP values across the basin both in east to west and north to south directions. Therefore, for storm transpositioning, the +/- 1,000 foot limitation was implemented, along with a latitudinal limitation based on distance from the moisture source. This had the most affect on the far western and northern grid points, as many of the central and southern Great Plains storms were not transpositioned to these locations.

1,000-foot Elevation Contours Arkansas Nuclear One Power Plant

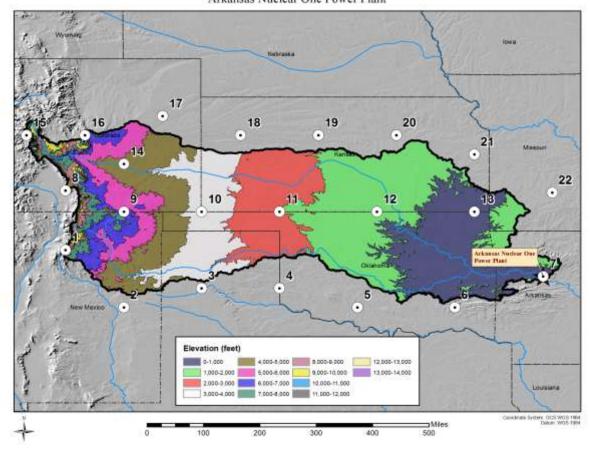


Figure 1.5 Elevations contours across the ANO basin at 500 foot intervals. Grid points used in the study are also shown.

2. Weather and Climate of ANO

2.1 ANO PMP Storm Type Climatology

The region around ANO is influenced by several factors that can potentially contribute to extreme rainfall. First is the proximity of the region to the Gulf of Mexico and the fact that no intervening mountain barriers prevents moisture from moving north (Figure 2.0). This allows high amounts of moisture to move directly into the region. The limiting factor is the duration that these high levels of atmospheric moisture are able to feed into storms in the region. More atmospheric moisture is available over the more southern and eastern regions of the basin compared with the northern and western portions of the basin. Because of the movement and strength of the upper level winds in the region, storm patterns generally do not stay fixed over any location for long periods. Therefore, the synoptic situations which lead to high levels of Gulf of Mexico moisture moving into the region are transient and limit the magnitude of PMP-type rainfall as well as limiting the spatial extent of such storms. This lack of consistent moisture is somewhat compensated for by the stronger storm dynamics associated with synoptic weather systems which move through the region and added lift as the atmospheric moisture is forced to rise over elevated terrain moving south to north and east to west across the basin.

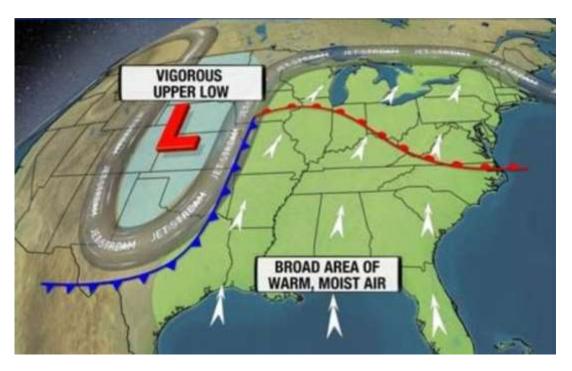


Figure 2.0 Locations of surface features associated with a strong flow of moisture from the Gulf of Mexico into the upper Midwest.

But moisture alone does not create rainfall. Instead a mechanism to lift and condense that moisture is required. The lift required to convert these high levels of atmospheric moisture into rainfall on the ground is provided in several ways in and around the region. Synoptic storm dynamics are very effective in converting atmospheric moisture into rainfall on the ground.

These are most often associated with fronts which affect the region (Figure 2.1). Numerous large scale weather systems with their associated fronts traverse the region throughout the year, with the fewest and weakest occurring in the summer period. The fronts (boundaries between two different air masses) can be a focusing mechanism providing upward motion in the atmosphere. These are often locations where heavy rainfall is produced. Normally, a front will move through with enough speed that no one area receives excessive amounts of rainfall. However, in extreme instances the pattern can become blocked and some of these fronts will stall or move very slowly across the region. This allows large amounts of rainfall to continue for several days in the same general area, which can lead to extreme widespread flooding.

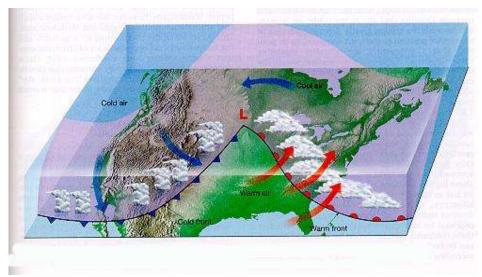


Figure 2.1 Locations of surface features associated with a common synoptic storm pattern across the United States.

Another mechanism which creates lift in the region is heating of the surface and lower atmosphere by the solar radiation. This creates warmer air below colder air resulting in atmospheric instability and leads to rising motions. This will often form ordinary afternoon and evening thunderstorms. However, in unique circumstances the instability and moisture levels in the atmosphere can reach very high levels and stay over the same region for an extended period of time. This can lead to intense thunderstorms and very heavy rainfall. If these storms are focused over the same area for a long period, flooding rains can be produced. This type of storm produces some of the largest point rainfall amounts recorded, but often do not affect larger areas with extreme rainfall amounts. Therefore, this scenario is common in the spring and summer and is often responsible for the LIP storm. However, this storm scenario does not lead to PMF level flood events across the very large ANO basin. More details on the PMP storm types which produce PMP level rainfalls in and around the basin are given in Section 3.

2.2 General Weather Patterns over the ANO Basin

The weather patterns in the region are characterized by passages of fronts with differing air masses that lead to large ranges in temperatures and rainfall. Fronts are most prevalent in the fall, winter, and spring, with more stagnant patterns common from late spring through early fall.

There are several air mass types that affect the weather and climate of the region and produce heavy rainfall (Figure 2.2). The continental polar (cP) air mass, with origins from the arctic regions of Canada, is most common during the winter months. This air mass is often associated with a strong cold front passage and stratiform snowfall events. When this air mass type arrives, it often collides with a more humid air mass from warmer regions to the south. Low pressure (rising air) often results, and when combined with strong winds aloft, can produce extreme rainfall. However, this air mass type is often highly modified by the time it reaches the southern half of the ANO basin, as it is now a great distance from its original source, has moved over non-snow covered land, and is significantly modified by the warmer conditions from the Gulf of Mexico.

The second type of air mass observed in the region is the maritime polar (mP) which originates in the Gulf of Alaska and Pacific Ocean. This air mass often arrives on strong winds from the west and northwest, but is usually devoid of significant amounts of low-level moisture because it has traveled across several mountain ranges. This storm type often produces precipitation (rain and snow) at these upwind locations, losing much of its low-level moisture on its way to the Central and Southern plains. However, in extreme cases, moisture flowing north from the Gulf of Mexico can replenish low-level atmospheric moisture enough to produce heavy rainfall. If the storm system stalls over the region, flood producing rains can result. This storm type can occur anytime of the year, but is most common from fall through late spring.

Another type of air mass which affects the region and produces rainfall originates from the Gulf of Mexico and can contain copious amounts of atmospheric moisture in a conditionally unstable atmosphere. This type of air mass is called maritime tropical (mT). This type of air mass is most directly responsible for producing heavy rainfall in the region when interacting with a front and as well as an air mass of polar origins moving from the north. Often, the front is located over the basin, allowing high amounts of moisture to stream in from the south, where it is lifted, resulting in widespread rainfall. The release of the conditional instability in the atmosphere provides a very efficient mechanism to convert atmospheric moisture to rain on the ground. This can be enhanced by elevation changes in the underlying topography. If this pattern is able to remain in place for an extended period and to continue to draw in Gulf of Mexico moisture, flooding can result. This storm type is most common from late spring to early fall and is therefore the most common storm type for the PMP scenario.

In rare cases, this type of pattern can include moisture from a decaying tropical system that had previous made landfall along the Gulf Coast states. This scenario has led to the most extreme rainfall events in the historical record for durations of 24-hours and less in the southern portions of the ANO basin. Examples include Albany, TX August, 1978 (AWA 18) and Thrall, TX September, 1921 (AWA 77).

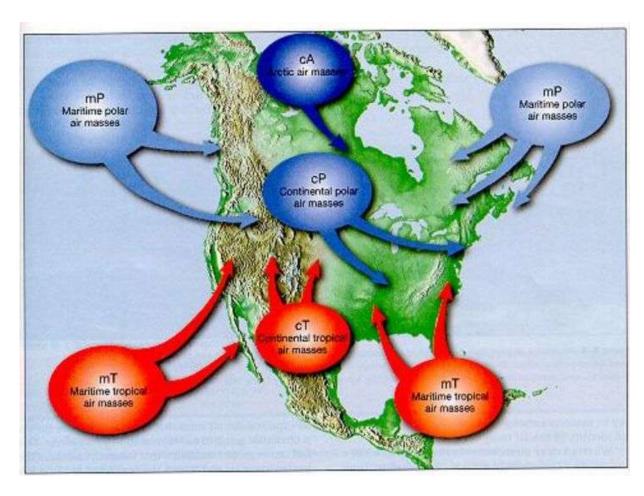


Figure 2.2 Air mass source regions affecting the ANO drainage basin.

3. Extreme Storm types

The ANO basin and the surrounding region have very active and varied weather patterns throughout the year. Consequently heavy rainfall events at both short and long durations are common. By far, the largest amount of moisture available for rainfall 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.

3.1 Synoptic Fronts

The polar front and jet stream, which separate cool, dry Canadian air to the north from warm, moist air to the south, is often a cause of heavy rainfall over large areas and long durations. This boundary provides large amounts of energy and strong storm dynamics to the atmosphere as fronts move through the region. These features are strongest and most active over the area during fall, winter, and spring months. A common type of storm occurrence with the polar front is an overrunning event. Frontal overrunning occurs when warm, humid air carried northward around the western edge of the Bermuda High circulation encounters the frontal zone and is forced to rise over the cooler, drier air mass to the north of the front. This forced ascent condenses atmospheric moisture in the air mass, forming clouds and producing precipitation while releasing latent heat. This process most often results in widespread rainfall over longer durations, but can also help enhance convection. Air that arrives at the frontal location is conditionally unstable, where the lower layers are much warmer and more humid than the air above. This conditionally unstable air mass needs a mechanism to initiate lift to begin energy release, leading to more instability and further lift. The forced ascent over the polar front initiates the lifting of the moist air mass, release of its energy, and initiates the conversion of the atmospheric moisture to rainfall.

A stationary or slow moving polar front located within the ANO basin will often provide the mechanism necessary for this warm, humid air mass to release its convective potential. When this occurs, rainfall is produced, sometimes associated with pockets of convection and extremely heavy rainfall. The pockets of heavy rain are usually associated with a minor wave riding along the frontal boundary, called a shortwave. These are not strong enough to move the overall large scale pattern, but instead add to the storm dynamics and energy available for producing rainfall.

This type of storm environment (synoptic frontal) will usually not produce the highest rainfall rates over short durations, but instead leads to flooding situations as moderate to heavy rain falls over the same regions for an extended period of time. In addition, this scenario can occur in succession with only a few dry days in between and therefore enhance runoff on a previously saturated basin. The rainfall and flooding event which occurred during May 1943 from Oklahoma eastward through the ANO site location is a good example of this type of storm.

3.2 Mesoscale Convective Systems

Mesoscale Convective Systems (MCSs) are capable of producing extreme amounts of rainfall for short durations and over small area sizes, generally 12 hours or less over area sizes of 500-square miles or less. The current understanding of MCS type storms has progressed tremendously with the advent of satellite technology starting in the 1970s and early 1980s. The current name of MCS was first applied in the late 1970s to these type of "flood producing", strong thunderstorm complexes (Maddox 1980). Mesoscale systems are so named because they are small in areal extent (10s to 100s of square miles), whereas synoptic storm events are 100s to 1,000s of square miles. MCSs also exhibit a distinctive signature on satellite imagery where they show rapidly growing cirrus clouds shields with very high cloud tops. Furthermore, the high level cloud shield associated with MCSs usually take on a nearly circular pattern about the size of the state of Iowa with constantly regenerating thunderstorms fed by a low-level-jet (LLJ) bringing an inflow of atmospheric moisture (Figure 3.0).

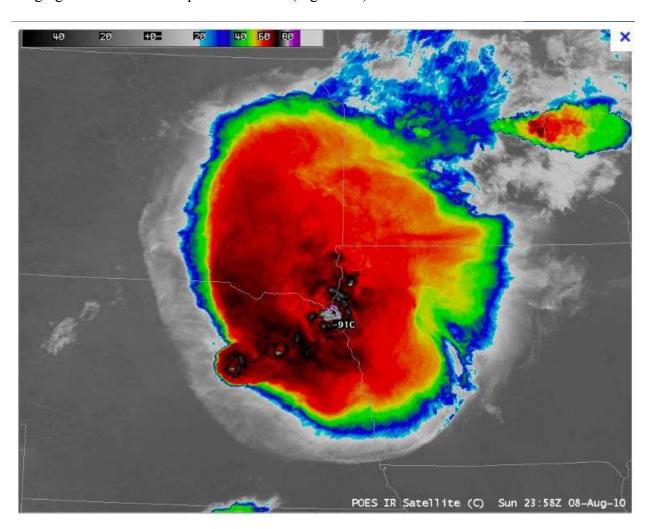


Figure 3.0 Color enhanced infrared satellite image of an MCS. Note the nearly circular structure, very cold cloud tops at the center (red, black, and center white colors), and a size similar to the state of Iowa.

The vast majority of MCSs have distinctive features and evolve in a standard pattern. A typical MCS begins as an area of thunderstorms over the western High Plains or Front Range of the Rocky Mountains. As these storms begin to form early in the day, the predominantly westerly winds aloft move them in a generally eastward direction. As the day progresses, the rain-cooled air below and around the storms begins to form a mesoscale high pressure area. This mesoscale high moves along with the area of thunderstorms. During nighttime hours, the MCS undergoes rapid development as it encounters increasingly warm and humid air from the Gulf of Mexico, usually associated with the LLJ 3,000-5,000 feet above the ground. The area of thunderstorms will often form a ring around the leading edge of the mesoscale high and continue to intensify, producing heavy rain, damaging winds, hail, and/or tornadoes. An MCS will often remain at a constant strength as long as the LLJ continues to provide an adequate supply of moisture. Once the mesoscale environment begins to change, the storms weaken, usually around sunrise, but may persist into the early daylight hours.

MCSs are included in the more general definition of MCCs, which include a wider variety of mesoscale sized storm systems, such as squall lines and tropical cyclones, and MCSs that do not fit the strict definition of size, duration, and/or appearance on satellite imagery. MCSs primarily form during the warm season months (April through October) around the ANO basin region.

Many of the storms previously analyzed by the USACE and NWS Hydrometeorological Branch in support of pre-1979 PMP research have features that indicate they were most likely MCCs or MCSs. However, this nomenclature had not yet been introduced into the scientific literature, nor were the events fully understood. For ANO basin, pure MCS storms do not produce PMF level flood events because of the very large basin size and the relatively small areas of rainfall produced by MCSs. However, intense convection similar to this storm type can occur within an overall synoptic frontal event. This can lead to intense areas of embedded heavy rainfall within the overall lighter rainfall pattern. This combination of synoptic and convective storm types is very important for determining PMP values for the basin.

4. Extreme Storm Identification

4.1 Storm Search Area

A comprehensive storm search covering the region important for the ANO basin has been conducted during previous site-specific and regional PMP studies. This included an analysis of all extreme rainfall storms in meteorological and topographically similar regions, where extreme rainfall storms similar to those that could occur over some part of the ANO basin may have been observed (Figure 4.0). These previous storm search results are current through 2013 and include all 12 months of the year (Figure 4.1). This ensured a large enough area was analyzed to capture all significant storms that could potentially influence the final PMP values for the basin.



Figure 4.0 AWA storm search domain.

AWA Storm Search Domains *Numerous Colorado PMP-Studies --Unional Statewide --Ohio Statewide --Ohio Statewide --Iarram Regional Water District -TVA 2013 *Lewis River --Scoggins Dam -PG & E --Piru Creek 2013 *Susitha --Watana 2012

Figure 4.1 AWA storm search domains through 2013. All storms used to develop the PMP values were identified from the storm search results.

4.2 Data Sources

AWA storm searches were conducted by searching the National Climatic Data Center (NCDC) hourly and daily rainfall records for maximum rainfall amounts that occurred during 6-hour, 24-hour/1-day, and 72-hour/3-day periods within the storm search domain. Further searches were conducted from additional sources listed below:

- 1. Cooperative Summary of the Day / TD3200 through 2013. These data are published by the National Climatic Data Center (NCDC)
- 2. Hourly Weather Observations published by NCDC, U.S. Environmental Protection Agency, and Forecast Systems Laboratory (now National Severe Storms Laboratory)
- 3. Hydrometeorological Reports
- 4. Corps of Engineers Storm Studies
- 5. Other data published by state climate office
- 6. American Meteorological Society journals
- 7. Various weather books
- 8. Data from supplemental sources, such as Community Collaborative Rain, Snow, and Hail Network (CoCoRaHS), Weather Underground, Forecast Systems Laboratories, RAWS

4.3 Short Storm List Derivation

The final short storm list used to determine the PMP values for the ANO basin was derived using the results of previous PMP studies in regions similar to this basin (Tomlinson 1993, Tomlinson et al. 2008, Kappel et al. 2012, Kappel et al. 2012, Tomlinson et al. 2013).

During this process, the storm lists used in each of these studies was combined and evaluated. The first set of parameters used to delineate the storms was whether they were transpositionable to any grid point used to derive the PMP values for the ANO basin. Factors such as elevation differences of more than +/- 1,000 feet and/or distances from moisture source were considered. Next, the storm type was evaluated. Storm types which would not result in a PMP/PMF scenario for the large ANO watershed were not considered. This included storms which were individual thunderstorms.

These analyses resulted in the final short storm lists used to derive both the PMP values for the basin. Table 4.0 provides the storm list. Figures 4.2 displays the locations of the storms in relation to the basin and ANO site. An AWA Storm Number is used to identify each storm used in this study to derive PMP values.

Table 4.0 Storm list used to calculate PMP, sorted in alphabetical order.

9	-	AWA				1		Maximum	anata-salah
E. W.	Photo	Storm	\$500	-		0.00		Rainfall in Inches	Precipitation
Storm Name	State	Number	Lar	Lon	Year	Month	Day	775757	Source SPAS 1179
ALBANY	MO	18	32.726	-99.350	1978		3 17	32.50 15.10	130000000000000000000000000000000000000
ALLEY SPRING AURORA COLLEGE	1L	10	37.160 41.458	-91.450 -88.070	2008 1996	3 7	16	18.13	SPAS 1242 SPAS 1286
BAYFIELD	CO	22	37,562	-88.070	1970	9	3	5.95	SPAS 1075
BEAULIEU	MN	67	47.300	-95,900	1909	7	18	10.50	UMV 1-11A
BIG ELK MEADOW	CO	23	40.267	-105.417	1969		4	20.01	SPAS 1253
BIO FORK	AR	13	35.871	-92.121	1982	12	1	15.92	SPAS 1219
BIG RAPIDS	MI	12	43.613	-85.313	1996	9	9	13.42	SPAS 1206
BIG THOMPSON CANYON	CO	19	40.479	-105.429	1976	1	31	12.52	SPAS 1231
BONAPARTE	IA	70	40.767	-91.750	1905	- 6	10	12.10	UMV 2-5
BOULDER	CO	86	40.015	-105.268	2013	9	8	20.41	SPAS 1302
BOYDEN	LA	60	43.190	-96.010	1926	9	.17	24.00	MR 4-24
CHEYENNE	OK	- 57	35.610	-99.670	1934	4	3	23.00	SW 2-11
CHEYENNE	WY	13	41.354	-104.819	1985	1	1	7.15	SPAS 1213
CHEYENNE MOUNTAIN	CO	85	38,790	-194.870	2013	9	8	18.89	SPAS 1302
CLAYTON	NM	64	36.333	-103.100	1914	4	29	9.60	SW 1-16
CLYDE	TX	16	32,479	-99,479	1981	10	10	23.25	SPAS 1154
COLE CAMP	MO	41	39,460	-93.203	1946	- 1	12	19.40	MR 7-2A
COLLEGE HILL	OH	30	40,085	-81.648	1963		3	19.39	SPAS 1226
COLLINSVILLE	II.	42	38.672	-89.990	1946	1	12	18.70	MR 7-2B
COOPER CROUE	MI	65 38	42.376	-85.610 ps. 100	1914	7	31	12.60	GL 2-16
DAVID CITY	KS NE	31	38.660 41.213	-96.490 -97.071	1951	6	24	15.50	MR 10-2 SPAS 1030
DUBUQUE	IA.	1	42,440	-90,750	2011	7	27	15.14	SPAS 1030 SPAS 1220
TYONGE	IA	39	42.752	-92,976	1951	6	25	12.00	UMV 3-29
EDGERTON	MO	26	40.413	-95.513	1965	7	18	20.76	SPAS 1183
ELBERT	CO	55	39.238	-104.488	1995	5	30	24.00	SPAS 1295
ENTD	080	- 21	36.381	-97.368	1973	10	10	19.45	SPAS 1034
FAIRFIELD	TX	58	31.725	-96,165	1932		30	19.50	GM 5-16A
FALL RIVER	KS	3	37,630	-96.050	2007	- 6	30	25.50	SPAS 1228
FOREST CITY	MIN	14	45.239	-94.540	1983	- 6	20	17.00	SPAS 1035
FORT COLLINS	co	8	40.548	-105.133	1997	7	28	14.48	SPAS 1230
RIJOLE CREEK	co	17	37.096	-104.379	1981	7	3	16.33	SPAS 1247
GLADEWATER	TX	25	32.537	-94,943	1966	4	27	25.33	SPAS 1101
GRANT TOWNSHIP	NE	51	42.240	-96.590	1940	- 6	3	13.00	MR 4-5
GREELEY	NE	76	41.550	-98,533	1896	6	4	12.30	MR.4-3
HALE	CO	56	39.513	-102.263	1935		30	18.00	SPAS 1295
HALLETT	OBC	52	36.230	-96.570	1940	9	2	24.00	SW 2-18
HAYWARD	WI	48	46.013	-91,485	1941	1	28	15.00	UMV 1-22
HEMPSTEAD	TX	53	30.133	-96.133	1940	11	22	21.10	GM 5-13
HOKAH	MN	6	43.813	-91.363	2007	1	18	18.32	SPAS 1048
HOLLY	CO	27	37,713	-102.404	1965	- 6	16	19.18	SPAS 1293
HOLT	MO	40	39.453	-94.342	1947	- 6	18	17.60	MR 8-20
DA GROVE	IA	32	42.317	-95,467	1962		30	12.85	EPRI
NDEX	AR	54	33.547	-94.042	1940	- 6	30	11.50	LMV 4-25
RONWOOD	MI	68	46.450	-90.183	1909	7	21	13.20	UMV 1-11B
KELSO	MO	37	37.191	-89.550	1952	- 1	- 11	13.00	UMV 3-30
LAKE MALOYA	NM	35	37.009	-194.341	1955		19	14.62	SPAS 1251
AMBERT	MN	75	47.800	-96,000	1897	J	18	8.00	UMV 1-2
LARRABEE	IA	77	42,861	-95,545	1891	9	10	13.00	MR 4-2
LARTO LAKE	LA	49	31.220	-92.130	2008	9	1 26	23.31	SPAS 1182
MCCOLLEUM RANCH	NM		32.167	-104.733	1941		20	21.20	GM 5-19
MEDFORD MEEK	NM	71 63	45.133	-90.333 -104.185	1905	6 9	4	11.20	GL 2-12
MEEK	OK	69	33.683 35.503	-105.183 -96.903	1919	10	15	9.50	GM 3-15B SW 1-11
MINNEAPOLES	MN	11	44.889	-93,402	1987	7	23	11.55	SPAS 1210
MOUNDS	OK	44	35.877	-96.061	1943	5	16	17.00	SW 2-21
NEOSHO FALLS	KS	61	38.082	-95.701	1926		12	14.00	SW 2-1
OGALLALA	NE	7	41.125	-101.717	2002	7	6	14.92	SPAS 1033
PARIS WATERWORKS	IN	34	39,050	-87,700	1957	6	27	12.40	HMB-V18
PAWNEE CREEK	CO	9	40.775	-103.625	1997	7	29	13.58	SPAS 1036
PENROSE	co	62	38.464	-105.070	1921	- 6	2	12.20	SPAS 1294
PLUM CREEK	CO	28	39.188	-104.296	1965	- 6	15	16.70	SPAS 1293
PORTER	NM	59	35.200	-103.283	1930	10	9	9.90	SW 2-6
PRAGUE	NE	33	41.358	-96.879	1959	- 1	1	13.09	SPAS 1031
PRAIRIEVIEW	NM	50	33.117	-103.200	1941	5	30	8,40	QM 5-18
RANCHO GRANDE	NM	47	34.950	-105.100	1942	8	29	8.00	SW 3-29
RITTER	1A	36	43.244	-95,823	1953	- 6	7	11.00	MR 10-8
ROCIADA	NM.	72	35.867	-105.333	1904	9	26	7.90	SW 1-6
SILVER LAKE	TX	45	32.670	-95.596	1943	- 6	5	16.50	SW 3-3
STANTON	NE	43	41.867	-97.050	1944	- 6	10	17.30	MR 6-15
THRALL	TX	77	30.591	-97.297	1921	9	9	39.70	GM 4-12
WAGON WHEEL	co	66	37,663	-106.938	1911	10	3	7.88	SPAS 1107
WARNER	OK	46	35.490	-95.310	1943	5	6	25,00	SW 2-30
WARNER PARK	TN	2	36,061	-86,906	2010	4	30	19.71	SPAS 1208
WATERTON RED ROCK	AB	75	49,090	-114.050	1975	.5	15	14.46	SPAS 1252
WOODBURN	IA	73	41.012	-93.599	1903	1	24	13.50	MR 1-10
WOOSTER	OH	24	40.915	-81.973	1969		4	14.95	SPAS 1209



Figure 4.2 Storm locations in relation to the ANO basin by AWA storm number.

4.3.1 New Storm Precipitation Analysis System (SPAS) Storm

Analysis

a

The results of the storm search and short storm list development identified one new storm important for PMP derivation which had not been previously analyzed by either the NWS or AWA. This was the September 2013 rainfall across the Front Range and Eastern Plains of Colorado and Wyoming (SPAS 1302, AWA Storm Number 85/86). A full storm analysis using the Storm Precipitation Analysis System (SPAS) was completed which produced the required storm DAD values (see Section 5 and Appendix G for a full description of the SPAS storm analysis process). The SPAS analysis produced all the necessary rainfall information required to evaluate and utilize the storm in the PMP derivation process. In addition, the current study included 35 previously analyzed SPAS storms used in other PMP studies¹.

¹ The precipitation/storm analysis source for each short list storm is listed in Tables 4.0. Each SPAS storm analysis is assigned a unique SPAS number (e.g. SPAS 1242), "EPRI" refers to storms analyzed during the

5. Storm Depth-Area-Duration (DAD) Analyses for New Storms

For the new extreme rainfall event, a full storm analysis needed to be completed. SPAS was used to compute the Depth-Area-Duration (DAD) table for this storm.

There are two main steps in a SPAS DAD analysis: 1) Creation of high-resolution hourly precipitation grids and 2) Computation of depth-area rainfall amounts for various durations.

Reliability of results from step 2) depends on the accuracy of step 1). Historically the process has been very labor intensive. SPAS utilizes Geographic Information Systems (GIS) concepts to create more spatially-oriented and accurate results in an efficient manner (step 1). Furthermore, the availability of NEXRAD data allows SPAS to better account for the spatial and temporal variability of storm precipitation for events occurring since the early 1990s. Prior to NEXRAD, the National Weather Service (NWS) developed and used a method based on the research of several scientists (Corps of Engineers, 1936-1973). Because this process has been the standard for many years and holds merit, the DAD analysis process developed within the SPAS program attempts to mimic it as much as possible. By adopting this approach, some level of consistency between the newly analyzed storms and the hundreds of storms already analyzed can be achieved. Comparisons between the NWS DAD results and those computed using the new method for two storms (Westfield, MA, 1955 and Ritter, IA, 1953) indicated very similar results (see Appendix G for complete discussion, comparisons, and results). The SPAS program and process is certified in this calculation.

Table 5.0 lists the SPAS storm used in during the development of PMP and LIP values during this study. The results of each SPAS storm analysis are included in Appendix F.

EPRI Michigan/Wisconsin Regional PMP study, while the remaining identifiers reference nomenclature from the NWS/USACE storm studies files.

Table 5.0 SPAS storms used in this study.

Storm Name	State	AWA Storm Number	Lat	Lon	Year	Month	Day	Maximum Rainfall in Inches	Precipitation Source
DAVID CITY	NE	31	41.213	-97.071	1963	6	24	15.98	SPAS 1030
PRAGUE	NE	33	41.358	-96.879	1959	8	1	13.09	SPAS 1031
OGALLALA	NE	7	41.125	-101.717	2002	7	6	14.92	SPAS 1033
ENID	OK	21	36.381	-97.868	1973	10	10	19.45	SPAS 1034
FOREST CITY	MN	14	45.239	-94.540	1983	6	20	17.00	SPAS 1035
PAWNEE CREEK	CO	9	40.775	-103.625	1997	7	29	13.58	SPAS 1036
HOKAH	MN	6	43.813	-91.363	2007	8	18	18.32	SPAS 1048
BAYFIELD	CO	22	37.562	-107.879	1970	9	3	5.95	SPAS 1075
WAGON WHEEL	CO	66	37.663	-106.938	1911	10	3	7.88	SPAS 1107
ALBANY	TX	18	32.726	-99.350	1978	8	3	32.50	SPAS 1179
GLADEWATER	TX	25	32.537	-94.943	1966	4	27	25.33	SPAS 1181
LARTO LAKE	LA	4	31.220	-92.130	2008	9	1	23.31	SPAS 1182
EDGERTON	MO	26	40.413	-95.513	1965	7	18	20.76	SPAS 1183
CLYDE	TX	16	32.479	-99.479	1981	10	10	23.23	SPAS 1184
BIG RAPIDS	MI	12	43.613	-85.313	1986	9	9	13.42	SPAS 1206
WARNER PARK	TN	2	36.061	-86.906	2010	4	30	19.71	SPAS 1208
WOOSTER	OH	24	40.915	-81.973	1969	7	4	14.95	SPAS 1209
MINNEAPOLIS	MN	11	44.889	-93.402	1987	7	23	11.55	SPAS 1210
CHEYENNE	WY	13	41.354	-104.819	1985	8	1	7.15	SPAS 1213
BIG FORK	AR	15	35.871	-92.121	1982	12	1	15.92	SPAS 1219
DUBUQUE	IA	1	42.440	90.750	2011	7	27	15.14	SPAS 1220
COLLEGE HILL	OH	30	40.085	-81.648	1963	6	3	19.39	SPAS 1226
FALL RIVER	KS	5	37.630	-96.050	2007	6	30	25.50	SPAS 1228
FORT COLLINS	CO	8	40.548	-105.133	1997	7	28	14.48	SPAS 1230
BIG THOMPSON CANYON	CO	19	40.479	-105.429	1976	7	31	12.52	SPAS 1231
ALLEY SPRING	MO	3	37.160	-91.450	2008	3	17	15.10	SPAS 1242
FRIJOLE CREEK	CO	17	37.096	-104.379	1981	7	3	16.33	SPAS 1247
LAKE MALOYA	NM	35	37.009	-104.341	1955	5	19	14.82	SPAS 1251
WATERTON RED ROCK	AB	75	49.090	-114.050	1975	6	15	14.46	SPAS 1252
BIG ELK MEADOW	CO	23	40.267	-105.417	1969	5	4	20.01	SPAS 1253
AURORA COLLEGE	IL	10	41.458	-88.070	1996	7	16	18.13	SPAS 1286
PLUM CREEK	CO	28	39.188	-104.296	1965	6	15	16.70	SPAS 1293
HOLLY	CO	27	37.713	-102.404	1965	6	16	19.18	SPAS 1293
PENROSE	CO	62	38.464	-105.070	1921	6	2	12.20	SPAS 1294
ELBERT	co	55	39.238	-104.488	1935	5	30	24.00	SPAS 1295
HALE	CO	56	39.613	-102.263	1935	5	30	18.00	SPAS 1295
BOULDER	CO	86	40.015	-105.268	2013	9	8	20.41	SPAS 1302
CHEYENNE MOUNTAIN	CO	85	38.790	-104.870	2013	9	8	18.89	SPAS 1302

6. Updated Data Sets Used in this Study

Several new data sets not used in the development of HMRs 51 and 55A were employed as part of this study in the development of the PMP and LIP values. These include the development of updated maximum dew point climatology maps for use in storm maximization and transposition, as well as the use of the HYSPLIT trajectory model to help in identifying the moisture source region for individual storm events. The identification and use of these data sets provide a significant improvement in storm adjustments, especially relating to the determination of each storm's moisture source and derivation of appropriate maximization factors.

6.1 Development of the Updated Dew Point Climatology

Updated maximum average dew point climatologies provide 20-year, 50-year, and 100-year return frequency values for 6-hour, 12-hour, and 24-hour durations. This process followed the same reasoning and use as described in the other AWA PMP studies. These analyses demonstrated that the maximum 12-hour persisting dew point climatology used in HMRs 51 and 55A were outdated and more importantly did not adequately represent the atmospheric moisture available in extreme rainfall storm environments. The updated climatology more accurately represents the atmospheric moisture fueling storms by using average maximum dew point values observed over durations specific to each storm's rainfall duration. The maximum average dew point values replace the maximum 12-hour persisting dew point values which often missed or underestimated the atmospheric moisture available and hence led to inaccurate maximization calculations.

6.2 HYSPLIT Trajectory Model

The HYSPLIT trajectory model developed by the NOAA Air Resources Laboratory (Draxler and Rolph 2003, 2010) was used during the analysis of each of the rainfall events included on the short storm list when available (1948-present). Use of a trajectory model provides increased confidence for determining moisture inflow vectors and storm representative dew points. The HYSPLIT model trajectories have been used to analyze the moisture inflow vectors in other PMP studies completed by AWA over the past several years. During these analyses, the model trajectory results were verified and the utility explicitly evaluated (e.g. Tomlinson et al. 2006-2011, Kappel et al. 2012-2013).

Instead of subjectively determining the moisture inflow trajectory, the HYSPLIT model interface was used to determine the trajectory of the atmospheric moisture inflow, both location and altitude, for various levels in the atmosphere associated with the storm's rainfall production. The HYSPLIT model was run for trajectories at several levels of the lower atmosphere to capture the moisture source for each storm event.

These included 700mb (approximately 10,000 feet), 850mb (approximately 5,000 feet), and storm center location surface elevation. For the majority of the analyses a combination of all three levels was determined to be most appropriate for use in evaluation of the upwind moisture source location. It is important to note that the resulting HYSPLIT model trajectories are only used as a general guide of where to evaluate the moisture source for storms in space and time. The final determination of the storm representative dew point and its location is determined following the standard procedures used by AWA in previous PMP studies and as outlined in the HMRs and WMO manuals. Appendix F of this report contains each of the HYSPLIT trajectories analyzed as part of this study for each storm. As an example, Figure 6.0 shows the HYSPLIT trajectory model results used to analyze the inflow vector for the Council Grove, KS, July 1951 storm (AWA 38).

NOAA HYSPLIT MODEL Backward trajectories ending at 1200 UTC 11 Jul 51 CDC1 Meteorological Data

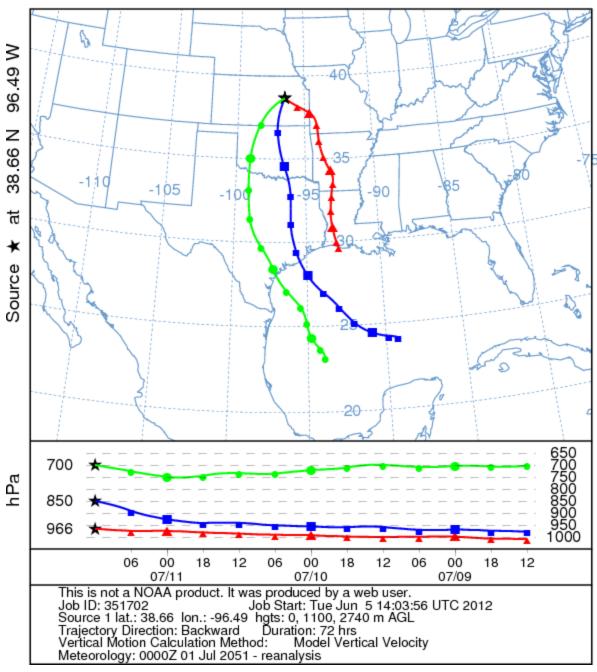


Figure 6.0 HYSPLIT trajectory model results for Council Grove, KS, July 1951 storm (AWA 18).

6.3 Use of Grid Points to Spatially Distribute PMP Values

To appropriately distribute rainfall values spatially and temporally across the large ANO basin, a series of grid points were used. The grid consisted of 22 locations, one of which was the ANO site location. In addition, the overall grid was extended outside of the basin boundaries over bordering regions (see Figure 1.3). This grid design ensured that no extrapolation of adjusted rainfall values were required for any location within the basin.

All appropriate storm rainfall values were maximized and transpositioned to each of the 22 grid points as appropriate (Appendix F lists the grid point(s) where each storm was transpositioned). Depth-Area (DA) curves for each duration (6-hours to 72-hours) and for area sizes from 10- through 100,000-square miles were plotted for each grid point and envelop curves constructed. Using results from the DA analyses, Depth-Duration (DD) curves were constructed for each grid point (see Section 9 for details). Results from the DD analysis were input into GIS where the values for each duration and area size at each grid point were spatially analyzed. The final PMP maps derived using the grid point methodologies are provided in Appendix A.

Having the contoured PMP maps to analyze on a regional basis proved to be a very valuable asset compared to having only rainfall values at a single location. The ability to look at the relationships among grid points at various spatial and temporal scales as a whole proved very insightful and was of great importance in deriving the final PMP values across the large ANO basin.

7. Storm Maximization

Storm maximization is the process of increasing rainfall associated with an observed extreme storm under the potential condition that additional atmospheric moisture could have been available to the storm for rainfall production. Maximization is accomplished by increasing surface dew points to some climatological maximum and calculating the enhanced rainfall amounts that could potentially be produced. An additional consideration is usually applied that selects the climatological maximum dew point for a date two weeks towards the warm season from the date that the storm actually occurred. This procedure assumes that the storm could have occurred with the same storm dynamics two weeks earlier or later in the year when maximum dew points (and hence moisture levels) could be higher. A more detailed discussion of this procedure and example calculations are provided in Appendix C.

7.1 Use of Dew Point Temperatures for Storm Maximization

HMR and WMO procedures for storm maximization use a representative storm dew point as the parameter to represent available moisture to a storm. Prior to the mid-1980s, maps of maximum dew point values from the Climatic Atlas of the United States (1968) were the source for maximum dew point values. HMR 55A published in 1988 updated maximum dew point values for a portion of United States from the Continental Divide eastward into the central plains. The regional PMP study for Michigan and Wisconsin produced return frequency maps using the L-moments method. The Review Committee for that study included representatives from NWS, FERC, Bureau of Reclamation, and others. They agreed that the 50-year return frequency values were appropriate for use in PMP calculations. HMR 57 was published in 1994 and HMR 59 in 1999. These more recent NWS publications also updated the maximum dew point climatology, but used maximum observed dew points instead of return frequency values. For the Nebraska statewide study, the Review Committee and FERC Board of Consultants agreed that the 100-year return frequency maximum dew point climatology maps were appropriate because this added a layer of conservatism over the use of 50-year return period values. This has subsequently been employed in all AWA PMP studies. This study is again using the 100-year return frequency climatology with the data updated through the first half of 2013 (Figure 7.0).

Observed storm rainfall amounts are maximized using the ratio of precipitable water for the maximum dew point to precipitable water for the storm representative dew point, assuming a vertically saturated atmosphere. This procedure was followed in this study using the updated maximum dew point climatology developed and described in Section 6. A more detailed discussion, along with examples of this procedure, is provided in Appendices C and D.

For storm maximization, average dew point values for the appropriate duration which was most representative of the actual rainfall accumulation period for an individual

storm (6-, 12-, or 24-hour) was used to determine the storm representative dew point. To determine which time frame was most appropriate, the total rainfall amount was analyzed. The duration (6-, 12- or 24-hour) closest to when approximately 90% of the rainfall had accumulated was used to determine the duration used, i.e. 6-hour, 12-hour, or 24-hour

Dewpoint Climatology Domains Wyoming Nabraska 2008/ Wyoming 2012 Arizona 2009 TRWD 2010

Figure 7.0 Dew point climatology development dates and regions.

7.1.1 Rationale for Using Maximum Average Dew Point Climatology

In previous storm analyses performed by the NWS and the USACE, a 12-hour persisting dew point was used for both the storm representative and maximum dew points. The 12-hour persisting dew point is the value equaled or exceeded at all observations during the 12-hour period (e.g. WMO 1986). However, as was established in previous and ongoing AWA PMP studies, this dew point methodology tends to underestimate the storm representative dew point value associated with the rainfall event.

An excellent example of this, from the Nebraska statewide PMP study but relevant for the storm types that affect the ANO basin, is illustrated by the David City, NE 1963 storm. During this extreme storm event, a narrow tongue of moisture was advected into the region by strong southeasterly flow during a short time period. Most of the rain with this event (approximately 15 inches) accumulated in less than 6 hours (Figure 7.1). For this storm, hourly dew point data were collected from several locations near the rainfall event. These included Omaha, NE; Des Moines, IA; Topeka, KS; and Kansas City, MO. Following standard procedures for determining storm representative dew point location, it was determined that Topeka, KS and Kansas City, MO were the two stations that best represented the air mass that produced the extreme rainfall. Using hourly dew point data for these two stations clearly showed that use of 6-hour average dew point values better represented the atmospheric moisture available to the storm event than did use of 12-hour persisting dew point values. The 6-hour average dew point representing the moisture in the air mass associated with the rainfall was 71.5°F at Kansas City, MO and 71°F at Topeka, KS. Using these dew point values, a 1,000 mb 6hour average dew point of 73.5°F was determined for Kansas City, MO and a dew point of 73°F was determined for Topeka, KS. Using the NWS approach, the 12-hour persisting dew point is 63°F (65°F at 1,000 mb) at Kansas City, MO and 66°F (68°F at 1,000 mb) at Topeka, KS for an average 1,000 mb adjusted value of 66.5°F (Table 7.0).

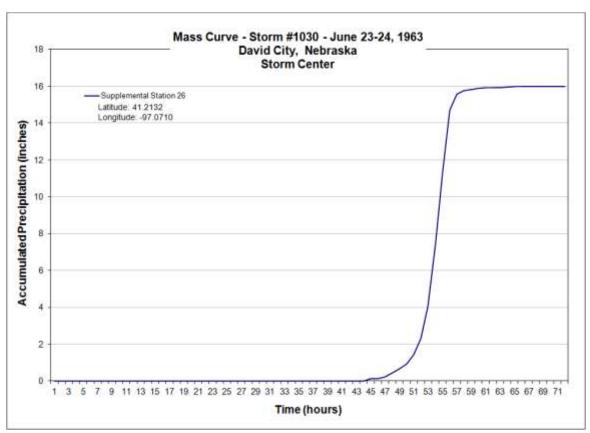


Figure 7.1 Mass Curve as analyzed by SPAS for David City, NE 1963 storm event

Table 7.0 Comparison of 6-hour average storm representative dew point vs. 12-hour persisting storm representative dew point for David City, NE 1963

							Obse	erved [Dew Po	int Val	ues foi	r David	City, N	IE 196	3									
Kansas City, MO																								
Hour	00Z	01Z	02Z	03Z	04Z	05Z	06Z	07Z	08Z	09Z	10Z	11Z	12Z	13Z	14Z	15Z	16Z	17Z	18Z	19Z	20Z	21Z	22Z	23Z
Dew Point	58	61	62	62	63	63	63	64	66	68	69	71	72	72	72	71	71	69	68	67	67	67	67	67
												Air	Mass S	upplyi	ng Rai	nfall E	vent							
12-Hour Persisting Td 6	63 (65	reduc	ed to	1000mb)					12	Hour P	ersistii	ng Td 1	imefra	ime									
6-Hour Average Td 7	-Hour Average Td 71.5 (73.5 reduced to 1000mb) 6 Hour Average Td timeframe																							
Topeka, KS																								
Hour	00Z	01Z	02Z	03Z	04Z	05Z	06Z	07Z	08Z	09Z	10Z	11Z	12Z	13Z	14Z	15Z	16Z	17Z	18Z	19Z	20Z	21Z	22Z	23Z
Dew Point	61	62	64	65	65	65	66	66	67	68	69	72	71	71	71	70	70	70	69	70	69	68	66	69
												Air	Mass S	upplyi	ng Rai	nfall E	vent							
12-Hour Persisting Td 6	66 (68	reduc	ed to 1	000mb)					12	Hour P	ersistii	ng Td 1	imefra	ıme									
6-Hour Average Td	71 (73	reduc	ed to 1	000mb)							6	Hour A	verag	e Td tir	nefran	ne .							

The 12-hour persisting dew point analysis included dew point values from a six hour period not associated with the rainfall. The hourly dew point value that provides the 12-hour persisting dew point occurred outside of the rainfall period after adjustment for advection time from the dew point observing station(s) to the storm location.

7.1.2 Rationale for Adjusting HMR 51 Persisting Dew Point Values

In some cases, storms on the short storm list previously analyzed in the USACE Storm Studies and used in NWS HMRs, an adjustment factor was applied to provide consistency in storm maximization while utilizing the updated dew point climatology. The adjustment factor was determined using the same procedure used in the EPRI and other AWA PMP studies.

Results from the dew point analyses showed consistent results for MCS type storms for differences between the older method for determining 12-hour persisting storm representative dew points and the approach using average storm representative dew points. The following discussion from the EPRI report addresses these differences:

The average difference between dew points for the synoptic storms was five degrees less than that for the MCS storms. This may be attributed to the greater homogeneity of inflow moisture associated with the synoptic events. With most of the modern MCS storms, limited-area, short-duration pockets of relatively moist air were found within the inflow moisture at one or two locations. The analyses may indicate that for MCS events, bubbles of extremely moist air interact with storm catalysts to create extreme rainfall events of short duration. A warm humid air mass over a broad area with small moisture gradients more aptly describes the synoptic inflow moisture. Several stations within the air mass may have the same or similar dew points. Much smaller variations in dew points along the inflow moisture vector are expected.

Large spatial and temporal variations in moisture associated with MCS-type storms are not represented well with 12-hour persisting dew points, especially when only two observations a day are available. Average dew point values, temporally consistent with the duration of the storm event provide a much improved description of the inflow moisture available for conversion to precipitation. The more homogeneous moist air

masses associated with synoptic storms result in smaller differences between average and persisting values.

This analysis has provided correlations between 12-hour persisting storm dew points and average storm dew points for both MCS and synoptic storms. Despite the small sample size, the consistent results tend to support the reliability of the analysis. However, the small sample size has been considered in making recommendations for adjusting the old storm representative dew points for use in determining PMP estimations. The eight degree difference for MCS-type storms has been decreased to five degrees to provide a conservative adjustment. A similar consideration is made for synoptic-type storms. The three-degree difference is decreased to two degrees to provide a conservative adjustment. The adjusted representative storm dew points are used with the new maximum average dew point climatology to maximize storms.

Similar analyses were completed in the Nebraska statewide PMP study, the Ohio statewide PMP study, and the Wyoming statewide PMP study. These analyses investigated additional modern storms. The results of these analyses of MCS storm data provided an average difference of 7°F between the average and 12-hour persisting dew points. For synoptic storms, the average difference was 2°F. Results of the more recent analyses were very consistent with the EPRI study. This again validated the process of adjusting the maximum 12-hour persisting dew points in order to achieve compliance with using the maximum average dew point climatology.

8. Storm Transpositioning

Extreme rain events that have occurred over geographically and climatically similar regions surrounding a study area are a very important part of the historical evidence on which PMP estimates for a drainage basin are based. Study locations usually have a limited period of record for rainfall data collected within the basin boundaries and hence have a limited number of extreme storms that have been observed over the basin. Storms observed regionally with a similar meteorology and topography are analyzed and adjusted to provide information describing the storm rainfall as if the storm had occurred over the study basin. Transfer of a storm from where it occurred to a location that is meteorologically and topographically similar is called *storm transpositioning*. The underlying assumption is that storms transposed to the study area could occur over the basin under similar meteorological conditions. To properly relocate such storms, it is necessary to address issues of similarity as they relate to topography and meteorological conditions and make appropriate adjustments.

The area considered to contain storms which were potentially transpositionable to one or more grid points analyzed as part of this study extended from the Continental Divide of the Rocky Mountains south of 48°N east through the first upslopes on the west side of the Appalachians, south the southern Plains to approximately 50 miles north of the Gulf of Mexico (see Section 4.1). This region was considered meteorologically homogenous to one or more locations within the overall ANO basin. Further analysis of storm patterns on both a temporal and spatial scale within non-orographic regions of the basin revealed that only storms that occurred within a +/- 1,000 feet of elevation of a particular location possessed similar enough storm dynamics to be transpositionable to that location. Further, the limits of transpositionability were refined for specific storms after all adjustments were applied based on meteorological judgment and fit with other similar storms in the region.

8.1 Storm Transposition Calculations

The procedure for in-place storm maximization has been discussed (see Section 7.0). The same maps used for deriving maximum dew points were used in the storm transpositioning procedure. The procedure for deriving the climatological maximum dew points for use in the calculating the transposition maximization ratio uses the information derived during the calculation of the in-place maximization factor. The wind inflow vector connecting the storm location with the storm representative dew point location was transpositioned to each grid point. The value of the maximum dew point at that upwind location provided the transpositioned maximum dew point value used to compute the transposition adjustment factor for relocating the storm to the appropriate grid point and basin centroid. Figure 8.0 shows an example inflow vector map and transpositioned vector to grid point 2 for the Albany, TX, August, 1978 (AWA 18) storm. The primary effect of storm transpositioning was to adjust storm rainfall amounts to account for

enhanced (or reduced) atmospheric moisture made available to the storm at the transposed location versus the original location. A more detailed discussion of this procedure and example calculations are provided in Appendix D. The inflow vector map and data used to calculate the transposition factor for each storm are included in Appendix F.



Figure 8.0 An example of inflow wind vector transpositioning for Albany, TX, August, 1978 storm (AWA 18). The storm representative dew point location is 260 miles south/southeast of the storm location.

8.2 Storm Spreadsheet Development Process

AWA has developed an Excel spreadsheet for each storm on the PMP and LIP short storm lists which incorporates relevant storm information, automatically calculates appropriate adjustment factors, and computes the adjusted rainfall DAD table. These storm spreadsheets used the observed storm DADs, storm representative dew points, maximum dew points (both in-place and transposition), storm elevation, and transposition location elevation information either as published in the USACE Storm Studies reports, HMR 51 tables, or as developed during AWA SPAS storm analyses. This information was entered into individual storm spreadsheets, one for each short list storm for each appropriate grid point. Using the storm center location and inflow vector, the in-place maximum dew point was determined. The same inflow vector was then moved to each appropriate grid point to determine the transpositioned maximum dew point value and

total adjustment factor for that storm at each location. This information was entered into the storm spreadsheet to calculate the in-place maximization factor, the transposition factor, and finally the total adjustment factor. This total adjustment factor was applied to the storm DAD table values to provide the final adjusted DAD table for the maximized and transpositioned storm rainfall values at each location.

Once all the storms were adjusted to each appropriate grid point, DA and DD plots were constructed for each location for analysis and envelopment. This ensured spatial and temporal continuity for each grid point location. The resulting analysis results were subsequently plotted and contoured within GIS to produce the final basin-wide PMP maps. Appendix F includes the storm spreadsheets developed for each storm transpositioned to a specific grid point. Figure 8.1 displays an example storm spreadsheet for the Warner Park, TN, May, 2010 storm (AWA 2) at the basin centroid. The information in Appendix F allows a user the opportunity to explicitly evaluate, verify, and recalculate the values derived in this study, if so desired.

	5 1208, V /2010	Warmers	and IN		Storm	Adiust	ment f	or ANG	Grid Po	oint 1	
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emporal Transposition Dat	ie	15-May									
		Lat	Long		1	Moisture b	nflow Direc	tion	SSW @ 360	miles	
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storm Rep Dew Point Locati		31.50 N	90.00 W			the party of the p	ter Elevatio		600	feet	
Fransposition Dew Point Lo Grid Point Location			95.94 W 93.23 W			Storm Rep	Analysis D	uration	12	hours	
9110 Foliat Cocation		35.31 N	93143 W			-					
The stom represents	stive dew	point is	75.0 F		precipitable					2.85	inches
The in-place main			76.5 F		precipitable					3.07	inches
The transpositioned massi			75.0 F		precipitable					2.85	inches
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		-	101 13	-			ian a degree o B. KHBG, an		sa. Usad an aven	age of	
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10 sq	Name and Address of the Owner, where the Owner, which the	4,4	15.0	17.3	18.0	18.1	19.0	19.2	19.4		
100 sq		3.7	13.2	15.9	16.5	16.6	18.3	18.5	18.7	+	
200 sq		3.4	12.2	15.0	15.6	15.8	17.8	18.1	18.3		
500 sq		2.8	9.0	13.5	14.3	14.6	16.8	17.4	17.7		
1000 sq 2000 sq		1.8	7.4	11.1	12.0	12.6	15.7	16.1	16.4		
5000 sq		1.4	5.2	9.2	10.3	10.9	14.1	14.8	15.0	-	1
10000 sq		1.0	3.8	7,4	8.4	8.6	12.2	13.0	13.1	+	
20000 sq	miles	0.7	2.9	5.4	6.3	7.2	10.2	11.0	11.2	\$11	1
Adjusted Storm	Death A	nen Dore	tion								
infanta seatu	_	Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq		4.3	14.4	16.7	17.3	17,4	18.3	18.4	18.7	+	
100 sq		3.6	12.7	15.3	15.9	16.0	17.6	17.8	18.0	- 4	1
200 sq 500 sq		3.3	10.2	14.4	15.0	15.2	17.1	17.4	17.6		
pe 0001	Street, Square, Square	2.7	8.7	12.1	13.8	13.0	15.8	16.2	16.4		
2000 sq		1.7	7.1	10.7	11.5	12.2	15.1	15.5	15.8	-	
5000 sq		1.3	5.0	8.9	9,9	10.5	13.6	14.2	14.4		
10000 sq		1.0	3.6	7.1	8.1	8.3	11.8	12.5	12.6	+	
20000 sq	miles	0.6	2.8	5.2	6.1	6.9	9.9	10.6	10.7	-	1
Storm or Storm C	enter Na	me		SPAS 1208,	Warner Par	rk, TN					
Storm Date(s)	enter Na	me		5/1-3/2010	Warner Par	rk, TN					
newsparking and property of the control of the cont	enter Na	me			Warner Par 36.91 W	rk, TN					
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Figure 8.1 Example of the storm spreadsheet for the Warner Park, TN, May 2010 storm (AWA 2) transpositioned to grid point 1.

9. Development of PMP Values for the ANO Basin

Storm maximization and transposition provide an indication of the maximum amount of rainfall that a particular storm could have produced at any location within the region analyzed for the ANO basin. Use of these values alone does not ensure that PMP values are provided for all area sizes and durations since some of the maximized and transpositioned values could be less than the PMP. By enveloping the rainfall amounts from all the major storms, rainfall values indicative of the PMP magnitude are produced (e.g. WMO, 1986, 2009). The standard process for deriving DAD values for all grid point was used in the project.

9.1 Envelopment Procedures and DAD Derivation

Enveloping is a process for selecting the largest value from a set of data. This technique provides continuous smooth curves based on the largest rainfall values from the set of maximized and transpositioned storm rainfall values. The largest rainfall amounts provide guidance for drawing the curves.

During the enveloping process, values which are not consistent (are either high or low) are re-evaluated to insure reliability. High values are enveloped unless an explanation can be provided to justify undercutting the value. No undercutting of rainfall values was done in this study. Low values are also re-evaluated for reliability and then enveloped to maintain consistency with surrounding values. This enveloping procedure addresses the possibility that for certain area sizes and durations, no significantly large storms have been observed that provide large enough values after being maximized and transposed to represent PMP at an area size and/or duration. The result of this procedure is a set of smooth curves that maintain continuity among temporal periods and areal sizes.

The envelopment process was used in PMP determination for this study, following the same procedures used for envelopment in the derivation of PMP in the HMRs, the WMO PMP Manual, and previous AWA PMP studies. Once the total storm adjusted rainfall values for the appropriate storms at each grid point were determined, they were plotted on individual DA charts for each duration for analysis. Envelopment was applied to each DA curve for each duration. The DA envelopment curves were drawn to provide continuity in space. Figure 9.0 is an example of an DA chart with the envelopment curve for the 72-hour duration at the ANO grid point 1.

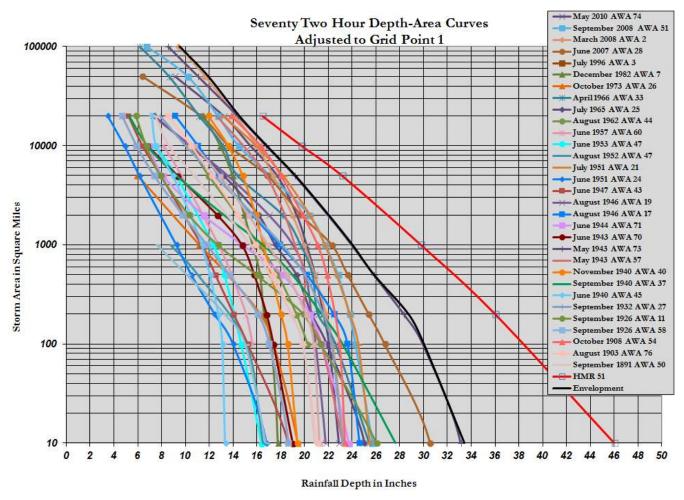


Figure 9.0 72-hour DA curves for ANO grid point 1.

The second application of the envelopment process was used with the DD curves at each location. Curves for each of the area sizes were constructed using results from the DA analysis at each grid point. The DD curves were drawn to produce smooth curves that provide continuity in time among all durations. Figure 9.1 gives an example of the DD curves for grid point 1.

Depth-Duration Chart of Enveloped Storm Data ANO Grid Point 1

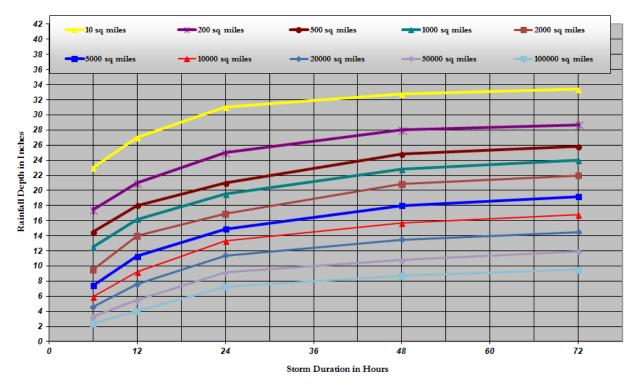


Figure 9.1 DD curves for ANO grid point 1.

The final set of DD curves for all durations at each grid point defines the initial set of PMP values. The envelopment of the adjusted storms together with the curve smoothing process insured that all storm data were included and that the resulting set of PMP values provides rainfall values that are consistent spatially and temporally at each location. These are the values that were then plotted and contoured in GIS to begin the process of manual smoothing. Several smoothing iterations were completed to provide spatial and temporal continuity of the PMP values across all grid points. The final version of this process produced the gridded PMP values.

10. Storm Dimensions

10.1 PMP Design Storm Parameters

Storm isohyetal patterns for 10 storms evaluated with SPAS were evaluated during a previous PMP study and compared to HMR 52 procedures and data over the ANO basin. Each of these storms were representative of the PMP storm type used in the PMP development. The SPAS storm analysis results were used to develop guidance for the hydrologist regarding the PMP design storm's preferred isohyetal orientation and range of movement (direction and speed) following the same approach as the overall development of the PMP, i.e. a storm based, data driven approach. This was required because of the large size of the ANO basin. The stationary PMP design storm as given in HMR 52 may not be as conservative or as meteorologically consistent as would occur in an actual PMP storm environment. Instead, the PMP storm isohyetal pattern would exhibit a preferred orientation based on the storm type(s) that would potentially produce the PMP rainfall over the basin. Further, those storm type(s) would exhibit some amount of movement during the PMF analysis period. This movement would be directly related to the storm dynamics and general meteorological synoptic pattern occurring with the PMP rainfall.

AWA analyzed the hourly gridded rainfall from the 10 SPAS storm events in Table 10.0 to derive these PMP design storm parameters. This procedure allowed for continuity in the overall PMP development by following a storm based, data driven approach to arrive at quantifiable results specific for the ANO basin.

Table 10.0 List of SPAS storms used in development of storm orientation and movement parameters.

Storm Name	State	AWA Storm Number	Lat	Lon	Year	Month	Day	Maximum Rainfall in Inches	Precipitation Source
ALLEY SPRING	MO	3	37.160	-91.450	2008	3	17	15.10	SPAS 1242
AURORA COLLEGE	IL	10	41.458	-88.070	1996	7	16	18.13	SPAS 1286
BIG RAPIDS	MI	12	43.613	-85.313	1986	9	9	13.42	SPAS 1206
DUBUQUE	IA	1	42.440	90.750	2011	7	27	15.14	SPAS 1220
EDGERTON	MO	26	40.413	-95.513	1965	7	18	20.76	SPAS 1183
FALL RIVER	KS	5	37.630	-96.050	2007	6	30	25.50	SPAS 1228
HOKAH	MN	6	43.813	-91.363	2007	8	18	18.32	SPAS 1048
HOLLY	co	27	37.713	-102.404	1965	6	16	19.18	SPAS 1293
WARNER PARK	TN	2	36.061	-86.906	2010	4	30	19.71	SPAS 1208
WOOSTER	OH	24	40.915	-81.973	1969	7	4	14.95	SPAS 1209

10.2 Storm Orientation

Storm orientation is an important storm characteristic when considering the placement of an isohyetal pattern over a basin. The orientations of the 10 storm events in Table 10.0 were evaluated to determine a preferred storm orientation for a design PMP storm pattern over the basin. The shape of each storm's total storm isohyetal pattern was

examined to determine the orientation of the major axis. Storm orientations are described by an angle of 180° to 359°, where 180° is equivalent to south-to-north and 270° is equivalent to west-to-east orientation. Results of these investigations showed that the orientation parameters as given in HMR 52 Figure 8 are appropriate for use in the ANO basin

10.3 Storm Movement Analysis

Storm movement for the 10 SPAS storm events were analyzed to determine a maximum and minimum speed of movement and range of directions of storm movement that could be expected for PMP storms. SPAS hourly rainfall grids were accumulated in 12-hour increments and 24-hour increments through the total storm duration and used in the analysis. The rainfall storm center for each set of 12-hour and 24-hour grids were used to get the distance and direction of movement. An elliptical with a ratio of 2.5 was centered over each storm center (lat/lon), and the orientation for each 12-hour and 24-hour pattern were determined. For example, the Warner Park, TN, May 2010 storm (AWA 2) had five 12-hour increments. The ellipse used to determine the orientation for the fourth 12-hour increment is shown in Figure 10.0. This process was repeated for each 12-hour and 24-hour hour increment.

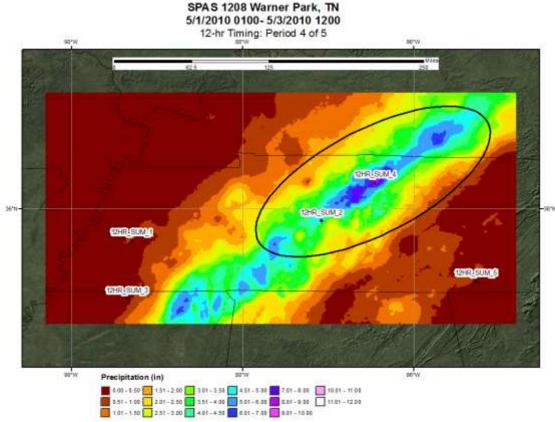


Figure 10.0 Example for Warner Park, TN, May, 2010 storm (AWA 2) showing elliptical used to determine orientation of the fourth 12-hour increment.

The rainfall storm centers for each 12-hour and 24-hour increment were used to calculate an average storm center movement (in miles) for each increment. This was done using least squares linear regression, the slope of the line is the direction of the storm movement and the length of the line represents the storm movement speed. For example, the Warner Park, TN, May 2010 storm (AWA 2) is shown below. This analysis results in a total storm center movement distance to the east-northeast of 175 miles during the fourth 12-hour increment (Figure 10.1).

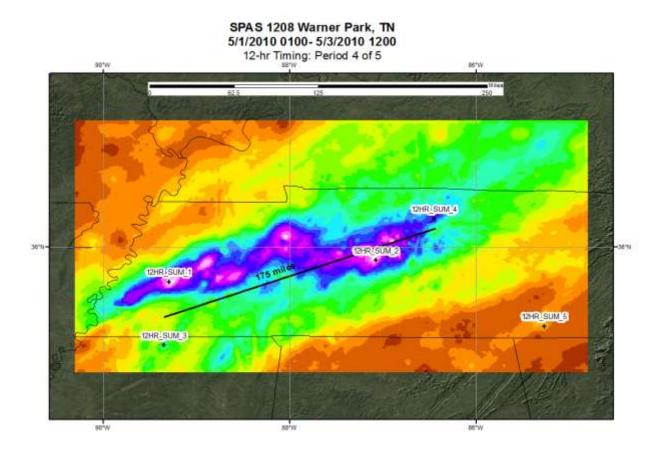


Figure 10.1 Example for Warner Park, TN, May, 2010 storm (AWA 2). Storm movement between each point at each 12-hour increment was calculated based on regression line and storm center points.

The 12-hour and 24-hour distances that a storm center moved were calculated and the direction of movement was determined using the storm centers for each 12-hour and 24-hour increment. The largest distance between to storm center locations for the 12-hour and 24-hour increments was measured and the line between these points was used to determine the orientation. For example, the Warner Park, TN, May 2010 storm (AWA 2) had three 24-hour increments, the greatest storm center movement was between the first and second storm center. The distance and direction of this line was 165 miles with an orientation of 255° (Figure 10.2).

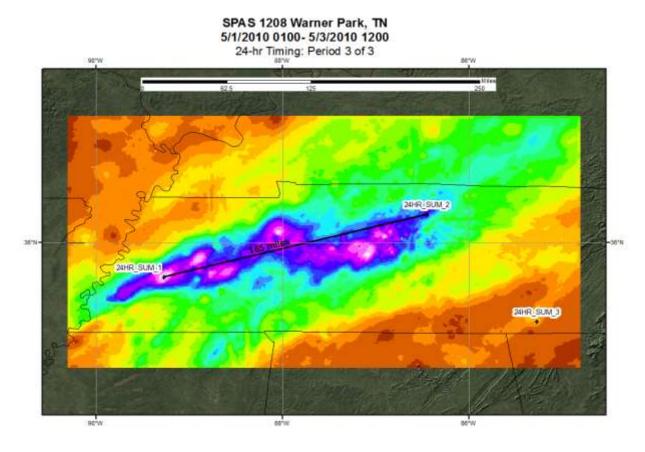


Figure 10.2 Example for Warner Park, TN, May, 2010 storm (AWA 2), 24-hour longest storm center movement and orientation.

The average storm center movement, by ordinary least squares regression, and maximum 12-hour and 24-hour distance and orientation were analyzed to determine the most appropriate range storm movement. The 24-hour movement was used for PMP/PMF determination. This analysis led to the following recommendations for PMP design storm movement of the all-season and cool-season PMP isohyetal patterns across the basin.

PMP Design Storm Isohyetal Movement and Orientation Recommendation

The maximum amount a storm can be moved in a 24-hour period is 200 miles and the minimum amount is 20 miles. The orientation of the isohyetal pattern should follow the guidance produced in HMR 52 and will vary from west to east and north to south across the ANO basin.

11. Local Intense Precipitation (LIP)

AWA completed an analysis to derive the 1-hour 1-square mile Local Intense Precipitation (LIP) for the ANO site location. This analysis followed the storm-based approach as used in the overall PMP development and as given in HMRs 51 and 52. The storm-based approach utilizes observed rainfall data from rainfall events which have occurred over the site and in regions where storms are considered to be transpositionable to the ANO site location. These rainfall data are maximized inplace following standard maximization procedures, then transpositioned to the ANO location. The transpositioning process accounts for differences in moisture and elevation between the original storm location and the ANO site. The process produces a total adjustment factor that is applied to the original rainfall data for each storm. The result represents the maximum rainfall each storm could have produced at the site had all factors leading to the rainfall been ideal and maximized. Information is included in this section detailing the storms used, how they were analyzed, and how the LIP values were derived. Information on each individual storm event evaluated is included in Appendix G, with the dew point climatologies used to maximize the storms provided in Appendix B.

11.1 Development of LIP Values

The PMP values provided in HMR 51 for the ANO site provide values starting with the 6-hour duration and the 10-square mile area size. There are no explicit values provided at the 1-hour duration and/or 1-square mile area size. HMR 52 provides information to derive the 1-hour 1-and 10-square mile values based on HMR 51 6-hour 10-square mile storm analyzed values. Unfortunately, the most recent storm evaluated in HMR 51 occurred in 1972. In addition, because HMR 51 covers a large domain, generalization and conservatism were employed in the development of the respective PMP and LIP values. This resulted in LIP values which were influenced by storms not appropriate for the ANO site location (e.g. Smethport, PA July 1942) and therefore are not reliable values for the ANO site.

The site-specific LIP analysis performed during this study for the ANO site corrected many of the issues in the HMRs by explicitly evaluating storms which are directly transpositionable to the ANO site. In addition, the understanding of the meteorology of these events has advanced significantly since HMR 51 was published. These corrections and the updated storm database were employed in this calculation. In addition, the results and data from numerous SPAS storm analyses used in the PMP development in this study and several others in the region were used extensively in this analysis.

11.2 LIP Storm List

The initial step in the development of the LIP values was to identify a set of storms which represent rainfall events that are LIP-type local storm events. This included storms where extreme heavy rainfall accumulated over short durations and small area sizes. These include observed rainfall amounts associated with MCS and individual thunderstorms. This procedure is similar to what is described in HMR 52 Section 6.

AWA evaluated all storms used in previous PMP studies in the region considered transpositionable to the ANO location to develop a list of the storms needed for proper LIP evaluation and determination. This resulted in 23 events being evaluated (Table 11.0 and Figure 11.0). Fourteen of these storms were previously analyzed in HMRs 33 and 51 by the NWS and USACE. The remaining nine were analyzed using SPAS.

Table 11.0 Storms used in the 1-hour 1-square mile Local Intense Precipitation analysis.

Storm Name	State	AWA Storm Number	Lat	Lon	Year	Month	Day	Max Rainfall	Precipitation Source	ANO Total Adjustment Factor	ANO 1 hour Imi ² PMP
WARNER PARK	TN	2	36.0611	-86.9056	2010	4	30	19.71	SPAS 1208	1.18	5.40
LARTOLAKE	LA	4	31,220	-92.130	2008	9	1	23.31	SPAS 1182	1.15	7.07
FALL RIVER	KS	5	37.6300	-96.0500	2007	6	30	25.50	SPAS 1228	1.23	5.76
ALBANY	TX	18	32.7260	-99.3500	1978	8	3	32.50	SPAS 1179	1.26	15.36
ENID	OK.	21	36,3805	-97.8683	1973	10	10	19.45	SPAS 1034	1.20	5.33
WOOSTER	OH	24	40.9146	-81.9729	1969	7	4	14.95	SPAS 1209	1.30	6.01
GLADEWATER	TX	25	32.5365	-94.9427	1966	4	27	25.33	SPAS 1181	1.24	3.62
EDGERTON	MO	26	40.4125	-95.5125	1965	7	18	20.76	SPAS 1183	1.27	4.67
COLLEGE HILL	OH	30	40.0854	-81,6479	1963	6	3	19.39	SPAS 1226	1.84	4.67
CAMP POLK	LA	81	31.067	-93.200	1953	4	23	21.10	LMV 5-3	0.97	4.97
HARRISONBURG DAN	LA	79	31,767	-91.817	1953	5	11	25.40	LMV 5-4	1.02	6.01
KELSO	MO	37	37.1906	-89.5495	1952	8	- 11	13.00	UMV 3-30	1.27	10.57
HOLT	MO	40	39,4528	-94.3422	1947	6	18	17.60	MR 8-20	1.18	14.16
COLLINSVILLE	IL	42	38.6717	-89.9800	1946	8	12	18,70	MR 7-2B	1.19	4.57
MOUNDS	OK	44	35,8770	-96.0610	1943	5	16	17.00	SW 2-21	1.39	14.14
SILVER LAKE	TX	45	32.6700	-95.5960	1943	6	5	16.50	SW 3-3	1.15	10.45
HALLETT	OK	52	36.2000	-96.6000	1940	9	2	24.00	SW 2-18	1.17	13.78
ENGLE	TX	83	29.681	-97.009	1940	6	29	22,70	GM 5-11	1.22	8.59
BEBE	TX	84	29.332	-97.682	1936	6	30	21.00	GM 5-6	1.11	9.95
NEOSHO FALLS	KS	61	38.0820	-95.7010	1926	9	12	14.00	SW 2-1	1.34	11.49
THRALL	TX	77	30,591	-97.297	1921	9	9	39.70	GM 4-12	1.14	16.34
BONAPARTE	IA.	70	40.7667	-91.7500	1905	6	10	12.10	UMV 2-5	1.29	8.26

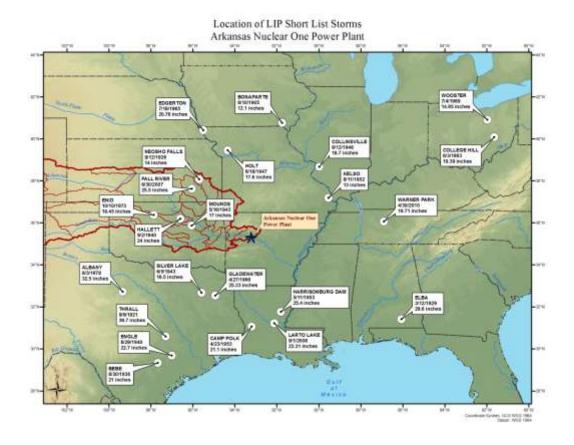


Figure 11.0 Storms used in the LIP calculations in relation to the ANO site location.

11.3 LIP Storm Calculation Process

Most of the 14 storms analyzed by the NWS/USACE did not contain explicit 1-hour 1-square mile rainfall data. This is the result of the lack of hourly recording information available during the original analyses. To correct for this, information presented in HMR 52, Section 6 was utilized. This information provided ratios which allowed for the computation of the 1-hour 1-square mile value to be derived from the 6-hour 10-square mile PMP value (HMR 52 Figure 23). Although these ratios were derived to apply to the HMR 51 PMP values, they are implicitly relevant for use in this calculation because both processes are using the same data set and following the storm-based approach, i.e. it is only a scaling variation that is occurring. No inherent change or adjustment to the data is taking place that would result in a different data set or storm type. For the Bonaparte, IA June 1905 and Holt, MO June 1947 storm events analyzed by the NWS/USACE, explicit 1-hour data was available and therefore no ratio application was required.

The nine storms analyzed using SPAS allowed for explicit hourly rainfall to be evaluated with a spatial resolution of 1/3rd square mile. This provided data for the storm rainfall 1-hour 1-square mile area sizes to be explicitly evaluated.

Once all the storms were identified and their 1-hour 1-square mile values derived, the final step in the process was to maximize each storm specific to the ANO location. This was a two-step process. First, the in-place maximization factor was calculated. This provides a value that is applied to the observed storm values which represents what the storm rainfall would have been had the atmospheric conditions and moisture been at maximum levels when the storm occurred. Next, the resulting in-place maximized values for each storm was adjusted as if the storm had occurred over the ANO site. To accomplish this, the transposition calculation process was followed to adjust the storm from its original location to the ANO site. The transposition calculation adjusts for differences in available moisture both in the horizontal (north/south and east/west directions) and vertical (differences in elevation) at the site versus the original storm location. All the calculations and resulting values for each storm used in the LIP analysis are provided in Appendix G.

After the maximization and transposition factors were calculated for each of the storms, the results were applied to the maximum 1-hour value for each storm to calculate the maximized 1-hour 1-square mile values. The largest of these values results in the site-specific LIP for the ANO site (see Table 11.0 for all resulting values). After adjustments were applied, the Thrall, TX September 1921 storm (AWA 77) had the highest 1-hour rainfall, with four other storms providing slightly smaller values and support for this value. Note that use of the Thrall, TX storm at the ANO site is beyond the transposition limits noted by the NWS. Therefore, AWA"s judgment to use this storm at the site produces LIP values that are higher than would be calculated had Thrall, TX not be transpositioned. However, this transposition limits of the storm, as well as the meteorology which led to the rainfall, were deemed similar enough during this analysis to allow it to be transpositioned.

For final application of the LIP hydrology, this value is then required to be split into sub-hourly increments of 5-, 15-, 30-minutes. Updated evaluations of the appropriate amount of rainfall to assign to each increment for the site based on storm data would have been ideal. However, a lack of sub-hourly PMP-type storm data from the 14 storms analyzed by the NWS/USACE prevented an updated evaluation from being completed. Therefore, it is recommended that the ratios derived in HMR 52 be applied at the ANO site (HMR 52 Figures 36-38). Table 11.1 shows the result of applying these ratios to the maximized Thrall, TX September 1921 (AWA 77) rainfall.

Table 11.1 Site specific 1-hour 1-square mile LIP values at the ANO site.

Time (min)	ANO PMP Depth (in) at 1-hour 1-square mile
60	16.3
30	12.2
15	8.4
5	5.4

12. Results

The following are the main conclusions from this study:

- HMR 51 and 55A PMP values are outdated. This study provided updated PMP values to replace HMR 51 and 55A PMP values.
- HMR 52 PMP design storm parameters were based on a set of storms that were not specifically transpositionable to this basin. This study provided updated PMP design storm movement guidance based on storms transpositionable to this basin and taking into consideration the large size of this basin.
- The most recent storm used to derive PMP values in HMR 51 occurred in 1972. This study updated the storm database to include storms through 2013.
- HMRs 51 and 52 did not use computer based technologies in the storm analyses procedures. This study used computer technology and GIS to more accurately analyze storm rainfall patterns and implement the spatially distributed PMP values.
- HMRs 51, 52, and 55A did not have weather radar to help spatially distribute rainfall among rain gauge locations. SPAS storm analyses incorporates this information when available to provide the most advanced spatial representation of rainfall storm patterns possible.
- Understanding of meteorological processes, interactions, and storm patterns have advanced greatly since the publication of HMRs 51 and 55A. Satellite and radar technology have greatly added to the understanding of storm patterns over the last 40 years. This study incorporated the state-of-the-science understanding and technology associated with analyzing extreme rainfall events.
- HMRs 51 and 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, 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 HMRs 51 and 52 necessarily had to encompass the Smethport maximized in-place rainfall far beyond its explicit transposition limits. Note, Section 3.2.4 of HMR 51 states that they "slightly undercut" the maximized 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. The HYSPLIT trajectory model (Draxler and Rolph 2003, Draxler and Rolph 2010) was used to evaluate moisture inflow vectors for storms on the short storm list. Trajectory models were not available in HMR studies. Use of HYSPLIT 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 this LIP analysis that
 were not included in HMRs 33, 51, and 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 calculation provided adjustments for storm elevation to the nearest 100 feet of elevation, whereas HMRs 51 and 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/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 utilized 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.

12.1 PMP Values

This PMP study has produced PMP values for use in computing the PMF using HMR 52 procedures with modifications to account for the large size of the ANO basin. This includes updated quantification of the PMP design storm movement across the basin. Values for all durations and area sizes provided in HMRs 51 and 55A, as well as for additional area sizes out to 100,000 square miles have been computed using the procedures described in this report.

The study provides PMP values for use in computing the PMF at any location within the basin. Values for all durations up to 72 hours and areal sizes up to 100,000 square miles have been computed in gridded GIS format. Note, HMR 51 standard area sizes extend only to 20,000 square miles and HMR 55A only extends to 5,000 square miles. Appendix A contains the PMP maps produced in this study.

The study was designed to retain as much continuity as possible with the methodology used in HMRs 51 and 55A, as well as previous AWA studies, while incorporating improvements based on changes in technology, meteorological

understanding, and availability of updated data. In addition, special consideration was given to the size of the ANO basin, especially relating to the PMP design storm movement

Full SPAS storm rainfall analyses were completed for one storm not analyzed in the HMRs or the previous AWA studies. The study continued the use of surface dew point data to quantify moisture inflow to storms. However, instead of using the 12-hour persisting value as in HMR 51, an average dew point value for a duration (6-, 12-, or 24-hours) consistent with the storm precipitation was used. This approach provides a more representative parameterization of the moisture available to the storm.

An updated dew point climatology was developed during previous AWA studies and was used in this study. This allows for average dew point values and maximum average dew point climatology maps at the 100-year return frequency level for 6-, 12-, and 24-hour durations to be used for storm maximization and transposition. Storms were maximized and transpositioned to a set of 22 grid points. This covered the entire basin and provided a margin for boundary conditions (see Figure 1.4).

12.2 Comparison of the PMP Values with HMR 51 PMP

A comparison was made at various area sizes and durations to determine the difference between results of PMP values versus HMR 51 values at each grid point where HMR 51 PMP values were available for direct comparison. Tables 12.0-12.4 provide the percent reductions from HMR 51 PMP values throughout the basin at each area size and duration analyzed for all grid points.

Table 12.0 Percent difference between PMP values at each grid point at the 6-hour duration vs HMR 51 PMP values. Negative values represent reductions from HMR 51. Only grid points with HMR 51 values are included in the comparisons.

		Arkansas Nuc	lear One Grid Poi	nts 6-hr PMP		
Grid Point	10 sqmi	200 sqmi	1,000 sqmi	5,000 sqmi	10,000 sqmi	20,000 sqmi
1	-26%	-26%	-22%	-23%	-19%	-14%
2	-21%	-17%	-19%	-22%	-19%	-14%
3	-20%	-20%	-19%	-19%	-18%	-20%
4	-19%	-19%	-21%	-13%	-11%	-12%
5	-22%	-18%	-19%	-30%	-34%	-31%
8	-26%	-20%	-20%	-20%	-20%	-21%
9	-26%	-17%	-19%	-20%	-20%	-18%
10	-26%	-17%	-17%	-17%	-16%	-15%
11	-24%	-20%	-19%	-15%	-14%	-12%
12	-20%	-17%	-19%	-29%	-26%	-26%
16	-25%	-17%	-17%	-18%	-18%	-14%
17	-24%	-16%	-14%	-14%	-14%	-13%
18	-23%	-20%	-17%	-15%	-16%	-13%
19	-19%	-19%	-19%	-30%	-32%	-33%
20	-21%	-22%	-27%	-32%	-33%	-40%

Table 12.1 Percent difference between PMP values at each grid point at the 12-hour duration vs HMR 51 PMP values. Negative values represent reductions from HMR 51. Only grid points with HMR 51 values are included in the comparisons.

		Arkansas Nuc	lear One Grid Poi	nts 12-hr PMP		
Grid Point	10 sqmi	200 sqmi	1,000 sqmi	5,000 sqmi	10,000 sqmi	20,000 sqmi
1	-27%	-25%	-22%	-15%	-13%	-17%
2	-22%	-18%	-23%	-16%	-13%	-17%
3	-20%	-13%	-24%	-19%	-17%	-23%
4	-16%	-7%	-18%	-9%	-10%	-16%
5	-23%	-15%	-22%	-27%	-28%	-26%
8	-23%	-21%	-23%	-21%	-18%	-20%
9	-23%	-21%	-21%	-16%	-13%	-15%
10	-22%	-20%	-19%	-12%	-12%	-14%
11	-22%	-21%	-18%	-12%	-18%	-24%
12	-24%	-24%	-25%	-19%	-22%	-27%
16	-21%	-19%	-19%	-16%	-14%	-16%
17	-20%	-17%	-16%	-15%	-15%	-16%
18	-22%	-19%	-17%	-12%	-14%	-20%
19	-24%	-24%	-25%	-20%	-27%	-34%
20	-28%	-23%	-32%	-25%	-34%	-45%

Table 12.2 Percent difference between PMP values at each grid point at the 24-hour duration vs HMR 51 PMP values. Negative values represent reductions from HMR 51. Only grid points with HMR 51 values are included in the comparisons.

		Arkansas Nuc	lear One Grid Poi	nts 24-hr PMP		
Grid Point	10 sqmi	200 sqmi	1,000 sqmi	5,000 sqmi	10,000 sqmi	20,000 sqmi
1	-27%	-20%	-18%	-11%	-12%	-12%
2	-25%	-22%	-26%	-19%	-15%	-13%
3	-18%	-12%	-23%	-22%	-20%	-18%
4	-13%	-5%	-14%	-12%	-7%	-5%
5	-24%	-13%	-21%	-13%	-11%	-10%
8	-23%	-18%	-22%	-18%	-12%	-10%
9	-25%	-19%	-22%	-15%	-7%	-4%
10	-20%	-14%	-19%	-10%	-4%	1%
11	-20%	-17%	-17%	-12%	-11%	-8%
12	-21%	-22%	-20%	-12%	-12%	-8%
16	-23%	-16%	-19%	-11%	-8%	-1%
17	-22%	-17%	-16%	-13%	-7%	-2%
18	-23%	-16%	-20%	-16%	-13%	-12%
19	-21%	-22%	-21%	-14%	-28%	-24%
20	-21%	-23%	-22%	-15%	-34%	-29%

Table 12.3 Percent difference between PMP values at each grid point at the 48-hour duration vs HMR 51 PMP values. Negative values represent reductions from HMR 51. Only grid points with HMR 51 values are included in the comparisons.

		Arkansas Nuc	lear One Grid Poi	nts 48-hr PMP		
Grid Point	10 sqmi	200 sqmi	1,000 sqmi	5,000 sqmi	10,000 sqmi	20,000 sqmi
1	-25%	-17%	-18%	-13%	-9%	-5%
2	-25%	-16%	-20%	-16%	-13%	-8%
3	-22%	-12%	-16%	-16%	-11%	-4%
4	-17%	-7%	-10%	-8%	-1%	7%
5	-27%	-18%	-21%	-20%	-20%	-19%
8	-28%	-18%	-16%	-14%	-11%	-9%
9	-26%	-17%	-17%	-11%	-7%	-5%
10	-27%	-16%	-16%	-11%	-7%	-4%
11	-25%	-17%	-19%	-13%	-8%	-7%
12	-27%	-16%	-24%	-23%	-23%	-21%
16	-26%	-14%	-16%	-10%	-6%	-4%
17	-26%	-14%	-13%	-8%	-5%	-3%
18	-25%	-13%	-22%	-12%	-7%	-6%
19	-23%	-11%	-25%	-25%	-22%	-26%
20	-21%	-9%	-24%	-25%	-23%	-34%

Table 12.4 Percent difference between PMP values at each grid point at the 72-hour duration vs HMR 51 PMP values. Negative values represent reductions from HMR 51. Only grid points with HMR 51 values are included in the comparisons.

		Arkansas Nuc	lear One Grid Poi	nts 72-hr PMP		
Grid Point	10 sqmi	200 sqmi	1,000 sqmi	5,000 sqmi	10,000 sqmi	20,000 sqmi
1	-27%	-20%	-19%	-17%	-15%	-13%
2	-28%	-22%	-23%	-20%	-17%	-15%
3	-26%	-19%	-20%	-19%	-18%	-16%
4	-20%	-12%	-14%	-11%	-6%	-5%
5	-27%	-18%	-21%	-18%	-19%	-25%
8	-29%	-19%	-18%	-16%	-15%	-14%
9	-28%	-19%	-18%	-12%	-10%	-8%
10	-29%	-17%	-17%	-11%	-8%	-8%
11	-27%	-15%	-14%	-9%	-8%	-9%
12	-27%	-17%	-23%	-26%	-27%	-26%
16	-28%	-15%	-17%	-11%	-9%	-9%
17	-28%	-16%	-15%	-6%	-4%	-5%
18	-27%	-16%	-19%	-7%	-3%	-4%
19	-25%	-14%	-25%	-16%	-23%	-17%
20	-23%	-11%	-21%	-20%	-32%	-32%

12.3 Reasons for Reductions of PMP versus HMR 51

This PMP study provided differences in PMP values from those presented in HMR 51. This study explicitly addressed elevation, whereas detailed terrain effects were not evaluated in HMR 51. All HMR 51 storms on both the PMP and LIP short storm lists were re-evaluated to determine the updated storm representative dew point and maximized using an updated dew point climatology.

Since the study followed the same basic storm rainfall adjustment procedures as HMR 51, it would be useful to understand the cause of the differences in the PMP values. Detailed working papers are not available for HMR 51, so explicit differences in calculations and procedures cannot be evaluated. However, the following issues were treated differently in the two studies:

- 1. HMR 51 provides generalized and smoothed PMP values over a large geographic domain covering the United States east of the 105th meridian. Specific characteristics unique to individual basins, such as ANO, were not addressed. This study considered characteristics specific to the basin, and produced PMP values explicitly considered the meteorology of the PMP storm type which would results in the PMF for the basin.
- Each storm's inflow vector was re-evaluated and combined with an updated set of dew point climatology data and when necessary, updated storm representative dew point values were used for the in-place maximization and computation of the total

adjustment factors. The HYSPLIT trajectory model was used to evaluate and verify moisture inflow vectors for storms on the short storm list. Trajectory models were not available in previous HMR studies. The use of HYSPLIT allowed for a high degree of confidence when evaluating moisture inflow vectors and storm representative dew points.

- 3. Several new storms have been analyzed and included in this PMP study that were not included in HMRs 51 and 55A. This provided a higher level of confidence in the final PMP and LIP values. Further, this allowed for a refined set of values that better represent the PMP values, as the data set used to derive PMP has been expanded to include a larger set of more recent storms.
- 4. The site-specific PMP study provided adjustments for storm elevation to the nearest 100 feet of elevation, whereas HMR 51 made no explicit adjustment for elevation for PMP value over the basin. This adjustment depends on the elevation of the historic storm's maximum rainfall location and therefore varies from storm to storm. Further, the average basin elevation for each grid point was evaluated in this study using GIS, providing a much more accurate representation and calculation to account for loss of available moisture up to that elevation.
- 5. SPAS was used in conjunction with NEXRAD data (when available) to evaluate the spatial and temporal distribution of rainfall. Use of NEXRAD data generally produced higher point rainfall amounts than were observed using only rain gauge observations and provides objective spatial distributions of storm rainfall for locations among rain gauges. SPAS results provided storm DADs, total storm precipitation patterns, and mass curves for the newly analyzed storms. Using these technologies, significant improvements of the storm rainfall analyses were achieved.
- 6. Previously analyzed storm events that occurred prior to 1948 that used 12-hour persisting dew points were adjusted using storm representative dew point adjustments of 2°F for synoptic type storm events and 7°F for MCS type storm events. 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 show those used in HMRs 51 and 55A underestimated the storm representative values. An updated set of maximum dew point climatology maps were produced. These maps have higher maximum dew point values than those used in HMR studies and therefore compensate to some extent for the higher storm representative dew points.
- 7. HMRs 51 and 52 provide generalized and smoothed LIP values over a large geographic domain that covers the United States east of the 105th meridian. Specific characteristics unique to the ANO site were not addressed. 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.
- 8. The transposition limits of the Smethport, PA July 1942, 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 HMRs 51 and 52 necessarily had to encompass the Smethport maximized in-place rainfall far beyond its explicit transposition limits. Note, Section 3.2.4 of HMR 51 states that they "slightly undercut" the maximized 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.

13. Sensitivity Analysis

In the process of deriving site-specific PMP values, various assumptions were made and explicit procedures were adopted for use. Additionally, various parameters and derived values are used in the calculations. It is of interest to assess the sensitivity of PMP values to assumptions that were made and to the variability of parameter values.

13.1 Assumptions

13.1.1 Saturated Storm Atmospheres

The atmospheric air masses that provide moisture to both the historic storm and the PMP storm are assumed to be saturated through the entire depth of the atmosphere and to contain the maximum moisture possible based on the surface dew point. This assumes moist pseudo-adiabatic temperature profiles for both the historic storm and the PMP storm. Limited evaluation of this assumption in the EPRI Michigan/Wisconsin Regional PMP study (Tomlinson, 1993) and the Blenheim Gilboa study (Tomlinson et al. 2008) indicated that historic storm atmospheric profiles are generally not entirely saturated and contain somewhat less precipitable water than is assumed in the PMP procedure. It follows that the PMP storm (if it were to occur) would also have somewhat less precipitable water available than the assumed saturated PMP atmosphere would contain. What is used in the PMP procedure is the ratio of precipitable water associated with each storm. If the precipitable water values for each storm are both slightly overestimated, the ratio of these values will be essentially unchanged. For example, consider the case where instead of a historic storm with a storm representative dew point of 70°F degrees having 2.25 inches of precipitable water assuming a saturated atmosphere, it actually had 90% of that value or about 2.02 inches. The PMP procedure assumes the same type of storm with similar atmospheric characteristics for the maximized storm but with a higher dew point, say 76°F degrees. The maximized storm, having similar atmospheric conditions, would have about 2.69 inches of precipitable water instead of the 2.99 inches associated with a saturated atmosphere with a dew point of 76°F degrees. The maximization factor computed using the assumed saturated atmospheric values would be 2.99/2.25 = 1.33. If both storms were about 90% saturated instead, the maximization factor would be 2.69/2.02 = 1.33. Therefore potential inaccuracy of assuming saturated atmospheres (whereas the atmospheres may be somewhat less than saturated) should have a minimal impact on storm maximization and subsequent PMP calculations.

13.1.2 Maximum Storm Efficiency

The assumption is made that if a sufficient period of record is available for rainfall observations, at least a few storms would have been observed that attained or came close to attaining the maximum storm efficiency possible in nature for converting atmospheric moisture to rainfall for regions with similar climates and topography. The

further assumption is made that if additional atmospheric moisture had been available, the storm would have maintained the same efficiency for converting atmospheric moisture to rainfall. The ratio of the maximized rainfall amounts to the actual rainfall amounts would be the same as the ratio of the precipitable water in the atmosphere associated with each storm.

There are two issues to be considered. First is the assumption that a storm has occurred that has rainfall efficiency close to the maximum possible. Unfortunately, state-of-the-science in meteorology does not support a theoretical evaluation of storm efficiency for use in PMP evaluation. However, if the period of record is considered (generally over 100 years), along with the extended geographic region with transpositionable storms, it is accepted that there should have been at least one storm with dynamics that approach the maximum efficiency for rainfall production.

The other issue is the assumption that storm efficiency does not change if additional atmospheric moisture is available. Storm dynamics could potentially become more efficient or possibly less efficient depending on the interaction of cloud microphysical processes with the storm dynamics. Offsetting effects could indeed lead to the storm efficiency remaining essentially unchanged. For the present, the assumption of no change in storm efficiency is accepted, mirroring the HMR and WMO assumptions.

13.2 Parameters

13.2.1 Storm Representative Dew Point and Maximum Dew Point

The in-place maximization factor depends on the determination of storm representative dew points, along with maximum historical dew point values. The magnitude of the maximization factor varies depending on the values used for the storm representative dew point and the maximum dew point. Holding all other variables constant, the maximization factor is smaller for higher storm representative dew points as well as for lower maximum dew point values. Likewise, larger maximization factors result from the use of lower storm representative dew points and/or higher maximum dew points. The magnitude of the change in the maximization factor varies depending on the dew point values. For the range of dew point values used in most PMP studies, the maximization factor for a particular storm will change about 5% for every 1°F difference between the storm representative and maximum dew point values. The same sensitivity applies to the transposition factor, with ~ 5% change for every 1°F change in either the in-place maximum dew point or the transposition maximum dew point².

For example, consider the following case:

Storm representative dew point: 75°F Precipitable water: 2.85 "

² Note that the amount of moisture per degree of dew point temp is not linear, but this 5% formula fits within the range of dew points used in this analysis.

Maximum dew point: $79^{\circ}F$ Precipitable water: 3.44" Maximization factor = 3.44"/2.85" = 1.21

If the storm representative dew point were $74^{\circ}F$ with precipitable water of 2.73", Maximization Factor = 3.44"/2.73" = 1.26 (an increase of approximately 4%)

If the maximum dew point were $78^{\circ}F$ with precipitable water of 3.29", Maximization Factor = 3.29"/2.85" = 1.15 (a decrease of approximately 5%)

13.2.2 Sensitivity of the Elevation Adjustment Factor

Variations in elevation associated with topographic features remove atmospheric moisture from an air mass as it moves over the terrain. When storms are transpositioned, the elevation of the storm center location is used to compute the amount of atmospheric moisture depleted from the storm atmosphere during the in-place moisture maximization process. The absolute amount of moisture depletion is somewhat dependent on the dew point values, but is primarily dependent on the elevation at the original storm location compared to the elevation of the basin centroid and each grid point. The elevation adjustment is slightly less than 1% for every 100 feet of elevation change between the original storm location and the study basin elevation.

For example, consider the following case:

Maximum dew point: 79°F Elevation: 1,000 'Precipitable water between 1000-mb and the top of the atmosphere: 3.44" Precipitable water between 1000-mb and 1,000': 0.28" Elevation Adjustment Factor = (3.44"-0.28")/3.44" = 0.92 (approximately 1% per 100 feet)

If the elevation were 2,000', the precipitable water between 1000 mb and 2,000' is 0.55''

Elevation Adjustment Factor = (3.44"-0.55")/3.44" = 0.84 (approximately 1% per 100 feet)

14. Recommendations for Application

14.1 PMP and LIP Applications

PMP values have been computed that provide maximum rainfall amounts for use in computing the PMF at any location within the ANO basin. The study addressed several issues that could potentially affect the magnitude of the PMP storm over basin as compared with HMRs 51 and 55A and the LIP storm over the ANO site location.

Analysis of moisture availability for previously analyzed storms and analysis of recent extreme storms with up to date state-of-the-science techniques resulted in PMP values which replace HMRs 51 and 55A and LIP values which replace those in HMR 52. These represent the most current PMP values that should be used together with the procedures in HMR 52 and updated PMP design storm parameters to provide PMP rainfall at any location within the basin.

HMR 52 uses a procedure for locating the largest amounts of rainfall associated with the PMP storm, such that the largest volume of rain falls within the watershed boundaries. Because the ANO basin is much larger than the largest HMR 52 design storm, updated parameters in addition to HMR 52 were evaluated. This included storm movement recommendations for the PMP design storm.

14.2 Discussion on the Spatial Limits of the PMP Values

The grid system used in this study was designed such that no regions within the basin required extrapolation of storm data but allowed for interpolation between rainfall values at grid point or the use of the gridded data within GIS. The grid extended beyond the geographic boundaries of the basin. The emphasis was to provide the most reliable and consistent analysis within the geographic region. PMP maps are provided to allow for PMP values to be extracted for any location in basin. As an option, a user who has GIS software can use the gridded data to explicitly determine PMP values at any location within the basin.

For each of the storms analyzed, appropriate transposition grid points were defined (see Appendix F). After all the storms were analyzed, the largest rainfall values were determined for each grid point for each duration and area size. These largest values were enveloped to insure both spatial and temporal continuity.

Once the enveloped values were finalized, lines of constant PMP values were drawn using GIS interpolation software for each duration and area size. These iso-PMP lines were extended beyond the basin boundary such that PMP values could be interpolated at all locations within the basin. Hence, the reason that some iso-PMP lines

extend beyond the basin boundary is to allow for gradients to be determined between lines for all locations within the ANO basin.

For regions outside of the basin where extrapolation would be required, the gradient is uncertain. There are probably regions where the extended lines provide reasonable PMP values while for other regions, PMP values are less reliable. This study provides PMP values only for locations within the ANO basin.

14.3 Climate Change Assumptions

AWA recognizes that the climate is in a constant state of change. However, the current scientific consensus and understanding cannot agree how climate is changing and more importantly what those changes will be for the region. Therefore, one cannot say whether the region will be wetter or drier, warmer or colder and/or experience more or less extreme rainfall events with any quantitative and statistically significant certainty. Further, most projects of this type have a projected life between 30 to 50 years before they are redeveloped. In general, most projected changes that *may* occur within the Earth's climate system would be unlikely to significantly affect the project's hydrology beyond the bounds of the PMP and/or LIP values derived as part of this project during its useful life. Based on these discussions, it is apparent that the current practice of PMP determination should *not* be modified in an attempt to address potential changes associated with climate change. This study has continued the practice of assuming no climate change, as climate trends are not considered when preparing PMP estimates (WMO, Section 1.1.1).

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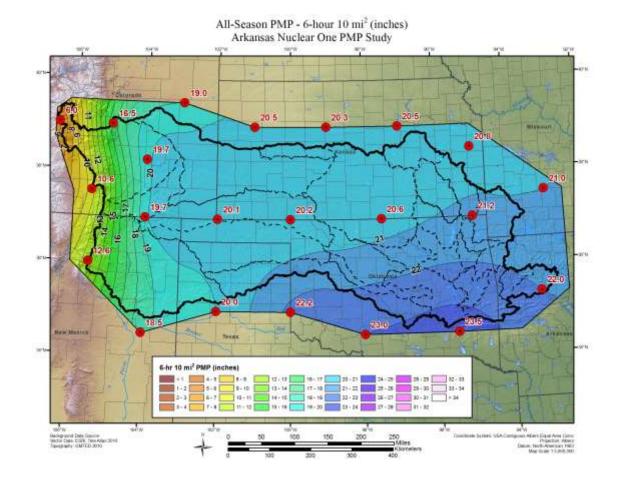
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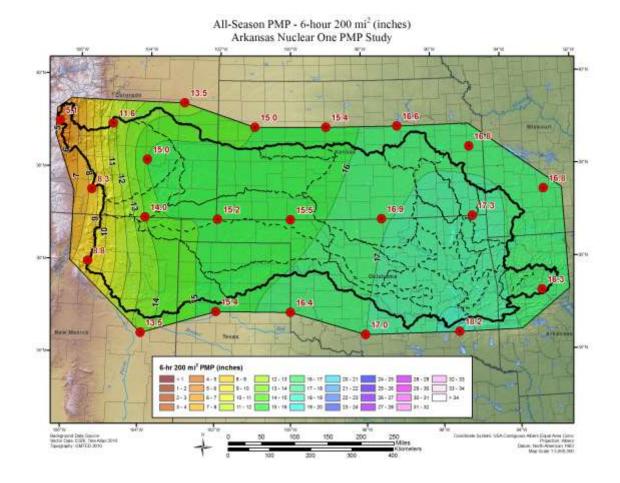
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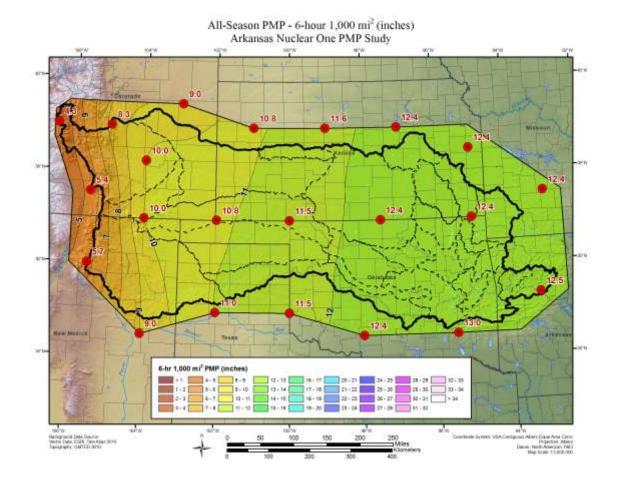
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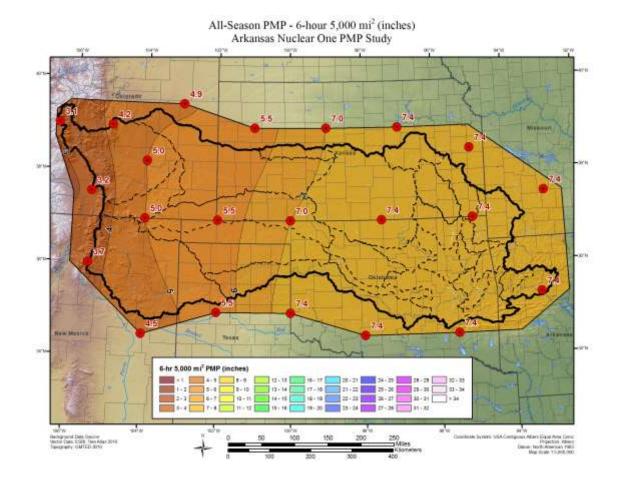
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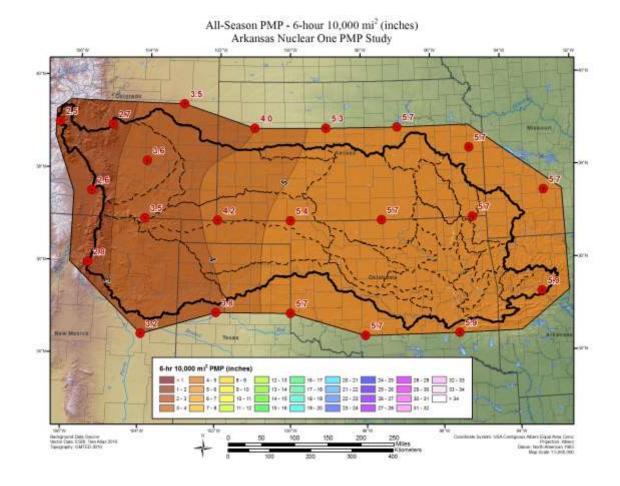
Appendix A ANO Probable Maximum Precipitation Maps

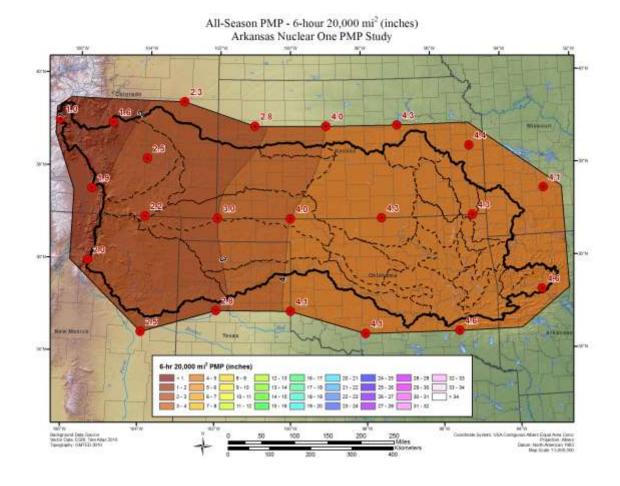


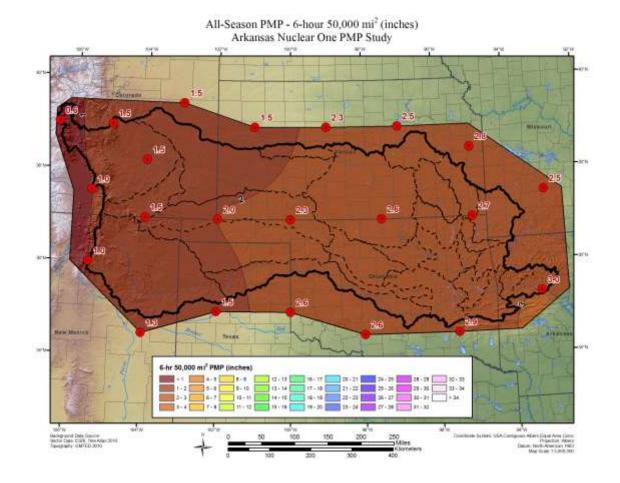


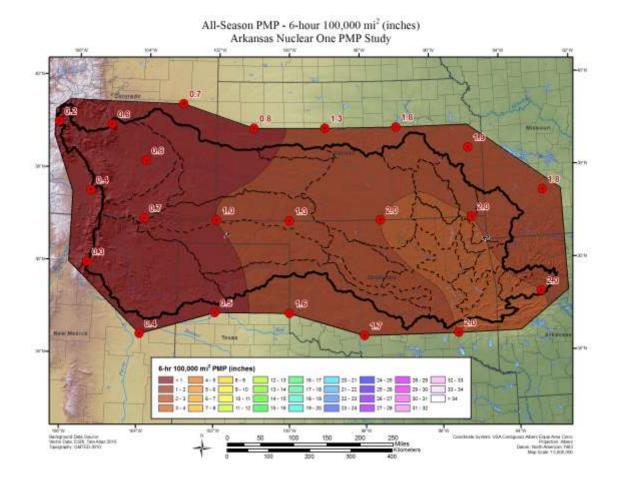


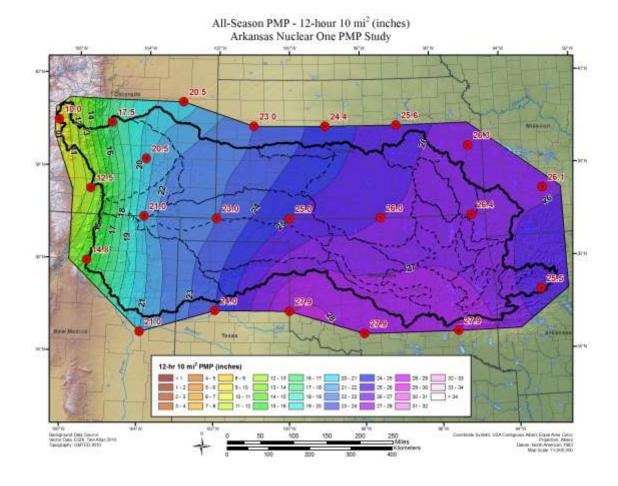


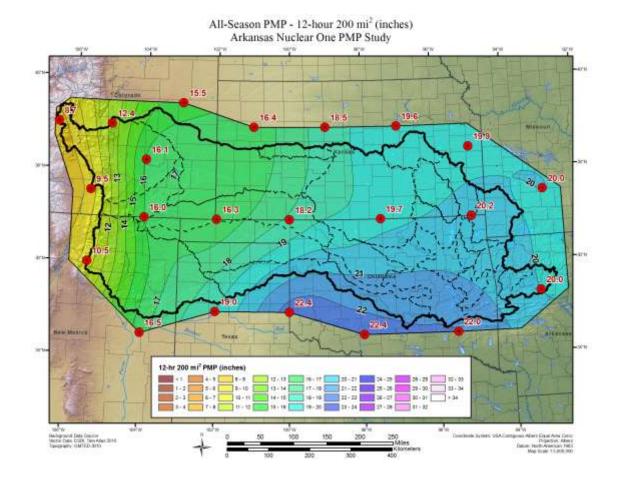


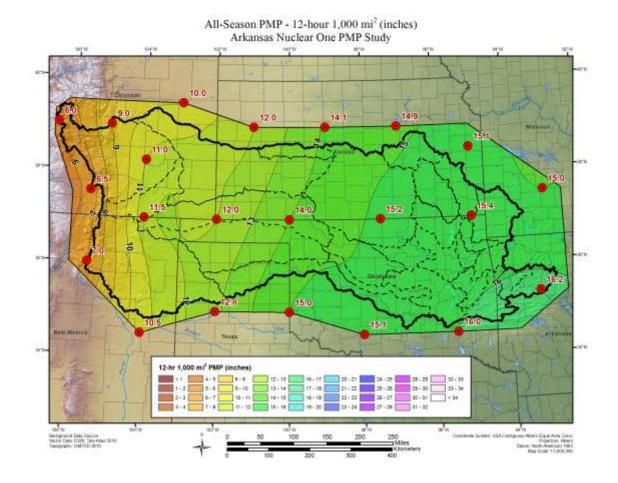


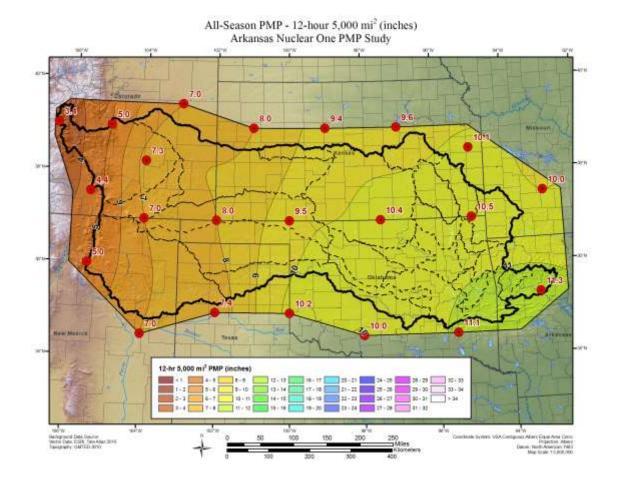


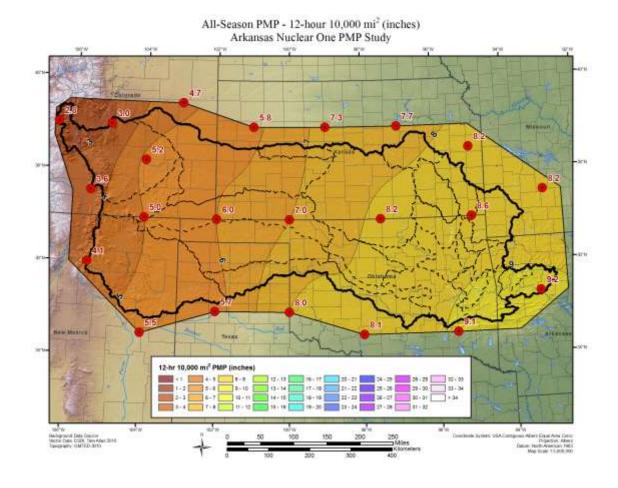


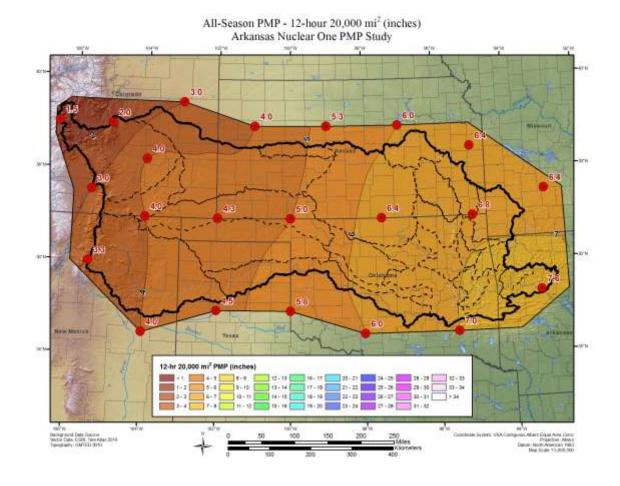


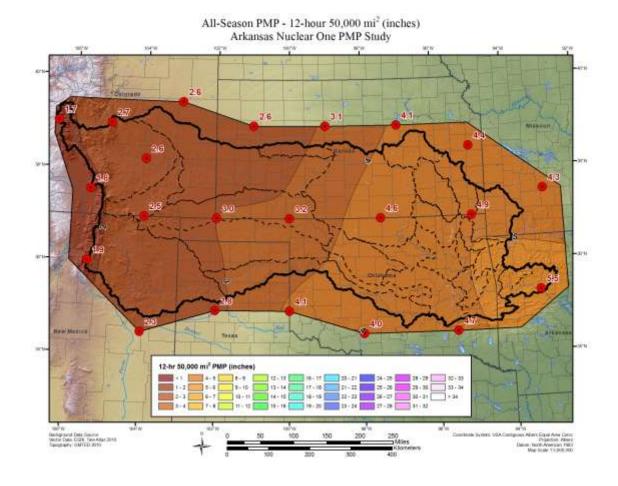


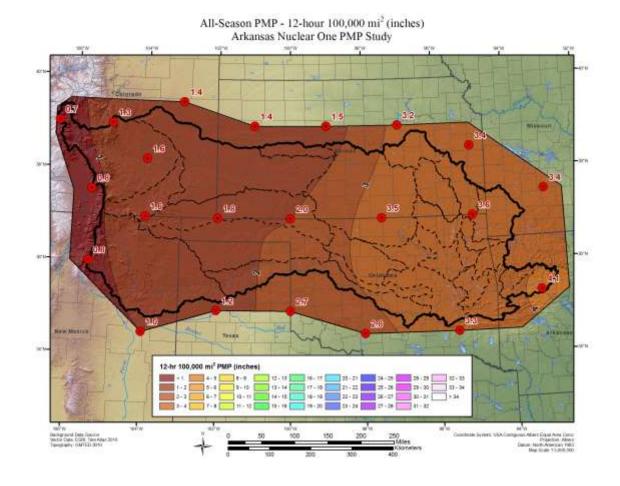


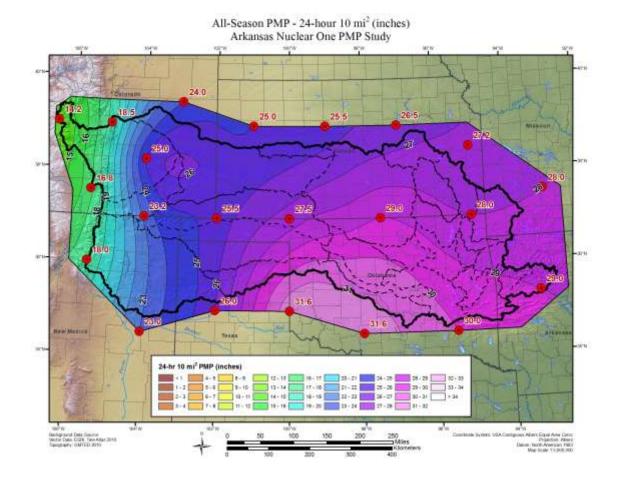


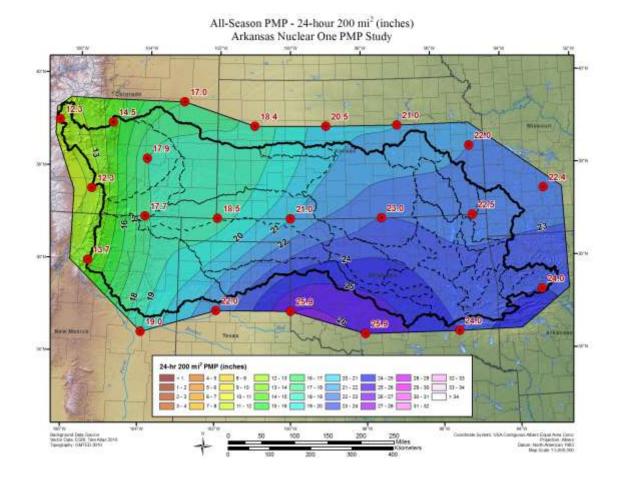


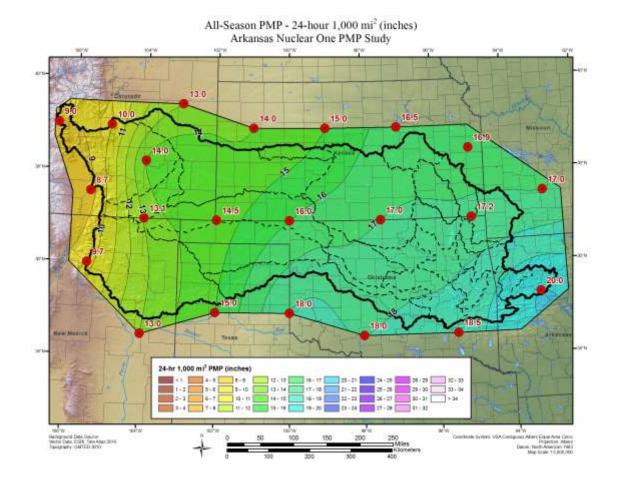


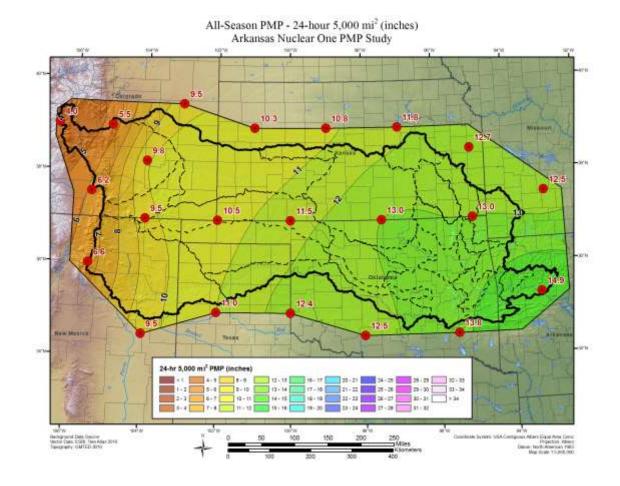


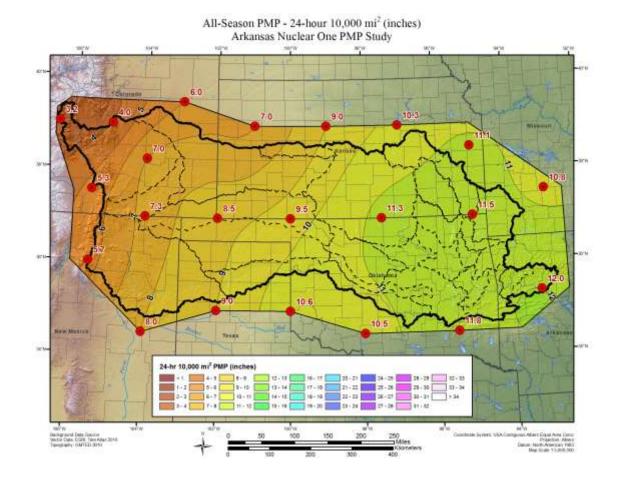


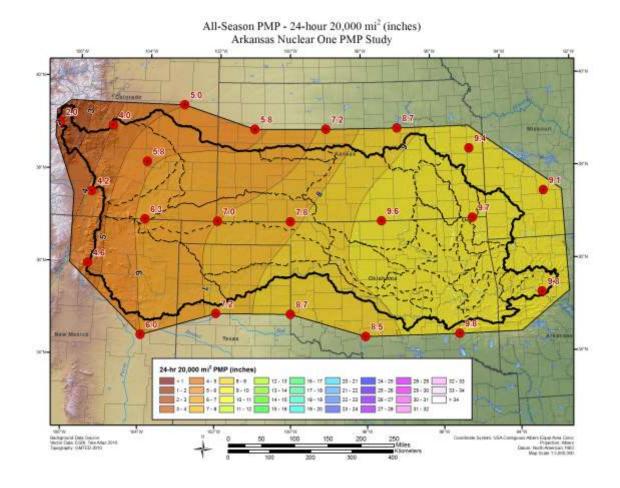


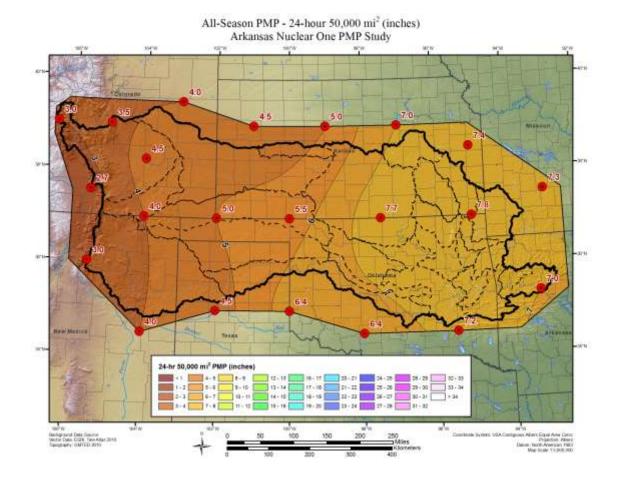


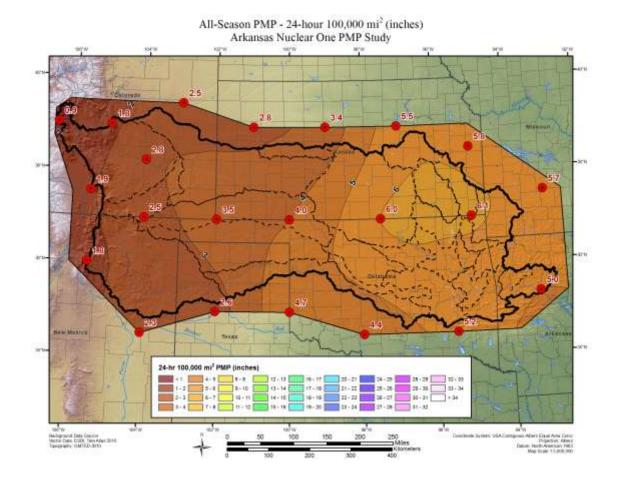


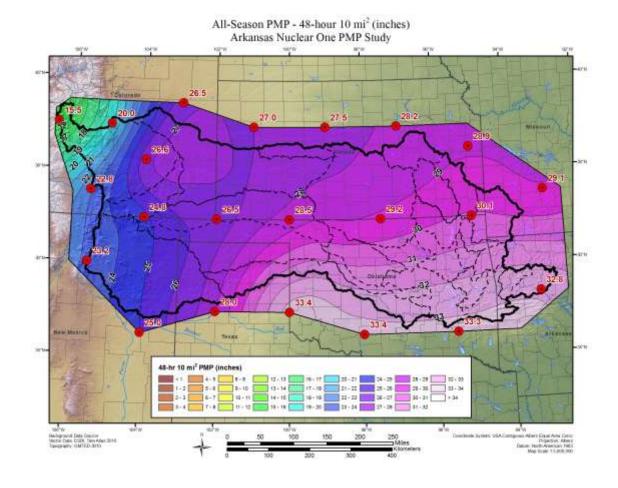


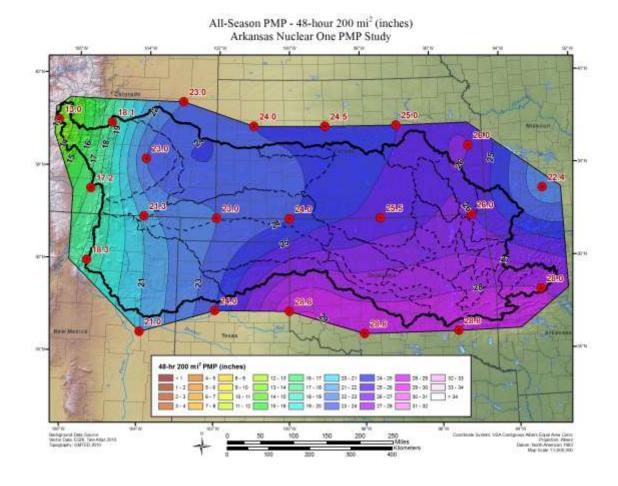


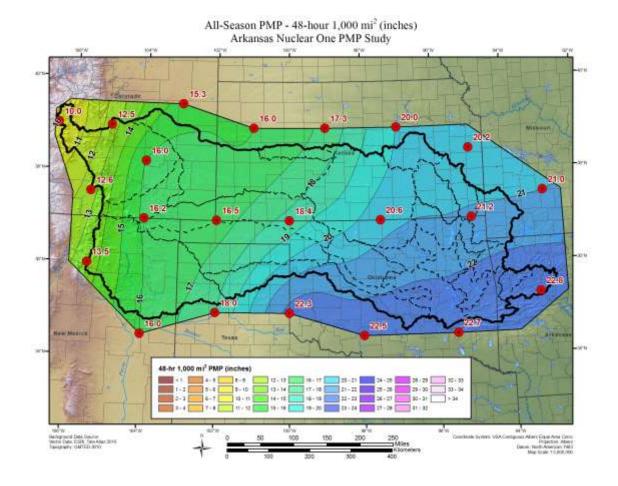


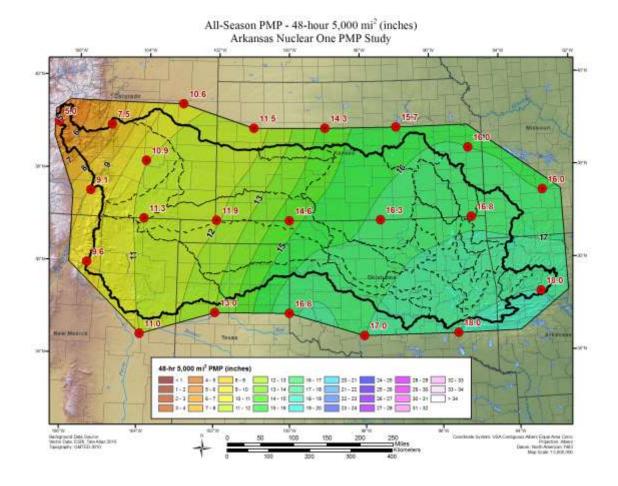


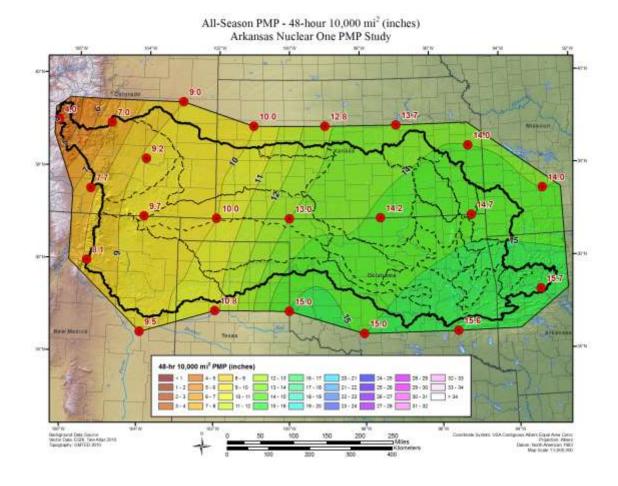


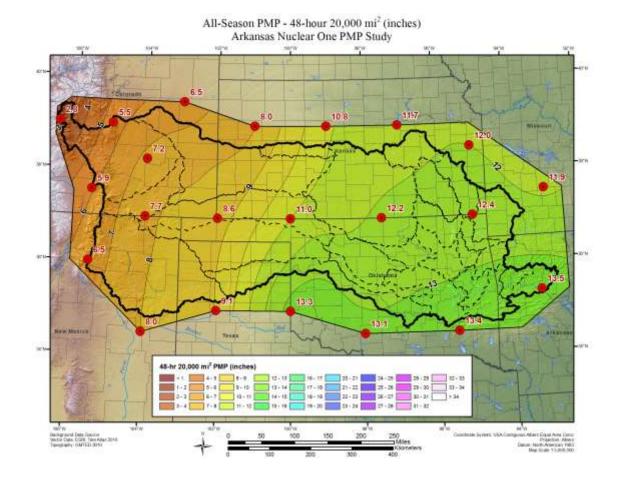


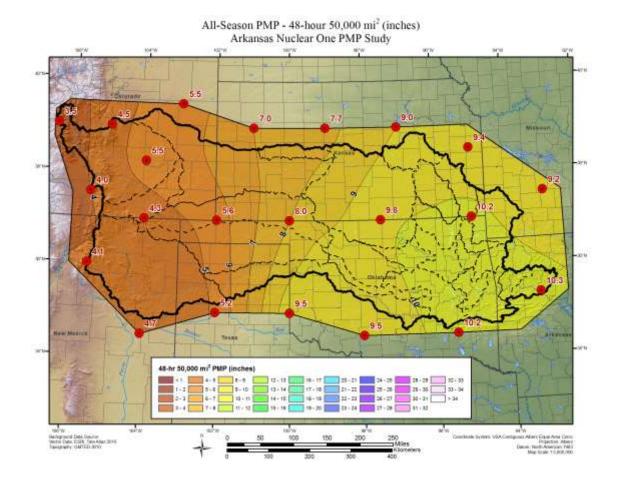


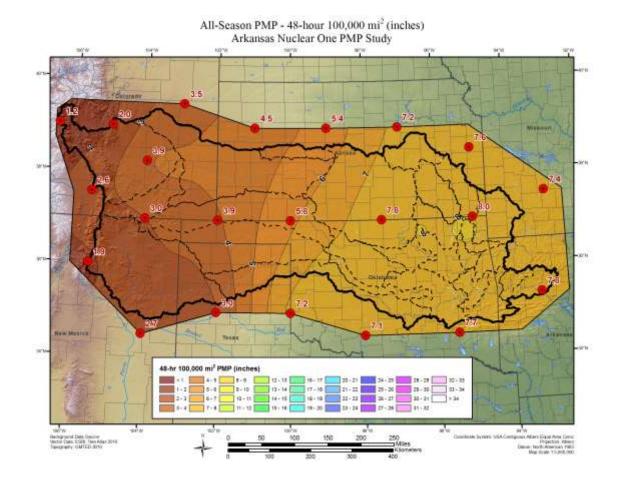


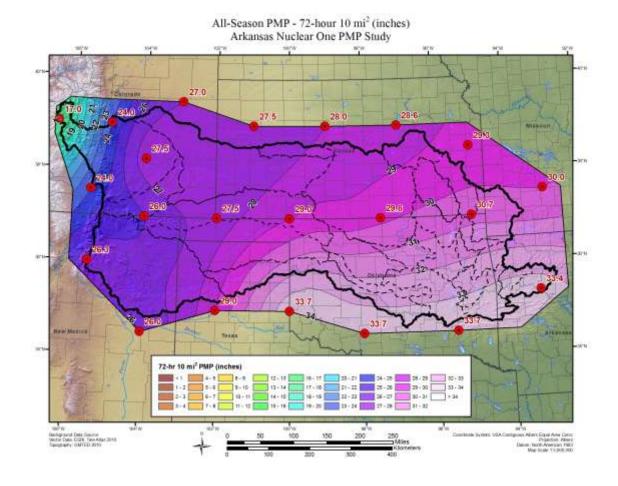


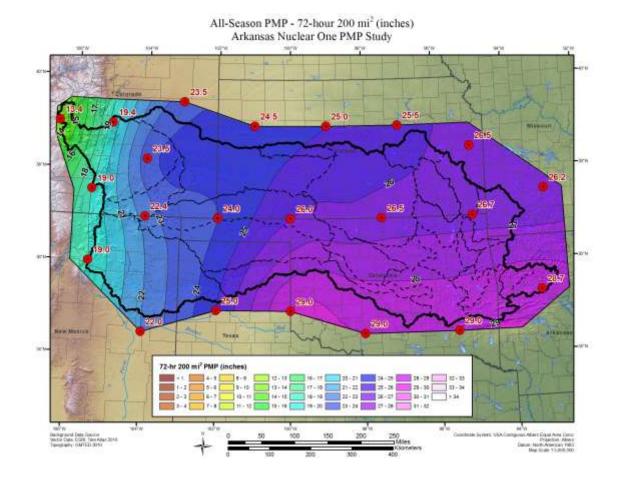


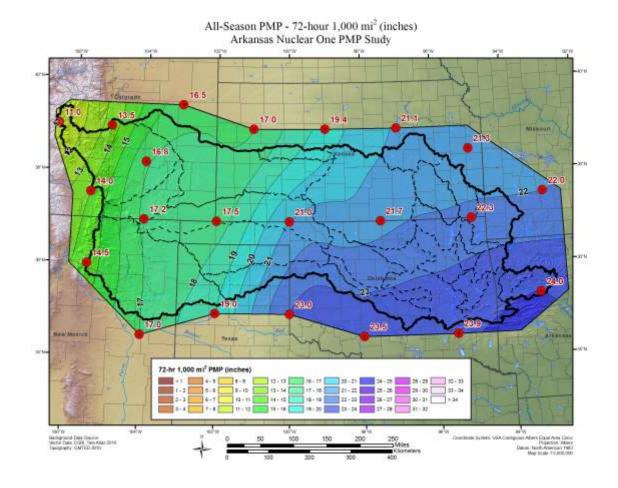


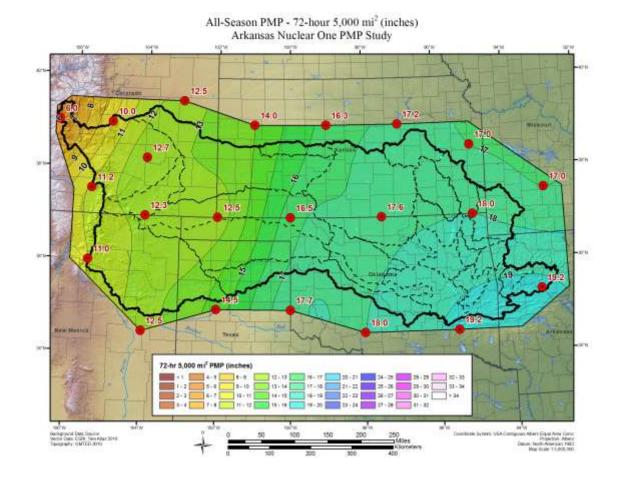


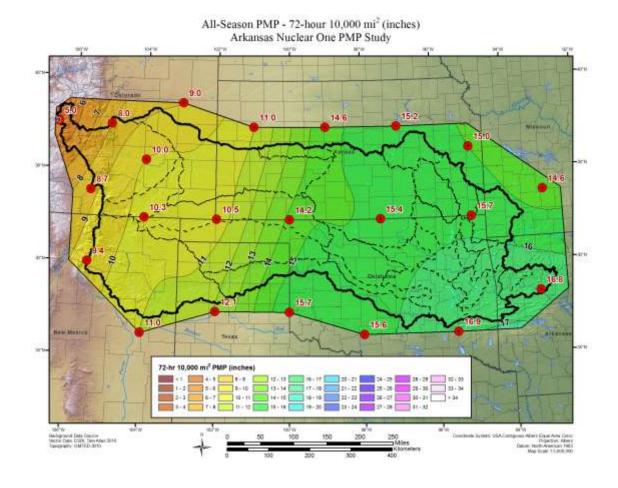


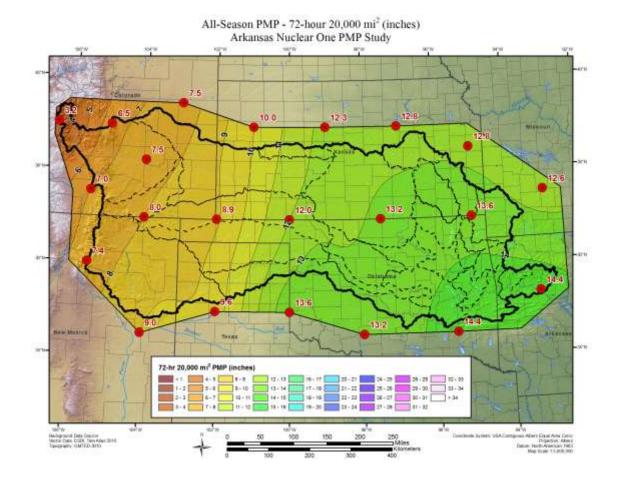


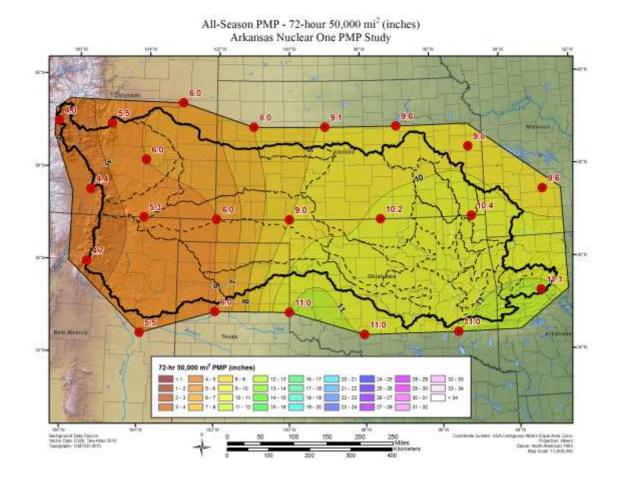


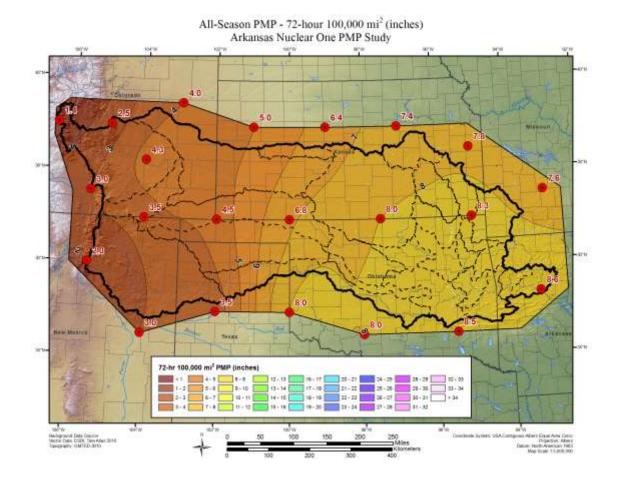






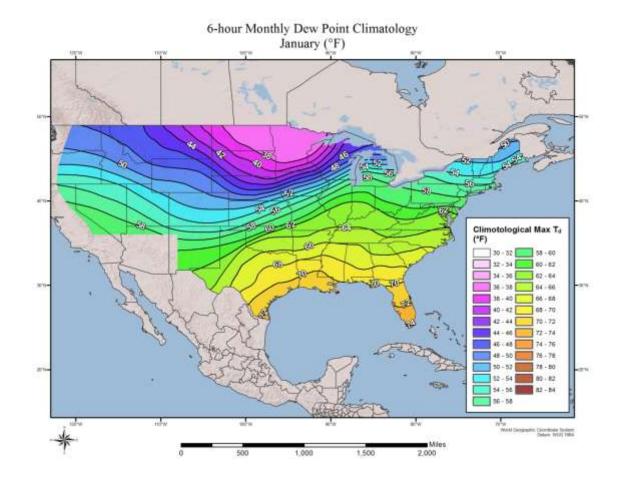


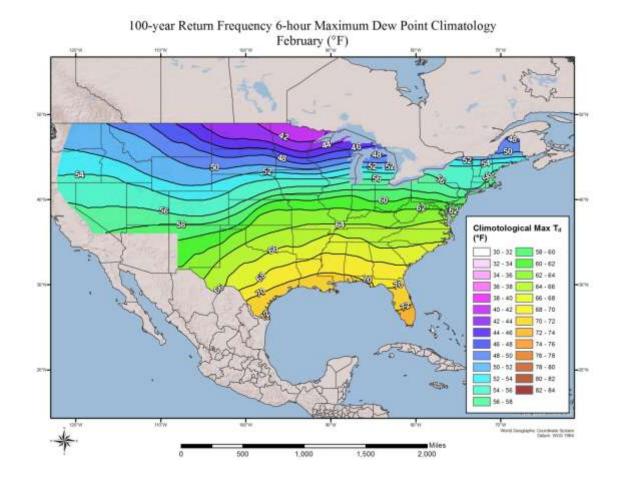


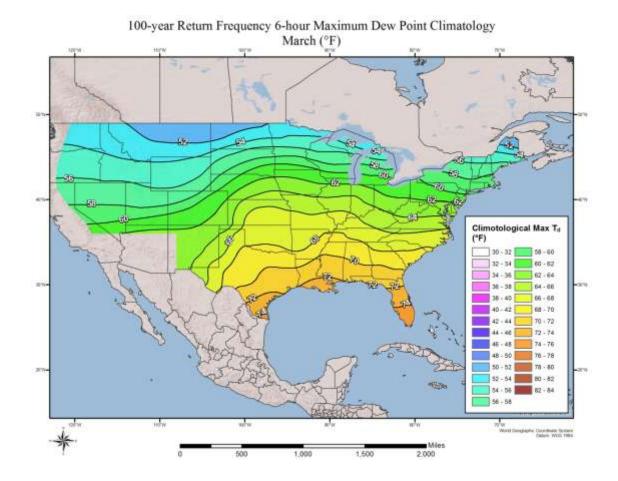


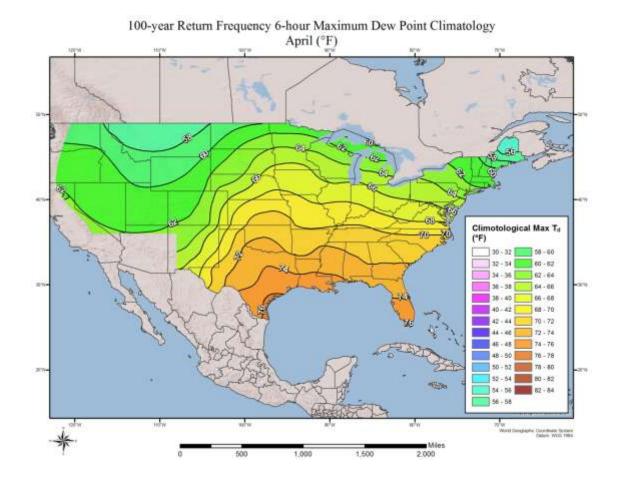
Appendix B

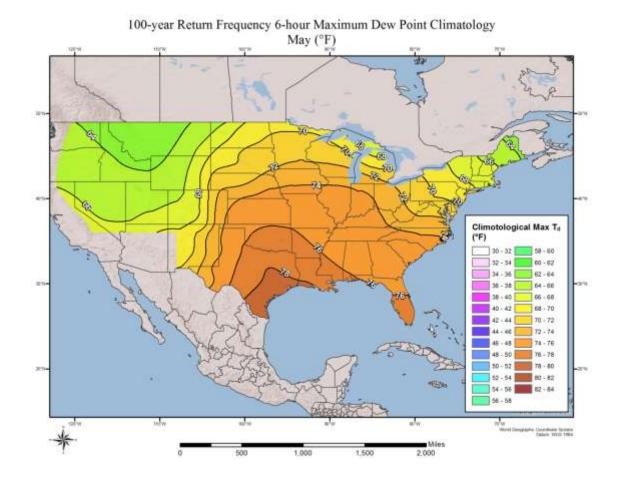
100-year Return Frequency Maximum Average Dew Point Climatology Maps Used in the Storm Maximization and Transposition Calculations

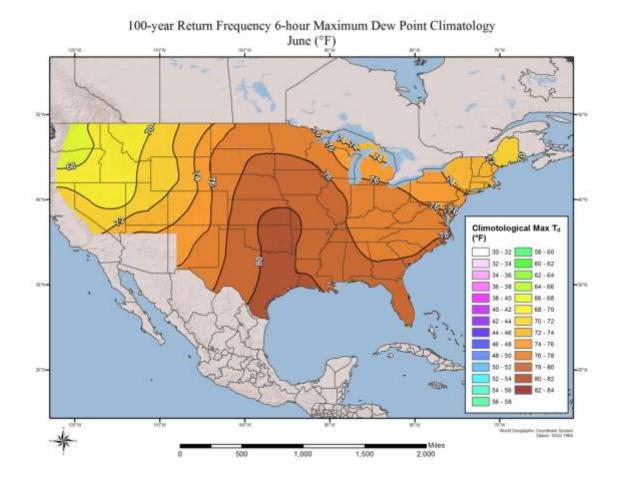


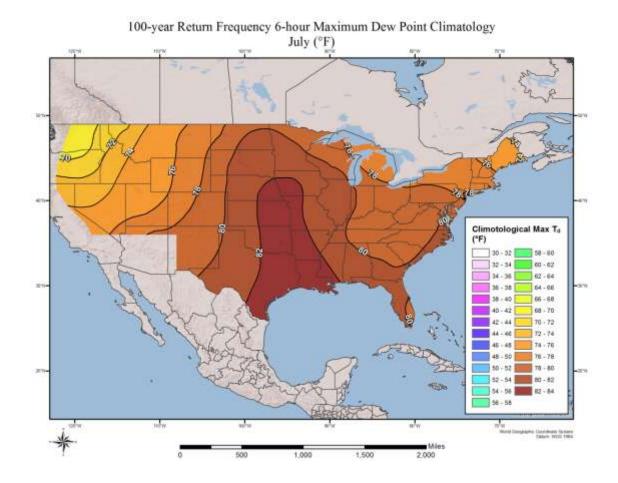


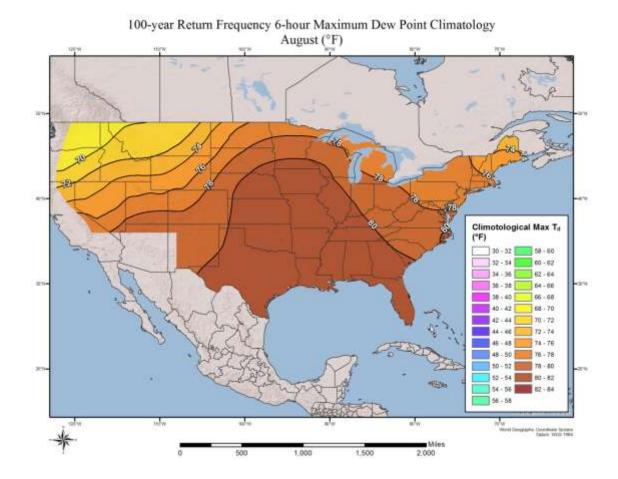


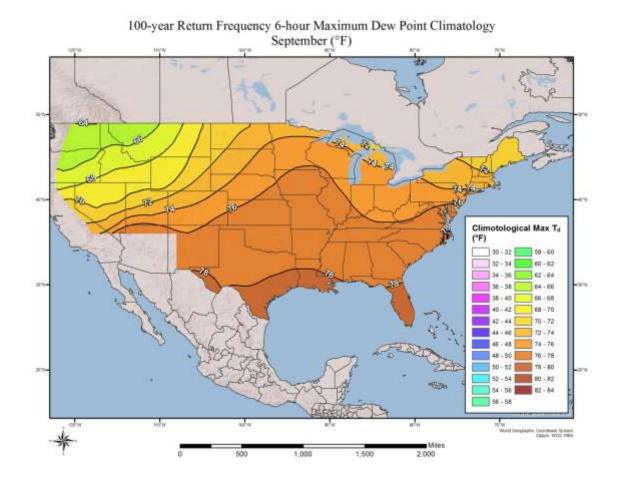


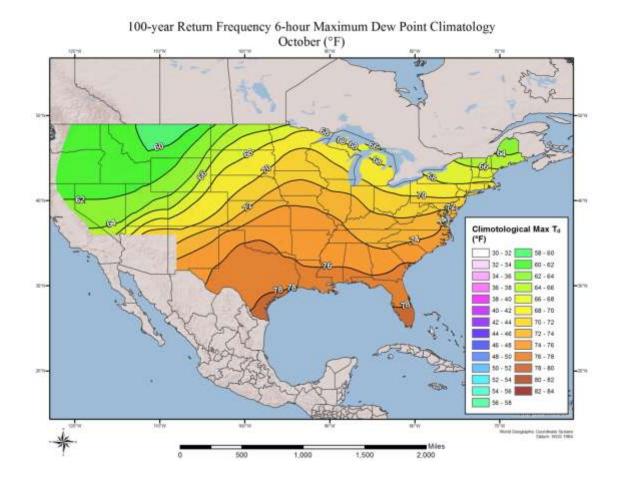


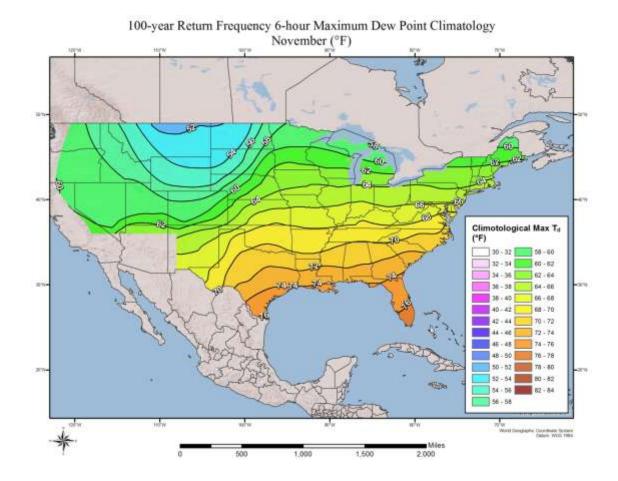


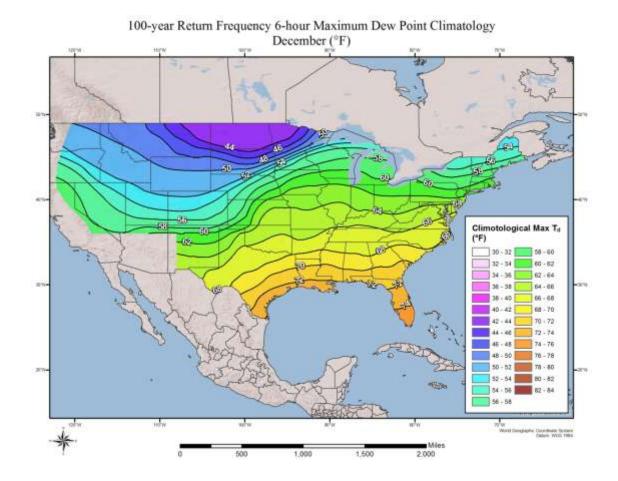


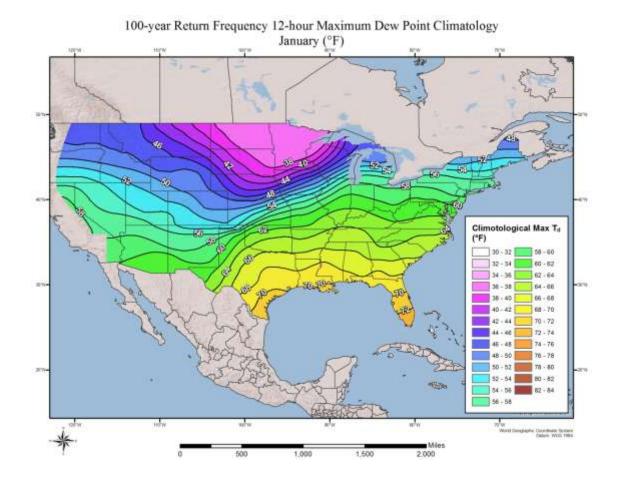


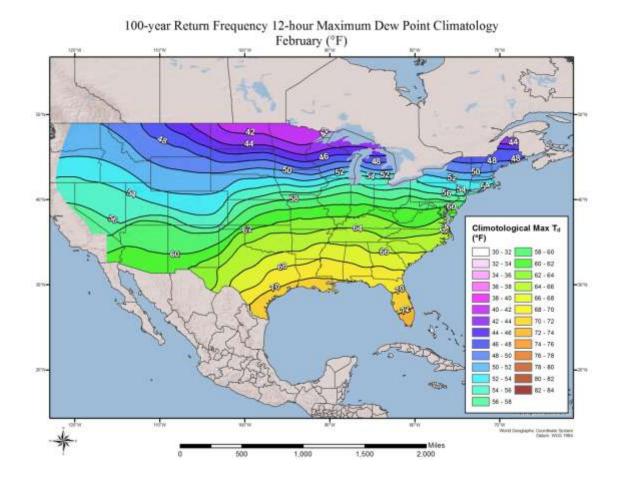


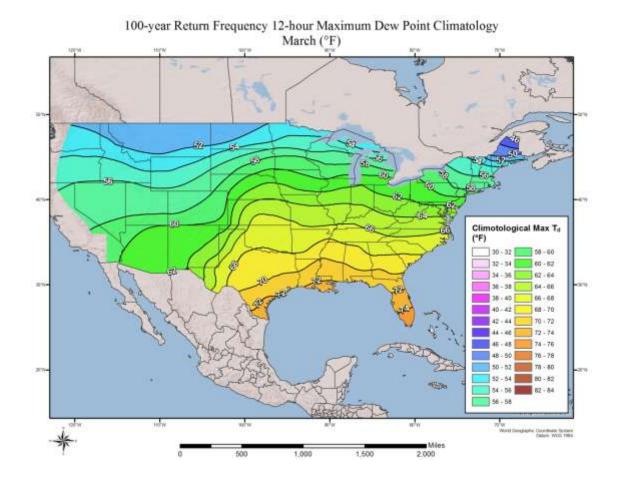


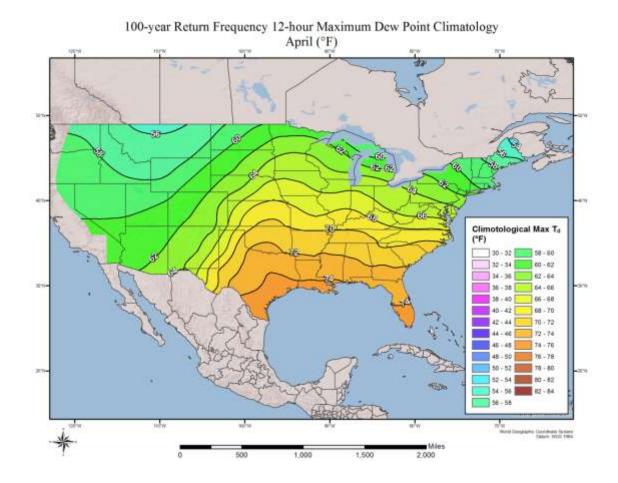


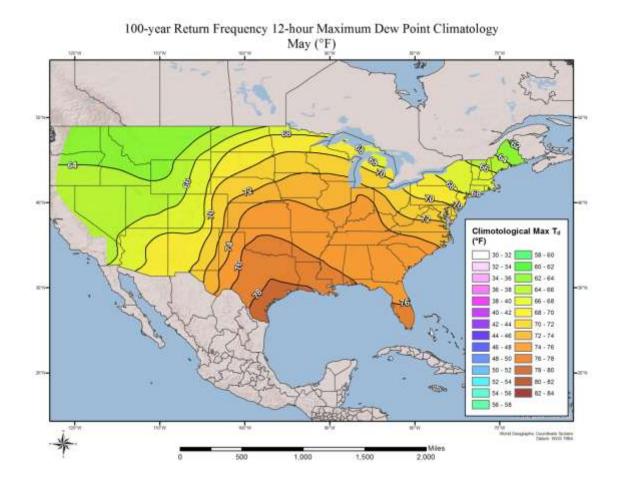


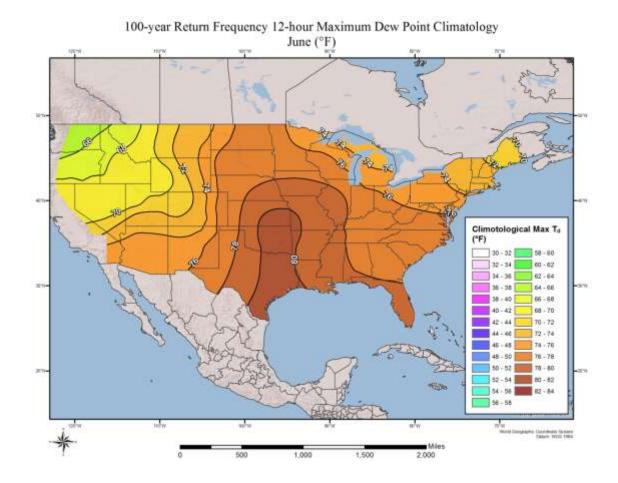


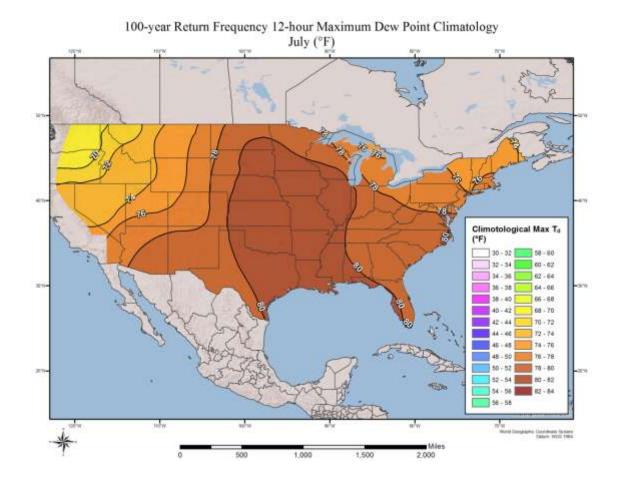


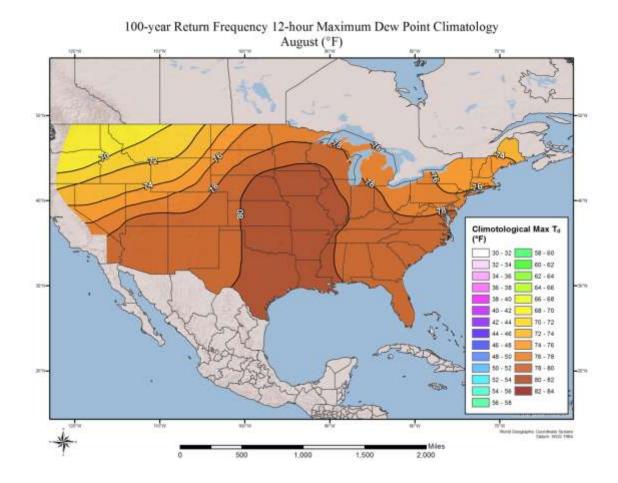


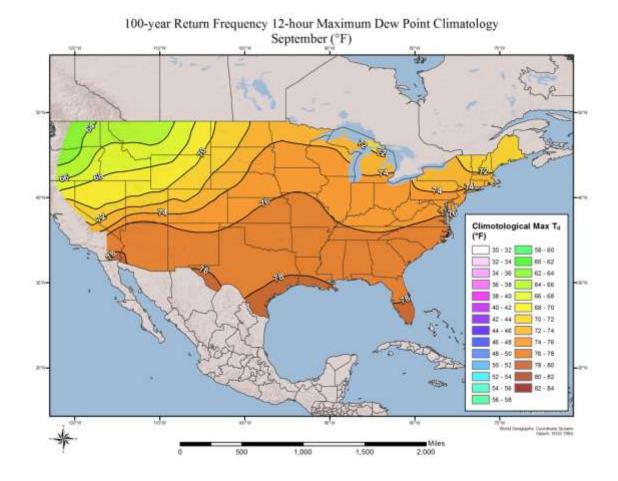


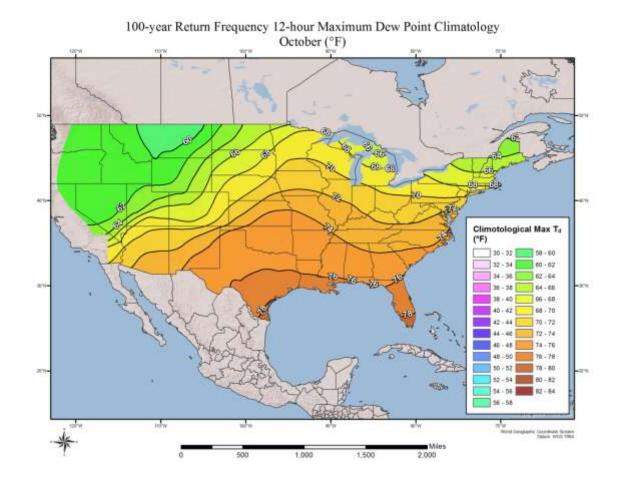


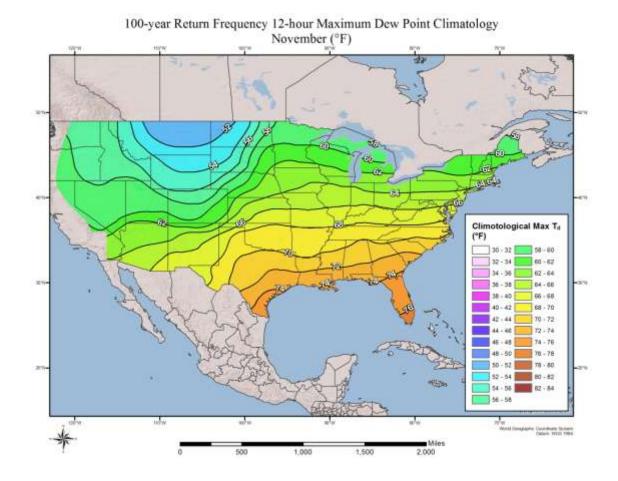


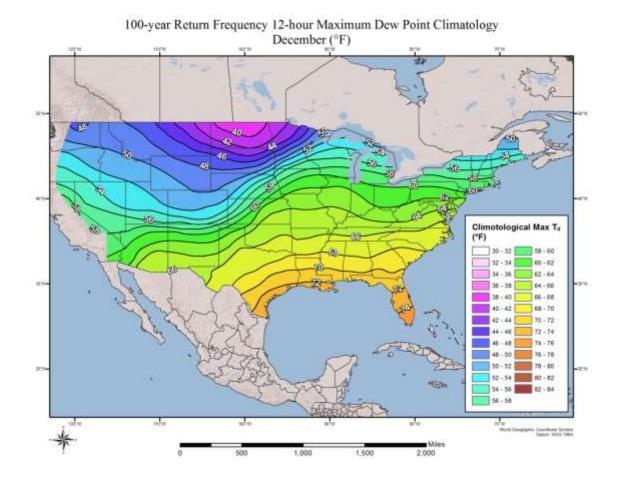


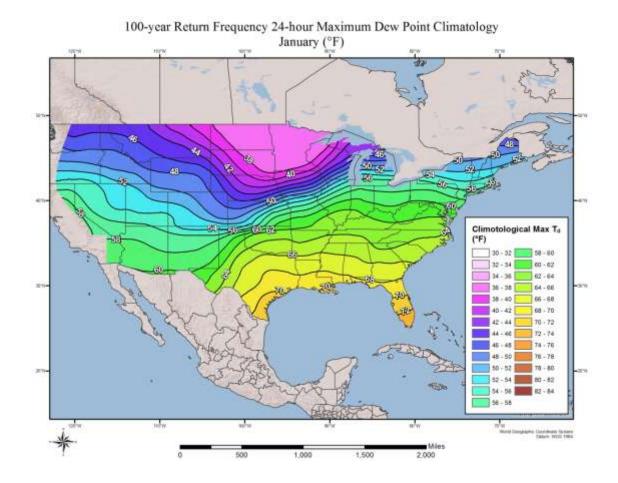


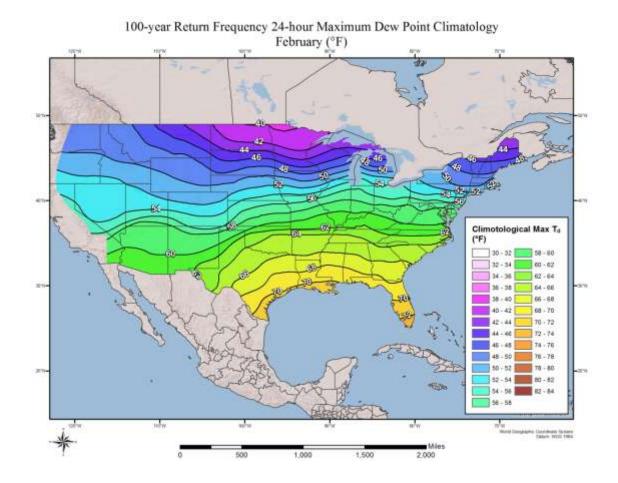


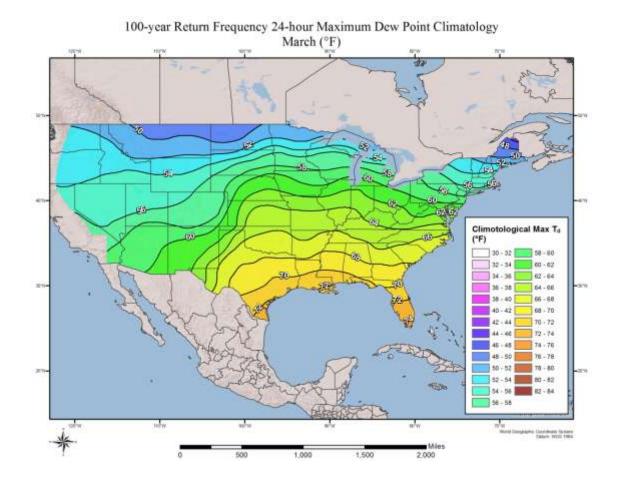


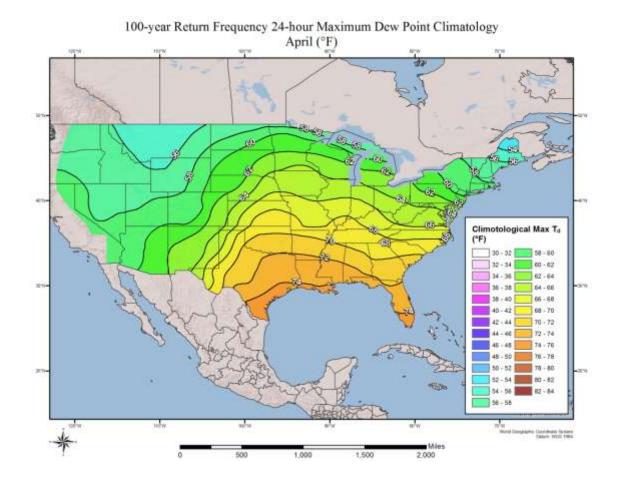


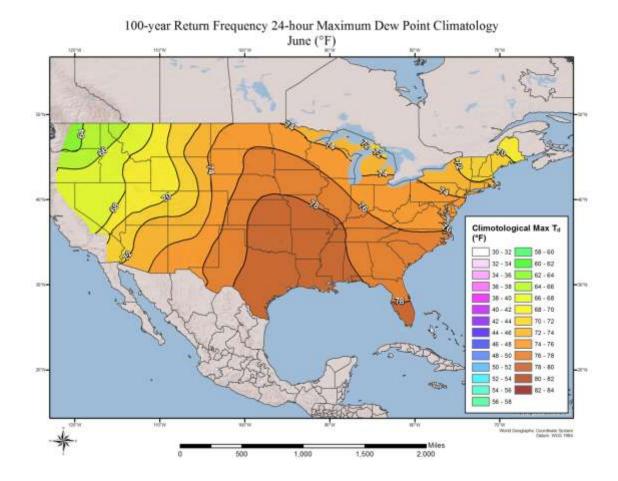


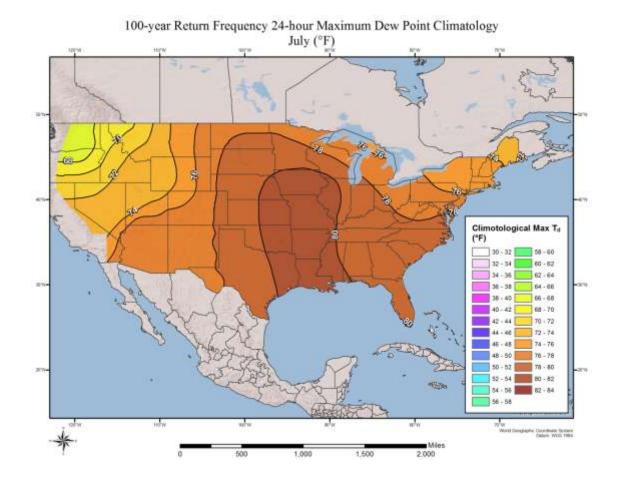


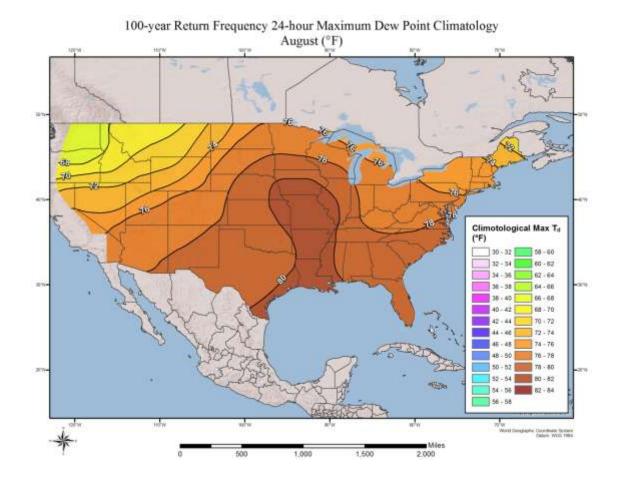


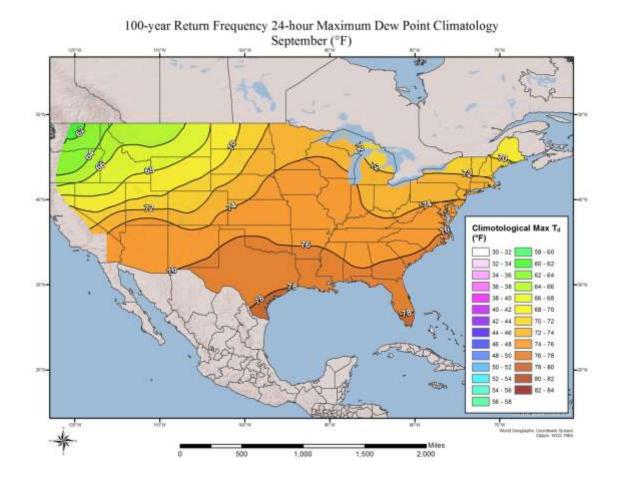


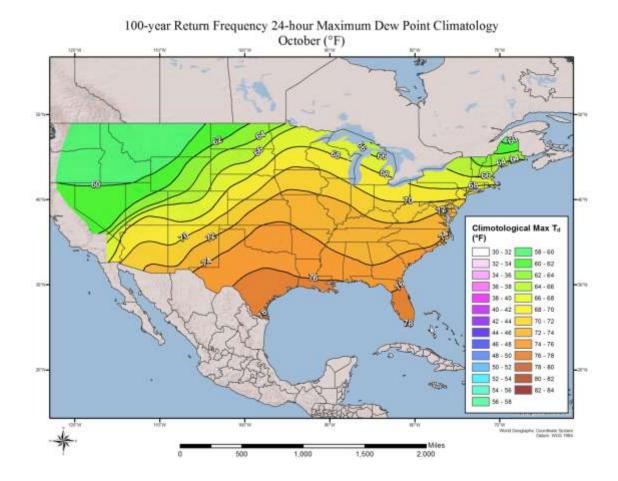


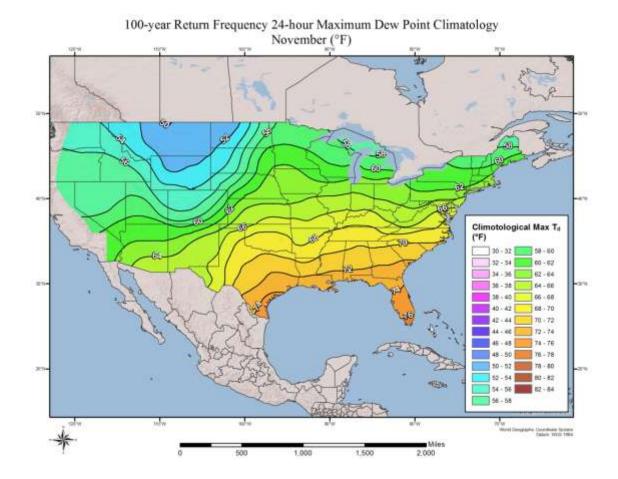


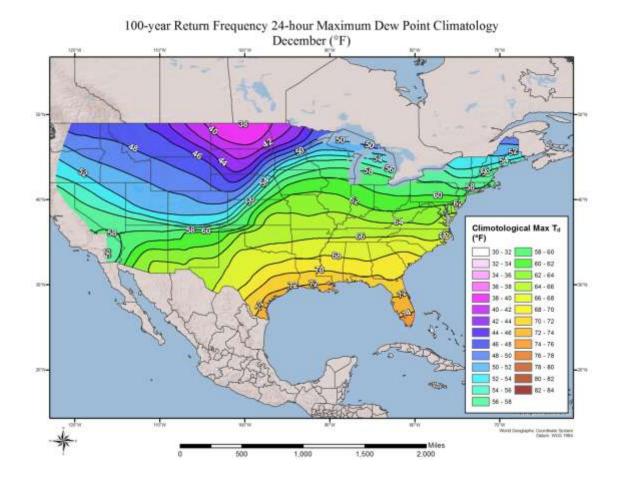












Appendix C

Procedure for using Dew Point Temperatures for Storm Maximization and Transposition

Maximum dew point temperatures (hereafter referred to as dew points) have historically been used for two primary purposes in the PMP computation process:

- 1. Increase the observed rainfall amounts to a maximum value based on a potential increase in atmospheric moisture available to the storm.
- 2. Adjust the available atmospheric moisture to account for any increases or decreases associated with the maximized storm potentially occurring at another location within the transposition limits for that storm.

HMR and WMO procedures for storm maximization use a representative storm dew point as the parameter to represent available moisture to a storm. Prior to the mid-1980s, maps of maximum dew point values from the Climatic Atlas of the United States, Environmental Data Services, Department of Commerce (1968), were the source for maximum dew point values. HMR 55 published in 1984 updated maximum dew point values for a portion of the United States from the Continental Divide eastward into the central plains. A regional PMP study for Michigan and Wisconsin produced return frequency maps using the L-moments method (Tomlinson 1993). Committee for that study included representatives from NWS, FERC, Bureau of Reclamation, and others. They agreed that the 50-year return frequency values were appropriate for use in PMP calculations. HMR 57 was published in 1994 and HMR 59 in 1999. These latest NWS publications also update the maximum dew point climatology but use maximum observed dew points instead of return frequency values. For this study, the 100-year return frequency dew point climatology maps were appropriate because this added a layer of conservatism and the extra 17 years of data available since the EPRI and Nebraska studies allow the 100-year return frequency to be more reliable. precipitation amounts are maximized using the ratio of precipitable water for the maximum observed dew point to precipitable water for the storm representative dew point, assuming a vertically saturated atmosphere. This procedure was followed in this study using the updated maximum dew point climatology developed during recent and ongoing PMP studies. The climatological maximum 100-year return frequency maps for the 6-, 12-, and 24-hour durations are giving in Appendix B.

The procedure for determining a storm representative dew point begins with the determination of the inflow wind vector (direction and magnitude) for the air mass that contains the atmospheric moisture available to the storm. Beginning and ending times of the rainfall event at locations of the most extreme rainfall amounts are determined using rainfall mass curves from those locations.

The storm inflow wind vector is determined using available wind data. The inflow wind vector has historically been determined using winds reported by weather stations, together with upper air winds, when available. Recently, re-analyzed weather model data representing various atmospheric parameters including wind direction and speed in the atmosphere have become available for use from the HYSPLIT trajectory model and the North American Reanalysis Project (Kalnay et al 1996). These analyses

are available back to 1948. Use of these wind fields in the lower portion of the atmosphere provides much improved reliability in the determination of the storm inflow wind vectors. The program is available through an online interface through the Air Resources Laboratory section of NOAA. Users are able to enter in specific parameters that then produce a trajectory from a starting point going backwards (or forwards) for a specified amount of time. Users can define variables such as the starting point (using latitude and longitude or a map interface), the date and time to start the trajectory, the length of time to run the trajectory, and the pressure level at which to delineate the inflow vector. Figure C.0 shows example inflow vectors generated by HYSPLIT at three levels: 700mb, 850mb, and surface for an example storm event. The data generated from the HYSPLIT runs is then used in conjunction with standard methods to help delineate the source region of the air mass responsible for the storm precipitation. Also, this serves as another tool to determine from which weather stations to derive hourly dew point data for storm representative dew point analysis.

NOAA HYSPLIT MODEL Backward trajectories ending at 1200 UTC 11 Jul 51 CDC1 Meteorological Data

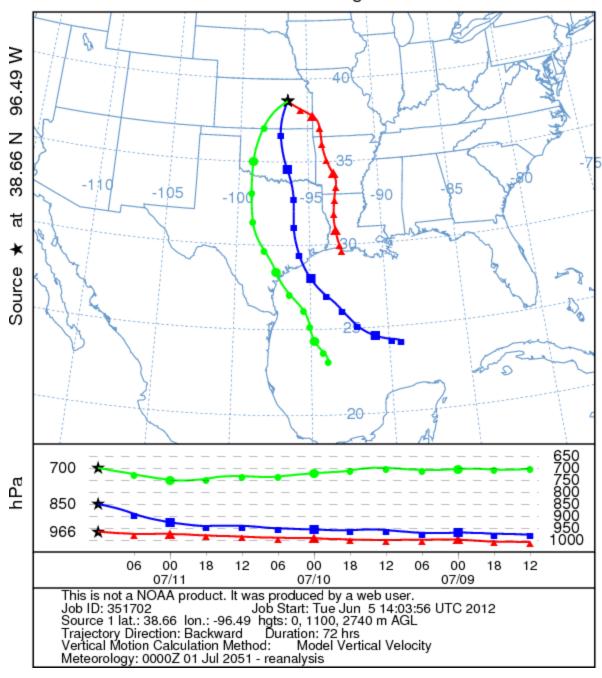


Figure C.0 HYSPLIT trajectory model results for Council Grove, KS, July 1951 storm (AWA 18).

The inflow wind vector is followed upwind until a location is reached that is outside of the storm rainfall. The nearest weather stations that report dew point values are identified. At least two stations are desired but a single station with reliable dew

points observations can be used. The time period used to identify the appropriate dew point values is determined by computing the time required for the air mass to be transported from the location of the weather station(s) to the location of maximum rainfall. The start time of the extreme rainfall is then adjusted back in time to account for transit time from the dew point observing station(s) to the maximum rainfall location.

For example, consider the following case:

- 1. Rainfall begins at 11:00am and ends at 6:00pm the following day at the location of maximum rainfall,
- 2. The storm representative dew point location (the location of the weather stations observing the dew points) is 100 miles from the maximum rainfall location in the direction of the inflow wind vector, and
 - 3. The inflow wind speed is 20 mph.

The transit time for the air mass from the weather stations to the maximum rainfall location is five hours (100 miles divided by 20 mph). The time to begin using the dew point observations is five hours before the rainfall began (11:00am minus 5 hours = 6:00am) and the time to stop using the dew point observations is five hours before the rainfall ended (6:00pm minus 5 hours = 1:00pm the following day). Dew point observations taken between these times are used to determine the storm representative average 24-hour 1000mb dew point value. The storm representative dew point location can come from a single location if only one station is used or from a location between the reporting weather stations if more than one station is used. The vector connecting this location and the location of maximum rainfall becomes the wind inflow vector used for storm transpositioning.

The storm representative dew point determined from the hourly dew point observations needs to be corrected to the 1000mb level. The elevation of the storm representative dew point location is used in this correction. The correction factor of 2.4°F per 1,000 feet of elevation is used. This is the same correction factor used in the *Climatic Atlas of the United States* (Environmental Data Services, Department of Commerce, 1968). For example, a storm representative dew point of 72°F at a station location with an elevation of 800 feet above sea level is corrected with a factor of 800 X 2.4 /1000 = 1.9°F. The dew point value corrected to 1000mb (sea level) is 72°F + 1.9°F = 74°F after rounding.

The procedure that computes the in-place maximized rainfall for a storm provides an estimate of the maximum amount of rainfall that could have been produced by the same storm at the same location if the maximum amount of atmospheric moisture had been available. This procedure requires that a maximum value for the storm representative dew point be determined. The maximum dew point value is selected at the same location where the storm dew point was determined using a maximum dew point climatology. The maximum dew point values must be corrected to 1000mb. The precipitable water in the atmosphere is determined using the storm representative and maximum dew point values. Precipitable water is defined in this study as the total

amount of moisture in a column of the atmosphere from sea level to 30,000 feet assuming a vertically saturated atmosphere. Values of atmospheric precipitable water are determined using the moist pseudo-adiabatic assumption, i.e. assume that for the given 1000mb dew point value, the atmosphere holds the maximum amount of moisture possible. The ratio of the precipitable water associated with the maximum 1000mb dew point to the precipitable water associated with the 1000-mb storm representative dew point is the maximization factor.

For example, consider the following case:

1000mb storm representative dew point:	72°F
1000mb maximum dew point:	76°F
Precipitable water associated with a 1000mb dew point of 72°F:	2.47"
Precipitable water associated with a 1000mb dew point of 76°F:	2.99"
Maximization factor: $PW(76^{\circ}F)/PW(72^{\circ}F) = 2.99''/2.47'' = 1.21$	

For transpositioning, the storm inflow vector (determined by connecting the storm representative dew point location with the location of maximum rainfall) is moved to the basin location being studied. The new location of the upwind end of the vector is determined. The maximum dew point associated with that location is then selected using the same maximum dew point climatology map used for in-place maximization. The transpositioning factor is the ratio of the precipitable water associated with the maximum 1000mb dew point value at the transpositioned location to the precipitable water associated with the maximum 1000mb dew point for the storm representative dew point location.

An example is provided.

1000mb maximum dew point at the storm representative dew point location:	76°F
1000mb maximum dew point at the transpositioned location:	74°F
Precipitable water associated with a 1000mb dew point of 76°F:	2.99"
Precipitable water associated with a 1000mb dew point of 74°F:	2.73"
Transposition factor: $PW(74^{\circ}F)/PW(76^{\circ}F) = 2.73^{\circ\prime}/2.99^{\circ\prime} = 0.91$	

Appendix D

Procedure for Deriving PMP Values from Storm Depth-Area-Duration (DAD) Analyses

Although PMP rainfall amounts are theoretical values, there currently is no theoretical method for determining the values. The accepted procedure for determining PMP values begins with the identification of the largest identified historic observed rainfall amounts in the region and applies the following procedures:

- 1. Increase the rainfall amounts to some maximized value (in-place maximization),
- 2. Adjust the "maximized" rainfall amounts to the potential situation where the historic storm occurs over the basin being studied (transposition),
- 3. Adjust the "maximized transpositioned" rainfall amounts for elevation changes or intervening topographic barriers which could potentially affect the storm moisture and subsequently the rainfall amounts for the "maximized transpositioned" storm (barrier adjustment).

The procedure begins with the Depth-Area-Duration (DAD) analysis from the largest of the identified storms that have occurred over regions that are climatologically and topographically similar to the area being studied. Identification of the largest rainfall events is relatively straight forward and is accomplished by identifying the largest station rainfall amounts and correlating the dates among adjacent stations to identify the areal extent of the heavy rainfall and the storm period. The DAD for each storm is computed using isohyetal analyses for each hour during the storm and determining the largest rainfall totals for each duration of interest over each area size of interest. HMR 51 uses temporal periods of 6-, 12-, 24-, 48- and 72- hours. Standard area sizes of 10-, 200-, 1,000-, 5,000-, 10,000- and 20,000-square miles area used. Other durations and area sizes can also be used in the DAD analysis as desired. In this study, area sizes of 50,000- and 100,000-square miles were analyzed in addition to the standard area sizes.

The US Army Corps of Engineers, the Bureau of Reclamation and the National Weather Service have performed storm studies and produced DADs for many storms. This study reviewed additional weather station data to identify extreme rainfall storms that had not been identified and studied previously. The new storms identified primarily occurred since the publication of HMRs 51 and 55A, but additional storms that occurred prior to HMR publication were also identified. DADs that had been previously developed are used in this report. Newly identified storms are analyzed in this study, and DADs are developed for these storms. These DADs quantify the rainfall associated with each storm event, providing the largest rainfall amounts for each of the durations and area sizes used in this study.

Identification of storms that can be transpositioned to the ANO basin is largely based on subjective judgments. For a storm to be transpositionable, it should have occurred over a region that is climatologically and topographically similar to the basin being studied. Storms generally should not be transpositioned across significant topographic features or into different climate regions. The largest rainfall events identified in the storm search generally occurred over locations closer to the Gulf of Mexico with moisture moving in from the south and north. These storms occurred in

similar meteorological, climatological, and topographical settings. Therefore, it is assumed that the same moisture sources and dynamics that produced these events could have produced a similar storm over the basin.

Maximization of the storm DADs involves deriving the in-place and transposition factors to adjust the observed rainfall to look like it would have occurred had the storm been located over the basin. This accounts for the three factors which could affect a particular storm as it's moved from its original location to the ANO basin; the storm could have been some amount bigger in-place had more moisture been available, the storm would have had more or less moisture available to it versus where it originally occurred based on it being moved toward or away from its moisture source, and the storm would have occurred at a lower or higher elevation than its original location.

For this study, all computations associated with historic storms are computed at the 1000mb level (approximately sea level). The elevation of the location where the largest rainfall was observed is used as the storm elevation. An adjustment is applied to the storm moisture to account for the elevation of the storm above sea level. For example, if the maximum rainfall occurred at an elevation of 500 feet, the total atmospheric moisture (500 to 30,000 feet) is decreased by the amount of moisture associated with the storm representative dew point between sea level and 500 feet. The adjustment factor uses precipitable water contained in the moisture maximized atmosphere above the storm elevation, i.e., the moisture contained in the entire depth of the moisture maximized atmosphere, minus the moisture contained in the moisture maximized atmosphere below the storm elevation. An adjustment was made to account for the storm's elevation (either higher or lower than the particular grid point basin centroid elevation) and the amount of precipitable water that would be available, more if the elevation was lower and less if the elevation was higher. This elevation adjustment factor is determined by computing the ratio of precipitable water in the moisture maximized atmosphere above the elevation to the precipitable water in the entire depth of the moisture maximized atmosphere.

The equations for the computation of the in-place maximization factor, transposition and elevation adjustment factors are as follows:

In-place maximization factor = (storm representative maximum dew point PW – in-place storm elevation maximum dew point PW) / (storm representative dew point PW – in-place storm elevation representative dew point PW)

Transpositioned/elevation to basin factor = (transpositioned maximum dew point PW – average basin elevation maximum dew point PW)/(storm representative maximum dew point PW – in-place storm elevation representative dew point PW)

Multiplication of these terms leads to a simplified computation where all the required adjustments are combined in a single equation.

Total adjustment factor = (in-place max factor) * (transpositioned/elevation to basin factor) * (barrier/elevation adjustment factor)

The total adjustment factor modifies the storm DAD by a factor using two computed values:

- 1) The maximum atmospheric moisture available to a historic storm if it were to occur over the study basin. This air mass is assumed to contain the maximum amount of atmospheric moisture for the basin location and is adjusted for elevation upwind of the basin and within the basin.
- 2) The atmospheric moisture available for the historic storm at the location and elevation where it occurred

The total adjustment factor is applied as a linear multiplier for all rainfall amounts in the storm DAD.

As an example, the DAD from the Warner Park, TN SPAS 1208 AWA Storm Number 2W storm center is maximized, transpositioned, and elevation/barrier adjusted to the basin centroid. The following are values for the parameters used in computing the adjustments:

Storm representative Td: In-place maximum Td: Transpositioned maximum Td: Storm elevation: Average basin elevation:	75.0° F 76.5° F 74.0° F 600' 1,150'
Total atmospheric precipitable water for 75.0° F:	2.85"
Total atmospheric precipitable water for 76.5° F:	3.07"
Total atmospheric precipitable water for 74.0° F:	2.73"
Adjustment for storm elevation, 1000mb to 600' at 75.0°F:	0.15"
Adjustment for storm elevation, 1000mb to 600' at 76.5°F:	0.16"
Adjustment for ave basin elevation, 1000mb to 1,150' at 74.0°F:	0.28"
Adjustment for inflow barrier elevation, 1000mb to 1150' at 74.0°F:	0.28"

Total adjustment factor =

(in-place max factor) * (transpositioned to basin factor) * (elevation/barrier adjustment factor)

```
= ((3.07" - 0.16") / (2.85" - 0.15")) * ((2.73" - 0.28") / (3.07" - 0.16")) * ((2.73" - 0.28") / (2.73" - 0.28")) = (1.08) * (0.84) * (1.00) = 0.91
```

To explicitly show how each adjustment factor (in-place maximization, transposition and elevation/barrier adjustment) affects the total adjustment, separate computation are provided.

<u>In-place maximization factor</u>

Storm representative dew point:	75.0° F
In-place maximum dew point:	76.5° F
Storm atmospheric precipitable water for 75.0° F:	2.85"
Maximum atmospheric precipitable water for 76.5° F:	3.07"
Adjustment for storm elevation, 1000mb to 600' at 75.0°F:	0.15"
Adjustment for storm elevation, 1000mb to 600' at 76.5°F:	0.16"

In-place maximization factor =

(storm representative maximum dew point PW – in place storm elevation maximum PW)/(storm representative dew point PW – in place storm elevation maximum dew point PW)

<u>Transposition factor</u>

In-place maximum dew point	76.5° F
Transpositioned maximum dew point	74.0° F
Maximum atmospheric precipitable water for 82.0° F:	3.07"
Maximum atmospheric precipitable water for 80.5° F:	2.73"
Adjustment for storm elevation, 1000mb to 600' at 76.0°F:	0.16"
Adjustment for storm elevation, 1000mb to 1,150' at 74.0°F:	0.28"

Transposition factor =

(transpositioned maximum dew point PW – basin elevation maximum dew point PW)/(storm representative maximum dew point PW – in place storm elevation maximum dew point PW)

Moisture inflow barrier adjustment factor

For this study there were no intervening barriers that would deplete moisture before reaching any of the grid points or basin centroid. Therefore, in all cases this factor was equal to 1.00.

Total adjustment factor = (In-Place maximization) X (Transposition) X (Barrier Adjustment/Storm elevation)

$$= 1.08 * 0.84 * 1.00$$

= 0.91

This is the same total adjustment computed earlier (within round-off error) using the single equation to compute the total adjustment factor.

Since these procedures involve linear multiplication, Excel spreadsheets can be used to incorporate the storm DAD and apply the factors to compute the total adjusted DAD. Each storm spreadsheet and all the data used for the calculations are presented for the PMP storms in Appendix F and the LIP storm list in Appendix G

Once the total adjustment factors are applied to all of the storms being considered, rainfall amounts from largest storms are plotted on a log-linear plot with rainfall depth plotted on the linear scale and area size plotted on the log scale. A separate graph is constructed for each duration period, e.g. 6-hour, 12-hour, etc. The graphs provide curves of the transpositioned maximized adjusted storm rainfall amounts for all area sizes. These DA curves represent the maximum rainfall potential based on standard procedure modifications of the largest observed historic storms in the region surrounding the basins. An enveloping curve is drawn using the largest rainfall values. All of the plotted rainfall amounts either lie on the enveloping curve or below it. The exception is in the case where there is reason to suspect that a value is larger than is reasonable and that rainfall value may be undercut, i.e. the envelop curve should be drawn beneath the value. Undercutting should rarely be done and each case needs to be justified. No undercutting was done in this study. In general, the enveloping curve should provide a smooth transition among the maximum rainfall values for various area sizes. This process of enveloping DA plots provides continuity in space for the rainfall amounts among various area sizes.

After enveloping curves are completed for each of the duration periods, DD curves are plotted on a linear-linear graph, with duration on one axis and depth on the other. Since there is only a single curve for each area size from the enveloped DA plots, all of DA curves can be plotted as a family of curves on a single graph. Enveloping of curves is completed for each area size. The enveloping curve should provide a smooth transition among the maximum rainfall values for various durations. This procedure of enveloping DD plots provides continuity in time for the rainfall amounts among various durations.

The final envelopment curves provide the maximum rainfall amounts that represent PMP values for each particular grid point. Rainfall amounts for each area size and each duration are taken from the curves and used to construct the PMP DAD table.

Appendix E

Storm Precipitation Analysis System (SPAS) Description

INTRODUCTION

The Storm Precipitation Analysis System (SPAS) is grounded on years of scientific research with a demonstrated reliability in hundreds of post-storm precipitation analyses. It has evolved into a trusted hydrometeorological tool that provides accurate precipitation data at a high spatial and temporal resolution for use in a variety of sensitive hydrologic applications (Faulkner et al 2004, Tomlinson et al 2003-2012). Applied Weather Associates, LLC and METSTAT, Inc. initially developed SPAS in 2002 for use in producing Depth-Area-Duration values for Probable Maximum Precipitator (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 km² and in a variety of customizable formats. To date (April 2012) SPAS has been used to analyze over 230 storm centers across all types of terrain, among highly varied meteorological settings and some occurring over 100-years ago.

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 increased spatial and temporal accuracy of precipitation estimates has eliminated the need for commonly made assumptions about precipitation characteristics (such as uniform precipitation over a watershed), thereby greatly improving the precision and reliability of hydrologic analyses.

In order to instill consistency in SPAS analyses, many of the core methods have remained consistent from beginning. However, SPAS is constantly evolving and improving through new scientific advancements and as new data and improvements are incorporated. This write-up describes the current inter-workings of SPAS, but the reader should realize SPAS can be customized on a case-by-case basis to account for special circumstances; these adaptations are documented and included in the deliverables. The over arching goal of SPAS is to combine the strengths of rain gauge data and radar data (when available) to provide sound, reliable and accurate spatial precipitation data.

Hourly precipitation observations are generally limited to a small number of locations, with many basins lacking observational precipitation data entirely. Meanwhile Next Generation Radar (NEXRAD) data provides valuable spatial and temporal information over data-sparse basins, it has historically lacked reliability for determining precipitation rates and reliable quantitative precipitation estimates (QPE). The improved reliability in SPAS is made possible by hourly calibration of the NEXRAD radar-precipitation relationship, combined with local hourly bias adjustments to force consistency between the final result and "ground truth" precipitation measurements. If NEXRAD radar data is available (generally for storm events since the mid-1990's), precipitation at temporal scales as frequent as 5-minutes is available, otherwise the precipitation data is available hourly. A summary of the general SPAS processes are shown in flow chart in Figure E.0.

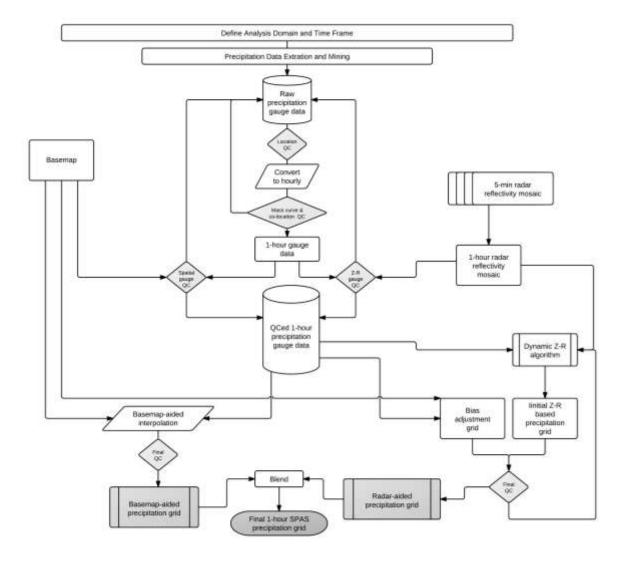


Figure E.0 SPAS flow chart.

SETUP

Prior to a SPAS analysis careful definition of the storm analysis domain and time frame to be analyzed is established. Several considerations are made to ensure the domain (longitude-latitude box) and time frame are sufficient for the given application.

SPAS Analysis Domain

For PMP applications it is important to establish an analysis domain that completely encompasses a storm center, meanwhile hydrologic modeling applications are more concerned about a specific basin, watershed or catchment. If radar data is available, then it is also important to establish an area large enough to encompass enough stations (minimum of \sim 30) to adequately derive reliable radar-precipitation intensity relationships

(discussed later). The domain is defined by evaluating existing documentation on the storm as well as plotting and evaluating initial precipitation gauge data on a map. The analysis domain is defined to include as many hourly recording gauges as possible given their importance in timing. The domain must include enough of a buffer to accurately model the nested domain of interest. The domain is defined as a longitude-latitude (upper left and lower right corner) rectangular region.

SPAS Analysis Time Frame

Ideally, the analysis time frame, also referred to as the Storm Precipitation Period (SPP), will extend from a dry period through the target wet period then back into another dry period. This is to ensure that total storm precipitation amounts can be confidently associated with the storm in question and not contaminated by adjacent wet periods. If this is not possible, a reasonable time period is selected that is bounded by relatively lighter precipitation. The time frame of the hourly data must be sufficient to capture the full range of daily gauge observational periods in order for the daily observations to be disaggregated into estimated incremental hourly values (discussed later). For example, if a daily gauge takes observations at 8:00 AM, then the hourly data must be available from 8:00 AM the day prior. Given the configuration of SPAS, the minimum SPP is 72 hours and aligns midnight to midnight.

The core precipitation period (CPP) is a sub-set of the SPP and represents the time period with the most precipitation and the greatest number of reporting gauges. The CPP represents the time period of interest and where our confidence in the results is highest.

DATA

The foundation of a SPAS analysis is the "ground truth" precipitation measurements. In fact, the level of effort involved in "data mining" and quality control represent over half of the total level of effort needed to conduct a complete storm analysis. SPAS operates with three primary data sets: precipitation gauge data, a "basemap" and, if available, radar data. Table E.0 conveys the variety of precipitation gauges usable by SPAS. For each gauge, the following elements are gathered, entered and archived into to SPAS database:

- Station ID
- Station name
- Station type (H=hourly, D=Daily, S=Supplemental, etc.)
- Longitude in decimal degrees
- Latitude in decimal degrees
- Elevation in feet above MSL
- Observed precipitation
- Observation times
- Source
- If unofficial, the measurement equipment and/or method is also noted.

Based on the SPP and analysis domain, hourly and daily precipitation gauge data are extracted from our in-house database as well as the Meteorological Assimilation Data Ingest System (MADIS). Our in-house database is contains data dating back to the late 1800s, while the MADIS system (described below) contains archived data back to 2002.

Hourly Precipitation Data

Our hourly precipitation database is largely comprised of data from NCDC TD-3240, but also precipitation data from other mesnonets and meteorological networks (e.g. ALERT, Flood Control Districts, etc.) that we have collected and archived as part of previous studies. Meanwhile, MADIS provides data from a large number of networks across the U.S., including NOAA's HADS (Hydrometeorological Automated Data System), numerous mesonets, the Citizen Weather Observers Program (CWOP), departments of transportation, etc. (see http://madis.noaa.gov/mesonet providers.html for a list of providers). Although our automatic data extraction is fast, cost-effective and efficient, it never captures all of the available precipitation data for a storm event. For this reason, a thorough "data mining" effort is undertaken to acquire all available data from sources such as U.S. Geological Survey (USGS), Remote Automated Weather Stations (RAWS), Community Collaborative Rain, Hail & Snow Network (CoCoRaHS), National Atmospheric Deposition Program (NADP), Clean Air Status and Trends Network (CASTNET), local observer networks, Climate Reference Network (CRN), Global Summary of the Day (GSD) and Soil Climate Analysis Network (SCAN). Unofficial hourly precipitation are gathered to give guidance on either timing or magnitude in areas otherwise void of precipitation data. The WeatherUnderground and MesoWest, two of the largest weather databases on the Internet, contain a good deal of official data, but also unofficial gauges.

Table E.0 Different precipitation gauge types used by SPAS.

Precipitation Gauge Type	Description
Hourly	Hourly gauges with complete, or nearly complete, incremental hourly precipitation data.
Hourly estimated	Hourly gauges with some estimated hourly values, but otherwise reliable.
Hourly pseudo	Hourly gauges with reliable temporal precipitation data, but the magnitude is questionable in relation to co-located daily or supplemental gauge.
Daily	Daily gauge with complete data and known observation times.

Daily estimated	Daily gauges with some or all estimated
	data.
Supplemental	Gauges with unknown or irregular
	observation times, but reliable total storm
	precipitation data. (E.g. public reports,
	storms reports, "Bucket surveys", etc.)
Supplemental estimated	Gauges with estimated total storm
	precipitation values based on other
	information (e.g. newspaper articles,
	stream flow discharge, inferences from
	nearby gauges, pre-existing
	total storm isohyetal maps, etc.)

Daily Precipitation Data

Our daily database is largely based on NCDC's TD-3206 (pre-1948) and TD-3200 (1948 through present) as well as SNOTEL data from NRCS. Since the late 1990s, the CoCoRaHS network of more than 15,000 observes in the U.S. has become a very important daily precipitation source. Other daily data is gathered from similar, but smaller gauge networks, for instance the High Spatial Density Precipitation Network in Minnesota.

As part of the daily data extraction process, the time of observation, as indicted in database (if available), accompanies each measured precipitation value. Accurate observation times are necessary for SPAS to disaggregate the daily precipitation into estimated incremental values (discussed later). Knowing the observation time also allows SPAS to maintain precipitation amounts within given time bounds, thereby retaining known precipitation intensities. Given the importance of observation times, efforts are taken to insure the observation times are accurate. Hardcopy reports of "Climatological Data," scanned observational forms (available on-line) and/or gauge metadata forms have proven to be valuable and accurate resources for validating observation times. Furthermore, erroneous observation times are identified in the mass-curve quality-control procedure (discussed later) and can be corrected at that point in the process.

Supplemental Precipitation Gauge Data

For gauges with unknown or irregular observation times, the gauge is considered a "supplemental" gauge. A supplemental gauge can either be added to the storm database with a storm total and the associated SPP as the temporal bounds or as a gauge with the known, but irregular observation times and associated precipitation amounts. For instance, if all that is known is 3" fell between 0800-0900, then that information can be entered. Gauges or reports with nothing more than a storm total are often abundant, but in order to use them, it is important the precipitation is only from the storm period in question. Therefore, it is ideal to have the analysis time frame bounded by dry periods.

Perhaps the most important source of data, if available, is from "bucket surveys," which provide comprehensive lists of precipitation measurements collected during a post-storm field exercise. Although some bucket survey amounts are not from conventional precipitation gauges, they provide important information, especially in areas lacking data. Particularly for PMP-storm analysis applications, it is customary to accept extreme, but valid non-measured precipitation values in order to capture the highest precipitation values

Basemap

"Basemaps" are independent grids of spatially distributed weather or climate variables that are used to govern 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 to govern the spatial resolution. Note that a base map is not required as the hourly precipitation patterns can be based on a station characteristics and an inverse distance weighting technique (discussed later). Basemaps in complex terrain are often based on the PRISM mean monthly precipitation (Figure E.1a) or Hydrometeorological Design Studies Center precipitation frequency grids (Figure E.1b) given they resolve orographic enhancement areas and micro-climates at a spatial resolution of 30-seconds (about 800 m). Basemaps of this nature in flat terrain are not as effective given the small terrain forced precipitation gradients. Therefore, basemaps for SPAS analyses in flat terrain are often developed from pre-existing (hand-drawn) isohyetal patterns (Figure E.1c), composite radar imagery or a blend of both.

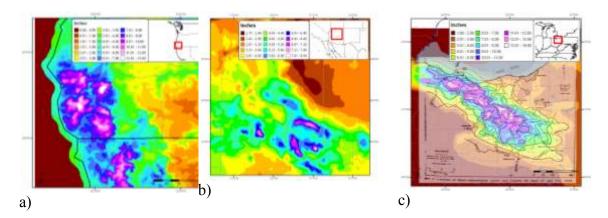


Figure E.1 Sample SPAS "basemaps:" (a) A pre-existing (USGS) isohyetal pattern across flat terrain (SPAS 1209), (b) PRISM mean monthly (October) precipitation (SPAS 1192) and (c) A 100-year 24-hour precipitation grid from NOAA Atlas 14 (SPAS 1138).

Radar Data

For storms occurring since approximately the mid-1990's, weather radar data is available to supplement the SPAS analysis. A fundamental requirement for high quality radarestimated precipitation is a high quality radar mosaic, which is a seamless collection of

concurrent weather radar data from individual radar sites, however in some cases a single radar is sufficient (i.e. for a small area size storm event such as a thunderstorm). Weather radar data has been in use by meteorologists since the 1960's to estimate precipitation depths, but it was not until the early 1990's that new, more accurate NEXRAD Doppler radar (WSR88D) was placed into service across the United States. Currently efforts are underway to convert the WSR88D radars to dual polarization (DualPol) radar. Today, NEXRAD radar coverage of the contiguous United States is comprised of 159 operational sites and 30 in Canada. Each U.S. radar covers an approximate 285 mile (460 km) radial extent and while Canadian radars have approximately 256 km (138 nautical miles) radial extent over which the radar can detect precipitation. (see Figure E.2) The primary vendor of NEXRAD weather radar data for SPAS is Weather Decision Technologies, Inc. (WDT), who accesses, mosaics, archives and quality-controls NEXRAD radar data from NOAA and Environment Canada. SPAS utilizes Level II NEXRAD radar reflectivity data in units of dBZ, available every 5-minutes in the U.S. and 10-minutes in Canada.

NEXRAD Coverage Below 10,000 Feet AGL

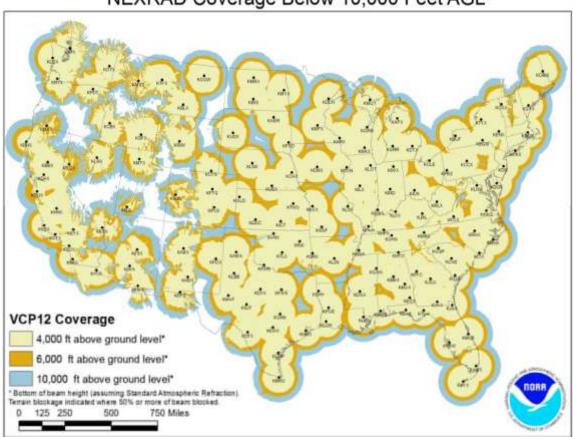


Figure E.2 U.S. radar locations and their radial extents of coverage below 10,000 feet above ground level (AGL). Each U.S. radar covers an approximate 285 mile radial extent over which the radar can detect precipitation.

The WDT and National Severe Storms Lab (NSSL) Radar Data Quality Control Algorithm (RDQC) removes non-precipitation artifacts from base Level–II radar data and remaps the data from polar coordinates to a Cartesian (latitude/longitude) grid. Non-precipitation artifacts include ground clutter, bright banding, sea clutter, anomalous propagation, sun strobes, clear air returns, chaff, biological targets, electronic interference and hardware test patterns. The RDQC algorithm uses sophisticated data processing and a Quality Control Neural Network (QCNN) to delineate the precipitation echoes caused by radar artifacts (Lakshmanan and Valente 2004). Beam blockages due to terrain are mitigated by using 30 meter DEM data to compute and then discard data from a radar beam that clears the ground by less than 50 meters and incurs more than 50% power blockage. A clear-air echo removal scheme is applied to radars in clear-air mode when there is no precipitation reported from observation gauges within the vicinity of the radar. In areas of radar coverage overlap, a distance weighting scheme is applied to assign reflectivity to each grid cell, for multiple vertical levels. This scheme is applied to data from the nearest radar that is unblocked by terrain.

Once the data from individual radars have passed through the RDQC, they are merged to create a seamless mosaic for the United States and southern Canada as shown in Figure E.3. A multi-sensor quality control can be applied by post-processing the mosaic to remove any remaining "false echoes". This technique uses observations of infra-red cloud top temperatures by GOES satellite and surface temperature to create a precipitation/no-precipitation mask. Figure 4 shows the impact of WDT's quality control measures. Upon completing all QC, WDT converts the radar data from its native polar coordinate projection (1 degree x 1.0 km) into a longitude-latitude Cartesian grid (based on the WGS84 datum), at a spatial resolution of ~1/3rd-square mile for processing in SPAS.

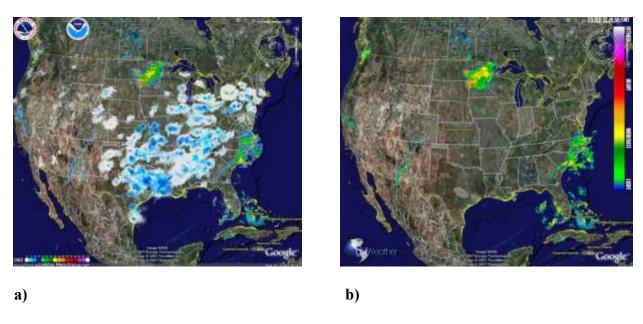


Figure E.3 (a) Level-II radar mosaic of CONUS radar with no quality control, (b) WDT quality controlled Level-II radar mosaic.

SPAS conducts further QC on the radar mosaic by infilling areas contaminated by beam blockages. Beam blocked areas are objectively determined by evaluating total storm reflectivity grid which naturally amplifies areas of the SPAS analysis domain suffering from beam blockage as shown in Figure E.4.

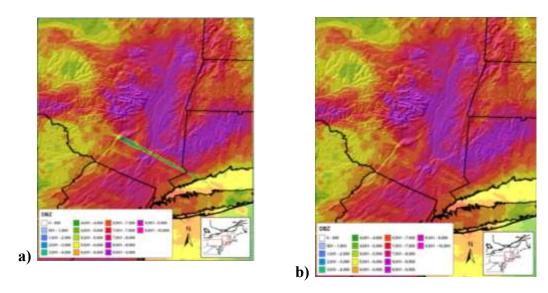


Figure E.4 Illustration of SPAS-beam blockage infilling where (a) is raw, blocked radar and (b) is filled for a 42-hour storm event.

METHODOLOGY

Daily and Supplemental Precipitation to Hourly

To obtain one hour temporal resolutions and utilize all gauge data, it is necessary to disaggregate the daily and supplemental precipitation observations into estimated hourly amounts. This process has traditionally been accomplished by distributing (temporally) the precipitation at each daily/supplemental gauge in accordance to a single nearby hourly gauge (Thiessen polygon approach). However, this may introduce biases and not correctly represent hourly precipitation at daily/supplemental gauges situated in-between hourly gauges. Instead, SPAS uses a spatial approach by which the estimated hourly precipitation at each daily and supplemental gauge is governed by a distance weighted algorithm of all nearby true hourly gauges.

In order to disaggregate (i.e. distribute) daily/supplemental gauge data into estimate hourly values, the true hourly gauge data is first evaluated and quality controlled using synoptic maps, nearby gauges, orographic effects, gauge history and other documentation on the storm. Any problems with the hourly data are resolved, and when possible/necessary accumulated hourly values are distributed. If an hourly value is missing, the analyst can choose to either estimate it or leave it missing for SPAS to estimate later based on nearby hourly gauges. At this point in the process, pseudo (hourly) gauges can be added to represent precipitation timing in topographically

complex locations, areas with limited/no hourly data or to capture localized convention. In order to adequately capture the temporal variations of the precipitation a pseudo hourly gauge is sometimes necessary. A pseudo gauge is created by distributing the precipitation at a co-located daily gauge or by creating a completely new pseudo gauge from other information such as inferences from COOP observation forms, METAR visibility data (if hourly precipitation isn't already available), lightning data, satellite data, or radar data. Often radar data is the best/only choice for creating pseudo hourly gauges, but this is done cautiously given the potential differences (over-shooting of the radar beam equating to erroneous precipitation) between radar data and precipitation. In any case, the pseudo hourly gauge is flagged so SPAS only uses it for timing and not magnitude. Care is taken to ensure hourly pseudo gauges represent justifiably important physical and meteorological characteristics before being incorporated into the SPAS database. Although pseudo gauges provide a very important role, their use is kept to a minimum. The importance of insuring the reliability of every hourly gauge cannot be over emphasized. All of the final hourly gauge data, including pseudos, are included in the hourly SPAS precipitation database.

Using the hourly SPAS precipitation database, each hourly precipitation value is converted into a percentage that represents the incremental hourly precipitation divided by the total SPP precipitation. The GIS-ready x-y-z file is constructed for each hour that contains the latitude (x), longitude(y) and percent of precipitation (z) for a particular hour. Using the GRASS GIS, an inverse-distance-weighting squared (IDW) interpolation technique is applied to each of the hourly files. The result is a continuous grid with percentage values for the entire analysis domain, keeping the grid cells on which the hourly gauge resides faithful to the observed/actual percentage. Since the percentages typically have a high degree of spatial autocorrelation, the spatial interpolation has skill in determining the percentages between gauges, especially since the percentages are somewhat independent of the precipitation magnitude. The end result is a GIS grid for each hour that represents the percentage of the SPP precipitation that fell during that hour.

After the hourly percentage grids are generated and QC'ed for the entire SPP, a program is executed that converts the daily/supplemental gauge data into incremental hourly data. The timing at each of the daily/supplemental gauges is based on (1) the daily/supplemental gauge observation time, (2) daily/supplemental precipitation amount and (3) the series of interpolated hourly percentages extracted from grids (described above).

This procedure is detailed in Figure E.5 below. In this example, a supplemental gauge reported 1.40" of precipitation during the storm event and is located equal distance from the three surrounding hourly recording gauges. The procedure steps are:

Step 1. For each hour, extract the percent of SPP from the hourly gauge-based percentage at the location of the daily/supplemental gauge. In this example, assume these values are the average of all the hourly gauges.

Step 2. Multiply the individual hourly percentages by the total storm precipitation at the daily/supplemental gauge to arrive at estimated hourly precipitation at the daily/supplemental gauge. To make the daily/supplemental accumulated precipitation data faithful to the daily/supplemental observations, it is sometimes necessary to adjust the hourly percentages so they add up to 100% and account for 100% of the daily observed precipitation.

			Hou	ır			
Precipitation	1	2	3	4	5	6	Total
Hourly station 1	0.02	0.12	0.42	0.50	0.10	0.00	1.16
Hourly station 2	0.01	0.15	0.48	0.62	0.05	0.01	1.32
Hourly station 3	0.00	0.18	0.38	0.55	0.20	0.05	1.36
			Hou	ır			
Percent of total storm precip.	1	2	3	4	5	6	Total
Hourly station 1	2%	10%	36%	43%	9%	0%	100%
Hourly station 2	1%	11%	36%	47%	4%	1%	100%
Hourly station 3	0%	13%	28%	40%	15%	4%	100%
Average	1%	12%	34%	44%	9%	1%	100%
Storm total precipitation at da	ily gauge			1.40			
			Hou	ır			
Precipitation (estimated)	1	2	3	4	5	6	Total
Daily station	0.01	0.16	0.47	0.61	0.13	0.02	1.40

Figure E.5 Example of disaggregation of daily precipitation into estimated hourly precipitation based on three (3) surrounding hourly recording gauges.

In cases where the hourly grids do not indicate any precipitation falling during the daily/supplemental gauge observational period, yet the daily/supplemental gauge reported precipitation, the daily/supplemental total precipitation is evenly distributed throughout the hours that make up the observational period; although this does not happen very often, this solution is consistent with NWS procedures. However, the SPAS analyst is notified of these cases in a comprehensive log file, and in most cases they are resolvable, sometimes with a pseudo hourly gauge.

GAUGE QUALITY CONTROL

Exhaustive quality control measures are taken throughout the SPAS analysis. Below are a few of the most significant QC measures taken.

Mass Curve Check

A mass curve-based QC-methodology is used to ensure the timing of precipitation at all gauges is consistent with nearby gauges. SPAS groups each gauge with the nearest four gauges (regardless of type) into a single file. These files are subsequently used in software for graphing and evaluation. Unusual characteristics in the mass curve are

investigated and the gauge data corrected, if possible and warranted. See Figure E.6 for an example.

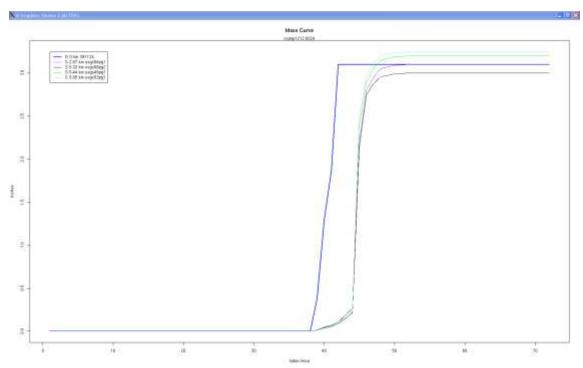


Figure E.6 Sample mass curve plot depicting a precipitation gauge with an erroneous observation time (blue line). X-axis is the SPAS index hour and the y-axis is inches. The statistics in the upper left denote gauge type, distance from target gauge (in km), and gauge ID. In this example, the center gauge (blue line) was found to have an observation error/shift of 1 day.

Gauge Mis-location Check

Although the gauge elevation is not explicitly used in SPAS, it is however used as a means of QCing gauge location. Gauge elevations are compared to a high-resolution 15-second DEM to identify gauges with large differences, which may indicate erroneous longitude and/or latitude values.

Co-located Gauge QC

Care is also taken to establish the most accurate precipitation depths at all co-located gauges. In general, where a co-located gauge pair exists, the highest precipitation is accepted (if accurate). If the hourly gauge reports higher precipitation, then the co-located daily (or supplemental) is removed from the analysis since it would not add anything to the analysis. Often daily (or supplemental) gauges report greater precipitation than a co-located hourly station since hourly tipping bucket gauges tend to suffer from gauge under-catch, particularly during extreme events, due to loss of precipitation during tips. In these cases the daily/supplemental is retained for the

magnitude and the hourly used as a pseudo hourly gauge for timing. Large discrepancies between any co-located gauges are investigated and resolved since SPAS can only utilize a single gauge magnitude at each co-located site.

SPATIAL INTERPOLATION

At this point the QCed observed hourly and disaggregated daily/supplemental hourly precipitation data are spatially interpolated into hourly precipitation grids. SPAS has three options for conducting the hourly precipitation interpolation, depending on the terrain and availability of radar data, thereby allowing SPAS to be optimized for any particular storm type or location. Figure E.7 depicts the results of each spatial interpolation methodology based on the same precipitation gauge data.

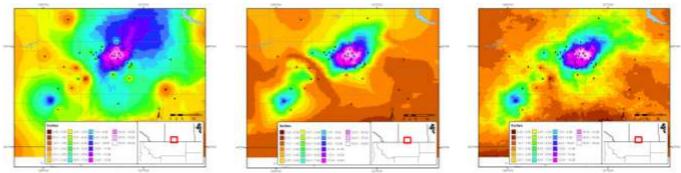


Figure E.7 Depictions of total storm precipitation based on the three SPAS interpolation methodologies for a storm (SPAS 1177, Vanguard, Canada) across flat terrain: (a) no basemap, (b) basemap-aided and (3) radar.

Basic Approach

The basic approach interpolates the hourly precipitation point values to a grid using an inverse distance weighting squared GIS algorithm. This is sometimes the best choice for convective storms over flat terrain when radar data is not available, yet high gauge density instills reliable precipitation patterns. This approach is rarely used.

Basemap Approach

Another option includes the use of a "basemap", also known as a climatologically-aided interpolation (Hunter 2005). As noted before, the spatial patterns of the basemap govern the interpolation between points of hourly precipitation estimates, while the actual hourly precipitation values govern the magnitude. This approach to interpolating point data across complex terrain is widely used. In fact, it was used extensively by the NWS during their storm analysis era from the 1940s through the 1970s.

In application, the hourly precipitation gauge values are first normalized by the corresponding grid cell value of the basemap before being interpolated. The normalization allows information and knowledge from the basemap to be transferred to

the spatial distribution of the hourly precipitation. Using an IDW squared algorithm, the normalized hourly precipitation values are interpolated to a grid. The resulting grid is then multiplied by the basemap grid to produce the hourly precipitation grid. This is repeated each hour of the storm.

Radar Approach

The coupling of SPAS with NEXRAD provides the most accurate method of spatially and temporally distributing precipitation. To increase the accuracy of the results however, quality-controlled precipitation observations are used for calibrating the radar reflectivity to rain rate relationship (Z-R relationship) each hour instead of assuming a default Z-R relationship. Also, spatial variability in the Z-R relationship is accounted for through local bias corrections (described later). The radar approach involves several steps, each briefly described below. The radar approach cannot operate alone – either the basic or basemap approach must be completed before radar data can be incorporated.

Z-R Relationship

SPAS derives high quality precipitation estimates by relating quality controlled level—II NEXRAD radar reflectivity radar data with quality-controlled precipitation gauge data in order to calibrate the Z-R (radar reflectivity, Z, and precipitation, R) relationship. Optimizing the Z-R relationship is essential for capturing temporal changes in the Z-R. Most current radar-derived precipitation techniques rely on a constant relationship between radar reflectivity and precipitation rate for a given storm type (e.g. tropical, convective), vertical structure of reflectivity and/or reflectivity magnitudes. This non-linear relationship is described by the Z-R equation below:

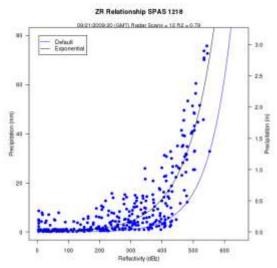


Figure E.8 Example SPAS (denoted as "Exponential") vs. default Z-R relationship (SPAS #1218, Georgia September 2009).

$$Z = A R^b \tag{1}$$

Where Z is the radar reflectivity (measured in units of dBZ), R is the precipitation (precipitation) rate (millimeters per hour), A is the "multiplicative coefficient" and b is the "power coefficient". Both A and b are directly related to the rain drop size distribution (DSD) and rain drop number distribution (DND) within a cloud (Martner and Dubovskiy 2005). The variability in the results of Z versus R is a direct result of differing DSD, DND and air mass characteristics (Dickens 2003). The

DSD and DND are determined by complex interactions of microphysical processes that fluctuate regionally, seasonally, daily, hourly, and even within the same cloud. For these

reasons, SPAS calculates an optimized Z-R relationship across the analysis domain each hour based on observed precipitation rates and radar reflectivity (see Figure E.8).

The National Weather Service (NWS) utilizes different default Z-R algorithms, depending on the precipitation-causing event, to estimate precipitation through the use of NEXRAD radar reflectivity data across the United States (see Figure E.90) (Baeck and Smith 1998 and Hunter 1999). A default Z-R relationship of $Z = 300R^{1.4}$ is the primary algorithm used throughout the continental U.S. However, it is widely known that this, compared to unadjusted radar-aided estimates of precipitation, suffers from deficiencies that may lead to significant over or under-estimation of precipitation.

RELATIONSHIP	Optimum for:	Also recommended for:
Marshall-Palmer (z=200R ^{1.6})	General stratiform precipitation	g.
East-Cool Stratiform (z=130R ^{2.0})	Winter stratiform precipitation - east of continental divide	Orographic rain - East
West-Cool Stratiform (z=75R ^{2.0})	Winter stratiform precipitation - west of continental divide	Orographic rain - West
WSR-88D Convective (z=300R ^{1.4})	Summer deep convection	Other non-tropical convection
Rosenfeld Tropical (z=250R ^{1.2})	Tropical convective systems	6

Figure E.9 Commonly used Z-R algorithms used by the NWS.

Instead of adopting a standard Z-R, SPAS utilizes a least squares fit procedure for optimizing the Z-R relationship each hour of the SPP. The process begins by determining if sufficient (minimum 12) observed hourly precipitation and radar data pairs are available to compute a reliable Z-R. If insufficient (<12) gauge pairs are available, then SPAS adopts the previous hour Z-R relationship, if available, or applies a user-defined default Z-R algorithm from Figure 9. If sufficient data are available, the one hour sum of NEXRAD reflectivity (Z) is related to the 1-hour precipitation at each gauge. A least-squares-fit exponential function using the data points is computed. The resulting best-fit, one hour-based Z-R is subjected to several tests to determine if the Z-R relationship and its resulting precipitation rates are within a certain tolerance based on the R-squared fit measure and difference between the derived and default Z-R precipitation results. Experience has shown the actual Z-R versus the default Z-R can be significantly different (Figure E.10).

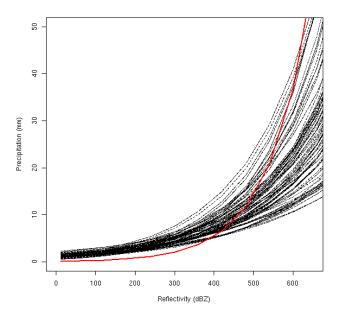


Figure E.10 Comparison of the SPAS optimized hourly Z-R relationships (black lines) versus a default Z=75R2.0 Z-R relationship (red line) for a period of 99 hours for a storm over southern California.

Radar-aided Hourly Precipitation Grids

Once a mathematically optimized hourly Z-R relationship is determined, it is applied to the total hourly Z grid to compute an initial precipitation rate (inches/hour) at each grid cell. To account for spatial differences in the Z-R relationship, SPAS computes residuals, the difference between the initial precipitation analysis (via the Z-R equation) and the actual "ground truth" precipitation (observed – initial analysis), at each gauge. The point residuals, also referred to as local biases, are normalized and interpolated to a residual grid using an inverse distance squared weighting algorithm. A radar-based hourly precipitation grid is created by adding the residual grid to the initial grid; this allows the precipitation at the grid cells for which gauges are "on" to be true and faithful to the gauge measurement. The pre-final radar-aided precipitation grid is subject to some final, visual QC checks to ensure the precipitation patterns are consistent with the terrain; these checks are particularly important in areas of complex terrain where even QCed radar data can be unreliable. The next incremental improvement with SPAS program will come as the NEXRAD radar sites are upgraded to dual-polarimetric capability.

Radar- and Basemap-Aided Hourly Precipitation Grids

At this stage of the radar approach, a radar- and basemap-aided hourly precipitation grid exists for each hour. At locations with precipitation gauges, the grids are equal, however elsewhere the grids can vary for a number of reasons. For instance, the basemap-aided hourly precipitation grid may depict heavy precipitation in an area of complex terrain, blocked by the radar, whereas the radar-aided hourly precipitation grid may suggest little, if any, precipitation fell in the same area. Similarly, the radar-aided hourly precipitation

grid may depict an area of heavy precipitation in flat terrain that the basemap-approach missed since the area of heavy precipitation occurred in an area without gauges. SPAS uses an algorithm to compute the hourly precipitation at each pixel given the two results. Areas that are completely blocked from a radar signal are accounted for with the basemap-aided results (discussed earlier). The precipitation in areas with orographically effective terrain and reliable radar data are governed by a blend of the basemap- and radar-aided precipitation. Elsewhere, the radar-aided precipitation is used exclusively. This blended approach has proven effective for resolving precipitation in complex terrain, yet retaining accurate radar-aided precipitation across areas where radar data is reliable. Figure E.11 illustrates the evolution of final precipitation from radar reflectivity in an area of complex terrain in southern California.

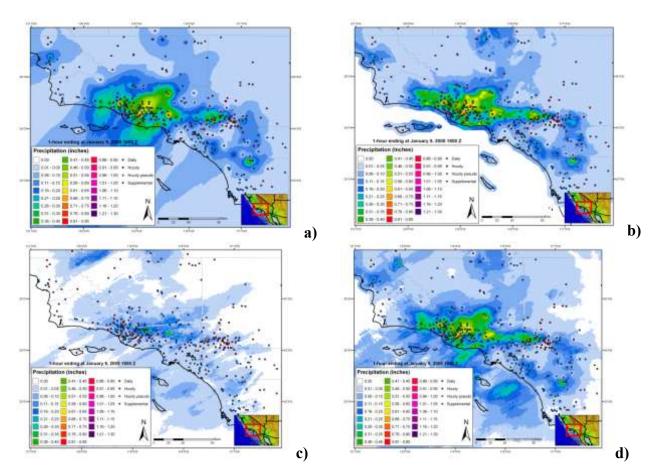


Figure E.11 A series of maps depicting 1-hour of precipitation utilizing (a) inverse distance weighting of gauge precipitation, (b) gauge data together with a climatologically-aided interpolation scheme, (c) default Z-R radar-estimated interpolation (no gauge correction) and (d) SPAS precipitation for a January 2005 storm in southern California, USA.

SPAS versus Gauge Precipitation

Performance measures are computed and evaluated each hour to detect errors and inconsistencies in the analysis. The measures include: hourly Z-R coefficients, observed hourly maximum precipitation, maximum gridded precipitation, hourly bias, hourly mean absolute error (MAE), root mean square error (RMSE), and hourly coefficient of determination (r^2) .

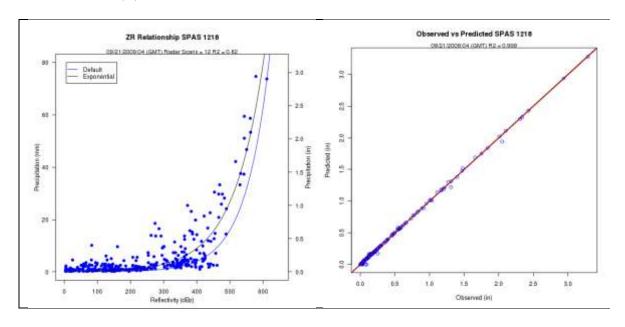


Figure E.12 Z-R plot (a), where the blue line is the SPAS derived Z-R and the black line is the default Z-R, and the (b) associated observed versus SPAS scatter plot at gauge locations.

Comparing SPAS-calculated precipitation (R_{spas}) to observed point precipitation depths at the gauge locations provides an objective measure of the consistency, accuracy and bias. Generally speaking SPAS is usually within 5% of the observed precipitation (see Figure E.12). Less-than-perfect correlations between SPAS precipitation depths and observed precipitation at gauged locations could be the result of any number of issues, including:

- **Point versus area:** A rain gauge observation represents a much smaller area than the area sampled by the radar. The area that the radar is sampling is approximately 1 km², whereas a rain gauge only samples approximately 8.0x10⁻⁹ km². Furthermore, the radar data represents an average reflectivity (Z) over the grid cell, when in fact the reflectivity can vary across the 1 km² grid cell. Therefore, comparing a grid cell radar derived precipitation value to a gauge (point) precipitation depth measured may vary.
- Precipitation gauge under-catch: Although we consider gauge data "ground truth," we recognize gauges themselves suffer from inaccuracies. Precipitation

gauges, shielded and unshielded, inherently underestimate total precipitation due to local airflow, wind under-catch, wetting, and evaporation. The wind under-catch errors are usually around 5% but can be as large as 40% in high winds (Guo et al 2001, Duchon and Essenberg 2001, Ciach 2003, Tokay et al 2010). Tipping buckets miss a small amount of precipitation during each tip of the bucket due to the bucket travel and tip time. As precipitation intensities increase, the volumetric loss of precipitation due to tipping tends to increase. Smaller tipping buckets can have higher volumetric losses due to higher tip frequencies, but on the other hand capture higher precision timing.

- Radar Calibration: NEXRAD radars calibrate reflectivity every volume scan, using an internally generated test. The test determines changes in internal variables such as beam power and path loss of the receiver signal processor since the last off-line calibration. If this value becomes large, it is likely that there is a radar calibration error that will translate into less reliable precipitation estimates. The calibration test is supposed to maintain a reflectivity precision of 1 dBZ. A 1 dBZ error can result in an error of up to 17% in R_{spas} using the default Z-R relationship Z=300R^{1.4}. Higher calibration errors will result in higher R_{spas} errors. However, by performing correlations each hour, the calibration issue is minimized in SPAS.
- Attenuation: Attenuation is the reduction in power of the radar beams' energy as it travels from the antenna to the target and back. It is caused by the absorption and the scattering of power from the beam by precipitation. Attenuation can result in errors in Z as large as 1 dBZ especially when the radar beam is sampling a large area of heavy precipitation. In some cases, storm precipitation is so intense (>12 inches/hour) that individual storm cells become "opaque" and the radar beam is totally attenuated. Armed with sufficient gauge data however, SPAS will overcome attenuation issues.
- Range effects: The curvature of the Earth and radar beam refraction result in the radar beam becoming more elevated above the surface with increasing range. With the increased elevation of the radar beam comes a decrease in Z values due to the radar beam not sampling the main precipitation portion of the cloud (i.e. "over topping" the precipitation and/or cloud altogether). Additionally, as the radar beam gets further from the radar, it naturally samples a larger and larger area, therefore amplifying point versus area differences (described above).
- Radar Beam Occultation/Ground Clutter: Radar occultation (beam blockage) results when the radar beam's energy intersects terrain features as depicted in Figure E.13. The result is an increase in radar reflectivity values that can result in higher than normal precipitation estimates. The WDT processing algorithms account for these issues, but SPAS uses GIS spatial interpolation functions to infill areas suffering from poor or no radar coverage.

• Anomalous Propagation (AP) - AP is false reflectivity echoes produced by unusual rates of refraction in the atmosphere. WDT algorithms remove most of the AP and false echoes, however in extreme cases the air near the ground may be so cold and dense that a radar beam that starts out moving upward is bent all the way down to the ground. This produces erroneously strong echoes at large distances from the radar. Again, equipped with sufficient gauge data, the SPAS bias corrections will overcome AP issues.

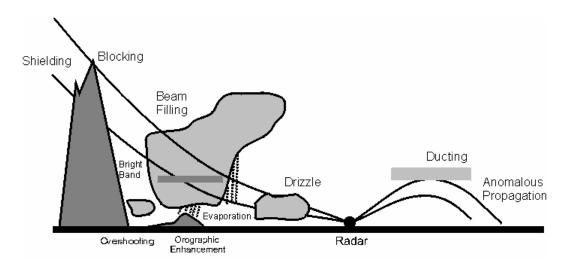


Figure E.13 Depiction of radar artifacts. (Source: Wikipedia)

SPAS is designed to overcome many of these short-comings by carefully using radar data for defining the spatial patterns and relative magnitudes of precipitation, but allowing measured precipitation values ("ground truth") at gauges to govern the magnitude. When absolutely necessary, the observed precipitation values at gauges are nudged up (or down) to force the SPAS results to be consistent with observed gauge values. Nudging gauge precipitation values helps to promote better consistency between the gauge value and the gridcell value, even though these two values sometimes should not be the same since they are sampling different area sizes. For reasons discussed in the "SPAS versus Gauge Precipitation" section, the gauge value and gridcell value can vary. Plus, SPAS is designed to toss observed individual hourly values that are grossly inconsistent with the radar data, hence driving a difference between the gauge and gridcell. In general, when the gauge and gridcell value differ by more than 15% and/or 0.50 inches, and the gauge data has been validated, then it is justified to nudge (artificially increase or decrease) the observed gauge value to "force" SPAS to derive a gridcell value equal to the observed value. Sometimes simply shifting the gauge location to an adjacent gridcell resolves the problems. Regardless, a large gauge versus gridcell difference is a "red flag" and sometimes the result of an erroneous gauge value or a mis-located gauge, but in some cases the difference can only be resolved by nudging the precipitation value.

Before final results are declared, a precipitation intensity check is conducted to ensure the spatial patterns and magnitudes of the maximum storm intensities at 1-, 6-, 12-, etc. hours

are consistent with surrounding gauges and published reports. Any erroneous data are corrected and SPAS re-run. Considering all of the QA/QC checks in SPAS, it typically requires 5-15 basemap SPAS runs and, if radar data is available, another 5-15 radar-aided runs, to arrive at the final output.

Test Cases

To check the accuracy of the DAD software, three test cases were evaluated.

"Pyramidville" Storm

The first test was that of a theoretical storm with a pyramid shaped isohyetal pattern. This case was called the Pyramidville storm. It contained 361 hourly stations, each occupying a single grid cell. The configuration of the Pyramidville storm (see Figure E.14) allowed for uncomplicated and accurate calculation of the analytical DA truth independent of the DAD software. The main motivation of this case was to verify that the DAD software was properly computing the area sizes and average depths.

- 1. Storm center: 39°N 104°W
- 2. Duration: 10-hours
- 3. Maximum grid cell precipitation: 1.00"
- 4. Grid cell resolution: 0.06 sq.-miles (361 total cells)
- 5. Total storm size: 23.11 sq-miles
- 6. Distribution of precipitation:
 - Hour 1: Storm drops 0.10" at center (area 0.06 sq-miles)
 - Hour 2: Storm drops 0.10" over center grid cell AND over one cell width around hour 1 center

Hours 3-10:

- 1. Storm drops 0.10" per hour at previously wet area, plus one cell width around previously wet area
- 2. Area analyzed at every 0.10"
- 3. Analysis resolution: 15-sec (~.25 square miles)

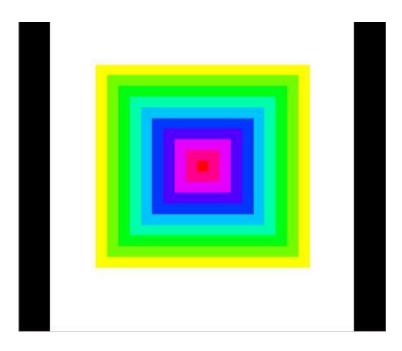


Figure E.14 "Pyramidville" Total precipitation. Center = 1.00", Outside edge = 0.10".

The analytical truth was calculated independent of the DAD software, and then compared to the DAD output. The DAD software results were equal to the truth, thus demonstrating that the DA estimates were properly calculated (Figure E.15).

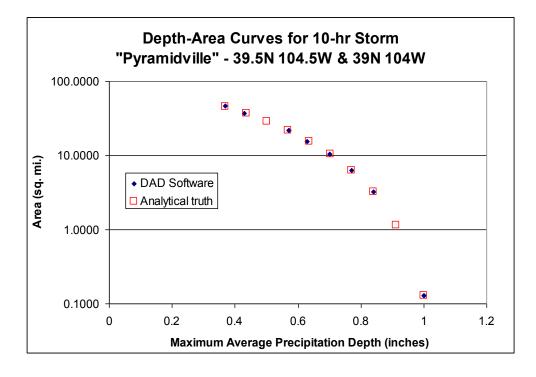


Figure E.15 10-hour DA results for "Pyramidville"; truth vs. output from DAD software.

The Pyramidville storm was then changed such that the mass curve and spatial interpolation methods would be stressed. Test cases included:

- Two-centers, each center with 361 hourly stations
- A single center with 36 hourly stations, 0 daily stations
- A single center with 3 hourly stations and 33 daily stations

As expected, results began shifting from the 'truth,' but minimally and within the expected uncertainty.

Ritter, Iowa Storm, June 7, 1953

Ritter, Iowa was chosen as a test case for a number of reasons. The NWS had completed a storm analysis, with available DAD values for comparison. The storm occurred over relatively flat terrain, so orographics was not an issue. An extensive "bucket survey" provided a great number of additional observations from this event. Of the hundreds of additional reports, about 30 of the most accurate reports were included in the DAD analysis.

The DAD software results are very similar to the NWS DAD values (Table E.1).

Table E.1 The percent difference [(AWA-NWS)/NWS] between the AWA DA results and those published by the NWS for the 1953 Ritter, Iowa storm.

%	
Dif	ference

	Duration	n (hours)			
Area (sq.mi.)		6	12	24	total
10		-15%	-7%	2%	2%
100		-7%	-6%	1%	1%
200		2%	0%	9%	9%
1000		-6%	-7%	4%	4%
5000		-13%	-8%	2%	2%
10000		-14%	-6%	0%	0%

Westfield, Massachusetts Storm, August 8, 1955

Westfield, Massachusetts was also chosen as a test case for a number of reasons. It is a probable maximum precipitation (PMP) driver for the northeastern United States. Also, the Westfield storm was analyzed by the NWS and the DAD values are available for

comparison. Although this case proved to be more challenging than any of the others, the final results are very similar to those published by the NWS (Table E.2).

Table E.2 The percent difference [(AWA-NWS)/NWS] between the AWA DA results and those published by the NWS for the 1955 Westfield, Massachusetts storm.

% Difference

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

The principal components of SPAS are: storm search, data extraction, quality control (QC), conversion of daily precipitation data into estimated hourly data, hourly and total storm precipitation grids/maps and a complete storm-centered DAD analysis.

OUTPUT

Armed with accurate, high-resolution precipitation grids, a variety of customized output can be created (see Figures E.16A-D). Among the most useful outputs are sub-hourly precipitation grids for input into hydrologic models. Sub-hourly (i.e. 5-minute) precipitation grids are created by applying the appropriate optimized hourly Z-R (scaled down to be applicable for instantaneous Z) to each of the individual 5-minute radar scans; 5-minutes is often the native scan rate of the radar in the US. Once the scaled Z-R is applied to each radar scan, the resulting precipitation is summed up. The proportion of each 5-minute precipitation to the total 1-hour radar-aided precipitation is calculated. Each 5-minute proportion (%) is then applied to the quality controlled, bias corrected 1-hour total precipitation (created above) to arrive at the final 5-minute precipitation for each scan. This technique ensures the sum of 5-minute precipitation equals that of the quality controlled, bias corrected 1-hour total precipitation derived initially.

Depth-area-duration (DAD) tables/plots, shown in Figure E.16d, are computed using a highly-computational extension to SPAS. DADs provide an objective three dimensional (magnitude, area size, and duration) perspective of a storms' precipitation. SPAS DADs are computed using the procedures outlined by the NWS Technical Paper 1 (1946).

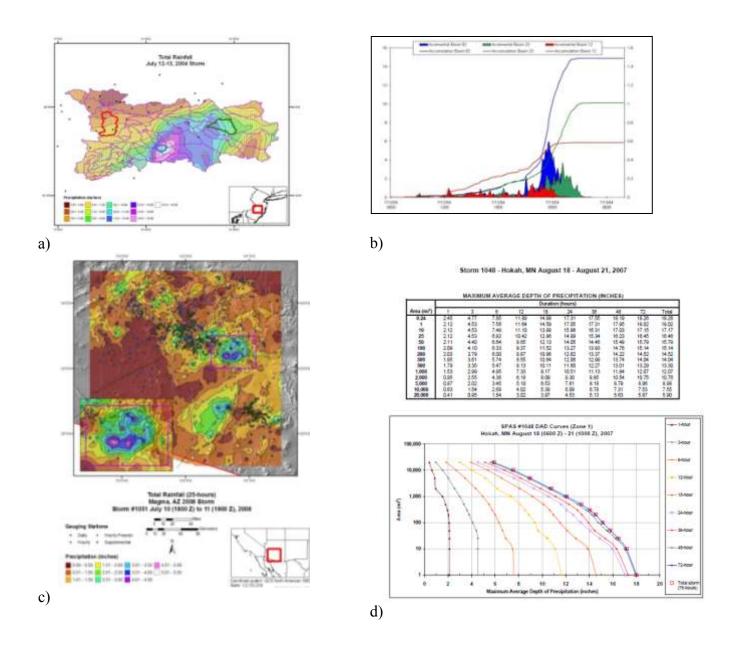


Figure E.16 Various examples of SPAS output, including (a) total storm map and its associated (b) basin average precipitation time series, (c) total storm precipitation map, (d) depth-area-duration (DAD) table and plot, and (e) precipitation gauge catalog with total storm statistics.

SUMMARY

Grounded on years of scientific research with a demonstrated reliability in post-storm analyses, SPAS is a hydro-meteorological tool that provides accurate precipitation analyses for a variety of applications. SPAS has the ability to compute precise and accurate results by using sophisticated timing algorithms, "basemaps", a variety of

precipitation data and most importantly NEXRAD weather radar data (if available). The approach taken by SPAS relies on hourly, daily and supplemental precipitation gauge observations to provide quantification of the precipitation amounts while relying on basemaps and NEXRAD data (if available) to provide the spatial distribution of precipitation between precipitation gauge sites. By determining the most appropriate coefficients for the Z-R equation on an hourly basis, the approach anchors the precipitation amounts to accepted precipitation gauge data while using the NEXRAD data to distribute precipitation between precipitation gauges for each hour of the storm. Hourly Z-R coefficient computations address changes in the cloud microphysics and storm characteristics as the storm evolves. Areas suffering from limited or no radar coverage, are estimated using the spatial patterns and magnitudes of the independently created basemap precipitation grids. Although largely automated, SPAS is flexible enough to allow hydro-meteorologists to make important adjustments and adapt to any storm situation.

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Appendix F PMP Short Storm List Storm Data

Appendix F: All Season Short Storm List Storm Analyses

Storm Name	State	AWA Storm Number	Lat	Lon	Year	Month	Day	Maximum Rainfall in Inches	Precipitation Source
BOULDER	CO	S6	40.015	-105.268	2013	9	8	20.41	SPAS 1302
CHEYENNE MOUNTAIN	CO	85	38,790	-103,200	2013	9	8	18.89	SPAS 1302
DUBUQUE	IA	1	42.440	90.750	2011	7	27	15,14	SPAS 1220
WARNER PARK	TN	2	36.061	-86.906	2010	4	30	19.71	SPAS 1208
ALLEY SPRING	MO	3		-91.450	2008	3	17	15.10	
		4	37.160			9			SPAS 1242
LARTO LAKE	LA		31.220	-92.130	2008		1	23.31	SPAS 1182
FALL RIVER	KS	- 5	37.630	-96.050	2007	6	30	25.50	SPAS 1228
HOKAH	MIN	6	43.813	-91.363	2007	- 5	18	18.32	SPAS 1048
OGALLALA	NE	7	41.125	-101,717	2002	7	6	14.92	SPAS 1033
FORT COLLINS	CO	1	40.548	-105.133	1997	7	28	14.48	SPAS 1230
PAWNEE CREEK	co	9	40.775	-103.625	1997	7	29	13.58	SPAS 1036
AURORA COLLEGE	TL.	10	41.458	-88.070	1996	7	16	18.13	SPAS 1286
MINNEAPOLIS	MN	11	44.889	-93.402	1987	7	23	11.55	SPAS 1210
BIG RAPIDS	MI	12	43,613	-85.313	1986	9	9	13.42	SPAS 1206
CHEYENNE	WY	13	41.354	-104.819	1985	8	1	7.15	SPAS 1213
FOREST CITY	MN	14	45,239	-94,540	1983	6	20	17.00	SPAS 1035
BIG FORK	AR	15	35.871	-92.121	1982	12	1	15.92	SPAS 1219
CLYDE	TX	16	32,479	-99,479	1981	10	10	23.23	SPAS 1184
FRIJOLE CREEK	CO	17	37,096	-104.379	1981	7	3	16.33	SPAS 1247
ALBANY	IX	18	32.726	-99.350	1978	8	3	32.50	SPAS 1179
	CO				1976	7		12.52	
BIG THOMPSON CANYON		19	40.479	-105,429			31		SPAS 1231
WATERTON RED ROCK	AB	75	49.090	-114.050	1975	6	15	14.46	SPAS 1252
ENID	OK.	21	36.381	-97.868	1973	10	10	19.45	SPAS 1034
BAYFIELD	CO	22	37.562	-107,879	1970	9	3	5,95	SPAS 1075
BIG ELK MEADOW	CO	23	40.267	-105.417	1969	5	4	20.01	SPAS 1253
WOOSTER	OH	24	40.915	-81.973	1969	1	4	14.95	SPAS 1209
SLADEWATER.	TX	25	32.537	-94,943	1966	4	27	25.33	SPAS 1181
EDGERTON	MO	26	40.413	-95.513	1965	7	18	20.76	SPAS 1183
HOLLY	co	27	37.713	-102.404	1965	6	16	19.18	SPAS 1293
PLUM CREEK	co	28	39.188	-104.296	1965	6	15	16.70	SPAS 1293
COLLEGE HILL	OH	30	40.085	-81.643	1963	6	3	19.39	SPAS 1226
DAVID CITY	NE	31	41.213	-97.071	1963	6	24	15.98	SPAS 1030
120000000000000000000000000000000000000									
DA GROVE	IA	32	42.317	-95.467	1962		30	12.65	EPRI
PRAGUE	NE	33	41.358	-96.879	1959	8	1	13.09	SPAS 1031
PARIS WATERWORKS	IN	34	39,050	-87,700	1957	- 6	27	12.40	HMB-VIE
LAKE MALOYA	NM	35	37,009	-104.341	1955	5	19	14.82	SPAS 1251
RITTER	IA	36	43.244	-95.823	1953	6	7	11.00	MR 10-8
KELSO	MO	37	37.191	-89,550	1952	8	11	13.00	UMV 3-30
COUNCIL GROVE	KS	38	38.660	-96.490	1951	7	9	18.50	MR 10-2
DUMONT	IA	39	42,752	-92.976	1951	- 6	25	12.00	UMV 3-29
HOLT	MO	40	39.453	-94.342	1947	6	18	17.60	MR 8-20
COLE CAMP	MO	41	38.460	-93.203	1946	1	12	19.40	MR 7-2A
COLLINSVILLE	IL.	42	38,672	-89.980	1946	8	12	18.70	MR 7-2B
STANTON	NE	43	41.567	-97.050	1944	6	10	17.30	MR 6-15
MOUNDS	OK.	44	35.877	96.061	1943	5	16	17.00	SW 2-21
	OK	46			1943	5			
WARNER			35,490	-95.310			6	25.00	SW 2-20
SILVER LAKE	TX	45	32,670	-95.596	1943	- 6	- 5	16.50	SW 3-3
RANCHO GRANDE	NM	47	34.950	-105.100	1942	- 8	29	8.00	SW 2-29
HAYWARD	WI	48	46.013	-91,485	1941	8	28	15.00	UMV 1-22
MCCOLLEUM RANCH	NM	49	32.167	-104.733	1941	9	20	21.20	GM 5-19
PRAIRIEVIEW	NM	50	33.117	-103.200	1941	5	20	8.40	GM 3-18
GRANT TOWNSHIP	NE	51	42.240	-96.590	1940	6	3	13.00	MR 4-5
HALLETT	OK.	52	36.230	-96.570	1940	9	2	24.00	SW 2-18
HEMPSTEAD	TX	53	30.133	-96.133	1940	- 11	22	21.10	GM 5-13
NDEX	AR	54	33,547	-94.042	1940	6	30	11.50	LMV 4-25
ELBERT	CO	55	39.238	-104.488	1935	5	30	24.00	SPAS 1295
HALE	co	56	39.613	-102.263	1935	5	30	18.00	SPAS 1295
CHEYENNE	OK.	57		-99.670	1934	4	3	23.00	SW 2-11
			35.610						
FAIRFIELD	TX	58	31.725	-96.165	1932	8	30	19.50	GM 5-16A
PORTER	NM	59	35,200	-103.283	1930	10	9	9.90	SW 2-6
BOYDEN	IA	60	43.190	-96.010	1926	9	17	24.00	MR 4-24
NEOSHO FALLS	KS	61	38.082	-95.701	1926	9	12	14.00	SW 2-1
PENROSE	CO	62	38.464	-105.070	1921	6	2	12.20	SPAS 1294
MEEK	NM	63	33,683	-105.183	1919	9	15	9.56	GM 5-15B
COOPER	М	65	42,376	-85,610	1914	1	31	12.60	GL 2-16
LAYTON	NM	64	36.333	-103.100	1914	4	29	9.60	SW 1-16
WAGON WHEEL	co	66	37.663	-106.938	1911	10	3	7.88	SPAS 1107
BEAULIEU	MN	67	47,300	-95,900	1909	7	18	10.50	UMV I-IIA
RONWOOD	MI	68	46.450	-90.183	1909	7	21	13.20	UMV 1-11B
MEEKER	OK.	69	35,503	-96.903	1908	10	19	16.23	SW 1-11
HONAPARTE	IA	70	40,767	-91.750	1905	6	10	12.10	UMV 2-5
MEDFORD	WI	71	45.133	-90.333	1905	6	4.	11.20	GL 2-12
ROCIADA	NM	72	35.867	-105.333	1904	9	26	7.90	SW 1-6
WOODBURN	IA	73	41.012	-93,599	1903		24	15.50	MR 1-10
AMBERT	MN	75	47.800	-96,000	1897	7	18	8.00	UMV 1-2
GREELEY	NE	76	41.550	-98.533	1896	6	4	12.30	MR 4-3
ARRABEE	IA	77	42.861	-95.545	1891	9	10	13.00	MR 4-2

Appendix F: Table F.1: List of storm used in the All Season PMP development

Boulder, CO, AWA 86

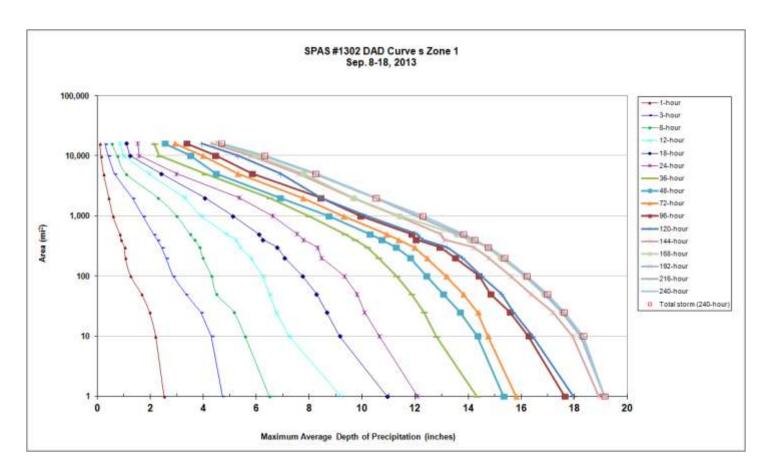
September 8, 2013 Storm Type: Frontal Grid Point Used: 21-22

	\$1302 Boulder, C 8/2013	O Zone 1	Storm Adjustment for Grid Point 21									
	0/2013			510	. III 210je	istinent	101 011	d I ome				
emporal Transposition Dat												
	Lat	Long				ıflow Directi	ion:	SE @ 255	miles			
orm center location	40.02 N	105.27 W			Grid Point	Elevation		7,381	feet			
orm Rep dew point location		102.5 W			Storm Cent	ter Elevation	l	5,330	feet			
ansposition dewpoint locat		104.13 W			Storm Rep.	Analysis Du	ration	24	feet			
asin location	39.00 N	105.00 W										
The storm represe	ntative dew point	76.0 F	with total	l precipitable	water above	sea level of			2.99	inches.		
	ximum dew point		with total	l precipitable	water above	e sea level of			3.07	inches.		
The transpositioned ma	•			l precipitable					3.14	inches.		
	e storm elevation			ch subtracts			f precipitabl		76.0 F			
	e storm elevation			ch subtracts ch subtracts			f precipitabl		76.5 F 77.0 F			
The inflow barrier/grid	on grid elevation a l elevation height i			ch subtracts ch subtracts	1.59		f precipitabl f precipitabl		77.0 F			
		.,,										
	lace storm maximiz		1.03					302 Zone 2. S				
The transpos	ition/elevation to		0.84		•	•		ed on maximur at KDHT, KC				
	The barrier adjust	ment factor is	1.00		and KLHX.	en september	11-12, 2015	at KDH1, KC	AO, KSPD			
	The total adjust	ment factor is	0.86									
				-								
Observed Storm	Depth-Area-Dura		6 II	10.17	1017	2417	2617	40.17	70 17	067		
1	1 Hours miles 2.5	3 Hours 4.7	6 Hours 6.5	12 Hours 9.2	18 Hours 10.9	24 Hours 12.1	36 Hours 14.3	48 Hours 15.3	72 Hours 15.8	96 Hour 17.6		
	miles 2.5	4.7	5.6	9.2 7.2	9.2	12.1	14.3	15.3	15.8	17.0		
	miles 2.2	2.9	4.3	6.2	7.7	9.3	11.3	12.4	13.2	14.4		
	miles 1.1	2.6	4.0	5.8	7.1	8.5	10.6	11.8	12.4	13.5		
	miles 0.9	2.1	3.5	4.9	6.1	7.5	9.3	10.3	10.9	11.9		
1000 sc	·	1.7	3.0	3.9	5.1	6.6	8.0	8.7	9.3	9.9		
2000 so	miles 0.4	1.3	2.3	3.3	4.1	5.4	6.5	6.9	7.7	8.4		
5000 sc	miles 0.2	0.6	1.1	1.9	2.4	3.0	4.1	4.5	5.3	5.8		
10000 so	•	0.4	0.8	1.0	1.2	1.6	2.3	3.5	4.0	4.5		
20000 sc 50000 sc	•	-	-	-	-	-	-	-	-	-		
30000 30	mines											
Adjusted Storm	Depth-Area-Durat		ć 11	1 10 11	10.11		26.11	40.77		06.11		
1.50	1 Hours miles 2.2	3 Hours 4.1	6 Hours 5.6	12 Hours 7.9	18 Hours 9.4	24 Hours 10.4	36 Hours 12.3	48 Hours 13.2	72 Hours 13.6	90 Hour 15.2		
	miles 1.9	3.7	4.8	6.2	7.9	9.2	11.0	12.3	12.7	14.0		
	miles 1.1	2.5	3.7	5.4	6.7	8.0	9.7	10.7	11.3	12.4		
	miles 0.9	2.2	3.4	5.0	6.1	7.3	9.1	10.2	10.7	11.6		
500 sc	miles 0.7	1.8	3.0	4.2	5.3	6.5	8.0	8.8	9.4	10.2		
1000 so	miles 0.5	1.5	2.6	3.4	4.4	5.7	6.9	7.5	8.0	8.6		
2000 so	•	1.1	2.0	2.8	3.5	4.6	5.6	5.9	6.7	7.3		
5000 sc		0.6	0.9	1.7	2.1	2.6	3.5	3.8	4.6	5.0		
10000 so		0.4	0.6	0.8	1.1	1.4	2.0	3.0	3.4	3.8		
20000 sc 20000 sc	•	-	-	-	-	-	-	-	-	-		
Storm or Storm C	antar Nama		SPAS1302 H	Pouldon CO	Zono 1					1		
Storm Date(s)	enter ivanie		9/8-18/2013	Journer, CO	Lone 1							
Storm Type			Synoptic									
Storm Location			40.02 N	105.27 W								
Storm Center Ele	vation		5,330									
Precipitation Tot	al & Duration		20.41 Inches	240-hours								
Storm Represent	ative Dewpoint		76.0 F	24						1		
	ative Dewpoint Lo	cation	37.00 N	102.5 W			Aug	Sep				
Maximum Dewpo			76.5 F				78.50	75.00				
Moisture Inflow			SE @ 255	Miles								
In-place Maximiz	ation Factor		1.03									
	osition (Date)		31-Aug									
Temporal Transp	wpoint Location		37.26 N	104.13 W			Aug	Sep				
			77.0 F				78.50	75.50				
Transposition De Transposition M	aximum Dewpoint									1		
Transposition De Transposition M Transposition A	djustment Factor		0.84									
Transposition De Transposition M Transposition A Average Basin E	djustment Factor levation		0.84 7,381	50sqmi ave								
Transposition Do Transposition M Transposition A Average Basin E Highest Elevation	djustment Factor levation n in Basin		0.84 7,381 14,344	50sqmi ave								
Transposition De Transposition M Transposition A Average Basin E	djustment Factor levation n in Basin ight		0.84 7,381	50sqmi ave								

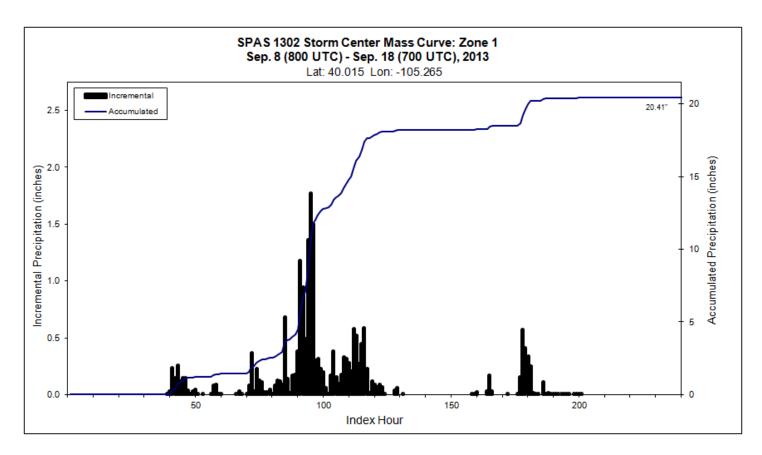
Appendix F: Table F.2: Storm spreadsheet for Boulder, CO September 8, 2013 Page **3** of **346**

				St	orm 13 MAXIM	02 - Se JM AVER	the Street Street and	a lateral and the second of the W			Control of the Control						
	Duration (hours)																
Area (mi²)	10	3	6	12	18	24	36	48	72	96	120	144	168	192	216	240	Total
0.4	2.59	4.83	7.25	9.46	11.21	12.44	15.04	16.24	16.89	18.2	18.93	20:23	20.41	20.41	20.41	20.41	20.41
1	2.52	4.72	6.49	9.18	10.94	12.08	14.31	15.32	15.8	17.64	17.95	18.93	19.13	19.13	19.13	19.13	19.13
10	2.2	4.31	5.57	7.23	9.15	10.64	12.79	14.33	14.73	16.27	16.42	17.94	18.23	18.24	18:33	18.33	18.33
25	1.97	3.9	5.15	6.75	8.66	10.08	12.32	13.68	14.35	15.56	15.7	17.18	17.51	17.53	17.61	17.61	17.61
50	1.67	3:33	4.5	6.5	8.27	9.8	11.85	13.04	13.79	14.84	15.25	16.35	16.86	16.87	16.98	16.98	16.98
100	1.26	2.85	4.31	6.24	7.74	9.32	11.29	12.41	13.15	14.4	14.48	15.59	16.13	16.13	16.2	16.2	16.20
200	1.06	2.59	3.98	5.79	7.07	8.46	10.61	11.8	12.42	13.49	13.77	14.75	15.21	15.36	15.36	15.36	15:36
300	1.03	2.42	3.86	5.38	5.79	8.31	10.18	11.26	11.95	12.92	13.18	14.19	14.71	14.74	14.75	14.75	14.75
400	0.89	2.27	3.66	5.22	6.25	7.78	9.71	10.72	11.35	12.03	12.28	13.09	14.04	14.2	14.22	14.23	14.23
500	0.85	2.12	3.49	4.87	6.1	7.54	9.33	10.27	10.91	11.85	12.07	12.96	13.55	13.64	13.79	13.81	13.81
1,000	0.59	1.72	2.99	3.91	5.12	6.61	7.97	8.73	9.27	9.93	10.15	11.34	11.41	12.04	12.26	12.28	12.28
2,000	0.44	1.32	2.29	3.29	4.05	5.35	6.49	6.88	7.74	8.43	8.44	9.62	9.67	10.45	10.5	10.51	10.51
5,000	0.24	0.64	1.09	1.94	2.41	2.99	4.05	4.46	5.29	5.83	6.92	7.58	7.75	8.16	8.2	8.24	8.24
10,000	0.14	0.41	0.75	0.98	1.23	1.58	2.32	3.51	3.96	4.46	5.29	5.74	5.94	6.23	6.26	6.3	6.30
16,014	0.1	0.29	0.54	0.85	1.11	1.53	2.14	2.54	2.91	3.37	3.95	4.31	4.54	4.65	4.67	4.68	4.68

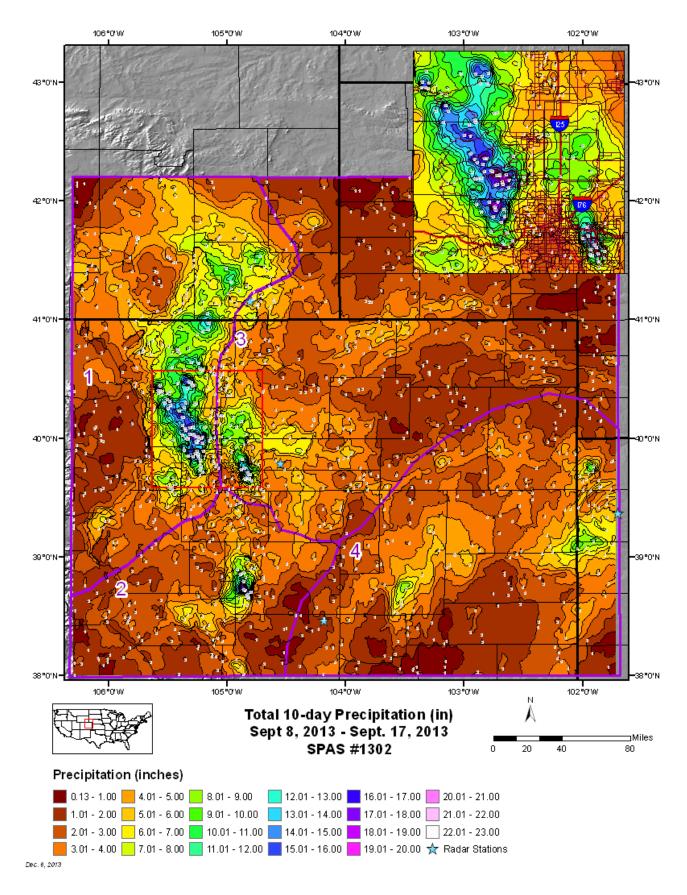
Appendix F: Table F.3: Depth-area-duration values for Boulder, CO September 8, 2013



Appendix F: Figure F.1: Depth-area-duration chart for Boulder, CO September 8, 2013



Appendix F: Figure F.2: Mass curve chart for Boulder, CO September 8, 2013



Appendix F: Figure F.3: Total storm isohyetal analysis for Boulder, CO September 8, 2013

Cheyenne Mountain, CO, AWA 85

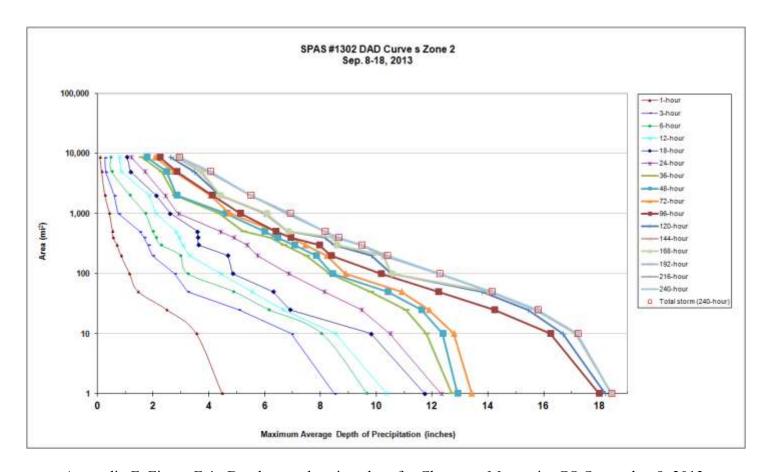
September 8, 2013 Storm Type: Frontal Grid Point Used: 14, 21-22

Storm Name: Storm Date:	SPAS 1302 9/8-18/201:	Cheyenne M 3	Iountain, CC		Sto	rm Adju	stment	for Gri	d Point	22	
AWA Analysis Date	: 12/20/2013	1				,					
emporal Transposi	tion Date	31-Aug									
		Lat	Long			Moisture In	flow Direct	ion:	SE @ 180	miles	
Storm center locatio	n	38.79 N	104.87 W			Grid Point l	Elevation		9,871	feet	
Storm Rep dew point	location	37.00 N	102.5 W			Storm Cent	er Elevation		9,380	feet	
Transposition dewpo	int location	37.26 N	104.13 W			Storm Rep.	Analysis Du	ration	24	feet	
Basin location		39.00 N	106.50 W								
			#co.	24						• • •	
	representative	•	76.0 F		l precipitable					2.99	inches.
	-place maximum	-	76.5 F		l precipitable					3.07 2.99	inches.
	ioned maximum le in-place stom		76.0 F 9,380		l precipitable ich subtracts			f precipitable	a mater at	76.0 F	inches.
	ie in-place stom ie in-place stom		9,380		ich subtracts			f precipitable		76.5 F	
	ansposition grid		9,871		ch subtracts			f precipitable		76.0 F	
	mier/grid elevat		9,871		ch subtracts			f precipitable		76.0 F	
								•			
	The in-place sto	orm maximizat	ion factor is	1.03		Notes: DAD	values taken	from SPAS 1	302 Zone 2. S	Storm	
	transposition/el			0.92		-	_	value was base			
	The b	arrier adjustm	ent factor is	1.00			en September	11-12, 2013	at KDHT, KO	CAO, KSPD	
						and KLHX.					
	The	total adjustm	ent factor is	0.95							
01	10, 5										
Observe	d Storm Depth-	Area-Duration 1 Hours	on 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 House
	1 sq miles	4.5	8.5	9.7	12 Hours	10 Hours	12.3	12.7	12.9	13.4	18.0
	10 sq miles	3.5	7.0	8.0	8.5	9.8	10.5	11.8	12.4	12.8	16.2
	100 sq miles	1.2	2.8	3.2	4.4	4.9	6.9	8.3	8.4	8.9	10.2
	200 sq miles	0.8	2.0	3.0	3.3	4.7	5.7	7.5	7.8	8.2	8.4
	500 sq miles	0.5	1.5	2.0	2.8	3.6	4.4	5.2	6.0	6.4	6.4
	1000 sq miles	0.4	0.8	1.7	2.1	2.6	2.9	4.4	4.6	4.7	5.1
	2000 sq miles	0.3	0.6	1.2	1.9	2.1	2.4	2.8	2.8	4.1	4.1
	5000 sq miles	0.2	0.3	0.5	0.8	1.2	1.7	2.3	2.5	2.7	2.8
	10000 sq miles	-	-	-	_	-	-	-	-	-	_
	20000 sq miles	-	-	-	-	-	-	-	-	-	-
	50000 sq miles	-	-	-	-	-	-	-	-	-	-
A 21	l C4 D4h	A D									
Adjusted	d Storm Depth-	1 Hours	n 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours
	1 sq miles	4.2	8.1	9.2	9.8	11.1	11.7	12.1	12.2	12.7	17.1
	10 sq miles	3.4	6.6	7.6	8.1	9.3	9.9	11.2	11.7	12.1	15.4
	100 sq miles	1.1	2.6	3.1	4.2	4.6	6.5	7.9	8.0	8.4	9.6
	200 sq miles	0.8	1.9	2.8	3.1	4.4	5.4	7.1	7.4	Ÿ	7.9
	500 sa miles		1.4			7.7		· /•1	/	7.8	
	500 sq miles	0.5	1.4	1.9	2.7	3.4	4.2	5.0	5.7	7.8 6.1	6.1
	1000 sq miles	0.4	0.7	1.6	2.0	3.4 2.5	4.2 2.7	5.0 4.1	5.7 4.4	6.1 4.5	6.1 4.8
	1000 sq miles 2000 sq miles	0.4 0.3	0.7 0.6	1.6 1.1	2.0 1.8	3.4 2.5 2.0	4.2 2.7 2.3	5.0 4.1 2.6	5.7 4.4 2.7	6.1 4.5 3.8	6.1 4.8 3.9
	1000 sq miles 2000 sq miles 5000 sq miles	0.4 0.3 0.1	0.7 0.6 0.3	1.6 1.1 0.5	2.0 1.8 0.8	3.4 2.5 2.0 1.1	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	0.4 0.3 0.1	0.7 0.6	1.6 1.1	2.0 1.8	3.4 2.5 2.0	4.2 2.7 2.3	5.0 4.1 2.6	5.7 4.4 2.7	6.1 4.5 3.8	6.1 4.8 3.9
	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	0.4 0.3 0.1 -	0.7 0.6 0.3	1.6 1.1 0.5	2.0 1.8 0.8	3.4 2.5 2.0 1.1	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	0.4 0.3 0.1 -	0.7 0.6 0.3	1.6 1.1 0.5	2.0 1.8 0.8	3.4 2.5 2.0 1.1	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	0.4 0.3 0.1 -	0.7 0.6 0.3	1.6 1.1 0.5	2.0 1.8 0.8	3.4 2.5 2.0 1.1	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	0.4 0.3 0.1 - -	0.7 0.6 0.3	1.6 1.1 0.5 - -	2.0 1.8 0.8 -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles	0.4 0.3 0.1 - -	0.7 0.6 0.3	1.6 1.1 0.5	2.0 1.8 0.8 -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Center Nate(s)	0.4 0.3 0.1 - -	0.7 0.6 0.3	1.6 1.1 0.5 - - - - - - SPAS 1302	2.0 1.8 0.8 -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm Da	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 4 Storm Center Mate(s) 4 ype	0.4 0.3 0.1 - -	0.7 0.6 0.3	1.6 1.1 0.5 - - - - SPAS 1302 9/8-18/2013	2.0 1.8 0.8 -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm Do Storm Ty Storm Lo Storm Ce	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	0.4 0.3 0.1 - -	0.7 0.6 0.3	1.6 1.1 0.5 - - - - - - - - - - - - - - - - - - -	2.0 1.8 0.8 - - - - - - - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm Di Storm Lo Storm Co	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	0.4 0.3 0.1 - -	0.7 0.6 0.3	1.6 1.1 0.5 - - - SPAS 1302 9/8-18/2013 Synoptic 38.79 N	2.0 1.8 0.8 - - - - - - - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm Da Storm Ty Storm Ce Storm Ce Precipita	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles control sq miles between the sq miles control sq miles cont	0.4 0.3 0.1 - - - - Name	0.7 0.6 0.3	1.6 1.1 0.5 - - - - - - - - - - - - - - - - - - -	2.0 1.8 0.8 - - - - - - - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm Da Storm Ty Storm Lo Storm Ce Precipita	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles estem Center N ate(s) ype pocation enter Elevation tition Total & De	0.4 0.3 0.1	0.7 0.6 0.3 -	1.6 1.1 0.5 - - - - - - - - - - - - - - - - - - -	2.0 1.8 0.8 - - - - - - - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm De Storm Ty Storm Ce Storm Ce Precipita Storm Re Storm Re	2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles estern in the service of	0.4 0.3 0.1	0.7 0.6 0.3 -	1.6 1.1 0.5 - - - - - - - - - - - - - - - - - - -	2.0 1.8 0.8 - - - - - - - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2 - -	5.7 4.4 2.7 2.4 -	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm De Storm Lo Storm Ce Precipita Storm Re Storm Re	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq	0.4 0.3 0.1	0.7 0.6 0.3 -	1.6 1.1 0.5 - - - - - - - - - - - - - - - - - - -	2.0 1.8 0.8 - - - - - - - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2	5.7 4.4 2.7 2.4	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm D: Storm Lo Storm Co Precipita Storm Re Storm Re Maximum	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq	0.4 0.3 0.1 Name Pewpoint Local	0.7 0.6 0.3 -	1.6 1.1 0.5 - - - - - - - - - - - - - - - - - - -	2.0 1.8 0.8 - - - - - - - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2 - -	5.7 4.4 2.7 2.4 -	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm D: Storm Lo Storm Co Precipita Storm Re Storm Re Maximum Moisture	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq	0.4 0.3 0.1 Name Pewpoint Local	0.7 0.6 0.3 -	1.6 1.1 0.5 - - - - - - - - - - - - - - - - - - -	2.0 1.8 0.8 - - - - - - - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2 - -	5.7 4.4 2.7 2.4 -	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm Da Storm Ty Storm Ce Storm Ce Precipita Storm Re Storm Re Maximur Moisture In-place	2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles cation Estorm Center Nate(s) pre cocation Center Elevation Center Elevation Control & Di Company	0.4 0.3 0.1 Name wration ewpoint ewpoint Local	0.7 0.6 0.3 -	1.6 1.1 0.5 SPAS 1302 9/8-18/2013 Synoptic 38.79 N 9,380 18.89 Inches 76.0 F 37.00 N 76.5 F SE @ 180 1.03	2.0 1.8 0.8 - - - - - - - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2 - -	5.7 4.4 2.7 2.4 -	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm Di Storm Ty Storm Le Storm Ce Precipita Storm Re Storm Re Maximur Moisture In-place	1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq	0.4 0.3 0.1 Name wration ewpoint Loca actor 1 (Date)	0.7 0.6 0.3 -	1.6 1.1 0.5 - - - - - - - - - - - - - - - - - - -	2.0 1.8 0.8 - - - - - - - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2 - -	5.7 4.4 2.7 2.4 -	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm De Storm Ty Storm Ce Precipita Storm Re Storm Re Maximur Moisture In-place Tempora	2000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Estorm Center N ate(s) The storm Center N ate(s) The stor	0.4 0.3 0.1	0.7 0.6 0.3 -	1.6 1.1 0.5 SPAS 1302 9/8-18/2013 Synoptic 38.79 N 9,380 18.89 Inches 76.0 F 37.00 N 76.5 F SE @ 180 1.03 31-Aug	2.0 1.8 0.8 - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2 - - - - - - - - - - - - - - - - - -	5.7 4.4 2.7 2.4 - - - - - - - - - - - - - - - - - - -	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm De Storm Ty Storm Ce Precipita Storm Re Storm Re Maximum Moisture In-place Tempora Transpo Transpo	2000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq	0.4 0.3 0.1	0.7 0.6 0.3 -	1.6 1.1 0.5 SPAS 1302 9/8-18/2013 Synoptic 38.79 N 9,380 18.89 Inches 76.0 F 37.00 N 76.5 F SE @ 180 1.03 31-Aug 37.26 N	2.0 1.8 0.8 - - - - - - - - - - - - -	3.4 2.5 2.0 1.1 -	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2 - - - - - - - - - - - - - - - - - -	5.7 4.4 2.7 2.4 - - - - - Sep 75.00	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm De Storm Ty Storm Le Storm Ce Precipita Storm Re Storm Re Maximum Moisture In-place Tempora Transpo Transpo	2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq	0.4 0.3 0.1 Name Name wewpoint ewpoint Local actor 1 (Date) t Location 1 Dewpoint ent Factor	0.7 0.6 0.3 -	1.6 1.1 0.5 SPAS 1302 9/8-18/2013 Synoptic 38.79 N 9,380 18.89 Inches 76.0 F 37.00 N 76.5 F SE @ 180 1.03 31-Aug 37.26 N 76.0 F	2.0 1.8 0.8 - - - - - - - - - - - - -	3.4 2.5 2.0 1.1	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2 - - - - - - - - - - - - - - - - - -	5.7 4.4 2.7 2.4 - - - - - Sep 75.00	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm Di Storm Ty Storm Co Storm Re Storm Re Storm Re Maximum Moisture In-place Tempora Transpo Transpo Transpo Average Highest	2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq	0.4 0.3 0.1	0.7 0.6 0.3 -	1.6 1.1 0.5	2.0 1.8 0.8 - - - - - - - - - - - - -	3.4 2.5 2.0 1.1	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2 - - - - - - - - - - - - - - - - - -	5.7 4.4 2.7 2.4 - - - - - Sep 75.00	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm De Storm Ty Storm Le Storm Ce Precipita Storm Re Storm Re Maximur Moisture In-place Tempora Transpo Transpo Transpo Average Highest Inflow B	2000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Estorm Center N ate(s) Storm Center N ate(s) Prope Cocation Center Elevation Control & Dr Corporation Control	0.4 0.3 0.1 Name Wame Wame Uration ewpoint Local actor actor actor t Docation t Docation t Docation t Docation sin	0.7 0.6 0.3 -	1.6 1.1 0.5	2.0 1.8 0.8 - - - - - - - - - - - - -	3.4 2.5 2.0 1.1	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2 - - - - - - - - - - - - - - - - - -	5.7 4.4 2.7 2.4 - - - - - Sep 75.00	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7
Storm or Storm De Storm Ty Storm Ce Precipita Storm Re Storm Re Maximum Moisture In-place Tempora Transpo Transpo Transpo Average Highest Inflow B	2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq	iame actor actor	0.7 0.6 0.3 -	1.6 1.1 0.5	2.0 1.8 0.8 - - - - - - - - - - - - -	3.4 2.5 2.0 1.1	4.2 2.7 2.3 1.6	5.0 4.1 2.6 2.2 - - - - - - - - - - - - - - - - - -	5.7 4.4 2.7 2.4 - - - - - Sep 75.00	6.1 4.5 3.8 2.6	6.1 4.8 3.9 2.7

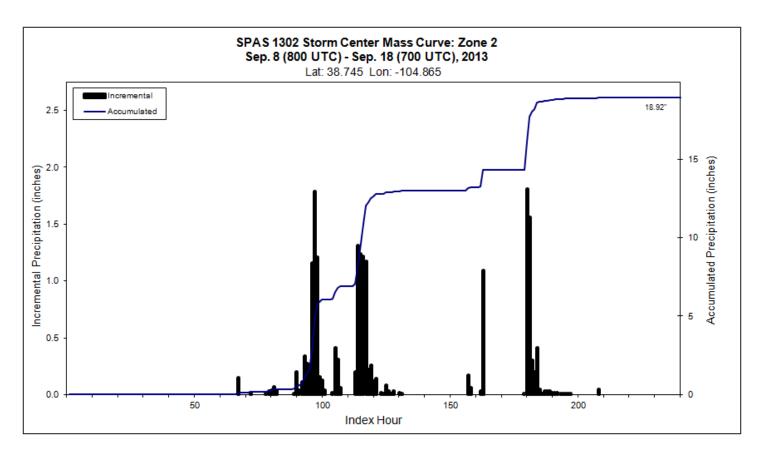
Appendix F: Table F.4: Storm spreadsheet for Cheyenne Mountain, CO September 8, 2013

	Storm 1302 - Sep. 8 (800 UTC) - Sep. 18 (700 UTC), 2013 MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																
	Duration (hours)																
Area (mi²)	1	3	6	12	18	24	36	48	72	96	120	144	168	192	216	240	Total
0.4	4.51	8.72	9.85	10.52	11.89	12.46	12.94	13.08	13.79	18.29	18.7	18.92	18.92	18.92	18.92	18.92	18.92
1	4.47	8.49	9.66	10.36	11.73	12.31	12.71	12.9	13.41	17.98	18.2	18.42	18.42	18.42	18.42	18.42	18.42
10	3.54	6.95	8.03	8.53	9.81	10.48	11.8	12.37	12.77	16.23	16.68	17.15	17:16	17.16	17.2	17.2	17.20
25	2.47	5.06	6.14	6.66	6.9	9.46	11.06	11.61	11.89	14.23	15.42	15.7	15.71	15.71	15.77	15.77	15.77
50	1.46	3.23	4:88	5.53	6.3	8.13	9.78	10.41	10.9	12.21	13.78	14.04	14.04	14:07	14.12	14.12	14.12
100	1.15	2.76	3.24	4.42	4.85	6.86	8.34	8,41	8.89	10.17	10.53	10.55	10.55	12.22	12.26	12.26	12.26
200	0.84	1.97	2.97	3.3	4.68	5.74	7.49	7.84	8.22	8.37	9.82	10.25	10.25	10.25	10.38	10.38	10.38
300	0.7	1.82	2.28	3.07	3.62	5.36	6.69	7.06	7.45	7.96	8.48	8.58	8.58	9.42	9.46	9.46	9.46
400	0.55	1.67	2.1	2.92	3.6	4.88	6.18	6.44	6.92	6.92	8.16	8.45	8.45	8.54	8.63	8.63	8.63
500	0.54	1.51	1.99	2.82	3.59	4.4	5.22	5:98	6.39	6.39	6.82	6.82	6.83	8.12	8.14	8.14	8.14
1,000	0.43	0.75	1.72	2.11	2.61	2.89	4.36	4.59	4.74	5.11	5.99	- 6	6.06	6.77	6.88	6.89	6.89
2,000	0.27	0.6	1.17	1.85	2.1	2.42	2.77	2.84	4.05	4.11	4.38	4.39	4.39	5.47	5.48	5.48	5.48
5,000	0.15	0.29	0.53	0.84	1.19	1.69	2.3	2.48	2.74	2.84	3.46	3.68	3.73	3.96	4.04	4.04	4.04
8,675	0.09	0.26	0.48	0.79	1.07	1.21	1.59	1.76	2.06	2.24	2.62	2.83	2.9	2.92	2.92	2.92	2.92

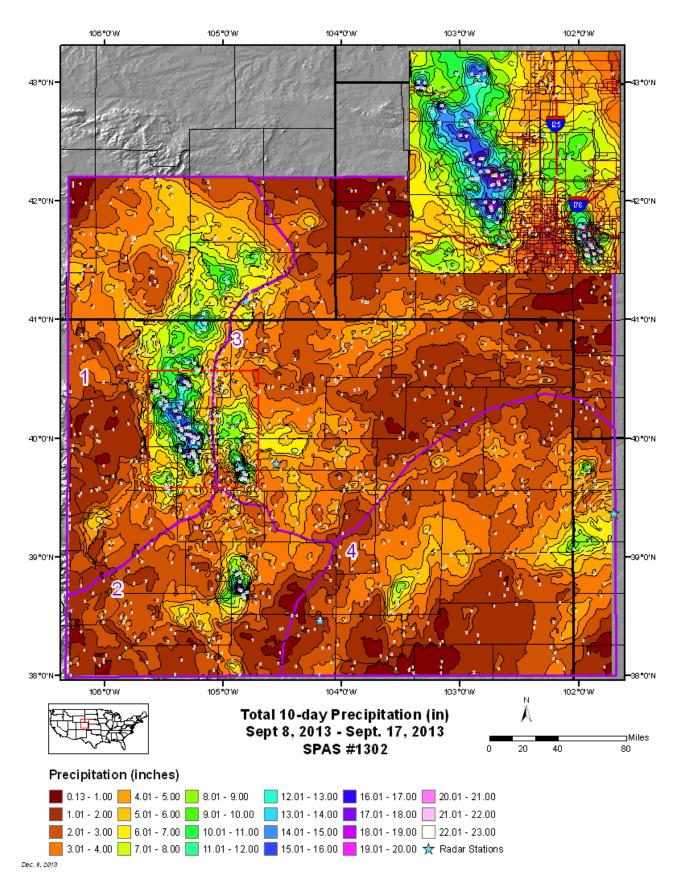
Appendix F: Table F.5: Depth-area-duration values for Cheyenne Mountain, CO September 8, 2013



Appendix F: Figure F.4: Depth-area-duration chart for Cheyenne Mountain, CO September 8, 2013



Appendix F: Figure F.5: Mass curve chart for Cheyenne Mountain, CO September 8, 2013



Appendix F: Figure F.6: Total storm isohyetal analysis for Cheyenne Mountain, CO September 8, 2013

Dubuque, IA, AWA 1

July 27, 2011

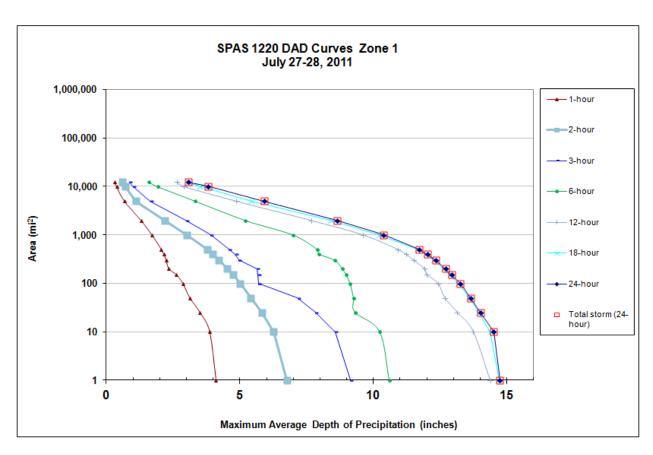
Storm Type: Frontal/MCC Grid Point Used: 8-10, 16-18

	Dubuque, IA		Storm Adjustment for ANO Grid Point 8									
orm Date: 7/27-28/20 WA Analysis Date: 12/13/2013				Storm	ı Aajusi	ment 10	or ANO	Gria Po	int 8			
mporal Transposition Date	15-Jul											
	Lat	Long			Moisture Ir	ıflow Directi	on	SSE @ 105	miles			
orm Center Location	42.44 N	90.75 W			Grid Point	Elevation		1,200	feet			
orm Rep Dew Point Location	40.95 N	90.27 W			Storm Cen	ter Elevation		900	feet			
ransposition Dew Point Location		92.10 W			Storm Rep	Analysis Du	ration	12	hours			
rid Point Location	37.50 N	93.00 W										
The storm representative	dew point is	79.0 F	with tota	al precipitable	water above	e sea level of			3.44	inches.		
The in-place maximum	dew point is	81.0 F	with tota	ıl precipitable	water above	e sea level of			3.76	inches.		
The transpositioned maximum	_	81.0 F		ıl precipitable					3.76	inches.		
The in-place stom		900		ich subtracts			f precipitabl		79.0 F			
The in-place stom The transposition basis		900 1,200		ich subtracts ich subtracts	0.28		f precipitabl f precipitabl		81.0 F 81.0 F			
The Grid point/inflow base		1,000		ich subtracts	0.30		f precipitabl		81.0 F			
				_								
The in-place st The transposition/e			1.09 0.99					220. Storm rep 112-hr Td valu				
	arrier adjustm		1.00					42, and 14923.				
The	total adjustm	ent factor is	1.09	J						l		
Observed Storm Depth	,			····		v		v				
	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours			
1 sq miles	4.1	9.1 8.6	10.6 10.2	14.4 13.7	14.7 14.4	14.7	-	-	-			
10 sq miles 100 sq miles	3.9 2.9	8.6 5.7	9.1	13.7	13.2	14.5 13.3	-	-	-	-		
200 sq miles	2.3	5.6	8.8	11.9	12.6	12.7	-	-	-			
500 sq miles	2.1	4.6	7.9	10.9	11.7	11.7	-	-	-			
1000 sq miles	1.7	3.9	7.0	9.6	10.2	10.4	-	-	-			
2000 sq miles	1.3	3.0	5.2	7.7	8.4	8.6	-	-	-			
5000 sq miles	0.7	1.6	3.3	4.9	5.4	5.9	-	-	-			
10000 sq miles 20000 sq miles	0.4 -	1.0	1.9	2.9 -	3.5 -	3.8	-	-	-			
	·	•		:		:		:				
Adjusted Storm Depth	Area-Duration 1 Hours	on 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours			
	4.5	9.9	11.5	15.6	16.0	16.0	-	-	-			
1 sq miles	4.5						<u> </u>	·:				
1 sq miles 10 sq miles	4.2	9.3	11.1	14.9	15.6	15.8	-	-	-			
10 sq miles 100 sq miles	4.2 3.1	6.2	9.9	13.5	15.6 14.3	14.4	-	-	-			
10 sq miles 100 sq miles 200 sq miles	4.2 3.1 2.5	6.2 6.1	9.9 9.6	13.5 13.0	15.6 14.3 13.7	14.4 13.8		<u> </u>				
10 sq miles 100 sq miles 200 sq miles 500 sq miles	4.2 3.1 2.5 2.2	6.2 6.1 5.0	9.9 9.6 8.6	13.5 13.0 11.9	15.6 14.3 13.7 12.7	14.4 13.8 12.7	- - -	<u> </u>				
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles	4.2 3.1 2.5 2.2 1.9	6.2 6.1 5.0 4.2	9.9 9.6 8.6 7.6	13.5 13.0 11.9 10.5	15.6 14.3 13.7 12.7 11.1	14.4 13.8 12.7 11.3	-	-	-			
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	4.2 3.1 2.5 2.2 1.9 1.4	6.2 6.1 5.0 4.2 3.2	9.9 9.6 8.6 7.6 5.7	13.5 13.0 11.9 10.5 8.3	15.6 14.3 13.7 12.7 11.1 9.1	14.4 13.8 12.7 11.3 9.4	- - - -	- - - -	- - - -			
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles	4.2 3.1 2.5 2.2 1.9	6.2 6.1 5.0 4.2	9.9 9.6 8.6 7.6	13.5 13.0 11.9 10.5	15.6 14.3 13.7 12.7 11.1	14.4 13.8 12.7 11.3	- - -	-	-			
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8	9,9 9.6 8.6 7.6 5.7 3.6	13.5 13.0 11.9 10.5 8.3 5.3	15.6 14.3 13.7 12.7 11.1 9.1 5.9	14.4 13.8 12.7 11.3 9.4 6.4	- - - - -	- - - -				
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1	13.5 13.0 11.9 10.5 8.3 5.3 3.2	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9,9 9.6 8.6 7.6 5.7 3.6 2.1	13.5 13.0 11.9 10.5 8.3 5.3 3.2	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 2000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9,9 9,6 8,6 7,6 5,7 3,6 2,1 - - SPAS1220 7/27-28/2011	13.5 13.0 11.9 10.5 8.3 5.3 3.2	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type Storm Location	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1 	13.5 13.0 11.9 10.5 8.3 5.3 3.2	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center: Storm Date(s) Storm Type Storm Location Storm Center Elevation	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1 - SPAS122011 MCC 42.44 N 900	13.5 13.0 11.9 10.5 8.3 5.3 3.2 - Dubuque, IA	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Type Storm Type Storm Location Storm Center Elevation Precipitation Total & D	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1 	13.5 13.0 11.9 10.5 8.3 5.3 3.2 - Dubuque, IA	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4 - Name	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1 - SPAS1220 17/27-28/2011 MCC 42.44 N 900 15.14 Inches	13.5 13.0 11.9 10.5 8.3 5.3 3.2	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4 - Name	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1 SPAS1220: 7/27-28/2011 MCC 42.44 N 900 15.14 Inches 79.0 F 40.95 N	13.5 13.0 11.9 10.5 8.3 5.3 3.2 - Dubuque, IA	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 100 sq miles 200 sq miles 300 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 2000	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9,9 9,6 8.6 7.6 5.7 3.6 2.1	13.5 13.0 11.9 10.5 8.3 5.3 3.2 	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1 SPAS1220: 7/27-28/2011 MCC 42.44 N 900 15.14 Inches 79.0 F 40.95 N	13.5 13.0 11.9 10.5 8.3 5.3 3.2	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 100 sq miles 200 sq miles 200 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 2000	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4 - Name Puration Dew Point Loc r Factor	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1 SPAS12201 MCC 42.44 N 900 15.14 Inches 79.0 F 40.95 N 81.0 F SSE @ 105	13.5 13.0 11.9 10.5 8.3 5.3 3.2 	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4 - Name Puration Dew Point Dow Factor In (Date)	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1 SPAS1220 7/27-28/2011 MC2C 42.44 N 900 15.14 Inches 79.0 F 40.95 N 815.0 F SSE @ 105 1.09	13.5 13.0 11.9 10.5 8.3 5.3 3.2 	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4 - Name Puration Dew Point Dow Point Location or (Date) nt Location	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1 SPAS1220: 7/27-28/2011 MCC 42.44 N 900 15.14 Inches 79.0 F 40.95 N 81.0 F SSE @ 105 1.09	13.5 13.0 11.9 10.5 8.3 5.3 3.2 - Dubuque, IA 90.75 W 24-hours 12 90.27 W Miles	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 100 sq miles 200 sq miles 200 sq miles 300 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000	A.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1 SPAS12201 MCC 42.44 N 900 15.14 Inches 79.0 F 40.95 N 81.0 F SSE @ 105 1.09 15-Jul 41.24 N 81.0 F 0.99	13.5 13.0 11.9 10.5 8.3 5.3 3.2 - Dubuque, IA 90.75 W 24-hours 12 90.27 W Miles	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 2000	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 8.6 7.6 2.1 - SPAS12201 MCC 42.44 N 900 15.14 Inches 79.0 F 40.95 N 81.0 F 8SE @ 105 1.09	13.5 13.0 11.9 10.5 8.3 5.3 3.2 - Dubuque, IA 90.75 W 24-hours 12 90.27 W Miles	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles 20000	4.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 5.7 3.6 2.1 - SPAS1220 7/27-28/2011 MCCC 42.44 N 900 15.14 Inches 79.0 F 40.95 N 8SE @ 105 1.09 15-Jul 41.24 N 81.0 F 0.99 1,200 14,344	13.5 13.0 11.9 10.5 8.3 5.3 3.2 - Dubuque, IA 90.75 W 24-hours 12 90.27 W Miles	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - -			
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 2000	A.2 3.1 2.5 2.2 1.9 1.4 0.7 0.4 - Name Puration Dew Point Dow Factor In (Date) Int Location In Dew Point Location In Dew Point Location In Exercise Point	6.2 6.1 5.0 4.2 3.2 1.8 1.1	9.9 9.6 8.6 7.6 8.6 7.6 2.1 - SPAS12201 MCC 42.44 N 900 15.14 Inches 79.0 F 40.95 N 81.0 F 8SE @ 105 1.09	13.5 13.0 11.9 10.5 8.3 5.3 3.2 - Dubuque, IA 90.75 W 24-hours 12 90.27 W Miles	15.6 14.3 13.7 12.7 11.1 9.1 5.9 3.8	14.4 13.8 12.7 11.3 9.4 6.4 4.1	- - - - - -	- - - -	- - - - - -			

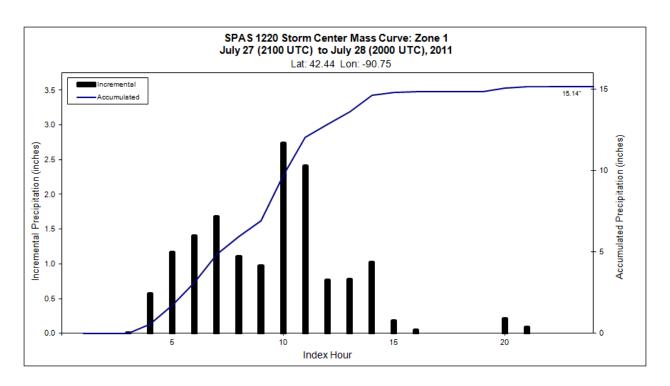
Appendix F: Table F.6: Storm spreadsheet for Dubuque, IA July 27, 2011

Storm 1								011							
MA	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
		Duration (hours)													
Area (mi ²)	1	2	3	6	12	18	24	Total							
0.4	4.2	6.92	9.38	10.9	14.8	15.14	15.14	15.14							
1	4.1	6.76	9.13	10.6	14.37	14.72	14.73	14.73							
10	3.86	6.26	8.56	10.24	13.74	14.38	14.5	14.50							
25	3.5	5.82	7.83	9.32	13.14	13.94	14	14.00							
50	3.12	5.41	7.15	9.26	12.68	13.59	13.64	13.64							
100	2.86	5.01	5.69	9.13	12.42	13.17	13.25	13.25							
150	2.62	4.75	5.68	8.98	12	12.87	12.93	12.93							
200	2.34	4.53	5.63	8.84	11.92	12.63	12.7	12.70							
300	2.24	4.21	4.95	8.56	11.51	12.26	12.33	12.33							
400	2.15	3.98	4.82	7.97	11.22	11.97	12.02	12.02							
500	2.06	3.78	4.58	7.9	10.92	11.65	11.7	11.70							
1,000	1.71	3.01	3.9	6.99	9.62	10.19	10.38	10.38							
2,000	1.3	2.18	2.98	5.2	7.67	8.4	8.63	8.63							
5,000	0.68	1.1	1.64	3.33	4.86	5.44	5.91	5.91							
10,000	0.39	0.71	0.99	1.92	2.91	3.49	3.8	3.80							
12,295	0.31	0.6	0.86	1.59	2.63	3.06	3.07	3.07							

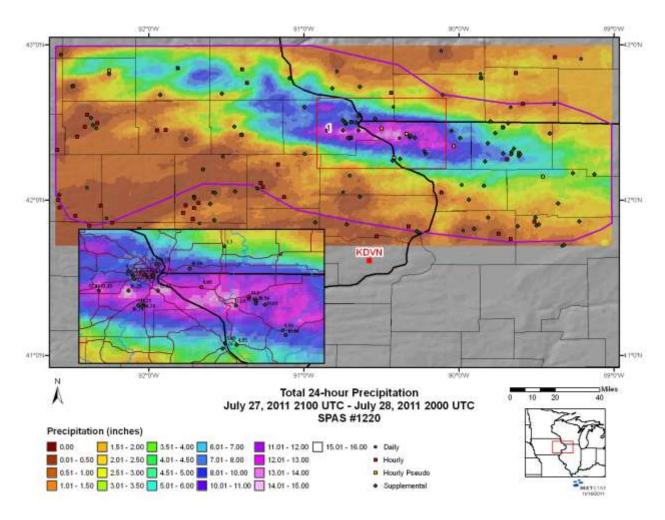
Appendix F: Table F.7: Depth-area-duration values for Dubuque, IA July 27, 2011



Appendix F: Figure F.7: Depth-area-duration chart for Dubuque, IA July 27, 2011
Page 14 of 346



Appendix F: Figure F.8: Mass curve chart for Dubuque, IA July 27,2011



Appendix F: Figure F.9: Total storm isohyetal analysis for Dubuque, IA July 2011

Warner Park, TN, AWA 2

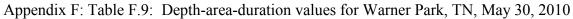
April 30, 2010

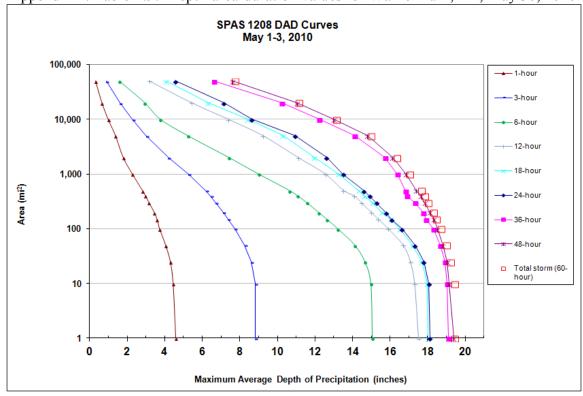
Storm Type: Frontal/MCC Grid Points Used: 1-3, 8-10, 16-17

Storm Name: SPAS 1208 Storm Date: 5/1-3/2010		ark, TN		Storm	Adinet	ment f	or ANG	Grid Po	int 1	
WA Analysis Date: 12/20/2013				Storm	Aujusi	шені і	or And	Griu Po	omt 1	
emporal Transposition Date	15-May									
	Lat	Long			Moisture I	nflow Direc	tion	SSW @ 360	miles	
torm Center Location	36.06 N	86.91 W			Grid Point	Elevation		350	feet	
torm Rep Dew Point Location	31.50 N	90.00 W			Storm Cen	ter Elevatio	n	600	feet	
ransposition Dew Point Location		95.94 W				Analysis D		12	hours	
Grid Point Location	35.31 N	93.23 W			Storm reep	Timely 515 D	urution		nouis	
The storm representative d	_	75.0 F		precipitable					2.85	inches
The in-place maximum d	-	76.5 F		precipitable					3.07	inches
The transpositioned maximum d	_	75.0 F		precipitable					2.85	inches
The in-place storm of		600		h subtracts			precipitabl		75.0 F	
The in-place storm of		600 350		ch subtracts ch subtracts			precipitabl		76.5 F 75.0 F	
The transposition storm e The Grid point/inflow barri		1,000		ch subtracts	0.25		precipitabl precipitabl		75.0 F	
The Glid politic lilliow balls	er neight is	1,000	WILL	ii subiiacis	0.23	inches of	precipitabl	e water at	75.0 F	
The in-place	e mavimizati	on factor is	1.08	1	Notes: Storm	representati	ve Td value w	as based on 12-h	r surface	1
The transposi			0.90		dewpoint val	ues between o	n May 1 alor	ng with Hysplit b	ackward	
•	ier adjustme		1.00					on where temper		
	,					ian a degree o B, KHBG, and		ea. Used an aver	age of	
The to	tal adjustme	nt factor is	0.96		KJAIN, KIVIC	D, KILDO, and	KASD.			
Observed Storm Depth	,	,		·						
<u> </u>	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	4.4	15.0	17.3	18.0	18.1	19.0	19.2	19.4	-	-
100 sq miles	3.7	13.2	15.9	16.5	16.6	18.3	18.5	18.7	-	-
200 sq miles	3.4	12.2	15.0	15.6	15.8	17.8	18.1	18.3	-	-
500 sq miles	2.8 2.3	10.6 9.0	13.5 12.6	14.3 13.3	14.6 13.5	16.8 16.4	17.4 16.9	17.7 17.1	-	-
1000 sq miles 2000 sq miles	2.3 1.8	9.0 7.4	12.0 11.1	13.3	13.5	16.4 15.7	16.1	17.1	-	1
5000 sq miles	1.6	7.4 5.2	9.2	10.3	10.9	14.1	14.8	15.0	-	
10000 sq miles	1.0	3.8	7.4	8.4	8.6	12.2	13.0	13.1		1
20000 sq miles	0.7	2.9	5.4	6.3	7.2	10.2	11.0	11.2	-	
Adjusted Storm Depth-	-Area-Dura	tion								
	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	4.3	14.4	16.7	17.3	17.4	18.3	18.4	18.7	-	
100 sq miles	3.6	12.7	15.3	15.9	16.0	17.6	17.8	18.0	-	
200 sq miles	3.3	11.7	14.4	15.0	15.2	17.1	17.4	17.6	-	
500 sq miles	2.7	10.2	13.0	13.8	14.1	16.2	16.8	17.0	-	
1000 sq miles	2.2 1.7	8.7 7.1	12.1 10.7	12.8 11.5	13.0 12.2	15.8 15.1	16.2 15.5	16.4 15.8	-	
2000 sq miles 5000 sq miles	1.7	7.1 5.0	8.9	9.9	10.5	13.6	14.2	15.6	-	
10000 sq miles	1.0	3.6	7.1	8.1	8.3	11.8	12.5	12.6	-	
20000 sq miles	0.6	2.8	5.2	6.1	6.9	9.9	10.6	10.7	-	
		,								
Storm or Storm Center 1	Name		SPAS 1208,	Warner Par	k, TN					
Storm Date(s)			5/1-3/2010							
Storm Type			Synoptic							1
Storm Location			36.06 N	86.91 W						!
Storm Center Elevation		>	600	- 601						-
	uration (10	sq mı)	19.71 inches i	n ou hours						1
Precipitation Total & D			75.0 F	12						1
•	ſď			90.00 W						1
Storm Representative T			31.50 N							1
•	d Location		31.50 N 76.5 F							
Storm Representative T Storm Representative T	Td Location									1
Storm Representative T Storm Representative T In-place Maximum Td	rd Location		76.5 F							
Storm Representative T Storm Representative T In-place Maximum Td Moisture Inflow Vector	rd Location		76.5 F SSW @ 360							
Storm Representative T Storm Representative T In-place Maximum Td Moisture Inflow Vector	Id Location r Factor		76.5 F SSW @ 360							
Stom Representative T Stom Representative T In-place Maximum Td Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Td Loca	r Factor n (Date)		76.5 F SSW @ 360 1.08 15-May 38.16 N	95.94 W						
Stom Representative T Storm Representative T In-place Maximum Td Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Td Local Transposition Maximum	r Factor in (Date) tion m Td		76.5 F SSW @ 360 1.08 15-May 38.16 N 75.0 F	95.94 W						
Stom Representative T Stom Representative T In-place Maximum Td Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Td Local Transposition Maximum Transposition Adjustm	r Factor in (Date) tion m Td		76.5 F SSW @ 360 1.08 15-May 38.16 N 75.0 F 0.90	95.94 W						
Stom Representative T Stom Representative T In-place Maximum Td Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Td Local Transposition Maximum Transposition Adjustm Grid point Elevation	r Factor n (Date) tion m Td nent Factor		76.5 F SSW @ 360 1.08 15-May 38.16 N 75.0 F 0.90	95.94 W						
Stom Representative T Stom Representative T In-place Maximum Td Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Td Local Transposition Maximum Transposition Adjustm Grid point Elevation Highest Elevation in Ba	r Factor n (Date) tion m Td nent Factor		76.5 F SSW @ 360 1.08 15-May 38.16 N 75.0 F 0.90 350 14,344	95.94 W						
Stom Representative T Stom Representative T In-place Maximum Td Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Td Local Transposition Maximum Transposition Adjustm Grid point Elevation	r Factor n (Date) tition m Td nent Factor		76.5 F SSW @ 360 1.08 15-May 38.16 N 75.0 F 0.90	95.94 W						

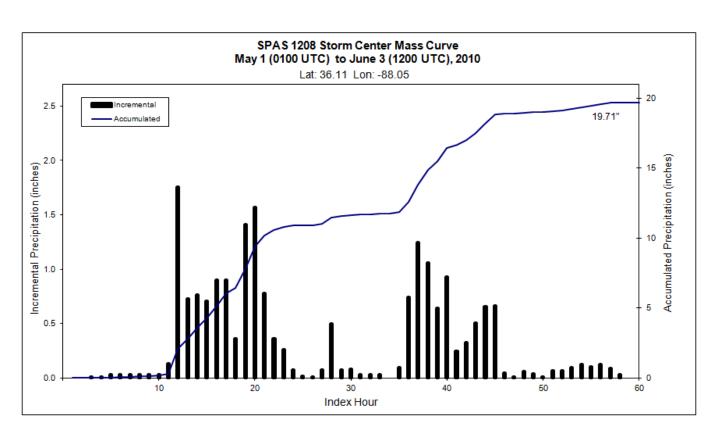
Appendix F: Table F.8: Storm spreadsheet for Warner Park, TN May 30, 2010

	Storm	1208 -	May 1	(0100 L	JTC) - I	May 3 (1200 U	TC), 20	10	
	MA	XIMUM A	VERAG	E DEPTI	H OF PR	ECIPITA	TION (IN	CHES)		
					Duration	n (hours)				
Area (mi²)	1	3	6	12	18	24	36	48	60	Total
0.4	4.63	8.92	15.31	17.77	18.33	18.39	19.36	19.66	19.71	19.71
1	4.58	8.82	15.06	17.52	18.03	18.12	19.11	19.38	19.45	19.45
10	4.44	8.81	14.98	17.31	17.97	18.06	19.04	19.15	19.43	19.43
25	4.29	8.61	14.66	17.08	17.69	17.8	18.91	19.05	19.24	19.24
50	4.04	8.25	14.12	16.7	17.2	17.33	18.67	18.82	19.01	19.01
100	3.72	7.72	13.21	15.9	16.52	16.63	18.31	18.51	18.71	18.71
150	3.58	7.37	12.62	15.37	16.04	16.07	17.91	18.35	18.48	18.48
200	3.43	7.12	12.18	14.99	15.57	15.78	17.75	18.11	18.32	18.32
300	3.16	6.72	11.56	14.47	15.07	15.28	17.33	17.85	18.05	18.05
400	2.97	6.44	11.07	14.08	14.65	14.91	16.9	17.65	17.85	17.85
500	2.81	6.19	10.63	13.52	14.34	14.61	16.84	17.4	17.67	17.67
1,000	2.27	5.26	8.99	12.55	13.27	13.5	16.39	16.86	17.05	17.05
2,000	1.79	4.19	7.41	11.11	11.96	12.62	15.72	16.14	16.37	16.37
5,000	1.38	3	5.23	9.24	10.3	10.93	14.12	14.79	15	15.00
10,000	0.99	2.28	3.76	7.39	8.42	8.64	12.21	13	13.13	13.13
20,000	0.66	1.6	2.93	5.44	6.33	7.16	10.24	11.04	11.15	11.15
50,000	0.32	0.88	1.58	3.19	4.08	4.59	6.63	7.63	7.75	7.75

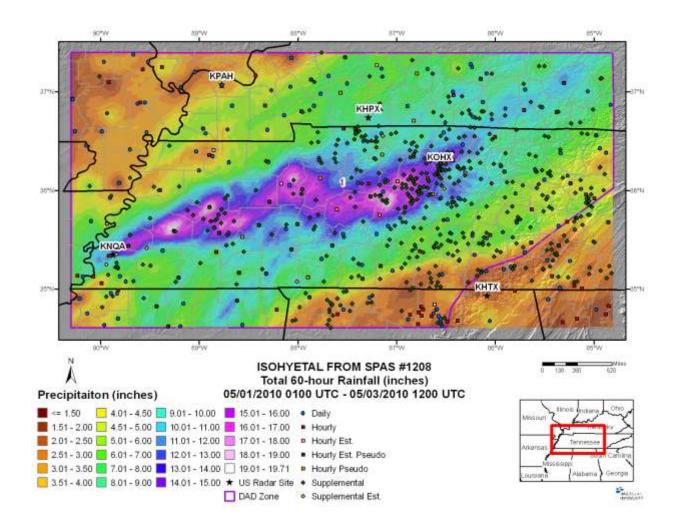




Appendix F: Figure F.10: Depth-area-duration chart for Warner Park, TN, May 30, 2010



Appendix F: Figure F.11: Mass curve chart for Warner Park, TN, May 30, 2010



Appendix F: Figure F.12: Total storm isohyetal analysis for Warner Park, TN, May 30, 2010

Alley Spring, MO, AWA 3

March 17, 2008 Storm Type: Frontal Grid Points Used: 8-10, 16-17

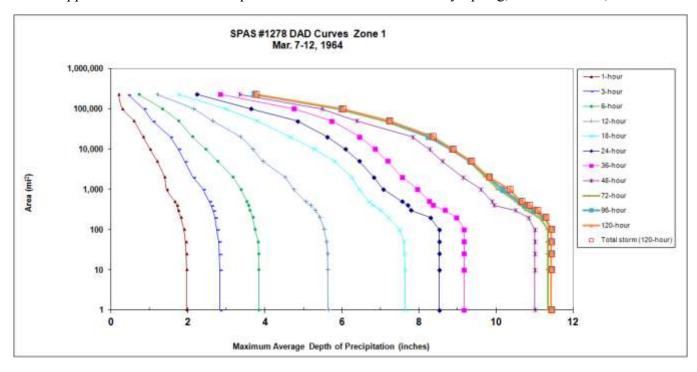
Storm Name: SPAS 1242 Storm Date: 3/17-20/20 AWA Analysis Date: 12/13/2013	08	ng, MO		Storm A	Adjustn	nent fo	r ANO	Grid Po	int 1	
emporal Transposition Date	1-Apr									
emporar Transposition Date	Lat	Long			Moisture I	nflow Direc	ction	SE @ 500	miles	
torm Center Location	37.16 N	91.45 W			Grid Point			350	feet	
torm Rep Dew Point Location	31.30 N	86.40 W				iter Elevatio	nn.	1,050	feet	
ransposition Dew Point Location		87.18 W				Analysis I		24	hrs	
ransposition Dew Point Education Frid Point Location	35.31 N	93.23 W			этогш кер	Allatysis I	Juration	24	1115	
The storm representative d	ew noint is	66.0 F	with total n	recipitable w	ater ahove	sea level of	,		1.86	inches
The in-place maximum d	_	71.0 F	_	recipitable w					2.36	inches
The transpositioned maximum d	•	67.0 F		recipitable w					1.95	inches
The in-place storm e	•	1,050	which	h subtracts	0.20	inches o	f precipitabl	e water at	66.0 F	
The in-place storm of	elevation is	1,050	which	h subtracts	0.23	inches o	f precipitabl	e water at	71.0 F	
The transposition storm e	elevation at	350	whice	ch subtracts	0.19	inches o	f precipitabl	e water at	67.0 F	
The Grid Point/inflow barri	er height is	1,000	which	h subtracts	0.19	inches o	f precipitabl	e water at	67.0 F	
The in-place	e maximizati	on factor is	1.28		Notes: Storn	n representat	ive dew point	value was based	on	1
_	transpositi				maximum 24	4-hr Td value	s for March 1	6-17, 2008 at		
The elevation/barr	-				KPRN, KOZ	R, KCEW, a	nd K79J.			
The to	tal adjustme	ent factor is	1.06		<u></u>					
Observed Storm Depth	-Area-Dura 1 Hours	tion 6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	2.2	6.0	8.9	11.0	12.9	14.3	14.7		14.7	1
10 sq miles	2.0	5.9	8.7	11.0	12.9	14.3	14.7		14.7	1
100 sq miles	1.6	5.0	8.0	10.8	12.7	13.7	14.0	· · · · · · · · · · · · · · · · · · ·	14.1	
200 sq miles	1.4	4.6	7.7	10.5	12.4	13.4	13.6		13.8	
500 sq miles	1.3	3.9	7.1	9.8	11.8	12.7	13.0		13.2	1
1000 sq miles	1.2	3.8	6.2	8.9	11.0	12.2	12.5		12.6	
2000 sq miles	1.1	3.3	5.9	8.1	10.5	11.6	11.9		12.0	1
5000 sq miles	0.9	2.8	5.2	7.2	9.4	10.6	11.0	ļ	11.0	1
10000 sq miles 20000 sq miles	0.7 0.6	2.5 2.2	4.7 4.1	6.5 5.6	8.3 7.0	9.7 8.6	10.0 8.9		10.1 9.0	
Adjusted Storm Depth-	Area-Dura 1 Hours	tion 6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	2.3	6.4	9.4	11.6	13.6	15.1	15.6	-	15.6	
10 sq miles	2.1	6.2	9.2	11.6	13.6	15.1	15.6	-	15.6	1
100 sq miles	1.7	5.3	8.4	11.5	13.4	14.4	14.8	- 1	14.9	
200 sq miles	1.5	4.9	8.1	11.1	13.1	14.1	14.4	-	14.6	
500 sq miles	1.4	4.1	7.5	10.4	12.4	13.4	13.7	-	13.9	
1000 sq miles	1.3	4.0	6.6	9.4	11.6	12.9	13.2		13.3	
2000 sq miles	1.2	3.5	6.3	8.6	11.0	12.3	12.6	-	12.7	1
5000 sq miles	1.0	3.0	5.5	7.6	9.9	11.2	11.6	-	11.6	
10000 sq miles 20000 sq miles	0.8 0.6	2.7	4.9 4.3	6.9 5.9	8.7 7.4	10.2 9.1	10.6 9.4	-	10.7 9.5	1
Storm or Storm Center 1	Name		SPAS 1242 All	ley Spring. I	MO					1
Storm Date(s)			3/17-20/2008							
Storm Type			General Storm							
Storm Location			37.16 N	91.45 W						1
Storm Center Elevation Precipitation Total & D		sa mi)	1050 15.09 inches in	72 hours						1
•	1	- 1/								
Storm Representative D			66.0 F	24						1
Storm Representative D	Dew Point L	ocation	31.30 N	86.40 W		Mar	Apr			1
Maximum Dew Point	_		71.0 F			69.5	72			1
Moisture Inflow Vector			SE @ 500 1.28							1
In-place Maximization F			1 0							
In-place Maximization F	- (D-t-)		1-Apr	87.18 W		Mar	Ann			1
In-place Maximization F Temporal Transposition				10 / 18 W		Mar	Apr 68.5			1
In-place Maximization F Temporal Transposition Transposition Dew Poi	nt Location		36.85 N	07.120 11						1
In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximur	nt Location n Dew Poir		67.0 F	07.10 17		65	00.3			1
In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximur Transposition Adjustm	nt Location n Dew Poir ent Factor		67.0 F 0.83			60	06.3			
In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximur Transposition Adjustm Grid Point Basin Elevate	nt Location n Dew Poir ent Factor ion		67.0 F 0.83 350			65	08.3			
In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm Grid Point Basin Elevati Highest Elevation in Ba	nt Location n Dew Poir ent Factor ion		67.0 F 0.83			63	06.3			
In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum Transposition Adjustm Grid Point Basin Elevat	nt Location n Dew Poir tent Factor tion asin		67.0 F 0.83 350 14,344			63	06.3			

Appendix F: Table F.10: Storm spreadsheet for Alley Spring, MO, March 17, 2008

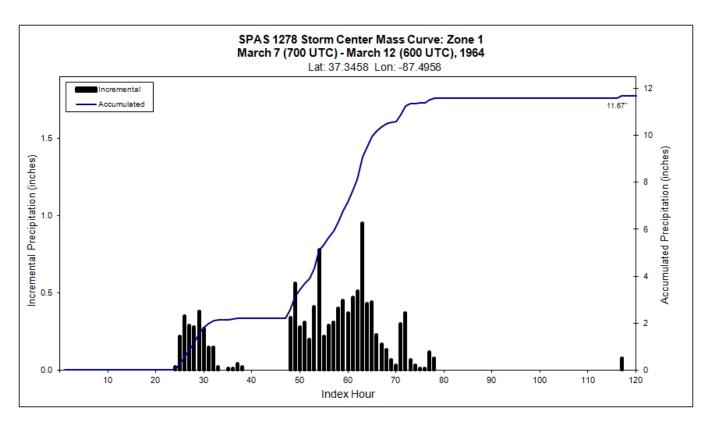
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	Storm 1278 - March 7 (0700 UTC) - Mach 12 (0600 UTC), 1964 MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
					•	•		•					
						Duration	n (hours)						
Area (mi²)	1	3	6	12	18	24	36	48	72	96	120	Total	
0.3	2	2.89	3.9	5.64	7.74	8.71	9.37	11.25	11.59	11.67	11.67	11.67	
1	1.97	2.83	3.84	5.64	7.63	8.52	9.17	11	11.34	11.43	11.43	11.43	
10	1.97	2.83	3.84	5.63	7.63	8.52	9.17	11	11.34	11.43	11.43	11.43	
25	1.96	2.82	3.83	5.62	7.62	8.52	9.17	11	11.34	11.43	11.43	11.43	
50	1.94	2.8	3.82	5.59	7.61	8.52	9.17	11	11.34	11.43	11.43	11.43	
100	1.9	2.76	3.74	5.53	7.49	8.52	9.17	11	11.34	11.43	11.43	11.43	
200	1.82	2.7	3.68	5.42	7.19	8.29	8.97	10.83	11.12	11.25	11.28	11.28	
300	1.75	2.65	3.61	5.3	7	7.78	8.67	10.49	10.79	10.96	11.06	11.06	
400	1.72	2.6	3.57	5.18	6.81	7.71	8.37	9.94	10.65	10.74	10.85	10.85	
500	1.66	2.55	3.53	5.05	6.7	7.55	8.27	9.89	10.53	10.61	10.65	10.65	
1,000	1.45	2.39	3.37	4.74	6.45	7.07	7.96	9.59	10.05	10.16	10.34	10.34	
2,000	1.4	2.13	3.16	4.51	6.25	6.82	7.56	9.13	9.72	9.8	9.81	9.81	
5,000	1.2	1.92	2.77	3.95	5.81	6.44	7.18	8.6	9.3	9.32	9.35	9.35	
10,000	1.02	1.75	2.46	3.68	5.29	6.09	6.86	8.26	8.82	8.84	8.88	8.88	
20,000	0.84	1.54	2.12	3.36	4.64	5.61	6.46	7.82	8.23	8.24	8.36	8.36	
50,000	0.6	1.08	1.76	2.64	3.79	4.84	5.74	6.38	7.1	7.2	7.23	7.23	
100,000	0.3	0.86	1.34	2.14	2.98	3.63	4.76	5.47	5.9	5.97	6.01	6.01	
227,343	0.2	0.45	0.73	1.2	1.76	2.24	2.85	3.34	3.72	3.72	3.77	3.77	

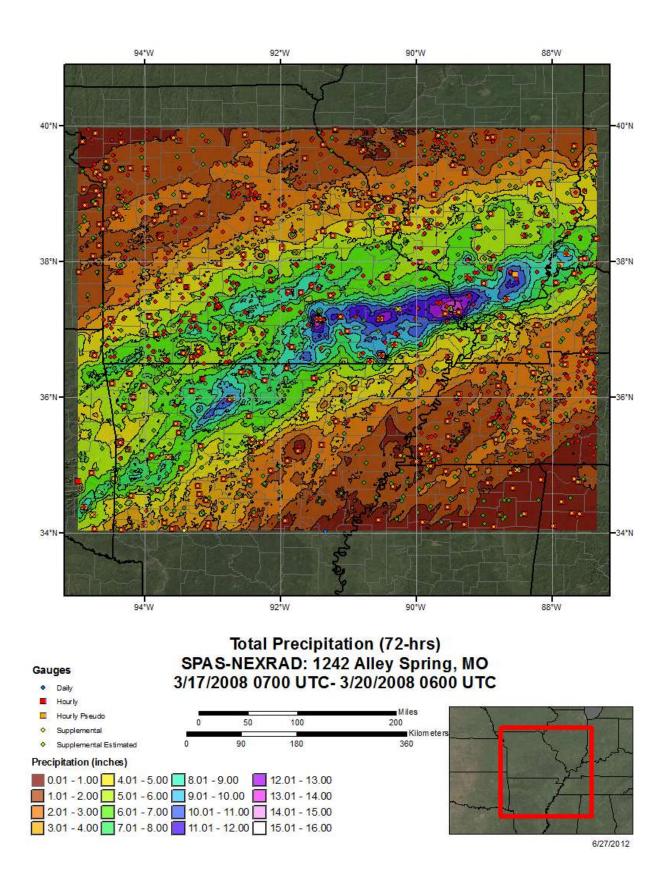
Appendix F: Table F.11: Depth-area-duration values for Alley Spring, MO March 17, 2008



Appendix F: Figure F.13: Depth-area-duration chart for Alley Spring, MO March 17, 2008



Appendix F: Figure F.14: Mass curve chart for Alley Spring, MO March 17, 2008



Appendix F: Figure F.15: Total storm isohyetal analysis for Alley Spring, MO March 2008

Larto Lake, LA, AWA 4

September 1, 2008 Storm Type: Tropical Grid Points Used: 1-2

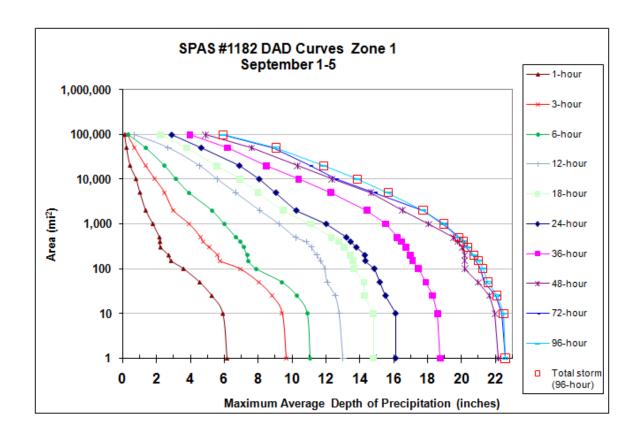
	2-Larto Lake	, LA								
orm Date: 9/1-5/2008 VA Analysis Date: 12/13/201				Storm .	Adjustr	nent fo	r ANO	Grid Po	int 1	
emporal Transposition Date	15-Aug									
	Lat	Long			Moisture I	nflow Direct	ion:	SW @ 150	miles	
torm center location	31.22 N	92.13 W			Grid Point	Elevation		400	feet	
torm Rep Td location	30.00 N	94.00 W			Storm Cen	ter Elevation	1	50	feet	
ransposition Td location	34.10 N	95.19 W				Analysis D		24	hours	
rid Point location	35.31 N	93.23 W				,				
The eterms resumment	tation TAin	76.0 F	unith total m	recipitable w		11 -6			2.99	inches
The storm represer The in-place ma		80.0 F		recipitable w recipitable w					3.60	inches.
The transpositioned ma		79.5 F		recipitable w					3.52	inches
The in-place storm		50		ch subtracts			f precipitabl	e water at	76.0 F	
The in-place storm		50	whi	ch subtracts	0.03		f precipitabl		80.0 F	
The transposition storm	elevation at	400	whi	ch subtracts	0.12	inches o	f precipitabl	e water at	79.5 F	
The Grid point/inflow bar	rier height is	400	whi	ch subtracts	0.12	inches o	f precipitabl	e water at	79.5 F	
The in-pla	ice maximizati	ion factor is	1.21	1	Notes:					1
	ne transpositi									
The elevation/ba	-									
			1.15							
The t	total adjustm	ent factor is	1.15							
Observed Storm Depth	-Area-Durat	ion			·····		·····			
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles		12.8	14.8	16.1	-	18.6	22.0	-	22.4	
100 sq miles	• • • • • • • • • • • • • • • • • • • •	11.9	13.7	14.9	-	17.5	20.2	-	21.1	-
200 sq miles		11.5 10.2	13.5 12.3	14.3 13.2	-	17.0 16.2	20.2 19.5	-	20.7	
500 sq miles 1000 sq miles	•	9.2	12.3 11.1	13.2	-	16.2 15.5	19.5	-	19.8 18.9	1
2000 sq miles	•	8.1	9.5	10.3	-	14.4	16.5	-	17.7	
5000 sq miles	•	6.7	8.0	9.1	-	12.3	14.7	-	14.9	1
10000 sq miles	•	5.6	6.9	8.1	-	10.4	12.4	-	12.6	
20000 sq miles	· \$ · · · · · · · · · · · · · · · · · ·	4.5	5.6	6.9	-	8.5	10.3	-	11.1	
Adjusted Storm Depth-	Anna Dunnati									
Aujusteu Storm Depth-	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	•••••••••••	14.7	17.0	18.5	-	21.4	25.2	-	25.7	
100 sq miles	9.1	13.7	15.7	17.1	-	20.1	23.2	-	24.2	
200 sq miles		13.2	15.4	16.4	-	19.5	23.2	-	23.7	
500 sq miles	•	11.7	14.2	15.2	-	18.6	22.4	-	22.8	
1000 sq miles		10.6	12.7	13.8	-	17.9	20.8	-	21.7	
2000 sq miles	• •	9.3	10.9	11.8	-	16.6	19.0	-	20.4	
5000 sq miles 10000 sq miles		7.7 6.4	9.2 8.0	10.4 9.3	-	14.1 11.9	16.9 14.2	-	17.1 14.4	
20000 sq miles	• • • • • • • • • • • • • • • • • • • •	5.2	6.4	7.9	-	9.7	11.8	-	12.7	
•										
Storm or Storm Center	Name		SPAS 1182-La	rto Lake 1.4	\					1
Storm Date(s)	······		9/1-5/2008	Dune, Dr	_					
Storm Type			Tropical Storm	Gustav						1
Storm Location			31.22 N	92.13 W						
Storm Center Elevation			50							
Precipitation Total & D	uration (10 s	q mi)	23.31 inches in	72hrs						
Storm Representative	Td		76.0 F							
Storm Representative			30.00 N	94.00 W		A				
In-place Maximum Td			80.0 F			79				
Moisture Inflow Vector			SW @ 150							
In-place Maximization I	actor									
Temporal Transposition			15-Aug							
Transposition Dewpoir			34.10 N	95.19 W		A				
Transposition Maximus			79.5 F			78.5				
Transposition Adjustm	ent Factor		400							-
Grid Point Elevation			400							-
Highest Elevation in Ba Inflow Barrier Height	15111		14,344 N/A							1
Elevation Adjustment I	Factor		4/22							1
Total Adjustment Factor			1.15							1
										_

Appendix F: Table F.12: Storm spreadsheet for Larto Lake, LA, September 1, 2008

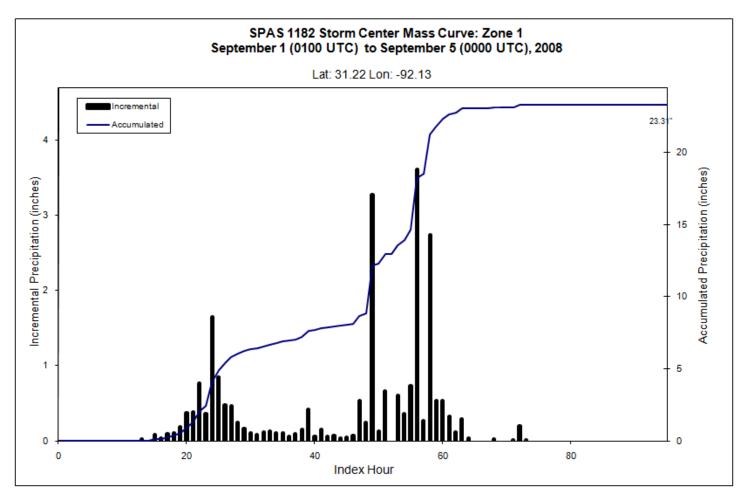
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Sto	rm 118:	2 - Sep	tember JM AVER	1 (010 RAGE DE	0 UTC)	to Sep	otembe	r 5 (000	00 UTC), 2008	
						ration (ho		`	•		
Area (mi²)	1	3	6	12	18	24	36	48	72	96	Total
0.40	6.35	9.89	11.34	13.44	15.26	16.55	19.37	22.93	23.31	23.31	23.31
1	6.15	9.65	11.08	13.02	14.80	16.10	18.75	22.17	22.60	22.60	22.60
10	5.90	9.42	10.91	12.80	14.80	16.10	18.59	21.98	22.37	22.48	22.48
25	5.25	8.82	10.29	12.56	14.26	15.51	18.29	21.66	22.03	22.10	22.10
50	4.54	8.03	9.42	12.09	14.24	15.17	17.89	21.00	21.34	21.56	21.56
100	3.58	6.92	7.88	11.94	13.66	14.85	17.47	20.21	21.11	21.28	21.28
150	2.85	5.72	7.44	11.70	13.60	14.32	17.11	20.20	20.89	21.01	21.01
200	2.71	5.61	7.35	11.46	13.45	14.29	16.99	20.19	20.67	20.73	20.73
300	2.23	5.10	7.15	11.15	13.09	13.79	16.72	20.03	20.25	20.39	20.39
400	2.20	4.74	6.96	10.84	12.75	13.45	16.45	19.77	20.04	20.13	20.13
500	2.17	4.61	6.70	10.22	12.32	13.20	16.21	19.51	19.83	19.87	19.87
1,000	1.78	3.93	6.00	9.23	11.08	12.01	15.54	18.07	18.90	18.98	18.98
2,000	1.36	3.00	5.27	8.09	9.47	10.25	14.42	16.52	17.74	17.75	17.75
5,000	1.02	2.48	3.92	6.66	7.99	9.05	12.30	14.67	14.86	15.67	15.67
10,000	0.79	1.91	3.16	5.57	6.93	8.06	10.39	12.35	12.57	13.85	13.85
20,000	0.44	1.35	2.47	4.52	5.55	6.89	8.47	10.31	11.06	11.87	11.87
50,000	0.23	0.71	1.36	2.68	3.78	4.64	6.20	7.63	8.86	9.05	9.05
97,260	0.12	0.28	0.34	0.67	2.22	2.90	3.98	4.89	5.86	5.94	5.94

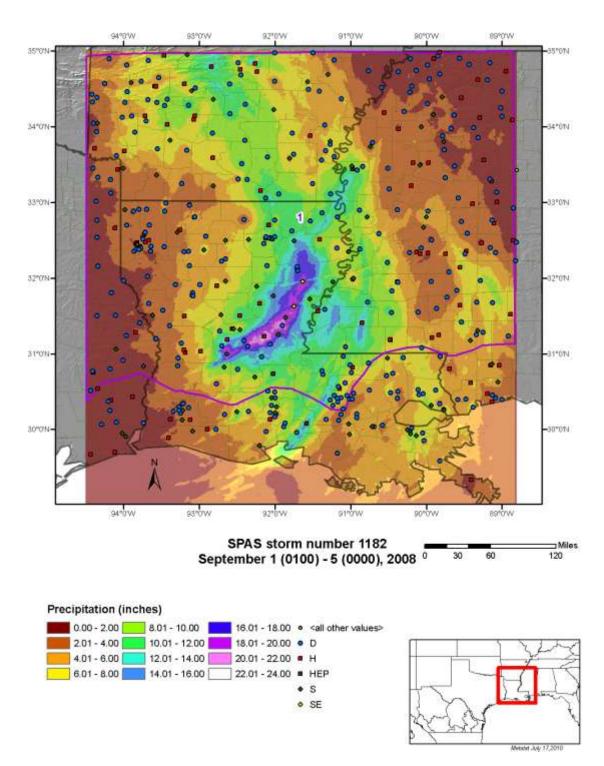
Appendix F: Table F.13: Depth-area-duration values for Larto Lake, LA, September 1, 2008



Appendix F: Figure F.16: Depth-area-duration chart for Larto Lake, LA, September 1, 2008



Appendix F: Figure F.17: Mass curve chart for Larto Lake, LA, September 1, 2008



Appendix F: Figure F.18 Total storm isohyetal analysis for Larto Lake, LA, September 1, 2008

Fall River, KS, AWA 5

June 30, 2007

Storm Type: Frontal/MCC

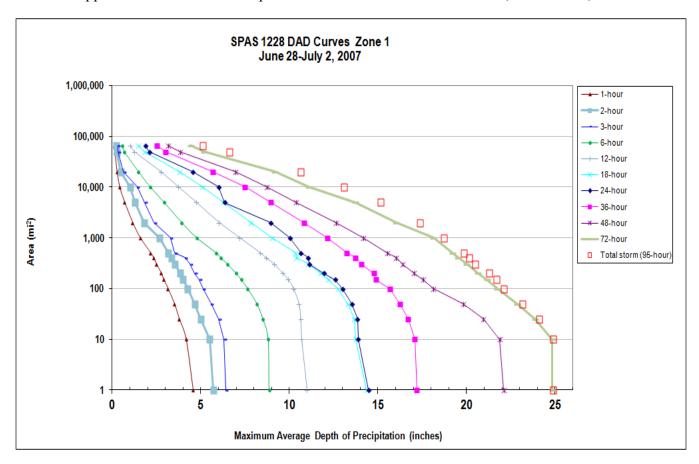
Grid Points Used: 1-4, 8-11, 16-18

	8 Fall River, I	KS		04	A 4! 4		4 3100	Cult		
orm Date: 6/28/2007 WA Analysis Date: 12/13/201	- 7/2/2007 3			Storm	Aajust	ment id	or ANO	Grid Po	oint 1	
	J 15-Jul									
emporal Transposition Date	Lat	Long			Moisture Ir	nflow Direct	ion	S @ 460	miles	
torm Center Location	37.63 N	96.05 W			Grid Point		ion	350	feet	
torm Rep Dew Point Location	31.00 N	95.50 W				ter Elevation		900	feet	
ransposition Dew Point Location		93.30 W 92.00 W				Analysis Du		24	hours	
rid Point Location	35.31 N	93.23 W			Storm Kep	Allalysis Di	II ation	24	nouis	
		•								
The storm representative	dew point is	76.5 F		al precipitable					3.07	inches.
The in-place maximum	-	80.0 F		al precipitable					3.60	inches.
The transpositioned maximum	•	80.5 F		al precipitable					3.68	inches.
The in-place ston The in-place ston		900 900		iich subtracts iich subtracts			f precipitabl f precipitabl		76.5 F 80.0 F	
The transposition basis				ich subtracts			f precipitabl		80.5 F	
The grid point/inflow ba		1,000		ich subtracts			f precipitabl		80.5 F	
The in-place st			1.17					228. Storm re		
The transposition/e			1.02			alue was base 2007 at KDK		n 24-hr Td val	ues between	
The b	arrier adjustm	ent factor is	1.00		June 21-28, .	2007 at KDK	r and AU13.			
The	total adjustm	ent factor is	1.18	1						
1116	.ota aujuotiii	CIR IUCIOI IS	2.10							
Observed Storm Depth	ı-Area-Durati	ion								
	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles	÷	6.4	8.9	11.0	14.4	14.5	17.2	22.1	24.8	
10 sq miles		6.3	8.8	10.7	13.8	13.9	17.1	21.9	24.8	
100 sq miles	•	5.1	7.6	10.2	12.7	13.0	15.7	18.1	21.7	
200 sq miles		4.7	7.0	9.6	11.8	11.9	14.8	17.1	20.7	
500 sq miles	•	3.5	5.9	8.4	10.4	10.7	13.2	15.5	19.2	
1000 sq miles		3.3 2.4	4.8 3.9	7.2 6.0	9.0 7.8	10.0 9.0	12.1 10.8	14.2 12.6	18.1 16.0	1
2000 sq miles 5000 sq miles	÷	1.8	2.9	4.7	6.3	6.4	9.0	10.4	13.7	
10000 sq miles		1.4	2.2	3.7	5.1	6.0	7.5	8.7	11.1	
20000 sq miles		0.6	1.5	2.7	3.8	4.6	5.7	7.0	9.2	
Adjusted Storm Depth		,			y		·		,	
	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles		7.6	10.5	13.0	17.0	17.1	20.4	26.2	29.4	-
10 sq miles 100 sq miles	•	7.5 6.1	10.4 9.0	12.7 12.1	16.3 15.1	16.4 15.4	20.2 18.6	25.9 21.5	29.4 25.7	
200 sq miles		5.5	8.3	11.4	13.9	14.1	17.5	20.2	24.4	
500 sq miles	÷	4.2	6.9	9.9	12.3	12.6	15.7	18.4	22.7	
1000 sq miles		3.9	5.6	8.5	10.7	11.9	14.4	16.8	21.5	
2000 sq miles	1.3	2.8	4.6	7.1	9.3	10.6	12.8	14.9	19.0	
5000 sq miles		2.2	3.5	5.6	7.4	7.5	10.6	12.3	16.3	
10000 sq miles		1.7	2.5	4.4	6.0	7.1	8.9	10.3	13.1	
20000 sq miles	0.3	0.7	1.8	3.2	4.5	5.4	6.7	8.2	10.9	
Storm or Storm Center	Name		SPAS 1228	Fall River, K	S					
Storm Date(s)			6/28/2007 - 7							
Storm Type			Synoptic							
Storm Location			37.63 N	96.05 W						
Storm Center Elevation			900	05.1						-
Precipitation Total & I	ruration		25.50 Inches	y)-nours						1
Storm Representative I	Dew Point		76.5 F	24						1
Storm Representative I			31.00 N	95.50 W						1
			80.0 F							
Maximum Dew Point			S @ 460	Miles						_
Moisture Inflow Vecto	Castan		1.17							-
	Factor									1
Moisture Inflow Vecto In-place Maximization			15-Jul							1
Moisture Inflow Vecto In-place Maximization Temporal Transpositio	n (Date)		15-Jul 36.10 N	92.00 W						
Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dew Po	n (Date) int Location		15-Jul 36.10 N 80.5 F	92.00 W						
Moisture Inflow Vecto In-place Maximization Temporal Transpositio	on (Date) int Location m Dew Point		36.10 N	92.00 W						
Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dew Po Transposition Maximu	on (Date) int Location m Dew Point		36.10 N 80.5 F	92.00 W						
Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dew Po Transposition Maximu Transposition Adjusts Grid Point Elevation Highest Elevation in B	on (Date) int Location m Dew Point nent Factor		36.10 N 80.5 F 1.02	92.00 W						
Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dew Po Transposition Maximu Transposition Adjuste Grid Point Elevation Highest Elevation in B Inflow Barrier Height	on (Date) int Location m Dew Point nent Factor asin		36.10 N 80.5 F 1.02 350 14,344 1,000	92.00 W						
Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dew Po Transposition Maximu Transposition Adjusts Grid Point Elevation Highest Elevation in B	on (Date) int Location in Dew Point nent Factor asin Factor		36.10 N 80.5 F 1.02 350 14,344	92.00 W						

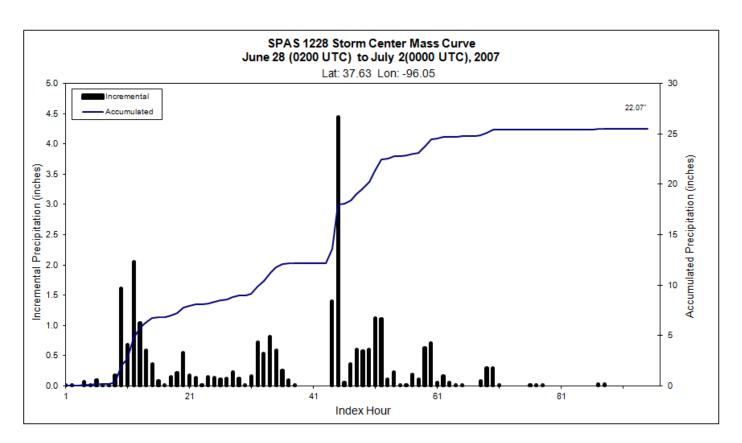
Appendix F: Table F.14: Storm spreadsheet for Fall River, KS, June 30, 2007

	Sto	rm 122	8 - Jun	e 28 (02	200 UT	C) - Jul	y 2 (00	00 UTC), 2007		
		MAXIMU	JM AVE	RAGE DE	EPTH OF	PRECIF	OITATIO	N (INCHE	S)		
					Du	ration (hou	urs)				
Area (mi²)	1	2	3	6	12	18	24	36	48	72	Total
0.4	4.68	5.84	6.6	9.12	11.37	14.72	14.91	17.72	22.66	25.43	25.50
1	4.56	5.7	6.41	8.86	10.99	14.35	14.46	17.2	22.09	24.84	24.90
10	4.16	5.5	6.31	8.81	10.69	13.76	13.89	17.08	21.88	24.84	24.90
25	3.78	4.99	6.02	8.51	10.63	13.66	13.85	16.71	20.96	23.86	24.10
50	3.5	4.66	5.58	8.17	10.53	13.31	13.53	16.24	19.81	22.86	23.18
100	3.14	4.26	5.12	7.64	10.22	12.73	13.01	15.68	18.13	21.74	22.11
150	2.9	4	4.91	7.28	9.93	12.22	12.58	14.89	17.55	21.16	21.69
200	2.76	3.83	4.65	6.99	9.61	11.77	11.94	14.76	17.05	20.65	21.28
300	2.49	3.54	4.4	6.5	9.14	11.07	11.13	14.05	16.39	20.02	20.49
400	2.33	3.35	4.11	6.15	8.67	10.39	11.07	13.73	16.03	19.53	20.17
500	2.16	3.18	3.52	5.87	8.36	10.36	10.65	13.24	15.53	19.21	19.84
1,000	1.57	2.66	3.29	4.76	7.18	9.02	10.04	12.13	14.17	18.13	18.71
2,000	1.14	1.79	2.37	3.92	6.03	7.83	8.95	10.82	12.62	16.03	17.37
5,000	0.69	1.29	1.83	2.92	4.73	6.29	6.35	8.96	10.39	13.73	15.17
10,000	0.41	1	1.4	2.15	3.74	5.09	6.01	7.5	8.72	11.08	13.09
20,000	0.26	0.48	0.63	1.48	2.73	3.79	4.55	5.68	6.95	9.18	10.66
50,000	0.14	0.25	0.34	0.68	1.24	1.84	2.11	3.02	3.82	5.21	6.63
65,761	0.12	0.23	0.31	0.55	1.03	1.48	1.87	2.51	3.15	4.44	5.10

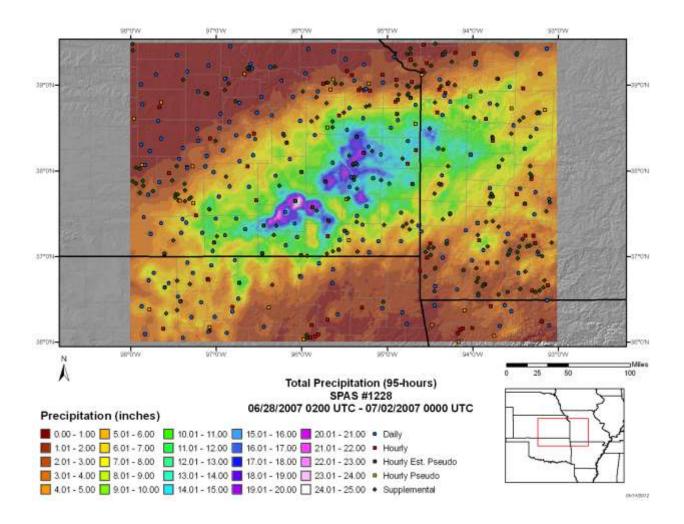
Appendix F: Table F.15: Depth-area-duration values for Fall River, KS June 30, 2007



Appendix F: Figure F.19: Depth-area-duration chart for Fall River, KS June 30, 2007
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Appendix F: Figure F.20: Mass curve chart for Fall River, KS June 30, 2007



Appendix F: Figure F.21: Total storm isohyetal analysis for Fall River, KS June 30, 2007

Hokah, MN, AWA 6

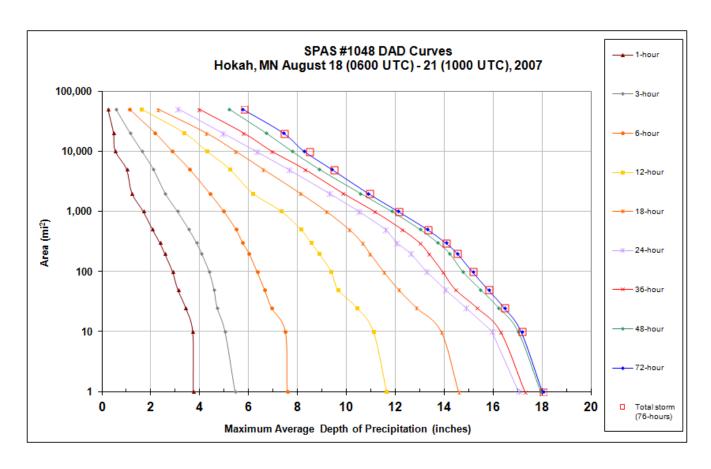
August 18, 2007 Storm Type: Frontal/MCC Grid Points Used: 8-11, 16-18

orm Name: Hokah, MN- orm Date: 18-Aug-200	-SPAS 1048)7			Storm	Adiust	ment fo	or ANO	Grid Po	int 8	
WA Analysis Date: 12/13/2013				500111	Trojust			OHO I O		
emporal Transposition Date	3-Aug				20.0	5 Di (00331 0 460	-	
	Lat	Long				nflow Direct	ion	SSW @ 360	miles	
orm Center Location	43.81 N	91.52 W			Grid Point			1,200	feet	
orm Rep Dew Point Location	38.91 N	93.85 W				ter Elevatior		1,000	feet	
ansposition Dew Point Location	37.83 N	94.87 W			Storm Rep	Analysis Du	ıration	24	hours	
rid Point Location	37.50 N	93.00 W								
The storm representative	_	74.0 F		l precipitable					2.73	inches.
The in-place maximum	_	80.5 F		l precipitable					3.68	inches.
The transpositioned maximum	-	80.0 F		l precipitable					3.60	inches.
The in-place storm		1,000		ich subtracts			f precipitabl		74.0 F	
The in-place storm		1,000		ich subtracts			f precipitabl		80.5 F	
The transposition basin		1,200		ich subtracts			f precipitabl		80.0 F	
The Grid point /inflow bar	ner neight is	1,000	WI	ich subtracts	0.29	menes e	f precipitabl	e water at	80.0 F	
The in-place sto	rm maximizat	ion factor is	1.36		Notes: DA	D values tak	en from SPA	S 1048. 24hr	ave Td	
The transposition/ele			0.98		from KIXD	, KLXT, KM	CI, KMKC, I	KOJC, KSTJ, I	KSZL 17th	
The ba	rrier adjustm	ent factor is	1.00		00Z to 18th	00Z				
The t	total adjustm	ent factor is	1.33							
Observed Storm Depth-	Area-Durati	ion		···		· y · · · · · · · · · · · · · · · · · ·		·v		·
	1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hou
1 sq miles	2.12	7.6	11.6	14.6	17.1	-	17.6	18.2	-	18.3
10 sq miles	2.12	7.5	11.1	13.9	16.0	-	16.3	17.0	-	17.2
100 sq miles	2.09	6.3	9.4	11.5	13.3	-	13.9	14.8	-	15.1
200 sq miles	2.03	6.0	8.9	11.0	12.6	-	13.4	14.2	-	14.5
500 sq miles	1.79	5.5	8.1	10.1	11.6	-	12.3	13.0	-	13.3
1000 sq miles	1.53	5.0	7.3	9.2	10.5	-	11.1	11.8	-	12.1
2000 sq miles	0.95	4.4	6.2	8.1	9.3	-	9.9	10.5	-	10.8
5000 sq miles	0.87	3.5	5.2	6.5	7.6	-	8.2	8.8	-	9.0
10000 sq miles 20000 sq miles	0.63 0.41	2.7 1.8	4.0 3.0	5.4 4.0	6.1 4.5	-	6.8 5.1	7.3 5.6	-	7.5 5.9
20000 Sq macs;	0112	2.0		, 110						
Adjusted Storm Depth-		· · · · · · · · · · · · · · · · · · ·	12.11	10 77	24 11	20.11	26 II	40 TT	60 II	72.11
1 sq miles	1 Hour 2.8	6 Hours 10.0	12 Hours 15.5	18 Hours 19.4	24 Hours 22.7	30 Hours	36 Hours 23.3	48 Hours 24.2	60 Hours	72 Hou 24.3
10 sq miles	2.8	10.0	14.8	18.5	21.2	-	21.7	22.6	-	22.8
100 sq miles	2.8	8.4	12.5	15.3	17.6	-	18.5	19.6	-	20.1
200 sq miles	2.7	8.0	11.8	14.6	16.8	_	17.8	18.9	_	19.3
500 sq miles	2.4	7.3	10.8	13.4	15.4	-	16.3	17.3	-	17.7
1000 sq miles	2.0	6.6	9.7	12.2	14.0	-	14.8	15.7	-	16.0
2000 sq miles	1.3	5.8	8.2	10.8	12.4	-	13.1	14.0	-	14.3
5000 sq miles	1.2	4.6	6.9	8.7	10.1	-	10.9	11.7	-	11.9
10000 sq miles	0.8	3.6	5.3	7.2	8.1	_	9.0	9.7	-	10.0
20000 sq miles	0.5	2.4	4.0	5.3	6.0	-	6.8	7.5	-	7.8
Storm or Storm Center N	Vame		Hokah, MN-							
Storm Date(s)			18-Aug-2007							
Storm Type			Synoptic/Th							
Storm Location Storm Center Elevation			43.81 N 1.000	91.52 W						
Precipitation Total & Du	ıration		-	72-hours-SP.	AS 1048					
Storm Representative D	ew Point		74.0 F	24						
Storm Representative D			38.91 N	93.85 W						1
Maximum Dew Point			80.5 F							
Moisture Inflow Vector			SSW @ 360							
In-place Maximization F	actor		1.36							
Temporal Transposition	(Date)		3-Aug							1
Transposition Dew Poin	<u> </u>		37.83 N	94.87 W		J	A			1
Transposition Maximum			80.0 F	3 11		80.5	80			1
Transposition Adjustme			0.98							1
			1,200							1
Grid Point Elevation										
Grid Point Elevation Highest Elevation in Ba	sin		14,344							
	sin		14,344 1,000							

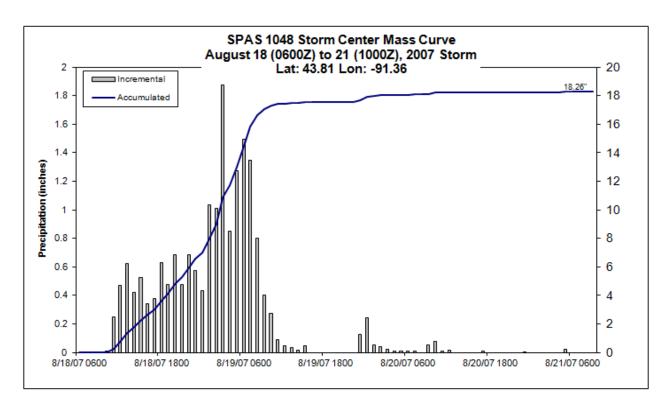
Appendix F: Table F.16: Storm spreadsheet for Hokah, MN, August 18, 2007

	St	orm 10	48 - Hol	kah, MN	N Augus	st 18 - A	ugust 2	21, 200	7	
	ı	MAXIMUI	M AVERA	GE DEP	TH OF P	RECIPITA	ATION (II	NCHES)		
					Duration	n (hours)				
Area (mi²)	1	3	6	12	18	24	36	48	72	Total
0.24	4.02	5.71	7.85	11.89	14.88	17.31	17.55	18.19	18.26	18.26
1	3.72	5.43	7.56	11.64	14.59	17.05	17.31	17.95	18.02	18.02
10	3.70	5.02	7.49	11.10	13.88	15.96	16.31	17.03	17.15	17.17
25	3.41	4.70	6.92	10.42	12.86	14.89	15.34	16.23	16.45	16.46
50	3.09	4.57	6.64	9.65	12.13	14.05	14.46	15.49	15.79	15.79
100	2.87	4.37	6.33	9.37	11.52	13.27	13.93	14.76	15.14	15.14
200	2.55	4.06	6.00	8.87	10.96	12.62	13.37	14.22	14.52	14.52
300	2.35	3.85	5.74	8.55	10.64	12.06	12.99	13.74	14.04	14.04
500	2.05	3.54	5.47	8.13	10.11	11.60	12.27	13.01	13.29	13.30
1,000	1.67	3.07	4.97	7.33	9.17	10.51	11.13	11.84	12.09	12.12
2,000	1.21	2.57	4.39	6.16	8.10	9.30	9.85	10.56	10.86	10.92
5,000	0.99	2.09	3.57	5.23	6.59	7.65	8.28	8.89	9.37	9.47
10,000	0.53	1.62	2.86	4.29	5.46	6.33	6.93	7.77	8.24	8.45
20,000	0.46	1.14	2.16	3.37	4.26	4.95	5.78	6.71	7.39	7.43
50,000	0.23	0.56	1.11	1.61	2.28	3.11	3.95	5.20	5.72	5.80

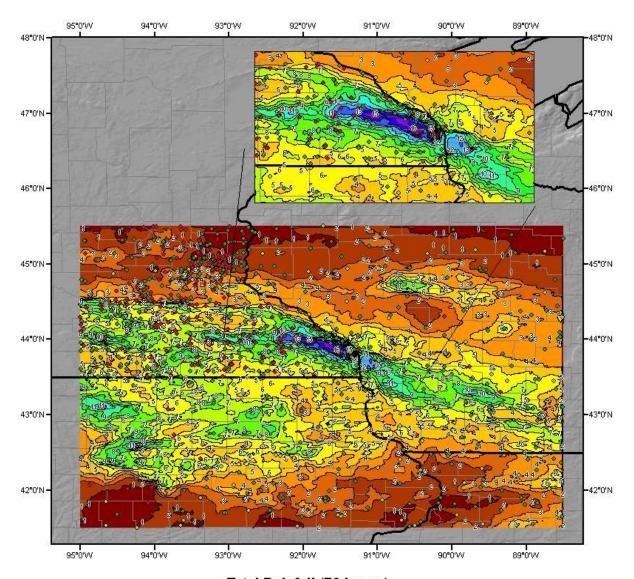
Appendix F: Table F.17: Depth-area-duration values for Hokah, MN, June 2007



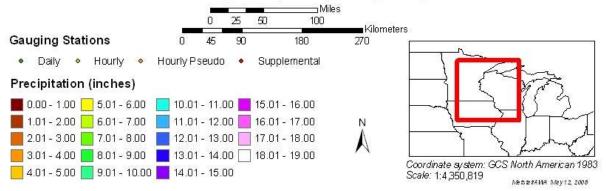
Appendix F: Figure F.22: Depth-area-duration chart for Hokah, MN, June 2007



Appendix F: Figure F.23: Mass curve chart for Hokah, MN, June 2007



Total Rainfall (76-hours) Hokah, MN 2007 Storm Storm #1048 August 18 (0600 Z) to 21 (1000 Z), 2007



Appendix F: Figure F.24: Total storm isohyetal analysis for Hokah, MN, June 2007

Ogallala, NE, AWA 7

July 6, 2002 Storm Type: MCC

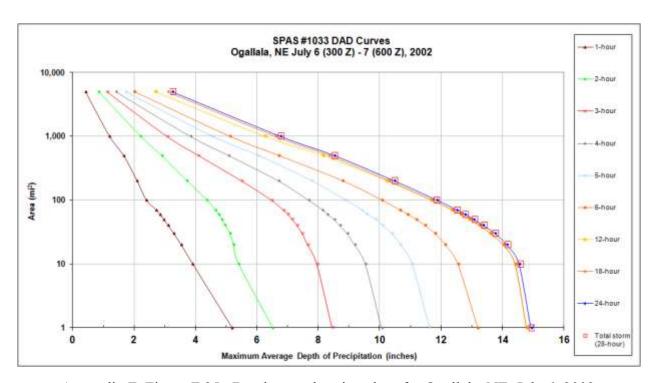
Grid Points Used: 5, 12, 19-20

Storm Name: Ogalla				_						
torm Date: 06-Jul-				Storn	ı Adjust	tment f	or ANC	Grid P	oint 5	
WA Analysis Date: 12/13/2										
emporal Transposition Date	15-Jul	$\overline{}$						~ ~		
	Lat	Long				iflow Directi	on:	S @ 125	miles	
torm center location	41.03 N	101.78 W			Grid Point			3,700 3,428	feet	
torm Rep dew point location	39.34 N	101.97 W				er Elevation			feet	
ransposition dewpoint location	on 40.56 N 35.00 N	101.00 W 102.00 W			Storm Kep	Analysis Du	ration	6	hours	
,										
The storm represents	•			al precipitab					2.79	inches
The in-place maxir				al precipitab					3.84	inches
The transpositioned maxim	num dew point is storm elevation is			tal precipitab ch subtracts	0.775		or f precipitabl	e water at	3.92 74.5 F	inches
•	storm elevation is			ch subtracts	0.99		f precipitabl		81.5 F	
The transposition b				ch subtracts	0.9		f precipitabl		82.0 F	
The Grid point/inflov			whice	ch subtracts	0.9		f precipitabl		82.0 F	
T1 : 1			2.42	1	N-4 (1	т.	4-1 C I	CODO 4 IVI	DT 6 07	1
	e storm maximiza on/elevation to ba		1.41 1.06					KGDC and KI DAD values		
-	on/eievation to bi he barrier adjustn		1.00		SPAS 1033	. 100ai to 0/-0		values	caren Hull	
•			2.00							
	The total adjustn	nent factor is	1.50							
Olesson 1 Ctore D	anth Assa D	ion								
Observed Storm D	epth-Area-Durat 6 Hours	10 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq m		14.4	14.4	14.5	0.0	0.0	0.0	0.0	0.0	1
100 sq m	·············	11.7	11.7	11.8	0.0	0.0	0.0	0.0	0.0	
200 sq m	iles 8.8	10.2	10.3	10.5	0.0	0.0	0.0	0.0	0.0	
500 sq m		8.1	8.3	8.5	0.0	0.0	0.0	0.0	0.0	
1000 sq m	·············	6.2	6.6	6.8	0.0	0.0	0.0	0.0	0.0	
5000 sq m 10000 sq m	••••••••	2.7 0.0	3.1 0.0	3.2 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0	0.0 0.0	
20000 sq m	·············	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Adjusted Storm De	epth-Area-Durati 6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq m	············	21.6	21.6	24 110415	0.0	0.0	0.0	0.0	0.0	
100 sq m	······································	17.5	17.5	17.7	0.0	0.0	0.0	0.0	0.0	1
200 sq m	iles 13.2	15.3	15.4	15.7	0.0	0.0	0.0	0.0	0.0	
500 sq m	············	12.2	12.5	12.7	0.0	0.0	0.0	0.0	0.0	
1000 sq m		9.4	9.9	10.1	0.0	0.0	0.0	0.0	0.0	
5000 sq m	iles 3.0						0.0	0.0	0.0	
		4.0	4.6	4.8	0.0	0.0		· •		
10000 sq m	iles 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1
	iles 0.0	÷		÷		·····		· •		
10000 sq m 20000 sq m	iles 0.0 iles 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0	0.0	0.0	0.0	0.0	
10000 sq m 20000 sq m Storm or Storm Cer	iles 0.0 iles 0.0	0.0	0.0 0.0 Ogallala, N	0.0 0.0	0.0	0.0	0.0	0.0	0.0	
20000 sq m 20000 sq m Stom or Stom Cer Stom Date(s)	iles 0.0 iles 0.0	0.0	0.0 0.0 Ogallala, N 6-Jul-2002	0.0 0.0	0.0	0.0	0.0	0.0	0.0	
10000 sq m 20000 sq m Storm or Storm Cer	iles 0.0 iles 0.0	0.0	0.0 0.0 Ogallala, N 6-Jul-2002	0.0 0.0	0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Location Storm Center Eleva	ales 0.0 ales 0.0 ater Name	0.0	0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428	0.0 0.0 E hunderstorm 101.78 W	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Location	ales 0.0 ales 0.0 ater Name	0.0	0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428	0.0 0.0 E hunderstorm	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Type Storm Location Storm Center Eleva Precipitation Total	nter Name ttion & Duration	0.0	0.0 0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428 14.92 in 24h	0.0 0.0 E hunderstorm 101.78 W	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Type Storm Location Storm Center Eleva	nter Name ttion & Duration ive Dewpoint	0.0	0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428	0.0 0.0 E hunderstorm 101.78 W	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Type Storm Location Storm Center Eleva Precipitation Total Storm Representati Storm Representati	nter Name ttion & Duration ive Dewpoint Locate	0.0 0.0	0.0 0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428 14.92 in 24h 74.5 F 39.34 N 81.5 F	0.0 0.0 0.0 E hunderstorm 101.78 W	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Type Storm Location Storm Center Eleva Precipitation Total Storm Representati Storm Representati Maximum Dewpoin Moisture Inflow Ve	nter Name ttion & Duration ive Dewpoint Locate ector	0.0 0.0	0.0 0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428 14.92 in 24h 74.5 F 39.34 N 81.5 F S @ 125	0.0 0.0 0.0 E hunderstorm 101.78 W	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Type Storm Location Storm Center Eleva Precipitation Total Storm Representati Storm Representati	nter Name ttion & Duration ive Dewpoint Locate ector	0.0 0.0	0.0 0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428 14.92 in 24h 74.5 F 39.34 N 81.5 F	0.0 0.0 0.0 E hunderstorm 101.78 W	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Type Storm Location Storm Center Eleva Precipitation Total Storm Representati Storm Representati Maximum Dewpoin Moisture Inflow Ve	nter Name ttion & Duration ive Dewpoint Locate ector ion Factor	0.0 0.0	0.0 0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428 14.92 in 24h 74.5 F 39.34 N 81.5 F S @ 125	0.0 0.0 0.0 E hunderstorm 101.78 W	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Type Storm Location Storm Center Eleva Precipitation Total Storm Representati Storm Representati Maximum Dewpoin Moisture Inflow Ve In-place Maximizati	nter Name ttion & Duration ive Dewpoint too tt ector con Factor sition (Date)	0.0 0.0	0.0 0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428 14.92 in 24h 74.5 F 39.34 N 81.5 F S @ 125 1.41	0.0 0.0 0.0 E hunderstorm 101.78 W	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Location Storm Center Eleva Precipitation Total Storm Representati Maximum Dewpoir Moisture Inflow Ve In-place Maximizat Temporal Transposition Dew Transposition Dew Transposition Max	atter Name attion & Duration by Description control attion control a	0.0 0.0	0.0 0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428 14.92 in 24h 74.5 F 39.34 N 81.5 F 8 @ 125 1.41 15-Jul 40.56 N 82.0 F	0.0 0.0 0.0 E hunderstorm 101.78 W ars from SPA:	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Type Storm Location Storm Center Eleva Precipitation Total Storm Representati Maximum Dewpoir Moisture Inflow Ve In-place Maximizat Temporal Transpo: Transposition Dew Transposition Max Grid Point Elevation	nter Name tition & Duration we Dewpoint Location for Factor point Location imum Dewpoint n	0.0 0.0	0.0 0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428 14.92 in 24h 74.5 F 39.34 N 81.5 F S @ 125 1.41 15-Jul 40.56 N 82.0 F 3,700	0.0 0.0 0.0 E hunderstorm 101.78 W ars from SPA:	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Type Storm Location Storm Center Eleva Precipitation Total Storm Representati Maximum Dewpoin Moisture Inflow Ve In-place Maximizati Temporal Transpoi Transposition Dew Transposition Max Grid Point Elevation Highest Elevation	nter Name tion & Duration ive Dewpoint Location for Factor sition (Date) point Location imum Dewpoint in Basin	0.0 0.0	0.0 0.0 0.0 Ogallala, N 6-Jul-2002 Synoptic-Ti 41.03 N 3,428 14.92 in 24h 74.5 F 39.34 N 81.5 F S @ 125 1.41 15-Jul 40.56 N 82.0 F 3,700 14,344	0.0 0.0 0.0 E hunderstorm 101.78 W ars from SPA:	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Type Storm Location Storm Center Eleva Precipitation Total Storm Representati Maximum Dewpoin Moisture Inflow Ve In-place Maximizati Temporal Transposition Dew Transposition Max Grid Point Elevation Highest Elevation Transposition to B	nter Name tion & Duration ive Dewpoint Location in Factor sition (Date) point Location imum Dewpoint in Basin asin Adjustment	0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 E hunderstorm 101.78 W ars from SPA:	0.0 0.0	0.0	0.0	0.0	0.0	
Storm or Storm Cer Storm Date(s) Storm Type Storm Location Storm Center Eleva Precipitation Total Storm Representati Maximum Dewpoin Moisture Inflow Ve In-place Maximizati Temporal Transpoi Transposition Dew Transposition Dew Transposition Max Grid Point Elevation Highest Elevation	nter Name tion & Duration we Dewpoint Location factor sition (Date) point Location cimum Dewpoint in Basin asin Adjustment	0.0 0.0 eation	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 E hunderstorm 101.78 W ars from SPA:	0.0 0.0	0.0	0.0	0.0	0.0	

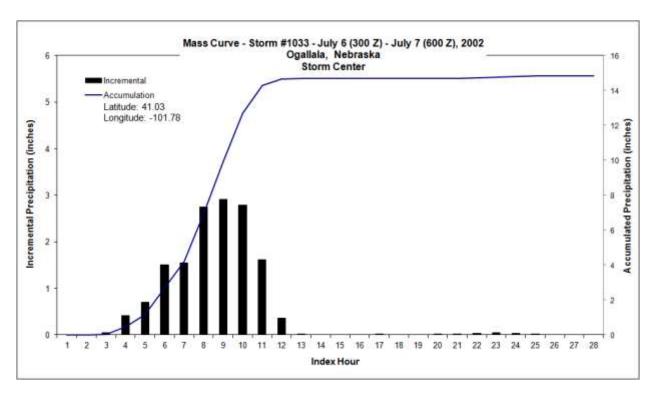
 $Appendix \ F: Table \ F.18: \ Storm \ spreadsheet \ for \ Ogallala, \ NE, \ July \ 6, \ 2002$

	Storm 1033 - Ogallala, NE July 6 (300 Z) - July 7 (600 Z), 2002 MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
						ration (ho		(,						
Area (mi²)	1	2	3	4	5	6	12	18	24	28	total				
1	5.18	6.51	8.45	10.06	11.61	13.19	14.77	14.78	14.92	14.92	14.92				
10	3.90	5.40	7.95	9.53	11.04	12.54	14.39	14.41	14.53	14.57	14.57				
20	3.52	5.23	7.65	9.17	10.66	12.12	14.00	14.01	14.12	14.16	14.16				
30	3.28	5.12	7.47	8.93	10.38	11.79	13.57	13.60	13.74	13.74	13.74				
40	3.10	4.96	7.30	8.69	10.08	11.47	13.22	13.25	13.36	13.39	13.39				
50	2.95	4.86	7.14	8.50	9.85	11.18	12.90	12.93	13.05	13.08	13.08				
60	2.83	4.75	7.00	8.29	9.57	10.90	12.61	12.63	12.77	12.78	12.78				
70	2.71	4.64	6.85	8.13	9.41	10.65	12.34	12.36	12.50	12.51	12.51				
100	2.39	4.37	6.46	7.67	8.88	10.06	11.66	11.69	11.84	11.84	11.84				
200	2.09	3.72	5.49	6.69	7.78	8.79	10.22	10.30	10.46	10.46	10.46				
500	1.65	2.89	4.09	5.07	6.04	6.70	8.14	8.34	8.50	8.51	8.51				
1,000	1.19	2.21	3.06	3.82	4.54	5.11	6.24	6.59	6.75	6.76	6.76				
5,000	0.41	0.84	1.11	1.40	1.72	2.00	2.68	3.09	3.23	3.25	3.25				

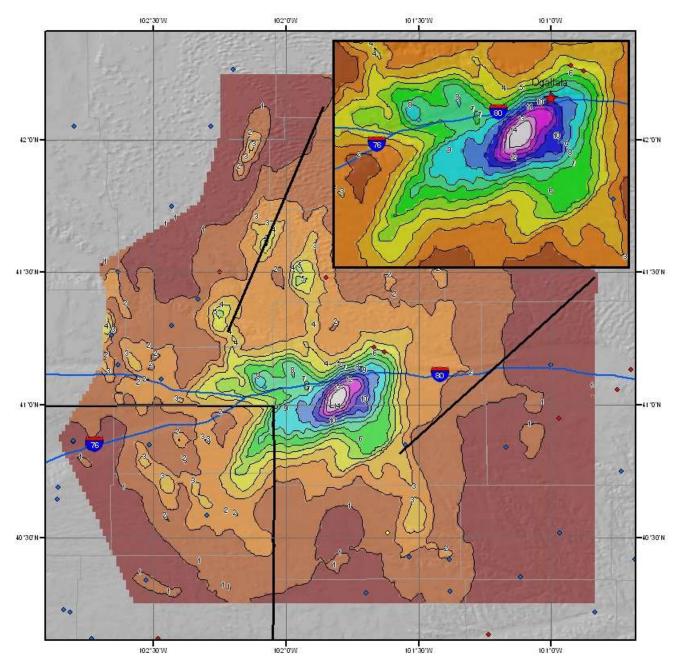
Appendix F: Table F.19: Depth-area-duration values for Ogallala, NE, July 6, 2002



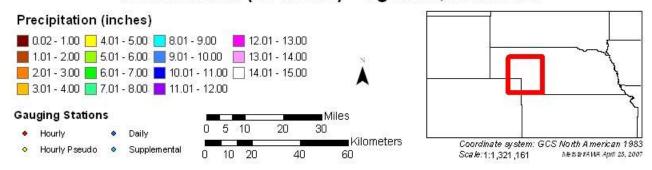
Appendix F: Figure F.25: Depth-area-duration chart for Ogallala, NE, July 6, 2002



Appendix F: Figure F.26: Mass curve chart for Ogallala, NE, July 6, 2002



SPAS Storm #1033 - July 6 to 7, 2002 Total Rainfall (28-hours) - Ogallala, Nebraska



Appendix F: Figure F.27: Total storm isohyetal analysis for Ogallala, NE, July 6, 2002

Fort Collins, CO, AWA 8

July 28, 1997 Storm Type: MCC

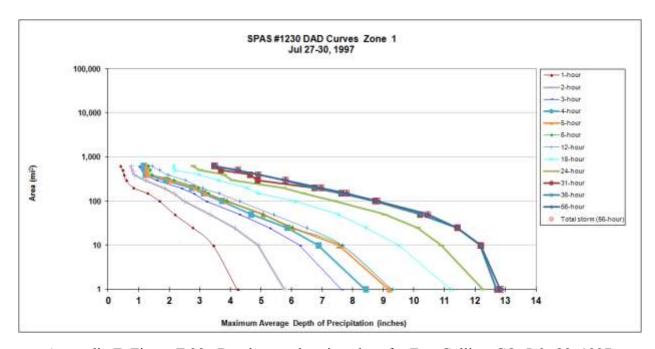
Grid Points Used: 6, 13, 15, 21

Storm Name: Storm Date:	SPAS 1230 7/27-28/199	Fort Collins	,co		Storm	Adinet	mont fo	r ANO	Crid Da	oint 6		
Storm Date: AWA Analysis Date:		97			Storm	Adjust	шент то	r ANO	Gria Po	ли о		
Temporal Transpositio	n Date	15-Jul										
		Lat	Long			Moisture Ir	ıflow Directi	ion:	ESE @ 100	miles		
Storm center location		40.55 N	105.13W			Grid Point	Elevation		4,400	feet		
Storm Rep dew point lo	cation	40.00 N	103.35 W			Storm Cent	er Elevation		5,150	feet		
Transposition dewpoint location 38.16 N		38.16 N	87.45 W			Storm Rep	Analysis Du	ration	12	hours		
Grid Point location		34.50 N	104.00 W			_	<u>-</u>					
The storm re	presentative	dew point is	76.5 F	with total	precipitable	water above	sea level of			3.07	inches.	
The in-place maximum dew point is			79.0 F	with total	precipitable	water above	sea level of			3.44	inches.	
The transposition	ed maximum	dew point is	80.0 F	with total	precipitable	water above	sea level of			3.60	inches.	
The in-place storm elevation is				ich subtracts			f precipitable		76.5 F			
The in-place storm elevation is				ich subtracts			f precipitable		79.0 F			
The transposition basin elevation at The Grid point/inflow barrier height is			which subtracts which subtracts			inches of precipitable inches of precipitable			80.0 F 80.0 F			
The Grid por	HUHIHOW DA	mer neight is	XX	WIII	ch subtracts	X.XX	miches o	i precipitable	water at	1 0.00		
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	ine	total aujustiii	icin iactoi 18	# (ALUE:								
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1 1-	1 Hours 4.2	2 Hours 5.8	3 Hours 7.6	4 Hours 8.4	5 Hours 9.2	6 Hours 9.3	12 Hours 9.3	18 Hours 11.2	24 Hours 12.3	31 Hours 12.7	36 Hours 12.7	56 Hours 12.8
1 sq mile 10 sq mile	3.4	5.8 4.9	6.3	6.9	7.5	9.3 7.6	9.3 7.7	9.5	12.3	12.7	12.7	12.8
50 sq mile	2.2	3.3	4.3	6.9 4.7	7.5 5.0	7.0 5.1	7.7 5.4	9.5 7.5	9.0	10.2	10.2	10.4
······································	1.7	2.5	3.2	3.7	3.9	3.9	4.3	6.1	7.4	8.7	8.7	8.8
100 sq miles 200 sq miles	0.8	1.8	2.4	2.7	2.8	2.9	4.3 3.1	4.6	7.4 5.7	6.7	6.7	6.9
500 sq miles	0.5	0.8	1.1	1.2	1.3	1.4	1.7	2.2	3.0	3.7	4.2	4.2
627 sq miles	0.4	0.7	1.0	1.1	1.3	1.3	1.4	2.1	2.8	3.5	3.5	3.5
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10 sq mile 50 sq mile 100 sq miles 200 sq miles 200 sq miles 500 sq miles 500 sq miles 627 sq miles 627 sq miles 627 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Maximum Dewpoint Moisture Inflow Vector In-place Maximization F I emporal Transposition Fransposition Dewpoir Transposition Maximum Transposition Adjustm Grid Point Elevation	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! *** ** ** ** ** ** ** ** **	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! SPAS 1230 7/27-28/199' Convective 40.55 N 5,150 14.48 inches 76.5 F 40.00 N 79.0 F ESE @ 100 1.14 15-Jul 38.16 N 80.0 F #VALUE! 4,400	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! Fort Collins, 7 105.13W in 56 Hours 12 103.35 W	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! July 78.78	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! Aug 78.6	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALU #VALU #VALU #VALU #VALU
10 sq mile 50 sq miles 200 sq miles 200 sq miles 200 sq miles 500 sq miles 500 sq miles 627 sq miles 627 sq miles 627 sq miles Storm Date(s) Storm Date(s) Storm Type Storm Location Precipitation Total & D Storm Representative E Maximum Dewpoint Moisture Inflow Vector In-place Maximization F I emporal Transposition Transposition Dewpoir Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! *** ** ** ** ** ** ** ** **	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! SPAS 1230 7/27-28/199' Convective 40.55 N 5,150 14.48 inches 76.5 F 40.00 N 79.0 F ESE @ 100 1.14 15-Jul 38.16 N 80.0 F #VALUE! 4,400 14,344	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! Fort Collins, 7 105.13W in 56 Hours 12 103.35 W	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! July 78.78	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! Aug 78.6	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALU #VALU #VALU #VALU #VALU
10 sq mile 50 sq mile 100 sq miles 200 sq miles 200 sq miles 500 sq miles 500 sq miles 627 sq miles 627 sq miles 627 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Maximum Dewpoint Moisture Inflow Vector In-place Maximization F I emporal Transposition Fransposition Dewpoir Transposition Maximum Transposition Adjustm Grid Point Elevation	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! Same Dewpoint Dewpoint Location In (Date) In Location In Dewpoint Entry Action In Dewpoint In De	2 Hours #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! SPAS 1230 7/27-28/199' Convective 40.55 N 5,150 14.48 inches 76.5 F 40.00 N 79.0 F ESE @ 100 1.14 15-Jul 38.16 N 80.0 F #VALUE! 4,400	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! Fort Collins, 7 105.13W in 56 Hours 12 103.35 W	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! July 78.78	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! #VALUE! Aug 78.6	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALUE! #VALUE! #VALUE! #VALUE! #VALUE!	#VALU #VALU #VALU #VALU #VALU

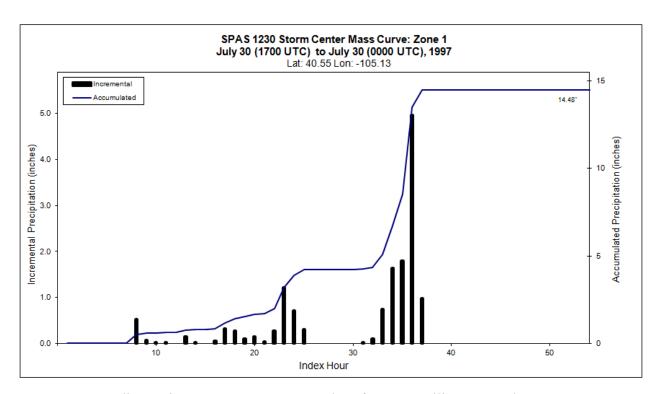
Appendix F: Table F.20: Storm spreadsheet for Fort Collins, CO, July 28, 1997

Area (mi²)	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES) Duration (hours)												
	1	2	3	4	5	6	12	18	24	31	36	56	Total
0.1	4.96	6.76	8.4	9.38	10.13	10.24	10.26	12.95	13.72	14.48	14.48	14.48	14.48
1	4.22	5.76	7.63	8.41	9.17	9.28	9.28	11.21	12.26	12.71	12.71	12.83	12.83
10	3.43	4.9	6.25	6.86	7.53	7.63	7.65	9,49	10.89	12.17	12.17	12.18	12.18
25	2.76	4.11	5.26	5.84	6.01	6.01	6.46	8.43	10.1	11.4	11.4	11.4	11.40
50	2.17	3.31	4.28	4.66	5.04	5.05	5.38	7.51	9.03	10.19	10.19	10.43	10.43
100	1.67	2.48	3.19	3.7	3.86	3.87	4.27	6.09	7.39	8,71	8.71	8.79	8.79
150	1.28	2.14	2.78	3.1	3.18	3.26	3.61	4.89	6.37	7.61	7.61	7.78	7.78
200	0.82	1.81	2.38	2.72	2.84	2.93	3.06	4.55	5.73	6.74	6.74	6.94	6.94
300	0.58	1.2	1.56	1.86	2.01	2.15	2.49	3.59	4.06	4.88	5.74	5.78	5.78
400	0.51	0.83	1.17	1.2	1.27	1.42	1.93	2.95	3.76	4.62	4.88	4.88	4.88
500	0.46	0.79	1.09	1.18	1.26	1.37	1.67	2.17	3	3.68	4.18	4.22	4.22
627	0.39	0.73	1	1.14	1.26	1.31	1.42	2.14	2.77	3.45	3.45	3.48	3.48

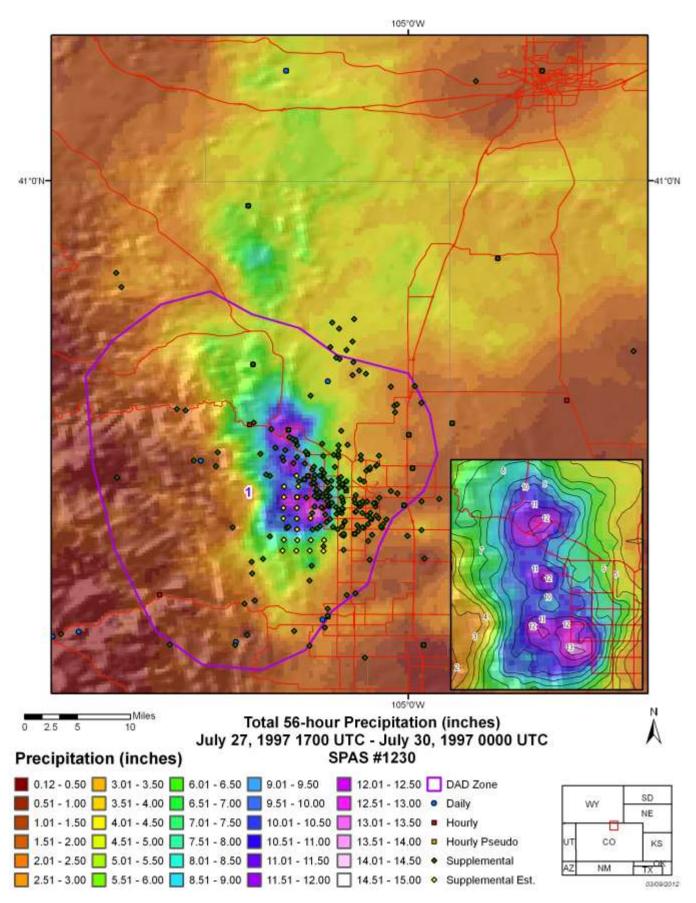
Appendix F: Table F.21: Depth-area-duration values for Fort Collins, CO, July 28, 1997



Appendix F: Figure F.28: Depth-area-duration chart for Fort Collins, CO, July 28, 1997



Appendix F: Figure F.29: Mass curve chart for Fort Collins, CO, July 28, 1997



Appendix F: Figure F.30: Total storm isohyetal analysis for Fort Collins, CO, July 28, 1997

Pawnee Creek, CO, AWA 9

July 29, 1997 Storm Type: MCC

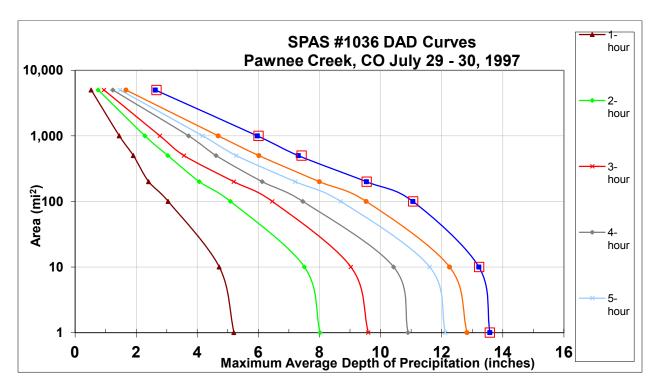
Grid Points Used: 5-6, 12, 15, 19-20

	e Creek, CO			Ct	. A dia	tm == 4 £	ou A NIC	Call	oint E	
orm Date: 28-Jul WA Analysis Date: 12/17/				Storn	ı Adjusi	iment 1	or ANC) Grid P	omt 5	
mporal Transposition Date	15-Jul									
	Lat	Long			Moisture Ir	ıflow Directi	ion:	SE @ 215 N	miles	
orm center location	40.78 N	103.63 W			Grid Point	Elevation		3,700	feet	
orm Rep dew point location	39.20 N	100.15 W			Storm Cent	ter Elevation	ı	4,500	feet	
ransposition dewpoint locati		98.96 W			Storm Rep.	Analysis Du	ration	6	hours	
rid Point location	35.00 N	102.00 W								
The storm represent	ative dew point is	75.5 F	with tot	al precipitabl	le water abo	ve sea level	of		2.92	inches.
The in-place maxi		81.0 F	with tot	al precipitabl	le water abo	ve sea level	of		3.76	inches.
The transpositioned maxi	mum dew point is	82.5	with tot	al precipitabl	le water abo	ve sea level	of		3.84	inches.
•	storm elevation is	4,500		ch subtracts			f precipitabl		75.5 F	
•	storm elevation is	4,500		ch subtracts			f precipitabl		81.0 F	
The transposition The Grid point/inflo				ch subtracts			f precipitabl f precipitabl		82.5 82.5	
тне она роши шио	w Daniel Height is	4,432	WIII	chi subtracts	1.215	inches o	i precipitati	ie water at	02.3	
	ce storm maximizat		1.34					S 1036. Storn	•	ve of KH
•	on/elevation to ba		1.03				S 21Z/28th	-02Z/29th, KG	LD 00Z-	
T	he barrier adjustm	ent factor is	1.00		UJZ/29th,or	iginal storm				
	The total adjustm	ent factor is	1.38							
Observed Storm D	Oepth-Area-Durat 6 Hours	ion 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq n	······	12 Hours	0.0	0.0	0.0	0.0	48 Hours 0.0	0.0	0.0	
100 sq n	······································	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
200 sq n	············	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	"
500 sq n	niles 6. 0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1000 sq n	······	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5000 sq n	••••••	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
10000 sq n	•••••••	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
20000 sq n	niles 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	_
Adjusted Storm D	epth-Area-Durati	on								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq n	niles 16.9	18.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
100 sq n		15.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
200 sq n	••••••	13.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
500 sq n	••••••	10.1 8.2	0.0 0.0	0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0	
1000 sq n 5000 sq n	·············	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
10000 sq n	······································	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
20000 sq n	···········	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Storm or Storm Ce	nter Name		Pawnee Cre	ek, CO						
Storm Date(s)			28-Jul-1997							
Storm Type			MCC-Thun							
Storm Location			40.78 N	103.63 W						
Storm Center Eleva			4,500	~~ . ~			4 64:			4
Precipitation Total	& Duration		13.58" from	SPAS 1037,	13./ Inches	12-hours Col	lorado Clima	ite Center rep	ort,	1
Storm Representat			75.5 F	6						
Storm Representat		ation	39.20 N	100.15 W						1
Maximum Dewpoin			81.0 F	[1]						1
Moisture Inflow V In-place Maximizat			SE @ 215 M	mes						
•										1
Temporal Transpo			15-Jul	00.00						
Transposition Dev	•		41.43 N	98.96 W						1
Transposition Ma Grid Point Elevation			82.5							-
Long Foint Elevation			3,700 14,344							1
	ın Rasın									
Highest Elevation		Factor	-							
	Basin Adjustment		1.03							
Highest Elevation Transposition to E	Basin Adjustment evation - Inflow B		1.03							

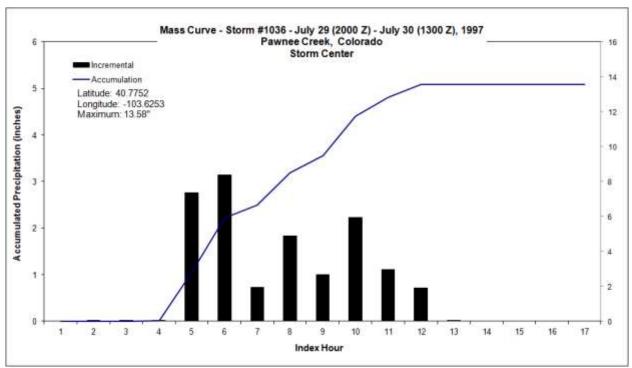
Appendix F: Table F.22: Storm spreadsheet for Pawnee Creek, CO, July 29, 1997

	Storm MAXIMU				•	uly 29									
	Duration (hours)														
Area (mi ²)	ea (mi ²) 1 2 3 4 5 6 12 17 total														
1	1 5.20 8.02 9.60 10.90 12.12 12.83 13.58 13.58 13.58														
10	4.72	7.51	9.03	10.43	11.61	12.26	13.22	13.23	13.23						
100	3.05	5.09	6.46	7.46	8.70	9.53	11.06	11.07	11.07						
200	2.41	4.07	5.20	6.13	7.21	8.00	9.54	9.55	9.55						
500	1.91	3.04	3.57	4.62	5.28	6.02	7.31	7.42	7.42						
1,000	1.45	2.29	2.78	3.72	4.18	4.69	5.97	6.01	6.01						
5,000	0.53	0.76	0.95	1.24	1.48	1.67	2.63	2.67	2.67						

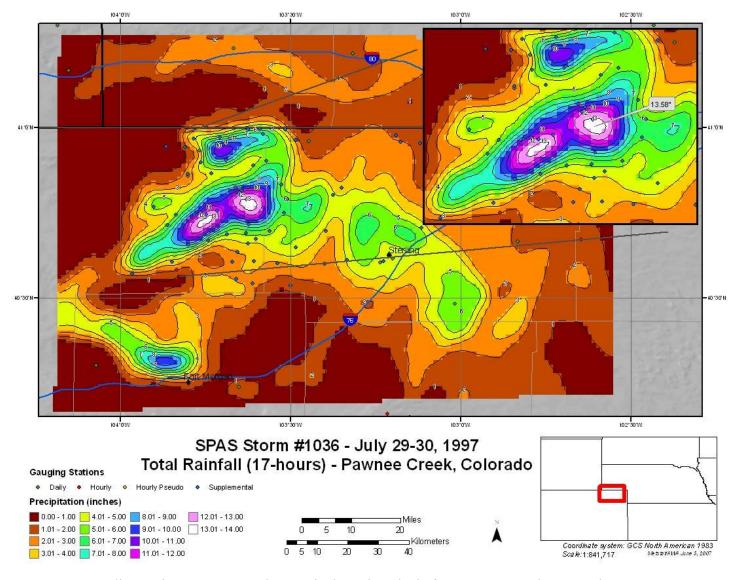
Appendix F: Table F.23: Depth-area-duration values for Pawnee Creek, CO, July 29, 1997



Appendix F: Figure F.31: Depth-area-duration chart for Pawnee Creek, CO, July 29, 1997



Appendix F: Figure F.32: Mass curve chart for Pawnee Creek, CO, July 29, 1997



Appendix F: Figure F.33: Total storm isohyetal analysis for Pawnee Creek, CO, July 29, 1997

Aurora College, IL, AWA 10

July 16, 1996

Storm Type: Frontal/MCC

Grid Points Used: 1-3, 8-10, 16-17

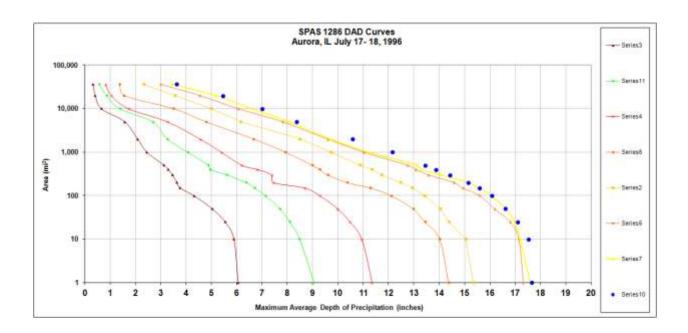
Storm Name: SPAS 1029 Storm Date: 17-Jul-1990 AWA Analysis Date: 12/13/2013		lege, IL		Storm	Adjust	ment fo	or ANO	Grid Po	oint 1	
	15-Jul									
Temporal Transposition Date		T ama			Maiatana Is	ıflow Direct		CW @ 200		
	Lat	Long					ion	SW @ 300	miles	
Storm Center Location	41.46 N	88.07 W			Grid Point	Elevation		350	feet	
Storm Rep Dew Point Location	38.63 N	92.24 W			Storm Cen	ter Elevation	ı	650	feet	
Transposition Dew Point Location	39.61 N	96.54 W			Storm Rep	Analysis Du	ıration	24	hours	
Grid Point Location	35.31 N	93.23 W			•	•				
The storm representative	dew point is	74.0 F	with tota	ıl precipitable	water above	e sea level of			2.73	inches.
The in-place maximum	dew point is	80.5 F	with tota	ıl precipitable	water above	e sea level of			3.68	inches.
The transpositioned maximum	dew point is	80.5 F		ıl precipitable					3.68	inches.
The in-place storm		650		ich subtracts			f precipitabl	e water at	74.0 F	
The in-place storm		650	wh	ich subtracts			f precipitabl		80.5 F	
The transposition basin		350	wh	ich subtracts	0.30		f precipitabl		80.5 F	
The Grid Point/Inflow Ban		1,000		ich subtracts			f precipitabl		80.5 F	
The in place ste	em marimizat	ion footoris	1.35	1	Notes: DAI	D values tak	en from SPA	S 1029. 24hr	average TA	1
The in-place sto			0.97	1		96 0000 CDT			average 10	-
The transposition/ele The ba	evation to ba irrier adjustm		1.00		110m 0/-1/-	20 0000 CD1	10 07-17-90	2500 CD1.		
	total adjustm		1.32							
The	cotai adjustiii	can ractor is	1.02							
Observed Storm Depth-			12 W	18 Hours	24 12	20 U	26 U	48 Hours	60 Hours	72 11
	1 Hour	6 Hours	12 Hours		24 Hours	30 Hours	36 Hours	48 Hours	ov Hours	72 Hours
1 sq miles	6.1	14.4	15.4	17.3	17.6	-	17.6	-	-	-
10 sq miles	5.9	14.0	15.1	17.2	17.2	-	17.5	ļ <u>-</u>	-	-
100 sq miles	4.3	12.1	13.4	15.6	16.0	-	16.1	-	-	-
200 sq miles	3.6	10.4	12.5	14.6	15.1	<u>-</u>	15.1	-	-	<u> </u>
500 sq miles	3.1	9.0	10.9	12.8	13.1	-	13.4	-	-	-
1000 sq miles	2.5	7.9	9.7	11.0	11.2	<u>-</u>	12.1	-	-	<u>-</u>
5000 sq miles	1.6	4.8	6.2	7.8	8.1	-	8.4	-	-	-
10000 sq miles	0.7	3.5	5.0	6.1	6.6	-	7.0	-	-	-
20000 sq miles	0.4	1.6	3.6	4.6	5.2	-	5.4	-	-	-
Adjusted Storm Depth-	Area-Duratio	0 n								
	1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours
1 sq miles	8.0	18.9	20.2	22.8	23.1	-	23.2	-	-	-
10 sq miles	7.7	18.4	19.8	22.6	22.6	-	23.0	-	-	-
100 sq miles	5.7	15.9	17.6	20.5	21.1	-	21.1	-	-	-
200 sq miles	4.8	13.6	16.4	19.2	19.9	-	19.9	-	-	-
500 sq miles	4.1	11.8	14.3	16.8	17.2	-	17.7	-	-	-
1000 sq miles	3.2	10.4	12.8	14.5	14.7	-	16.0	-	-	-
5000 sq miles	2.1	6.3	8.1	10.3	10.6	-	11.0	-	-	-
10000 sq miles	0.9	4.6	6.5	8.0	8.6	-	9.2	-	-	-
20000 sq miles	0.5	2.1	4.7	6.0	6.8	-	7.2	-	-	-
Storm or Storm Center N	Vame			Aurora Coll	ege, IL					
Storm Date(s)			17-Jul-1996							
Storm Type				understorms						1
Storm Location			41.46 N	88.07 W						
Storm Center Elevation Precipitation Total & Do			650 18 13 in 24hr	s from SPAS	1286					
•										
Storm Representative D			74.0 F	24						
Storm Representative D	ew Point Loc	ation	38.63 N	92.24 W						
Maximum Dew Point			80.5 F							-
Moisture Inflow Vector			SW @ 300 1.35							
In-place Maximization F										
In-place Maximization F	- ·									
In-place Maximization F Temporal Transposition			15-Jul 39.61 N	96.54 W						ı
In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum	nt Location n Dew Point		39.61 N 80.5 F	96.54 W						
In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum Transposition Adjustme	nt Location n Dew Point		39.61 N 80.5 F 0.97	96.54 W						
In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum Transposition Adjustme Grid Point Elevation	nt Location n Dew Point ent Factor		39.61 N 80.5 F 0.97 350	96.54 W						
In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	nt Location n Dew Point ent Factor		39.61 N 80.5 F 0.97 350 14,344	96.54 W						
In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum Transposition Adjustme Grid Point Elevation	nt Location n Dew Point ent Factor sin		39.61 N 80.5 F 0.97 350	96.54 W						

Appendix F: Table F.24: Storm spreadsheet for Aurora College, IL, July 16, 1996

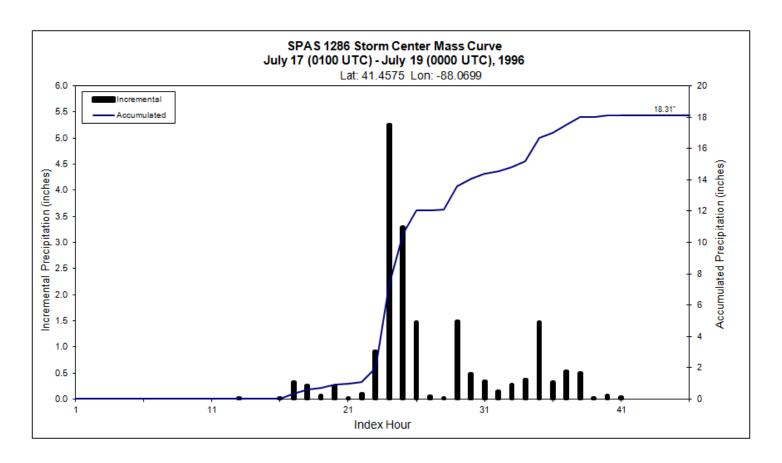
Page **58** of **346**

						286 - Aure RAGE DEP			B, 1996 ON (INCHES)	
				110000000	ALL COLORS		Duration	(hours)	W.X10.6.1.050 -10.	
Area (mi²)	1	2	3	4	- 6	6	12	18	24	total (36-hr)
1	6.06	9.05	11.35			14.38	15.35	17.33	17.58	17.64
10	5.89	8.48	10.94			14.02	15.05	17.15	17.18	17.51
25	5.54	8.09	10.47			13.44	14.38	16.81	16.96	17.09
50	5.03	7.70	9.99			12.97	14.04	16.19	16.61	16.61
100	4.31	7.13	9.28			12.11	13.42	15.60	16.04	16.06
150	3.76	6.71	8.69			11.28	12 94	14.94	15.53	15.58
200	3.64	6.37	7.45			10.37	12.46	14.59	15 12	15.14
300	3.46	5.61	7.38			9.60	11.71	13.59	14 04	14.42
400	3.29	4.95	6.82			9.28	11.34	13.08	13.24	13.86
500	3.13	4.88	6.20			8.98	10.87	12.76	13.10	13.43
1,000	2.45	4.07	5.40			7.93	9.72	11.04	11.18	12.13
2,000	2.09	3.26	4.56			6.68	8.50	9.60	9.67	10.56
5,000	1.58	2.69	3.26			4.79	6.15	7.82	8.05	8.36
10,000	0.65	1.40	1.73			3.51	4.98	6.07	6.55	7.00
20,000	0.41	0.87	1.05			1.56	3.57	4.56	5.16	5.44
36,456	0.32	0.57	0.82		15	1.38	2.33	3.00	3.43	3.61

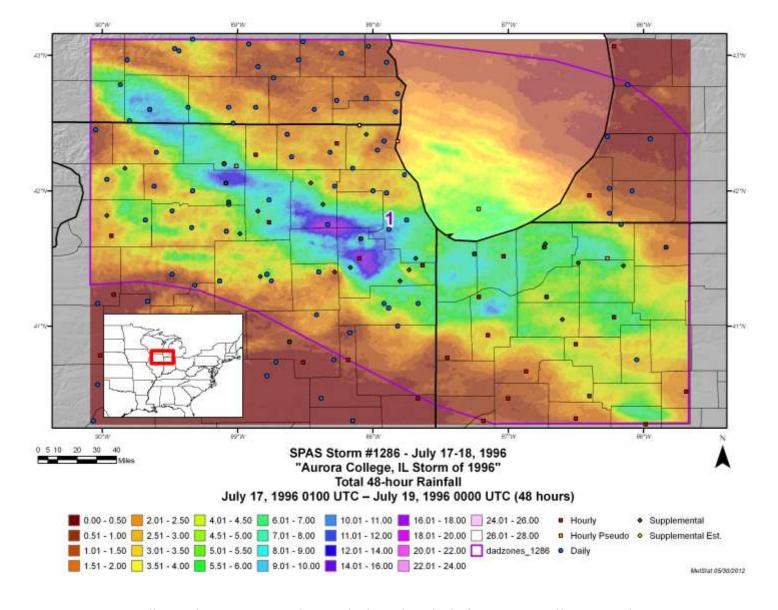
Appendix F: Table F.25: Depth-area-duration values for Aurora College, IL, July 16, 1996



Appendix F: Figure F.34: Depth-area-duration chart for Aurora College, IL, July 16, 1996



Appendix F: Figure F.35: Mass curve chart for Aurora College, IL, July 16, 1996



Appendix F: Figure F.36: Total storm isohyetal analysis for Aurora College, IL July 1996

Minneapolis, MN, AWA 11

July 23, 1987 Storm Type: MCC

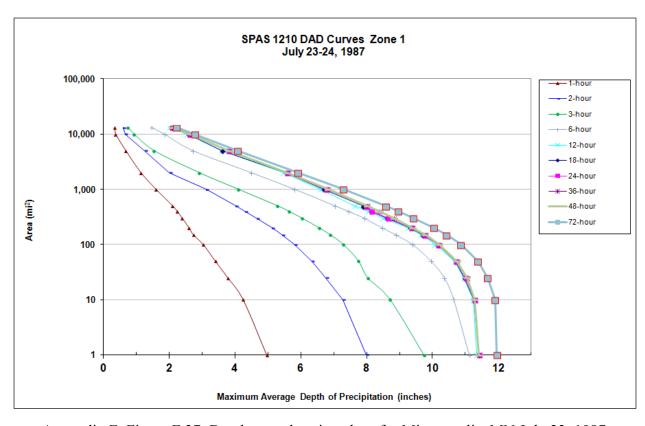
Grid Points Used: 8-11, 16-18

torm Name: Minneapoli torm Date: July 23-24	is, MN SPAS , 1987	1210		Storn	n Adius	tment f	or ANO	Grid Po	int 8	
WA Analysis Date: 12/13/2013	3			21011	i i i i i i i i i i i i i i i i i i i		01 111 10	011010		
mporal Transposition Date	15-Jul									
	Lat	Long			Moisture In	ıflow Directi	ion	WSW @ 90	miles	
orm Center Location	44.89 N	93.40 W			Grid Point	Elevation		1,200	feet	
orm Rep Dew Point Location	44.54 N	95.16 W			Storm Cent	ter Elevation	ı	900	feet	
ansposition Dew Point Location	42.38 N	94.28 W			Storm Rep	Analysis Du	ration	6	hours	
id Point Location	37.50 N	93.00 W				-				
The storm representative	dew point is	78.0 F	with total	l precipitable	water above	e sea level of			3.29	inches.
The in-place maximum	_	81.5 F		l precipitable					3.83	inches.
The transpositioned maximum	dew point is	82.0 F	with total	l precipitable	water above	e sea level of			3.91	inches.
The in-place stom		900		ch subtracts			f precipitable		78.0 F	
The in-place stom		900		ch subtracts			f precipitable		81.5 F	
The transposition basir		1,200		ch subtracts			f precipitable		82.0 F	
The Grid point/inflow bar	mer height is	1,000	whi	ch subtracts	0.31	inches o	f precipitable	e water at	82.0 F	
The in-place sto	orm maximizat	ion factor is	1.16					lue was based on r		1
The transposition/e	levation to ba	sin factor is	1.02					ills, MN. This wa		
The b	arrier adjustm	ent factor is	1.00					s produced during ized this event.	the Nebraska	
The	total adjustm	ent factor is	1.18							
Observed Storm Depth	Area Duncti	on								
Observed Storm Depth	-Area-Duran 1 Hours	on 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles	5.0	9.8	11.1	11.3	11.4	11.4	11.4	11.4	12.0	1
10 sq miles	4.3	8.7	10.7	11.2	11.3	11.3	11.3	11.3	11.9	
100 sq miles	3.0	7.3	9.4	10.1	10.2	10.2	10.2	10.2	10.9	
200 sq miles	2.6	6.6	8.5	9.3	9.3	9.4	9.4	9.4	10.0	
500 sq miles	2.1	5.3	7.0	7.6	7.9	8.0	8.0	8.0	8.6	
1000 sq miles 2000 sq miles	1.6 1.1	4.1 2.9	5.8 4.5	6.6 5.5	6.7 5.5	6.8 5.6	6.8 5.6	6.8 5.6	7.3 5.9	1
5000 sq miles	0.7	1.5	2.7	3.6	3.6	3.8	3.8	3.8	4.1	
10000 sq miles	0.4	0.9	1.9	2.5	2.6	2.6	2.6	2.6	2.8	1
20000 sq miles	-	-	-	-	-	-	-	-	-	
Adjusted Storm Depth-	Area Duratio	272								
rajusted Storm Depth	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles	5.9	11.5	13.2	13.4	13.5	13.5	13.5	13.5	14.1	
10 sq miles	5.0	10.3	12.6	13.3	13.3	13.3	13.3	13.3	14.1	
100 sq miles	3.6	8.6	11.1	11.9	12.0	12.0	12.1	12.1	12.9	
200 sq miles	3.1	7.8	10.0	10.9	11.0	11.1	11.1	11.1	11.9	
500 sq miles 1000 sq miles	2.5 1.9	6.3 4.8	8.3 6.9	9.0 7.8	9.3 7.9	9.4 8.0	9.5 8.1	9.5	10.1	
2000 sq miles	1.3	3.4	5.3	7.8 6.5	7.9 6.6	6.6	6.6	8.1 6.6	8.6 7.0	1
5000 sq miles	0.8	1.8	3.2	4.3	4.3	4.5	4.5	4.5	4.8	1
10000 sq miles		1.1	2.2	3.0	3.1	3.1	3.1	3.1	3.3	1
20000 sq miles	-	-	-	-	-	-	-	-	-	1
Storm or Storm Center	Name		Minneapolis,	MN SPAS 1	210					
Storm Date(s)			July 23-24, 19	87						1
Storm Type			MCC	02.40.777						1
Storm Location Storm Center Elevation			44.89 N 900	93.40 W						1
Precipitation Total & D			12.13 Inches	72-hours						1
Storm Representative I Storm Representative I	_	ation	78.0 F 44.54 N	6 95.16 W						1
Maximum Dewpoint	zewponn Loc	LUVII	81.5 F	55.10 W						1
Moisture Inflow Vector	r		WSW @ 90							1
In-place Maximization l			1.16							
Temporal Transposition	n (Date)		15-Jul							1
			42.38 N	94.28 W						
Transposition Dewpoir			82.0 F							1
Transposition Maximus	•									
Transposition Maximus Transposition Adjustm	•		1.02							-
Transposition Maximus Transposition Adjustm Grid Point Elevation	ent Factor		1,200							
Transposition Maximus Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	ent Factor		1,200 14,344							
Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in Ba Inflow Barrier Height	nent Factor asin		1,200							
Transposition Maximus Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	asin Factor		1,200 14,344 1,000							

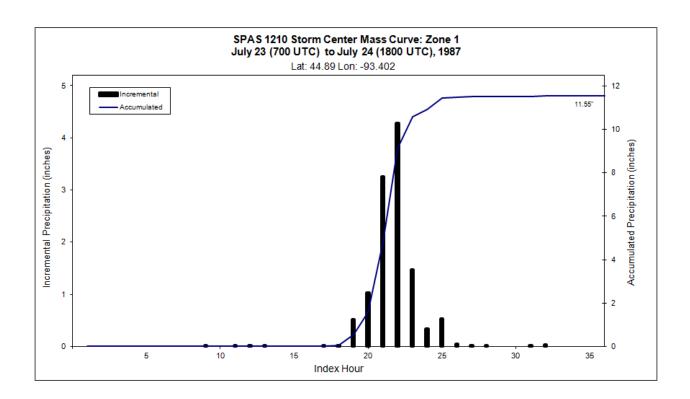
Appendix F: Table F.26: Storm spreadsheet for Minneapolis, MN July 23, 1987

	Sto	rm 121	0 - July	23 (07	00 UTC) - July	24 (18	00 UTC	3),1987		
		MAXIMU	JM AVE	RAGE DE	EPTH OF	PRECI	PITATION	N (INCHE	ES)		
					Du	ration (ho	urs)				
Area (mi²)	1	2	3	6	12	18	24	36	48	72	Total
0	5.16	8.19	10	11.24	11.5	11.54	11.55	11.55	11.55	12.13	12.13
1	4.97	7.99	9.75	11.12	11.34	11.41	11.42	11.42	11.42	11.96	11.96
10	4.25	7.27	8.72	10.65	11.24	11.27	11.28	11.28	11.28	11.91	11.91
25	3.78	6.76	8.04	10.36	10.96	10.98	11.01	11.05	11.05	11.68	11.68
50	3.4	6.33	7.76	9.96	10.67	10.7	10.73	10.75	10.75	11.39	11.39
100	3.03	5.8	7.3	9.39	10.07	10.16	10.17	10.21	10.21	10.87	10.87
150	2.73	5.43	6.9	8.88	9.66	9.7	9.75	9.78	9.78	10.43	10.43
200	2.6	5.12	6.56	8.47	9.25	9.33	9.37	9.39	9.39	10.04	10.04
300	2.39	4.65	6.04	7.92	8.51	8.62	8.65	8.83	8.83	9.43	9.43
400	2.24	4.3	5.64	7.44	8.05	8.13	8.15	8.39	8.39	8.97	8.97
500	2.1	4.02	5.3	7.04	7.64	7.89	7.98	8.01	8.01	8.58	8.58
1,000	1.59	3.12	4.1	5.81	6.59	6.69	6.77	6.83	6.83	7.29	7.29
2,000	1.13	2	2.91	4.49	5.48	5.54	5.59	5.59	5.59	5.92	5.92
5,000	0.67	1.25	1.54	2.72	3.6	3.6	3.82	3.82	3.82	4.08	4.08
10,000	0.36	0.66	0.93	1.85	2.54	2.58	2.62	2.63	2.63	2.78	2.78
13,158	0.34	0.59	0.74	1.46	2.02	2.05	2.09	2.09	2.09	2.22	2.22

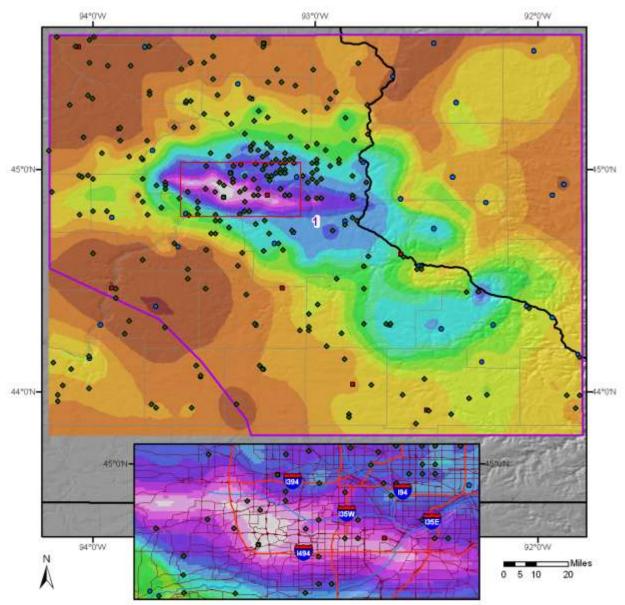
Appendix F: Table F.27: Depth-area-duration values for Minneapolis, MN July 23, 1987



Appendix F: Figure F.37: Depth-area-duration chart for Minneapolis, MN July 23, 1987



Appendix F: Figure F.38: Mass curve chart for Minneapolis, MN July 23, 1987



ISOHYETAL FROM SPAS #1210 - "Twin Cities Super Storm" Total 36-hour Rainfall (inches) 07/23/1987 0700 UTC - 07/24/1987 1800 UTC



Appendix F: Figure F.39: Total storm isohyetal analysis Minneapolis, MN July 23, 1987

Big Rapids, MI, AWA 12

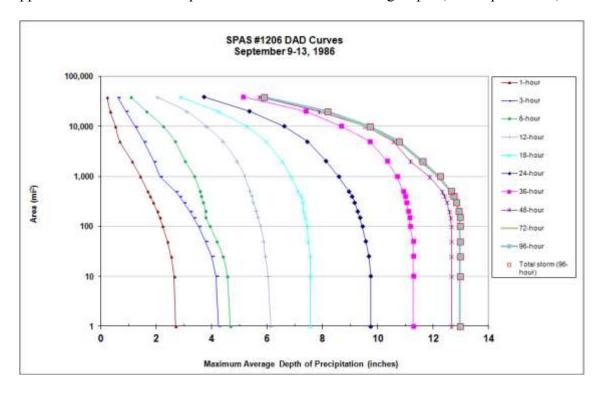
September 9, 1986 Storm Type: Frontal Grid Points Used: 8-11, 16-18

	Big Rapids, M	П		Storm	Ading	mont f	N ANO	Crid Do	int 0	
orm Date: 9/9-12/198 WA Analysis Date: 12/13/2013				Storm	Aajust	ment 10	or ANO	Grid Po	int 8	
mporal Transposition Date	1-Sep									
	Lat	Long			Moisture Ir	ıflow Direct	ion	SW @ 230	miles	
orm Center Location	43.61 N	85.31 W			Grid Point	Elevation		1,200	feet	
orm Rep Dew Point Location	41.36 N	88.68 W			Storm Cent	ter Elevation	1	950	feet	
ransposition Dew Point Location		95.91 W			Storm Rep	Analysis D	uration	24	hours	
rid Point Location	37.50 N	93.00 W								
The storm representative	dew point is	70.5 F	with tota	l precipitable	water above	e sea level o	f		2.31	inches.
The in-place maximum		77.0 F		l precipitable					3.14	inches.
The transpositioned maximum	-	77.5 F		l precipitable					3.22	inches.
The in-place stom		950		ich subtracts			of precipitabl		70.5 F	
The in-place stom The transposition basis		950 1,200		ich subtracts ich subtracts	0.26 0.28		of precipitabl of precipitabl		77.0 F 77.5 F	
The Grid Point/inflow base		1,000		ich subtracts	0.28		of precipitabl		77.5 F	
The in-place st			1.38					206. Storm rep		
The transposition/e			1.02					n 24-hr Td valu ues were select		
I ne b	arrier adjustm	erit ractor is	1.00		-			nan a 1-degree o	_	
The	total adjustm	ent factor is	1.40		area.		<u> </u>			
Observed Storm Depth		,	6 Harring	12 U	10 Ua	24 11-	26 U	40 Ua-	72 11	
1 sq miles	1 Hours 2.7	3 Hours 4.3	6 Hours 4.7	12 Hours 6.1	18 Hours 7.6	24 Hours 9.7	36 Hours 11.3	48 Hours 12.7	72 Hours 13.0	
10 sq miles	2.6	4.2	4.6	6.0	7.6	9.7	11.3	12.7	13.0	1
100 sq miles	2.2	3.5	3.9	5.8	7.5	9.4	11.2	12.7	13.0	
200 sq miles	2.0	3.2	3.8	5.6	7.3	9.3	11.1	12.6	12.9	
500 sq miles	1.7	2.7	3.6	5.4	7.1	9.0	10.9	12.3	12.6	
1000 sq miles	1.4	2.1 1.9	3.4	5.2 4.9	6.9 6.5	8.6 8.1	10.7 10.3	11.9	12.2 11.6	
2000 sq miles 5000 sq miles	1.1 0.7	1.6	3.0 2.7	4.4	6.0	7.5	9.7	11.2 10.6	10.7	-
10000 sq miles	0.5	1.2	2.2	3.8	5.3	6.6	8.7	9.5	9.5	
20000 sq miles	0.3	0.9	1.6	3.1	4.2	5.4	7.4	7.9	8.1	
Adjusted Storm Depth	Area-Durati 1 Hours	on 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles	3.8	6.0	6.5	8.6	10.6	13.6	15.8	17.7	18.2	
10 sq miles	3.7	5.8	6.4	8.4	10.6	13.6	15.8	17.7	18.2	
100 sq miles	3.1	4.9	5.5	8.1	10.4	13.2	15.6	17.7	18.2	
200 sq miles	2.8	4.5	5.3	7.8	10.3	13.0	15.6	17.6	18.1	-
500 sq miles 1000 sq miles	2.4	3.8 3.0	5.0 4.7	7.5 7.3	10.0 9.6	12.6 12.0	15.3 15.0	17.3 16.6	17.7 17.0	
2000 sq miles	1.6	2.7	4.2	6.9	9.2	11.4	14.5	15.6	16.2	
5000 sq miles	1.0	2.2	3.7	6.2	8.3	10.4	13.6	14.8	15.0	
10000 sq miles	0.7	1.7	3.1	5.3	7.4	9.3	12.1	13.4	13.4	
20000 sq miles	0.5	1.3	2.3	4.3	5.9	7.5	10.4	11.0	11.4	
Storm or Storm Center	Name			ig Rapids, M	[
Storm Date(s) Storm Type			9/9-12/1986							
Storm Lype Storm Location			Synoptic 43.61 N	85.31 W						
Storm Center Elevation			950							
Precipitation Total & D	uration		13.18 Inches	72-hours						
Storm Representative I	Dew Point		70.5 F	24						1
Storm Representative I			41.36 N	88.68 W			Aug	Sep		1
Maximum Dew Point			77.0 F				79	74.5		
Moisture Inflow Vector			SW @ 230	Miles						
In-place Maximization l	actor		1.38							
Temporal Transpositio	n (Date)		1-Sep							
Transposition Dew Poi	nt Location		40.48 N	95.91 W			Aug	Sep		
Transposition Maximu			77.5 F				80	75		-
Transposition Adjustm Grid Point Elevation	ent Factor		1.02 1,200							-
Highest Elevation in Ba	ısin		14,344							1
Inflow Barrier Height			1,000							
Elevation Adjustment I Total Adjustment Fact			1.00 1.40							

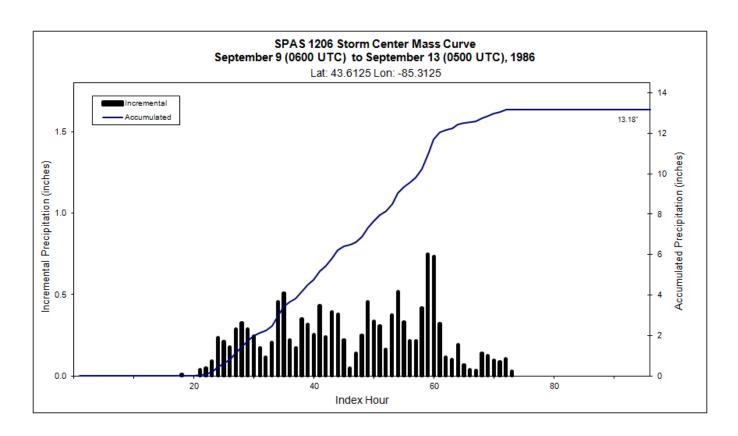
Appendix F: Table F.28: Storm spreadsheet for Big Rapids, MI September 9, 1986

	Sto	rm 120							•		
		MAXIMU	JM AVE	RAGE DI	PTH OF	PRECI	PITATIO	N (INCHE	-S)		
					Du	ration (ho	urs)				
Area (mi²)	1	3	6	12	18	24	36	48	72	96	Total
0	2.73	4.29	4.69	6.18	7.69	9.86	11.42	12.86	13.18	13.18	13.18
1	2.7	4.25	4.66	6.12	7.57	9.74	11.28	12.66	12.97	12.97	12.97
10	2.64	4.15	4.55	6.02	7.57	9.74	11.28	12.66	12.97	12.97	12.97
25	2.53	3.99	4.39	5.92	7.56	9.68	11.28	12.66	12.97	12.97	12.97
50	2.4	3.78	4.18	5.86	7.48	9.57	11.28	12.66	12.97	12.97	12.97
100	2.23	3.52	3.92	5.75	7.45	9.44	11.17	12.66	12.97	12.97	12.97
150	2.12	3.35	3.77	5.66	7.39	9.35	11.14	12.63	12.96	12.96	12.96
200	2.03	3.21	3.77	5.6	7.33	9.28	11.1	12.59	12.91	12.91	12.91
300	1.89	2.99	3.68	5.49	7.29	9.16	11.04	12.5	12.82	12.82	12.82
400	1.78	2.82	3.61	5.43	7.22	9.07	10.98	12.41	12.67	12.73	12.73
500	1.69	2.69	3.57	5.37	7.12	8.96	10.92	12.33	12.63	12.65	12.65
1,000	1.42	2.13	3.36	5.18	6.87	8.59	10.69	11.86	12.17	12.23	12.23
2,000	1.12	1.9	3.03	4.9	6.54	8.13	10.33	11.17	11.55	11.61	11.61
5,000	0.68	1.55	2.66	4.39	5.96	7.45	9.71	10.56	10.72	10.75	10.75
10,000	0.52	1.23	2.24	3.79	5.27	6.61	8.67	9.54	9.54	9.71	9.71
20,000	0.33	0.9	1.63	3.08	4.23	5.36	7.39	7.86	8.13	8.17	8.17
38,326	0.22	0.6	1.07	2.02	2.87	3.73	5.13	5.72	5.88	5.88	5.88

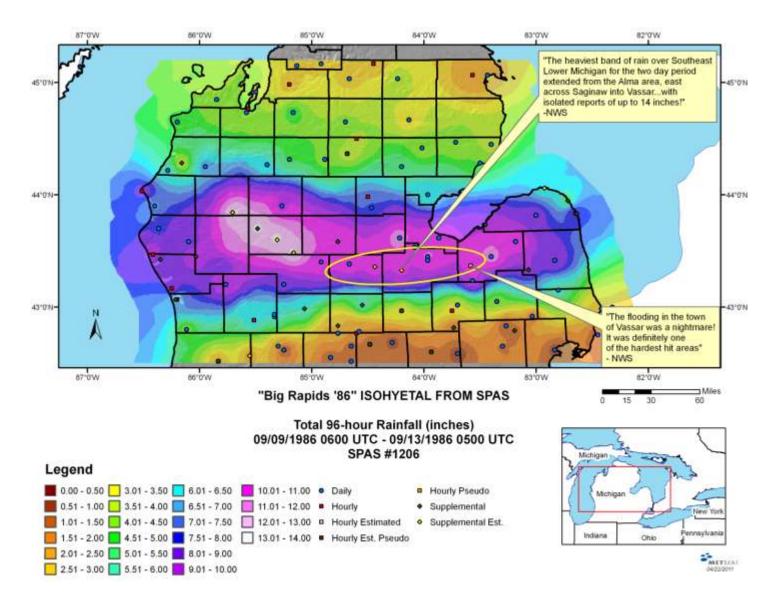
Appendix F: Table F.29: Depth-area-duration values for Big Rapids, MI September 9, 1986



Appendix F: Figure F.40: Depth-area-duration chart for Big Rapids, MI September 9, 1986



Appendix F: Figure F.41: Mass curve chart for Big Rapids, MI September 9, 1986



Appendix F: Figure F.42: Total storm isohyetal analysis for Big Rapids, MI September 9, 1986

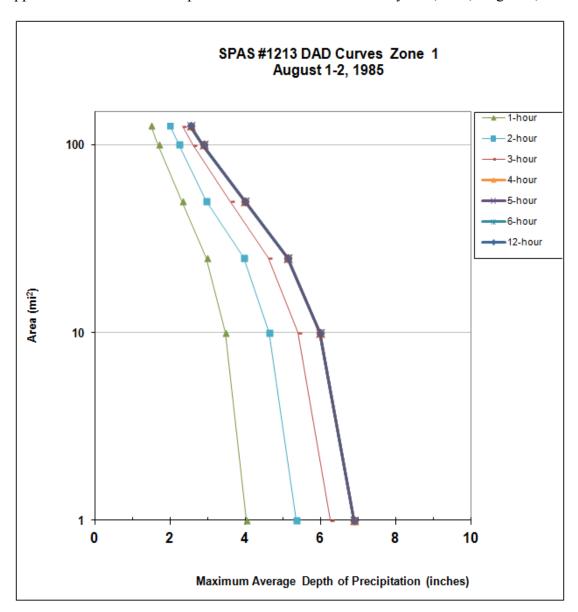
Cheyenne, WY, AWA 13

August 1, 1985 Storm Type: Thunderstorm Grid Points Used: 6, 13, 15, 21

torm Name: torm Date:	8/01/1985	3 Cheyenne, \	WY		Storm	Adjust	ment fo	or ANO	Grid P	oint 6	
	s Date: 12/17/2013									1	
mporal Tra	nsposition Date	15-Jul				76 to 1	5 Di		0.005	,	
		Lat	Long				iflow Direct	10 n :	S @ 95	miles	
orm center		41.14 N	104.82 W			Grid Point			4,400 6,100	feet	
_	w point location	39.80 N	105.00 W				ter Elevation		6	feet	
ransposition rid Point loc	dewpoint location	38.16 N 34.50 N	87.45 W 104.00 W			Storm Rep	Analysis D	iration	0	hours	
III I OIII IOC	ation	34.5011	104.00 11								
The	storm representative	dew point is	77.0 F	with total	l precipitable	water above	e sea level o	f		3.14	inches.
	he in-place maximum		78.5 F	with total	l precipitable	water above	e sea level o	f		3.37	inches.
The trans	positioned maximum	dew point is	78.0 F	with total	l precipitable	water above	e sea level o	f		3.29	inches.
	The in-place stom		6,100		ich subtracts			of precipitabl		77.0 F	
-	The in-place stom		6,100		ich subtracts			of precipitabl		78.5 F	
	e transposition basin				ich subtracts ich subtracts			of precipitabl		78.0 F	
The	Grid Point/Inflow bar	mer neight is	XX	WIII	ich subtracts	X.XX	miches c	of precipitabl	e water at	78.0 F	
	The in-place sto	orm maximizat	ion factor is	1.09	1	Notes: DAD	values taken	from SPAS 1	213. Storm r	epresentative	1
	The transposition/el			-					n 6-hr Td valu		
		arrier adjustm						ONR, and KA			
	The	total adjustm	ent factor is	#VALUE!		<u> </u>					
<u></u>	10, 5										
Ol	served Storm Depth	-Area-Durati 1 Hours	on 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
	1 sq miles	4.0	5.4	6.3	6.9	6.9	6.9	6.9	0.0	0.0	
	10 sq miles	3.5	4.6	5.4	6.0	6.0	6.0	6.0	0.0	0.0	1
	100 sq miles	1.7	2.2	2.6	2.9	2.9	2.9	2.9	0.0	0.0	
	200 sq miles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	500 sq miles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	1000 sq miles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	2000 sq miles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	5000 sq miles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	10000 sq miles 20000 sq miles	0.0 0.0	0.0 0.0	0.0 0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	20000 sq iiiies	0.0	0.0	0.0	0.0	. 0.0	0.0	. 0.0	0.0	; 0.0	-
Ad	ljusted Storm Depth-	Area-Durati	on								
		1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
	······································	#VALUE!	#VALUE!	#VALUE!	····	#VALUE!		#VALUE!	· 🎃 · · · · · · · · · · · · · · · · · ·	#VALUE!	
		#VALUE!	#VALUE!	#VALUE!		#VALUE!		#VALUE!	· <u>·</u>	#VALUE!	
	100 sq miles		#VALUE!	#VALUE!		#VALUE!		#VALUE!	· 🎃 · · · · · · · · · · · · · · · · · ·	#VALUE!	
	200 sq miles 500 sq miles		#VALUE! #VALUE!	#VALUE! #VALUE!	<u></u>	#VALUE!	·	#VALUE!	· <u>·</u>	#VALUE!	
	1000 sq miles		#VALUE!	#VALUE!		#VALUE!		#VALUE!	· 🎃 · · · · · · · · · · · · · · · · · ·	#VALUE!	
	2000 sq miles		#VALUE!	#VALUE!	<u></u>	#VALUE!		#VALUE!		#VALUE!	1
	5000 sq miles		#VALUE!	#VALUE!	····	#VALUE!		#VALUE!	#VALUE!	#VALUE!	
	10000 sq miles		#VALUE!	#VALUE!		#VALUE!				#VALUE!	
	20000 sq miles	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	
St	orm or Storm Center 1	Nama		SPAS 1213	Chavenne V	/V					1
	orm Date(s)	vanie		8/01/1985	Cheyenne, v	V 1					
	orm Type			Convective							
Sto	orm Location			41.14 N	104.82 W						
	orm Center Elevation			6,100							1
Pre	ecipitation Total & D	uration		7.15 Inches 1	5-hours						-
St	orm Representative D	Dewpoint		77.0 F	6						1
	orm Representative D			39.80 N	105.00 W		Jul	Aug			1
M	aximum Dewpoint			78.5 F			78.4	78.3			
	oisture Inflow Vector			S @ 95							
In-	place Maximization I	Factor		1.09							-
Ta	mporal Transposition	n (Date)		15-Jul							1
	ansposition Dewpoir			38.16 N	87.45 W		Jul	Aug			l
	ansposition Maximur			78.0 F			75.18	79.15			1
Tr	ansposition Adjustm			#VALUE!							
	id Point Elevation			4,400							
		asin									-
		Factor									-
											1
Hi; Inf Ele	id Point Elevation ghest Elevation in Ba flow Barrier Height evation Adjustment F etal Adjustment Facto	Factor		4,400 14,344 xx #VALUE! #VALUE!							_

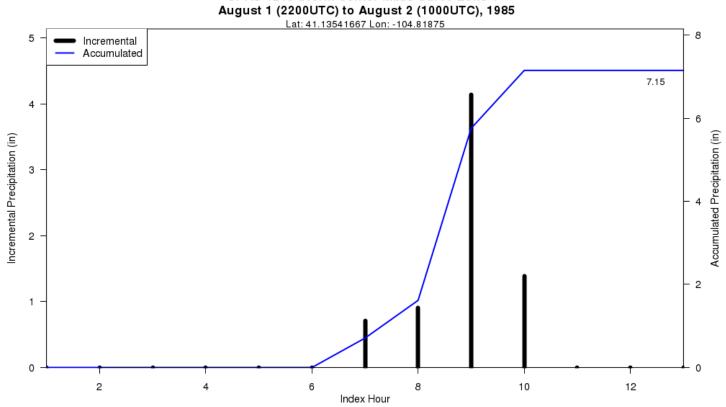
	SPAS		AD Curv st 1-2, 19	es Zone 85	1	
Area (mi²)	1	2	3	4	5	6
0.1	4.14	5.53	6.44	7.15	7.15	7.15
1	4.03	5.36	6.26	6.89	6.89	6.89
10	3.47	4.64	5.4	5.99	5.99	5.99
25	2.97	3.97	4.62	5.13	5.13	5.13
50	2.32	2.97	3.6	3.99	3.99	3.99
100	1.69	2.24	2.62	2.88	2.88	2.88
126	1.5	2	2.33	2.55	2.55	2.55

Appendix F: Table F.31: Depth-area-duration values for Cheyenne, WY, August 1, 1985

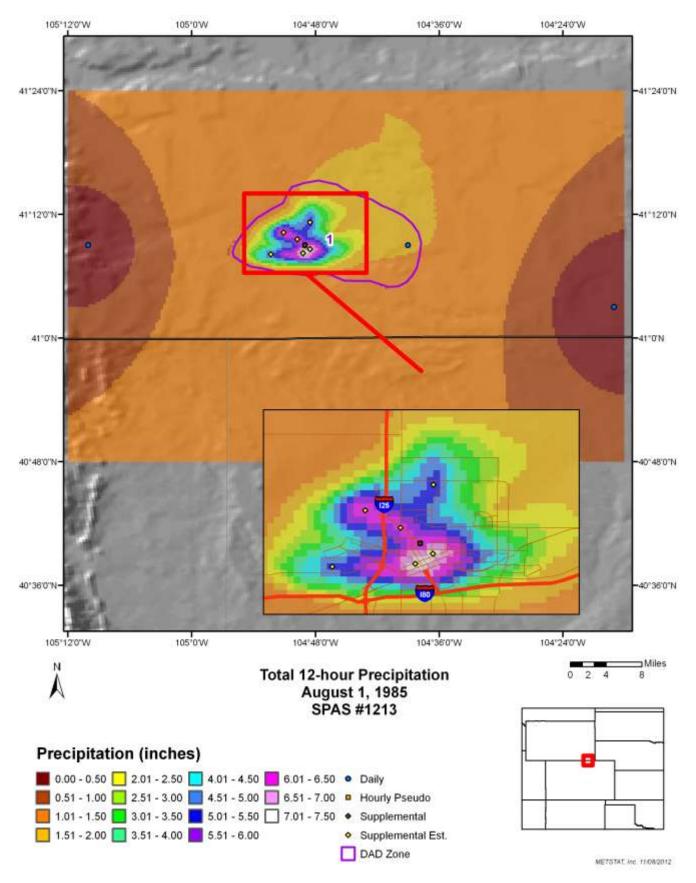


Appendix F: Figure F.43: Depth-area-duration chart for Cheyenne, WY, August 1, 1985

SPAS 1213 Storm Center Mass Curve Zone 1



Appendix F: Figure F.44: Mass curve chart for Cheyenne, WY, August 1, 1985



Appendix F: Figure F.45: Total storm isohyetal analysis for Cheyenne, WY, August 1, 1985

Forest City, MN, AWA 14

June 20, 1983 Storm Type: MCC

Grid Points Used: 8-11, 16-18

	5-Forest City,	MN		CI	A 11	4.6	4370	C !! F		
torm Date: 21-Jun-198 WA Analysis Date: 12/13/2013				Storm	Adjust	ment fo	r ANO	Grid Po	oint 8	
emporal Transposition Date	6-Jul									
•	Lat	Long			Moisture Ir	ıflow Directi	on	SE @ 115	miles	
orm Center Location	45.24 N	94.54 W			Grid Point			1,200	feet	
		92.94 W						1,100	feet	
orm Rep Dew Point Location	44.02 N					ter Elevation		1,100		
ansposition Dew Point Location rid Point Location	41.51 N 37.50 N	91.04 W 93.00 W			Storm Kep	Analysis Du	ration	12	hours	
Id I olit Escation	37.3011	75.00 11								
The storm representative	dew point is	72.0 F	with total	l precipitable	water above	e sea level of			2.47	inches.
The in-place maximum	dew point is	79.5 F		ıl precipitable					3.52	inches.
The transpositioned maximum	-	80.0 F		ıl precipitable					3.60	inches.
The in-place stom		1,100		ich subtracts			f precipitable	water at	72.0 F	
The in-place stom		1,100	whi	ich subtracts	0.34		f precipitable		79.5 F	
The transposition basin		1,200		ich subtracts			f precipitable		80.0 F	
The Grid point/inflow bar		1,000		ich subtracts			f precipitable		80.0 F	
•							•			
The in-place sto	orm maximizat	ion factor is	1.43		Notes: 1.6	1 calculated,	but 1.50 use	d based on I	HMR 51	
The transposition/el			1.04		and HMR 5	5A guidance	. DAD valu	es taken fron	n SPAS	
	arrier adjustm		1.00			average Td t				
	,					n 06-20-83 22				
The	total adjustm	ent factor is	1.49							
Observed Stermy Death	Aura Duméi	_								
Observed Storm Depth	1 Hours	on 6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hou
1 sq miles	3.7	8.4	13.8	13.9	13.9	-	16.5	16.5	-	16.5
10 sq miles	3.3	7.7	12.7	12.7	12.7	-	15.3	15.3	-	15.3
100 sq miles	2.6	6.2	10.2	10.2	10.2	-	12.8	12.8		12.8
200 sq miles	2.4	5.8	9.4	9.5	9.5	-	12.0	12.0	-	12.0
500 sq miles	2.2	5.0	7.9	8.0	8.0		9.9	9.9		10.0
1000 sq miles	2.0	4.5	6.5	6.6	6.6		7.9	7.9		7.9
5000 sq miles	1.1	2.4	3.4	3.4	3.4	-	4.0	4.0	-	4.0
10000 sq miles	-	-	-	-	-	_	-	-	-	-
20000 sq miles	-	-	-	-	-	-	-	_	-	-
				•						
Adjusted Storm Depth-	Area-Durati	n				·		·····		
	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hou
	5.5	12.4	20.6	20.7	20.7	-	24.6	24.6	-	24.6
1 sq miles							22.9			
10 sq miles	4.9	11.5	19.0	19.0	19.0	-		22.9	-	22.9
		11.5 9.3	19.0 15.3	19.0 15.3	19.0 15.3	-	19.1	22.9 19.1	-	19.1
10 sq miles 100 sq miles 200 sq miles	4.9 3.9 3.6	•••••••		15.3 14.1	15.3 14.1	-		19.1 17.8	- - -	19.1 17.8
10 sq miles 100 sq miles 200 sq miles 500 sq miles	4.9 3.9 3.6 3.3	9.3 8.6 7.5	15.3 14.0 11.8	15.3 14.1 11.9	15.3 14.1 11.9	- - -	19.1 17.8 14.8	19.1 17.8 14.8	-	19.1 17.8 14.9
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles	4.9 3.9 3.6 3.3 3.0	9.3 8.6 7.5 6.6	15.3 14.0 11.8 9.8	15.3 14.1 11.9 9.8	15.3 14.1 11.9 9.8		19.1 17.8 14.8 11.8	19.1 17.8 14.8 11.8	- - - -	19.1 17.8 14.9 11.8
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles	4.9 3.9 3.6 3.3	9.3 8.6 7.5	15.3 14.0 11.8	15.3 14.1 11.9	15.3 14.1 11.9		19.1 17.8 14.8	19.1 17.8 14.8	- - - - -	19.1 17.8 14.9
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles	4.9 3.9 3.6 3.3 3.0	9.3 8.6 7.5 6.6	15.3 14.0 11.8 9.8	15.3 14.1 11.9 9.8	15.3 14.1 11.9 9.8	-	19.1 17.8 14.8 11.8	19.1 17.8 14.8 11.8	- - - - - -	19.1 17.8 14.9 11.8
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8	15.3 14.1 11.9 9.8	15.3 14.1 11.9 9.8 5.0	- - -	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0	- - - - - - -	19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8	15.3 14.1 11.9 9.8	15.3 14.1 11.9 9.8 5.0	- - -	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	4.9 3.9 3.6 3.3 3.0 1.6	9,3 8,6 7,5 6,6 3,6	15.3 14.0 11.8 9.8 5.0	15.3 14.1 11.9 9.8 5.0	15.3 14.1 11.9 9.8 5.0	- - -	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0	15.3 14.1 11.9 9.8 5.0	15.3 14.1 11.9 9.8 5.0	- - -	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s)	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 - - - SPAS 1035- 21-Jun-1983	15.3 14.1 11.9 9.8 5.0	15.3 14.1 11.9 9.8 5.0	- - -	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 - - - SPAS 1035- 21-Jun-1983 MCC-Thund	15.3 14.1 11.9 9.8 5.0 - - 	15.3 14.1 11.9 9.8 5.0	- - -	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles	4.9 3.9 3.6 3.3 3.0 1.6 Name	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 - - - SPAS 1035- 21-Jun-1983 MCC-Thund 45.24 N	15.3 14.1 11.9 9.8 5.0	15.3 14.1 11.9 9.8 5.0	- - -	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 - - - SPAS 1035- 21-Jun-1983 MCC-Thund 45.24 N 1,100	15.3 14.1 11.9 9.8 5.0 - - - Forest City, lerstorm Com	15.3 14.1 11.9 9.8 5.0 -		19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 - - - SPAS 1035- 21-Jun-1983 MCC-Thund 45.24 N 1,100	15.3 14.1 11.9 9.8 5.0 - - 	15.3 14.1 11.9 9.8 5.0 -		19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles	4.9 3.9 3.6 3.3 3.0 1.6 Name	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 - - - SPAS 1035- 21-Jun-1983 MCC-Thund 45.24 N 1,100	15.3 14.1 11.9 9.8 5.0 - - - Forest City, lerstorm Com	15.3 14.1 11.9 9.8 5.0 -		19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 - - - - SPAS 1035- 21-Jun-1983 MCC-Thund 45.24 N 1,100 17.00 Inches	15.3 14.1 11.9 9.8 5.0 	15.3 14.1 11.9 9.8 5.0 -		19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 	15.3 14.1 11.9 9.8 5.0 	15.3 14.1 11.9 9.8 5.0 -		19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 	15.3 14.1 11.9 9.8 5.0 	15.3 14.1 11.9 9.8 5.0 -		19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 - - - SPAS 1035- 21-Jun-1983 MCC-Thund 45.24 N 1,100 17.00 Inches 72.0 F 44.02 N 79.5 F	15.3 14.1 11.9 9.8 5.0 	15.3 14.1 11.9 9.8 5.0 -		19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I	4.9 3.9 3.6 3.3 3.0 1.6 Name Puration Dew Point Loc r Factor	9,3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 SPAS 1035- 21-Jun-1983 MCC-Thund 45.24 N 1,100 17.00 Inches 72.0 F 44.02 N 79.5 F SE @ 115 1.43	15.3 14.1 11.9 9.8 5.0 	15.3 14.1 11.9 9.8 5.0 -		19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I	4.9 3.9 3.6 3.3 3.0 1.6 Name Puration Dew Point Locure Factor In (Date)	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0	15.3 14.1 11.9 9.8 5.0	15.3 14.1 11.9 9.8 5.0 -	ata report	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles 20	4.9 3.9 3.6 3.3 3.0 1.6 Name Puration Dew Point Loc r Factor in (Date) int Location	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0	15.3 14.1 11.9 9.8 5.0 	15.3 14.1 11.9 9.8 5.0 -	ata report	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 200 sq miles 200 sq miles 300 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles 20	4.9 3.9 3.6 3.3 3.0 1.6 Name Puration Dew Point Dow Factor in (Date) int Location in Dew Point int Dow Po	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0	15.3 14.1 11.9 9.8 5.0	15.3 14.1 11.9 9.8 5.0 -	ata report	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 20000 sq miles 2000	4.9 3.9 3.6 3.3 3.0 1.6 Name Puration Dew Point Dow Factor in (Date) int Location in Dew Point int Dow Po	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0	15.3 14.1 11.9 9.8 5.0	15.3 14.1 11.9 9.8 5.0 -	ata report	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 20000 sq miles 2000	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0	15.3 14.1 11.9 9.8 5.0	15.3 14.1 11.9 9.8 5.0 -	ata report	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 200 sq miles 300 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 20000	4.9 3.9 3.6 3.3 3.0 1.6	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0 SPAS 1035- 21-Jun-1983 MCC-Thund 45.24 N 1,100 17.00 Inches 72.0 F 44.02 N 79.5 F SE @ 115 1.43 6-Jul 41.51 N 80.0 F 1.04 1,200 14,344	15.3 14.1 11.9 9.8 5.0	15.3 14.1 11.9 9.8 5.0 -	ata report	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0
10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 20000 sq miles 2000	4.9 3.9 3.6 3.3 3.0 1.6 Name Puration Dew Point Loc Factor In (Date) Int Location In Dew Point Factor In Dew Point Factor In Dew Point Factor In Example Point Factor	9.3 8.6 7.5 6.6 3.6	15.3 14.0 11.8 9.8 5.0	15.3 14.1 11.9 9.8 5.0	15.3 14.1 11.9 9.8 5.0 -	ata report	19.1 17.8 14.8 11.8 6.0	19.1 17.8 14.8 11.8 6.0		19.1 17.8 14.9 11.8 6.0

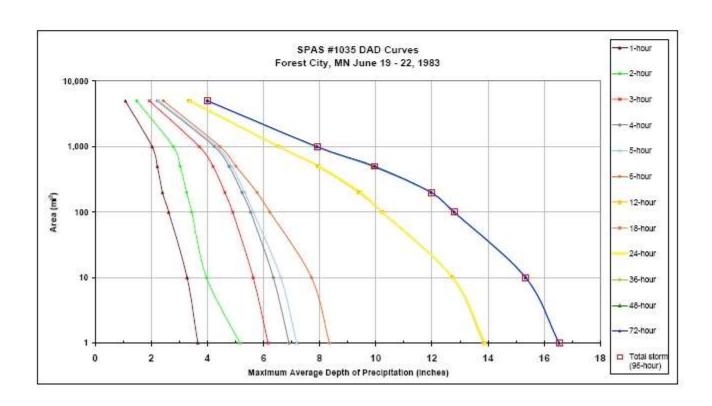
Appendix F: Table F.32: Storm spreadsheet for Forest City, MN, June 20, 1983

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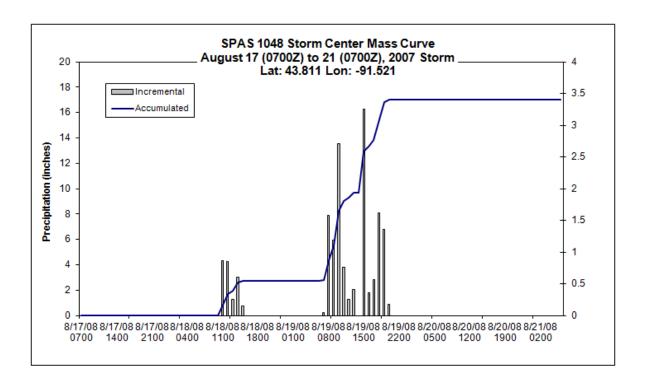
Storm 1035 - Forest City, MN June 19 - 22, 1983

MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)

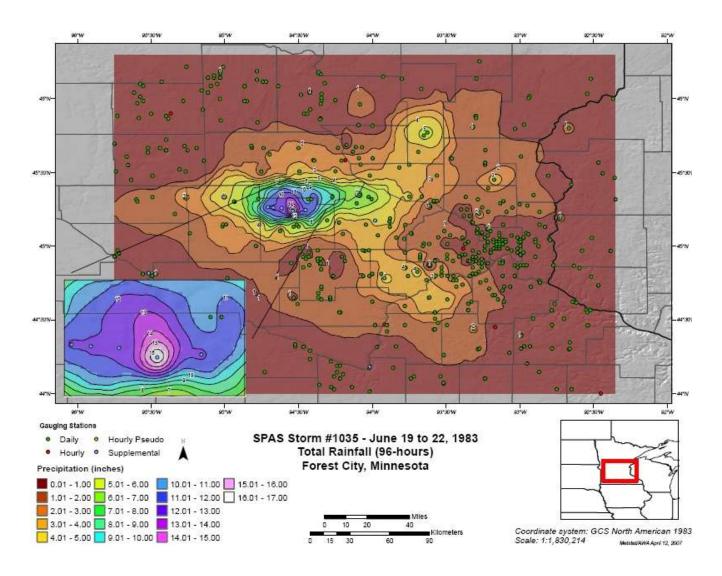
1537 - 40101-0494							Duration	(hours)						
Area (mi²)	.1	2	3	4	5	6	12	18	24	36	48	72	96	total
-1	3.66	5.16	6.16	6.91	7.18	8.35	13.84	13.89	13.89	16.53	16.53	16.53	16.53	16.53
10	3.28	3.97	5.63	6.35	6.62	7.71	12.73	12.74	12.74	15.34	15.34	15.34	15.34	15:34
100	2.62	3.44	4.90	5.54	5.63	6.23	10.23	10.23	10.23	12.79	12.79	12.79	12.79	12.79
200	2.40	3.26	4.62	5.23	5.33	5.77	9.38	9.45	9.45	11.97	11.97	11.97	11.97	11.97
500	2.22	3.03	4.20	4.77	4.87	5.02	7.94	7.98	7.98	9.90	9.90	9.97	9.97	9.97
1,000	2.03	2.79	3.71	4.25	4.33	4.45	6.54	6.55	6.55	7.89	7.89	7.91	7.91	7.91
5,000	1.08	1.48	1.94	2.22	2.26	2.43	3.35	3.38	3.38	4.00	4.00	4.00	4.01	4.01



Appendix F: Table F.33 and Figure F.46: Depth-area-duration values and Depth-area-duration chart for Forest City, MN, June 20, 1983



Appendix F: Figure F.47: Mass curve chart for Forest City, MN, June 20, 1983



Appendix F: Figure F.48: Total storm isohyetal analysis for Forest City, MN June 20, 1983

Big Fork, AR, AWA 15

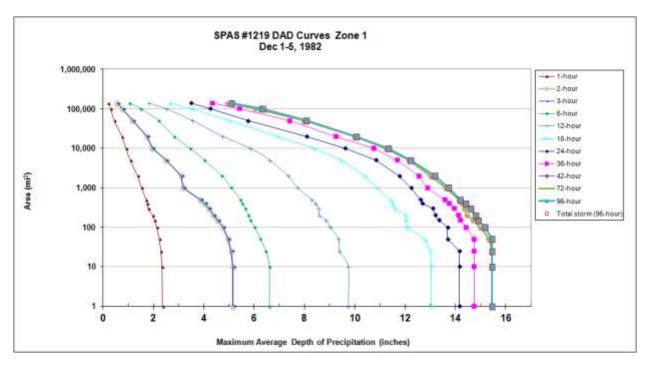
December 1, 1982 Storm Type: Frontal Grid Points Used: 1-3, 8-10, 16-17

Storm Date: Dec 1-5, 19 AWA Analysis Date: 12/13/2013		.9		Storn	n Adjus	tment f	or ANC	Grid Po	nt 1	
emporal Transposition Date	15-Nov									Т
emporar Transposition Date	Lat	Long			Moisture In	flow Direct	ion	SSW @ 415	miles	
torm Center Location	35.87 N	92.12 W			Grid Point			350	feet	_
		93.68 W			Storm Center Elevation			750	feet	
Storm Rep Dew Point Location 30.00 N		94.27 W			Storm Center Flevation Storm Rep Analysis Duration			24	hours	
ransposition Dew Point Location 36.86 N rid Point Location 35.31 N		93.23 W			Storm Kep	Anaiysis Du	iration	24	nours	
Id I olit Location	35.5111	75.25 11								
The storm representative	dew point is	72.0 F	with total	l precipitable	water above	sea level of			2.47	inches
• •		73.0 F	with total precipitable water above sea level of						2.60	inches
The transpositioned maximum dew point is		67.0 F	with total	precipitable	e water above sea level of				1.95	inches
The in-place storm elevation is		750	which subtracts		0.17 inches of precipitable			e water at	72.0 F	
The in-place storm elevation is		750	which subtracts		0.18 inches of precipitable			e water at		
The transposition basin elevation at		350	whi	ch subtracts	0.19	inches o	f precipitabl	e water at	67.0 F	
The Grid point/inflow bar	The Grid point/inflow barrier height is		whi	ch subtracts	0.19	inches o	f precipitabl	e water at	67.0 F	
			1.05		37 . 6.				. 24	4
	The in-place storm maximization factor is							ilue was based on r LCH, KBPT, KL		1
The transposition/e			0.73					rainfall during this		-
The b	arrier adjustm	ent factor is	1.00		24-hr period.					
The	total adjustm	ent <u>factor</u> is	0.77							
Observed Storm Depth	,		611	12.77-	10 77-	24.77-	26 11-	40 TT	72.11-	
4 9	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	1
1 sq miles	2.4	5.2	6.6	9.7	13.1	14.2	14.7	15.1	15.5	1
10 sq miles	2.3 2.1	5.2 4.8	6.6 6.0	9.7 9.0	13.1 12.1	14.2 13.7	14.7 14.4	15.1 14.7	15.5 15.0	1
100 sq miles 200 sq miles	2.1	4.4	5.8	9.0 8.6	12.1	13.7	14.4 14.1	14.7	15.0	1
500 sq miles	1.7	3.9	5.5	8.3	11.4	12.6	13.6	13.8	14.2	-
1000 sq miles	1.5	3.2	5.1	7.7	10.9	12.2	12.9	13.3	13.6	1
2000 sq miles	1.4	3.1	4.7	7.3	10.4	11.8	12.5	12.7	13.0	-
5000 sq miles	1.1	2.5	4.0	6.6	9.5	10.8	11.7	11.9	12.1	1
10000 sq miles	0.9	2.0	3.5	5.8	8.4	9.6	10.8	10.9	11.2	1
20000 sq miles	0.8	1.7	2.8	4.7	6.9	8.1	9.2	9.7	10.0	
Adjusted Storm Depth	-Area-Duration 1 Hours		6 II	12 H	10 II	24 11	26 Ш	40 H	72 H	
1 sq miles	1.8	3 Hours 3.9	6 Hours 5.1	12 Hours 7.4	18 Hours 10.0	24 Hours 10.8	36 Hours 11.3	48 Hours 11.5	72 Hours 11.8	
10 sq miles	1.8	3.9	5.1	7.4	10.0	10.8	11.3	11.5	11.8	-
100 sq miles	1.6	3.6	4.6	6.9	9.2	10.5	11.0	11.3	11.5	
200 sq miles	1.5	3.4	4.4	6.6	9.2	10.1	10.8	10.8	11.1	1
500 sq miles	1.3	3.0	4.2	6.3	8.7	9.6	10.4	10.6	10.8	
	1.2	2.4	3.9	•	<u> </u>	9.4	9.9	10.2	10.4	1
1000 sq miles	,			5.9	8.3				10.4	
1000 sq miles 2000 sq miles	1.0	2.4	3.6	5.9 5.6	8.3 8.0	9.0	9.6	9.7	9.9	
	1.0 0.8	2.4 1.9				٥	9.6 8.9	<u> </u>		
2000 sq miles			3.6	5.6	8.0	9.0	ò	9.7	9.9	<u>.</u>
2000 sq miles 5000 sq miles	0.8 0.7	1.9	3.6 3.1	5.6 5.1	8.0 7.2	9.0 8.3	8.9	9.7 9.1	9.9 9.3	
2000 sq miles 5000 sq miles 10000 sq miles	0.8 0.7	1.9 1.5	3.6 3.1	5.6 5.1 4.5	8.0 7.2 6.4	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	0.8 0.7 0.6	1.9 1.5	3.6 3.1 2.6 2.2	5.6 5.1 4.5 3.6	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	0.8 0.7 0.6	1.9 1.5	3.6 3.1	5.6 5.1 4.5 3.6	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	0.8 0.7 0.6	1.9 1.5	3.6 3.1 2.6 2.2 Big Fork, AF	5.6 5.1 4.5 3.6	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type Storm Location	0.8 0.7 0.6	1.9 1.5	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N	5.6 5.1 4.5 3.6	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation	0.8 0.7 0.6	1.9 1.5	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750	5.6 5.1 4.5 3.6 8 SPAS 1219	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type Storm Location	0.8 0.7 0.6	1.9 1.5	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N	5.6 5.1 4.5 3.6 8 SPAS 1219	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center: Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	0.8 0.7 0.6 Name	1.9 1.5	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches	5.6 5.1 4.5 3.6 R SPAS 1219 92.12 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Stom or Stom Center I Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & D Stom Representative I	0.8 0.7 0.6 Name Puration Dew Point	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750	5.6 5.1 4.5 3.6 8 SPAS 1219	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center: Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	0.8 0.7 0.6 Name Puration Dew Point	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches	5.6 5.1 4.5 3.6 R SPAS 1219 92.12 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Stom or Stom Center: Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & D Stom Representative I Stom Representative I	0.8 0.7 0.6 Name Puration Dew Point Loc	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches 72.0 F 30.00 N	5.6 5.1 4.5 3.6 8 SPAS 1219 92.12 W 72-hours 24 93.68 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point	0.8 0.7 0.6 Name Puration Dew Point Loc	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches 72.0 F 30.00 N 73.0 F	5.6 5.1 4.5 3.6 8 SPAS 1219 92.12 W 72-hours 24 93.68 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I	0.8 0.7 0.6 Name Puration Dew Point Loc r Factor	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches 72.0 F 30.00 N 73.0 F SSW @ 415 1.05	5.6 5.1 4.5 3.6 8 SPAS 1219 92.12 W 72-hours 24 93.68 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition	0.8 0.7 0.6 Name Puration Dew Point Loc r Factor n (Date)	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches 72.0 F 30.00 N 73.0 F SSW @ 415 1.05	5.6 5.1 4.5 3.6 R SPAS 1219 92.12 W 72-hours 24 93.68 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Stom Center I Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & D Stom Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi	0.8 0.7 0.6 Name Puration Dew Point Dow Point Location In (Date) Int Location	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches 72.0 F 30.00 N 73.0 F SSW @ 415 1.05	5.6 5.1 4.5 3.6 8 SPAS 1219 92.12 W 72-hours 24 93.68 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum	0.8 0.7 0.6 Name Puration Dew Point Loc r Factor n (Date) nt Location m Dew Point	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches 72.0 F 30.00 N 73.0 F SSW @ 415 1.05 15-Nov 36.86 N 67.0 F	5.6 5.1 4.5 3.6 R SPAS 1219 92.12 W 72-hours 24 93.68 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm	0.8 0.7 0.6 Name Puration Dew Point Loc r Factor n (Date) nt Location m Dew Point	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches 72.0 F 30.00 N 73.0 F SSW @ 415 1.05 15-Nov 36.86 N 67.0 F 0.73	5.6 5.1 4.5 3.6 R SPAS 1219 92.12 W 72-hours 24 93.68 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum	0.8 0.7 0.6 Name Puration Dew Point Dow Factor In (Date) In Use Point In the poi	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches 72.0 F 30.00 N 73.0 F SSW @ 415 1.05 15-Nov 36.86 N 67.0 F	5.6 5.1 4.5 3.6 R SPAS 1219 92.12 W 72-hours 24 93.68 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm Grid Point Elevation	0.8 0.7 0.6 Name Puration Dew Point Dow Factor In (Date) In Use Point In the poi	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches 72.0 F 30.00 N 73.0 F SSW @ 415 1.05 15-Nov 36.86 N 67.0 F 0.73 350	5.6 5.1 4.5 3.6 R SPAS 1219 92.12 W 72-hours 24 93.68 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	0.8 0.7 0.6 Name Puration Dew Point Loc Factor In (Date) Int Location In Dew Point Location Dew Point Location The Puration Interest Factor In the Point Location In the Poin	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches 72.0 F 30.00 N 73.0 F SSW @ 415 1.05 15-Nov 36.86 N 67.0 F 0.73 350 14,344	5.6 5.1 4.5 3.6 R SPAS 1219 92.12 W 72-hours 24 93.68 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	
2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Center Isome Iso	0.8 0.7 0.6 Name Puration Dew Point Dow Point Location In (Date) Int Location In Dew Point Factor Sector Point Factor The Company of the Point Location The Company of the Point Locati	1.9 1.5 1.3	3.6 3.1 2.6 2.2 Big Fork, AF Dec 1-5, 1982 Synoptic 35.87 N 750 15.45 Inches 72.0 F 30.00 N 73.0 F SSW @ 415 1.05 15-Nov 36.86 N 67.0 F 0.73 350 14,344 1,000	5.6 5.1 4.5 3.6 R SPAS 1219 92.12 W 72-hours 24 93.68 W	8.0 7.2 6.4 5.3	9.0 8.3 7.3	8.9 8.2	9.7 9.1 8.4	9.9 9.3 8.6	

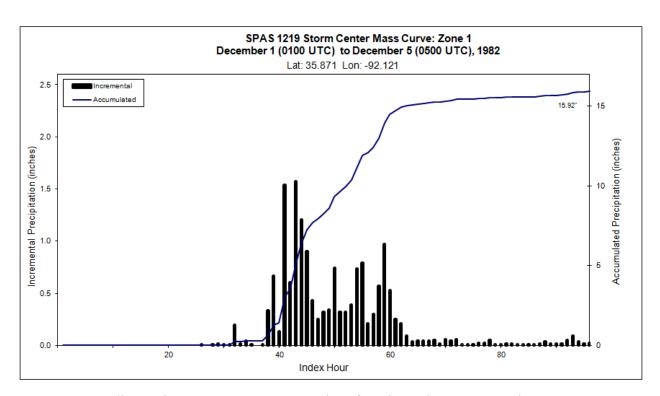
Appendix F: Table F.34: Storm spreadsheet for Big Fork, AR, December 1, 1982

Storm 1219 - Dec 1 (0100 UTC) - Dec 5 (0500 UTC), 1982											
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
	Duration (hours)										
Area (mi²)	1	3	6	12	18	24	36	48	72	96	Total
0.3	2.41	5.36	6.75	10	13.44	14.58	15.16	15.51	15.92	15.92	15.92
1	2.36	5.16	6.6	9.73	13.05	14.15	14.73	15.09	15.45	15.45	15.45
10	2.34	5.16	6.6	9.73	13.05	14.15	14.73	15.09	15.45	15.45	15.45
25	2.3	5.09	6.46	9.38	13	14.15	14.73	15.09	15.45	15.45	15.45
50	2.23	4.96	6.24	9.35	12.77	13.68	14.73	15.01	15.32	15.45	15.45
100	2.13	4.75	6.02	9.02	12.07	13.68	14.41	14.73	14.98	15.16	15.16
150	2.04	4.55	5.84	8.86	12.05	13.34	14.19	14.5	14.71	14.9	14.90
200	1.96	4.38	5.78	8.59	12.02	13.18	14.12	14.12	14.45	14.8	14.80
300	1.79	4.2	5.64	8.55	11.57	13.09	13.94	14.02	14.35	14.6	14.60
400	1.75	4.03	5.53	8.43	11.51	12.68	13.75	13.92	14.25	14.4	14.40
500	1.71	3.86	5.46	8.29	11.42	12.59	13.56	13.82	14.15	14.19	14.19
1,000	1.53	3.18	5.09	7.72	10.88	12.24	12.88	13.32	13.6	13.72	13.72
2,000	1.37	3.1	4.72	7.34	10.39	11.75	12.53	12.73	13	13.17	13.17
5,000	1.08	2.49	4.02	6.61	9.46	10.83	11.67	11.9	12.14	12.22	12.22
10,000	0.91	1.95	3.45	5.84	8.37	9.6	10.75	10.94	11.23	11.33	11.33
20,000	0.75	1.73	2.81	4.74	6.92	8.07	9.24	9.69	10.01	10.05	10.05
50,000	0.45	1.16	2.2	3.55	5.01	5.75	7.39	7.67	7.97	8.07	8.07
100,000	0.3	0.76	1.5	2.5	3.5	4.25	5.4	5.97	6.05	6.3	6.35
138,276	0.2	0.55	1.05	1.82	2.66	3.49	4.34	4.72	4.95	5.1	5.10

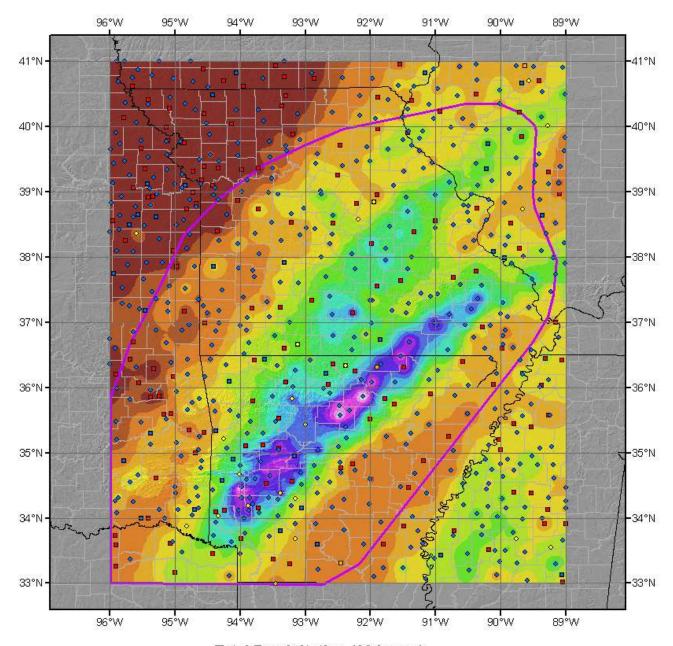
Appendix F: Table F.35: Depth-area-duration values for Big Fork, AR, December 1, 1982



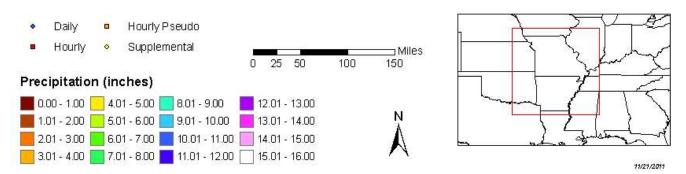
Appendix F: Figure F.49: Depth-area-duration chart for Big Fork, AR, December 1, 1982



Appendix F: Figure F.50: Mass curve chart for Big Fork, AR, December 1, 1982



Total Precipitation (96 hours)
SPAS #1219
12/01/1982 0100 UTC - 12/05/1982 0500 UTC



Appendix F: Figure F.51: Total storm isohyetal analysis for Big Fork, AR, December 1, 1982

Clyde, TX, AWA 65, SPAS 1184

October 10, 1981 Storm Type: Frontal/Tropical Grid Points Used: 8, 10-11, 16-18

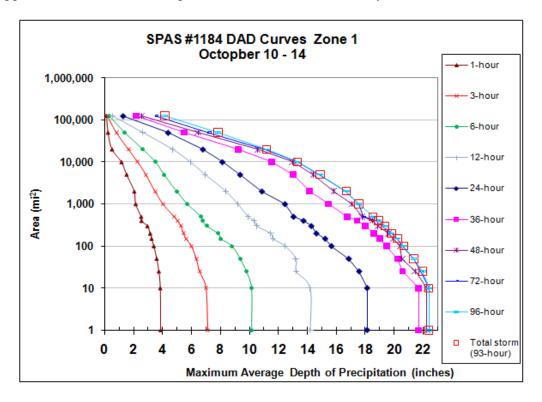
Storm Center Storm Center Storm Rep I Franspositic Grid Point I The The trans	Dew Point Location on Dew Point Location	25-Sep Lat 32.48 N	Long								
otorm Cente form Rep I ransposition rid Point I The T	er Location Dew Point Location on Dew Point Location	Lat 32.48 N									
torm Rep I ranspositio rid Point I The T The trans	Dew Point Location on Dew Point Location	32.48 N		1		Moisture I	nflow Direc	tion	SE @ 255	miles	
torm Rep I ranspositio rid Point I The T The trans	Dew Point Location on Dew Point Location		99.48 W			Grid Point		tion	1,200	feet	
ransposition of Point Language The Tans	on Dew Point Location								1,900		
The The T The trans		29.50 N	97.00 W				ter Elevatio			feet	
The T The trans	Jocation		89.83 W			Storm Rep	Analysis D	uration	24	hours	
The trans		37.50 N	93.00 W								
The trans	storm representative d	lew point is	76.0 F	with total p	recipitable w	ater above	sea level of			2.99	inches
	he in-place maximum d	lew point is	77.5 F	with total p	recipitable w	ater above	sea level of			3.22	inches
	spositioned maximum d	lew point is	74.0 F	with total p	recipitable w	ater above	sea level of			2.73	inches
	The in-place storm of	elevation is	1,900	which	h subtracts	0.48	inches of	f precipitabl	e water at	76.0 F	
	The in-place storm of	elevation is	1,900	which	ch subtracts	0.50		f precipitabl		77.5 F	
Th	e transposition storm e	elevation at	1,200	which	ch subtracts	0.24		f precipitabl		74.0 F	
The	Grid Point/inflow barri	er height is	1,000	which	ch subtracts	0.24	inches o	f precipitabl	e water at	74.0 F	
	The instant			1.00	1	Notes:					1
	The in-place					.10163.					
	The elevation/barr	transpositi				1					
	i ne elevation/barr	ier aujustme	ant ractor is	1.00							
	The to	tal adjustme	ent factor is	0.99							
(Observed Storm Depth	,,		10.77	24.77	20.77	26 11	40.77	60.77	72.77	
ļ	40 3	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	10.1	14.2	-	18.1	-	21.7	22.3	-	22.4	1
	100 sq miles	8.8	12.5	-	15.7	-	19.5	20.4	-	20.6	
	200 sq miles	7.8	11.5	-	14.6	-	18.6	19.6	-	19.8	
	500 sq miles	6.7 5.7	9.9 9.2	-	13.0 12.5	-	16.7 15.5	17.8 17.1	-	17.9 17.5	
	1000 sq miles	5.0	9.2 8.4	-	10.9	-	14.2	15.8	-	16.7	1
	2000 sq miles 5000 sq miles	4.1	7.0	-	9.4	-	13.0	14.4	-	14.8	-
	10000 sq miles	3.5	7.0 5.9	-	8.1	-	11.5	13.0	-	13.3	1
	20000 sq miles	2.6	4.7	-	6.8	-	9.2	10.6	-	11.0	
					•						
Į.	Adjusted Storm Depth-										
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	\$	60 Hours	72 Hours	
	10 sq miles	10.1	14.1 12.4	-	18.0 15.5	-	21.5 19.3	22.1 20.2	-	22.2 20.4	
	100 sq miles 200 sq miles	8.7 7.8	11.4	-	14.5	-	19.3	19.4	-	20.4 19.7	
	500 sq miles	6.6	9.8	-	12.9	-	16.6	17.6	-	17.7	
-	1000 sq miles	5.7	9.1	-	12.4	-	15.3	16.9	-	17.4	
	2000 sq miles	4.9	8.3	-	10.8	_	14.0	15.7	_	16.5	
	5000 sq miles	4.1	6.9	-	9.3	-	12.9	14.3	-	14.7	
	10000 sq miles	3.5	5.9	_	8.1	_	11.4	12.9	_	13.2	1
	20000 sq miles	2.6	4.7	-	6.7	-	9.1	10.5	-	10.9	
Ī.	Storm or Storm Center I	Name		SPAS 1184-CI	vde. TX						1
	Storm Date(s)	- Jane		10/10-14/1981	,, .A.						1
	Storm Type			General Storm							1
	Storm Location			32.48 N	99.48 W						1
	Storm Center Elevation			1900							1
	Precipitation Total & D		sq mi)	23.23 inches in	93hrs, 22.4 in	nches in 721	nrs				1
5	Storm Representative D	Dew Point		76.0 F	24						1
	Storm Representative I		ocation	29.50 N	97.00 W		S	0			1
	Maximum Dew Point			77.5 F			78	77			1
	Moisture Inflow Vector	r		SE @ 255							1
I	In-place Maximization I	Factor		1.08							1
<u>[</u>	Farmanat Trees	- (D-+-)		25 0							1
	Temporal Transposition			25-Sep	00 02 377		C	0			1
	Transposition Dew Poi			39.68 N	89.83 W		S 75	O 72.5			+
	Transposition Maximus		ıı	74.0 F 0.92			13	12.3			1
	Transposition Adjustm Grid Point Elevation	ent ractor		1,200							1
	Highest Elevation in Ba	ısin		14,344							1
	Inflow Barrier Height			1,000							1
	Elevation Adjustment I	Factor		1.00							1
		or		0.99				_			4

Appendix F: Table F.36: Storm spreadsheet for Clyde, TX, October 10, 1981

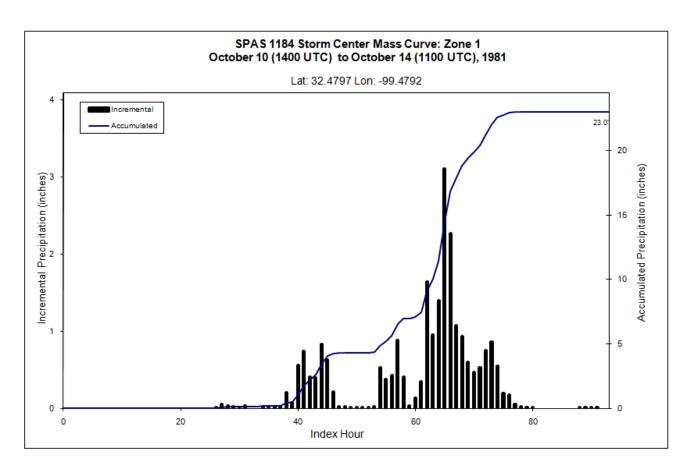
Storm 1184 - October 10 (1400 UTC) to October 14 (1100 UTC), 1981 MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)

					Duration	n (hours)				
Area (mi²)	1	3	6	12	24	36	48	72	93	Total
0.30	3.97	7.32	10.44	14.56	18.64	22.27	22.88	23.00	23.00	23.00
1	3.87	7.14	10.14	14.19	18.13	21.69	22.26	22.39	22.39	22.39
10	3.85	7.02	10.14	14.18	18.13	21.69	22.26	22.39	22.39	22.39
25	3.75	6.57	9.78	13.23	17.58	20.59	21.45	21.81	21.96	21.96
50	3.60	6.34	9.36	13.20	16.86	20.24	20.54	21.34	21.36	21.36
100	3.40	6.01	8.79	12.46	15.66	19.48	20.40	20.60	20.66	20.66
150	3.25	5.64	8.04	11.62	15.23	19.00	19.93	20.22	20.22	20.22
200	3.15	5.46	7.83	11.47	14.62	18.59	19.60	19.81	19.81	19.81
300	2.96	5.28	7.05	10.50	14.27	18.00	18.89	19.08	19.37	19.37
400	2.55	5.04	6.75	10.32	13.73	17.43	18.51	18.76	18.93	18.93
500	2.53	4.81	6.66	9.90	13.04	16.74	17.78	17.86	18.55	18.55
1,000	2.15	4.04	5.71	9.19	12.45	15.47	17.08	17.53	17.56	17.56
2,000	2.05	3.49	4.98	8.37	10.86	14.16	15.83	16.65	16.69	16.69
5,000	1.53	2.85	4.10	6.95	9.35	13.03	14.42	14.83	14.89	14.89
10,000	1.17	2.29	3.52	5.91	8.12	11.53	12.97	13.28	13.31	13.31
20,000	0.52	1.64	2.64	4.69	6.78	9.21	10.56	11.00	11.17	11.17
50,000	0.24	0.81	1.38	2.64	4.37	5.50	6.45	7.14	7.83	7.83
124,876	0.14	0.19	0.30	0.53	1.26	2.18	2.56	3.48	4.14	4.15

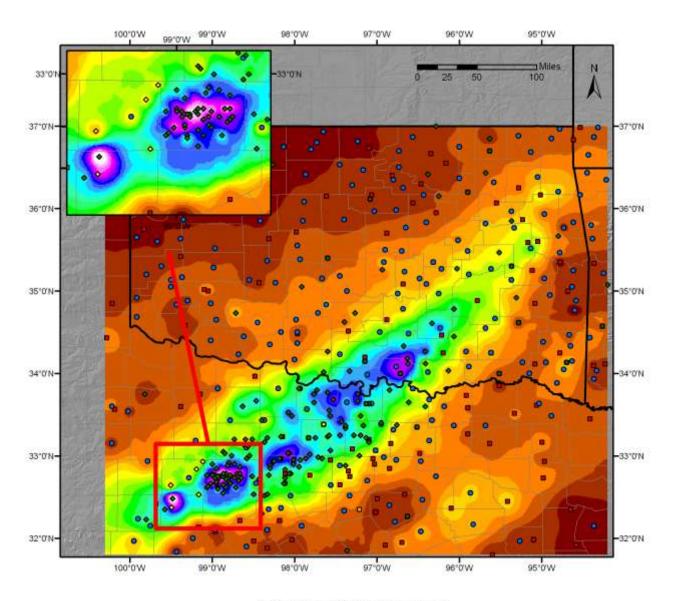
Appendix F: Table F.37: Depth-area-duration values for Clyde, TX, October 10, 1981



Appendix F: Figure F.52: Depth-area-duration chart for Clyde, TX, October 10, 1981



Appendix F: Figure F.53: Mass curve chart for Clyde, TX, October 10, 1981



Total Precipitation (inches)
SPAS storm number: 1184 - Breckenridge, TX
Lat/Lon box: 37.0 -100.3 31.8 -94.2
October 10 1400 UTC - October 14, 1981 1100 UTC (CPP: 93 hours)



Appendix F: Figure F.54: Total storm isohyetal analysis for Clyde, TX, October 10, 1981

Frijole Creek, CO, AWA 17

July 3, 1981

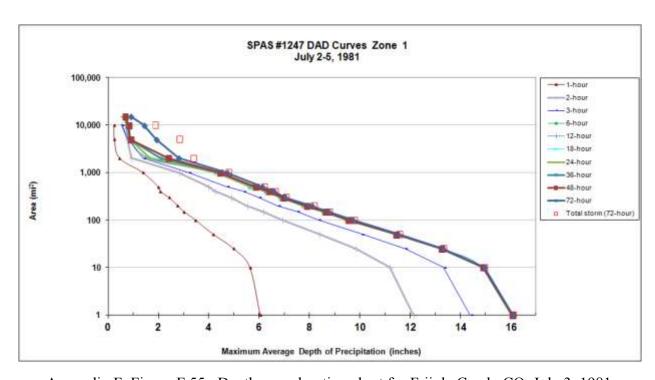
Storm Type: Thunderstorm Grid Points Used: 6, 13, 15, 21

torm Nam		7 Frijole Cree	k, CO		C4	A dimet	mort f	an A NIO	Culd D	int C	
orm Date VA Analy	e: 7/2-5/1981 ysis Date: 12/20/2013				Storm	Aajust	ment fo	or ANO	Grid Po	omt 6	
	ransposition Date	20-Jul									
inporar i	Tansposition Date	Lat	Long			Moisture Ir	nflow Direct	tion:	S @ 120	miles	
orm cent	er location	37.10 N	104.40 W			Grid Point			4,400	feet	
	dew point location	35.40 N	104.45 W				ter Elevation		6,550	feet	
	ion dewpoint location	33.70 N	104.43 W				Analysis D		6	hours	
rid Point l		34.50 N	104.30 W			этогш кер	Alialysis D	uration	U	nours	
Ti	he storm representative	dew point is	77.0 F	with tota	al precipitable	water above	e sea level o	f		3.14	inches
	The in-place maximum	_	79.5 F		al precipitable					3.52	inches
The tra	anspositioned maximum	dew point is	80.0 F	with tota	al precipitable	water above	e sea level o	f		3.60	inches
	The in-place stom		6,550		iich subtracts	1.45		of precipitabl		77.0 F	
	The in-place stom		6,550		ich subtracts	1.58		of precipitabl		79.5 F	
	The transposition basir		4,400		ich subtracts	1.16		of precipitabl		80.0 F	
11	he Grid Point/inflow bar	mer height is	4,400	wh	iich subtracts	1.16	inches	of precipitabl	e water at	80.0 F	
г	TH : 4			115		Matan: Stan	m esp dans pe	sint talean from	n the 6hr avera	as at	1
	The in-place s The transposition			1.15 1.26				Q July 1 11Z		ge at	
	•		ment factor is	1.00			-,	C ,			
	The	carrer aujust	cin ractor IS	1.00							
	Th	ie total adjust	ment factor is	1.44							
											1
	Observed Storm Depth	-Area-Durati	on								
		1 Hours	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	18 Hours	24 Hours	
	1 sq miles	6.0	12.1	14.4	16.0	16.0	16.0	16.0	16.1	16.1	
	10 sq miles	5.6	11.2	13.3	14.9	14.9	14.9	14.9	14.9	14.9	
	100 sq miles	3.5	6.9	8.3	9.5	9.5	9.5	9.5	9.5	9.5	
	200 sq miles	2.8	5.5	6.7	7.7	7.7	7.7	7.8	7.9	7.9	
	500 sq miles	2.0	4.0	4.7	5.6	5.6	5.6	5.7	5.8	5.9	
	1000 sq miles	1.4 0.4	2.8 0.9	3.2	4.2	4.2 1.6	4.3	4.3 1.7	4.4 2.1	4.4 2.4	
	2000 sq miles 5000 sq miles	0.4	0.8	1.4 0.8	1.6 0.9	0.9	1.7 0.9	0.9	0.9	0.9	
	10000 sq miles	0.2	0.5	0.5	0.7	0.7	0.7	0.8	0.8	0.8	
	20000 sq miles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
-											
	Adjusted Storm Depth-	Area-Duratio	on								
		1 Hours	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	18 Hours	24 Hours	
	1 sq miles	8.7	17.5	20.8	23.1	23.1	23.1	23.1	23.2	23.2	
	10 sq miles	8.1	16.2	19.2	21.5	21.5	21.5	21.5	21.5	21.5	
	100 sq miles	5.0	10.0	12.0	13.6	13.7	13.7	13.7	13.8	13.8	
	200 sq miles 500 sq miles	4.0 2.9	8.0 5.7	9.7 6.8	11.1 8.1	11.2 8.1	11.2 8.1	11.2 8.2	11.3 8.4	11.4 8.4	
	1000 sq miles	2.0	4.0	4.6	6.1	6.1	6.1	6.2	6.4	6.4	
	2000 sq miles	0.6	1.3	2.0	2.2	2.4	2.4	2.4	3.0	3.4	
	5000 sq miles	0.3	1.1	1.1	1.2	1.3	1.3	1.3	1.3	1.3	1
	10000 sq miles	0.3	0.8	0.8	1.0	1.0	1.1	1.1	1.1	1.2	
	20000 sq miles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
-	a. a. a.	\ 7		CD 4 C 10 45	F " 1 6 1	60					1
	Storm or Storm Center : Storm Date(s)	Name		7/2-5/1981	Frijole Creel	ι, το					
	Storm Type			Convective							
	Storm Location			37.10 N	104.40 W						1
	Storm Center Elevation			6,550							
	Precipitation Total & D	uration		16.08 Inches	72-hours						
	Storm Representative I			77.0 F	6				Δ.		-
	Storm Representative I	ewpoint Loc	ation	35.40 N	104.45 W			Jul 70.51	Aug 70.50		1
	Maximum Dewpoint	r		79.5 F S @ 120				79.51	79.59		1
	Moisture Inflow Vector			1.15							1
	Moisture Inflow Vector In-place Maximization I	Factor									1
	Moisture Inflow Vector In-place Maximization I	Factor									
				20-Jul							
	In-place Maximization I	n (Date)		20-Jul 33.70 N	104.50 W			Jul	Aug		
	In-place Maximization I Temporal Transpositio Transposition Dewpoir Transposition Maximu	n (Date) nt Location m Dewpoint			104.50 W			Jul 80	Aug 80		
	In-place Maximization I Temporal Transpositio Transposition Dewpoir Transposition Maximur Transposition Adjustm	n (Date) nt Location m Dewpoint		33.70 N 80.0 F 1.26	104.50 W						
	In-place Maximization I Temporal Transpositio Transposition Dewpoir Transposition Maximum Transposition Adjustm Grid Point Elevation	n (Date) nt Location m Dewpoint nent Factor		33.70 N 80.0 F 1.26 4,400	104.50 W						
	In-place Maximization I Temporal Transpositio Transposition Dewpoir Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	n (Date) nt Location m Dewpoint nent Factor		33.70 N 80.0 F 1.26 4,400 14,344	104.50 W						
	In-place Maximization I Temporal Transpositio Transposition Dewpoir Transposition Maximur Transposition Adjustin Grid Point Elevation	n (Date) nt Location m Dewpoint nent Factor asin		33.70 N 80.0 F 1.26 4,400	104.50 W						

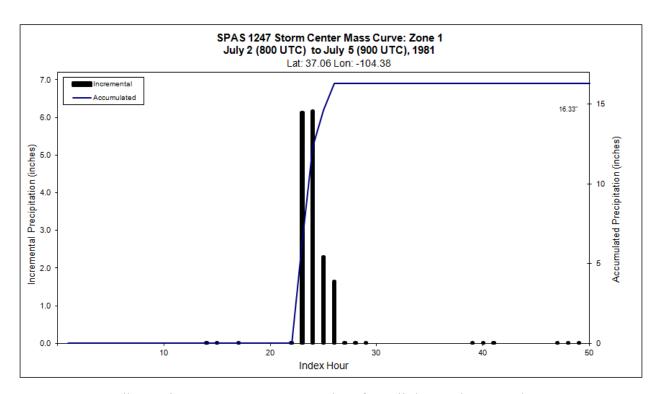
Appendix F: Table F.38: Storm spreadsheet for Frijole Creek, CO, July 3, 1981

					111-112-11-112-1	Duration	(hours)		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
Area (mi²)	1	2	3	4	5	6	12	18	24	48	72	Total
0.3	6.17	12.30	14.60	16.26	16.27	16.27	16.28	16.30	16.30	16.33	16.33	16.33
1	6.04	12.12	14.39	16.02	16.03	16.03	16.03	16.05	16.05	16.08	16.08	16.08
10	5.63	11.19	13.32	14.86	14.87	14.87	14.88	14.88	14.88	14.93	14.94	14.94
25	4.98	9.84	11.79	13.20	13.22	13.22	13.23	13.23	13.23	13.29	13.30	13.30
50	4.17	8.38	10.07	11.35	11.40	11.41	11.41	11.41	11.42	11.52	11.55	11.55
100	3.46	6.91	8.34	9.45	9.47	9.47	9.48	9.54	9.54	9.71	9.75	9.75
150	3.00	6.15	7.51	8.50	8.53	8.53	8.56	8.59	8.62	8.74	8.77	8.77
200	2.75	5.52	6.73	7.70	7.73	7.73	7.76	7.85	7.87	8.08	8.16	8.16
300	2.40	4.88	5.99	6.80	6,83	6.84	6.85	6.88	6.94	7.03	7.04	7.04
400	2.05	4.24	5.36	6.19	6.23	6.23	6.26	6.33	6.39	6.57	6.61	6.61
500	1.98	3.98	4.71	5.58	5.62	5.62	5.66	5.79	5.85	6.11	6.18	6.18
1,000	1.36	2.80	3.20	4.20	4.24	4.25	4.29	4,40	4.44	4.71	4.77	4.77
2,000	0.44	0.91	1.39	1.55	1.63	1.65	1.65	2.07	2.37	2.80	3.38	3.38
5,000	0.24	0.76	0.79	0.86	0.87	0.87	0.88	0.88	88.0	1.91	2.81	2.81
10,000	0.23	0.53	0.53	0.70	0.72	0.73	0.75	0.77	0.81	1.41	1.86	1.86
15,205	0.18	0.35	0.46	0.53	0.56	0.57	0.59	0.67	0.67	0.90	0.90	0.90

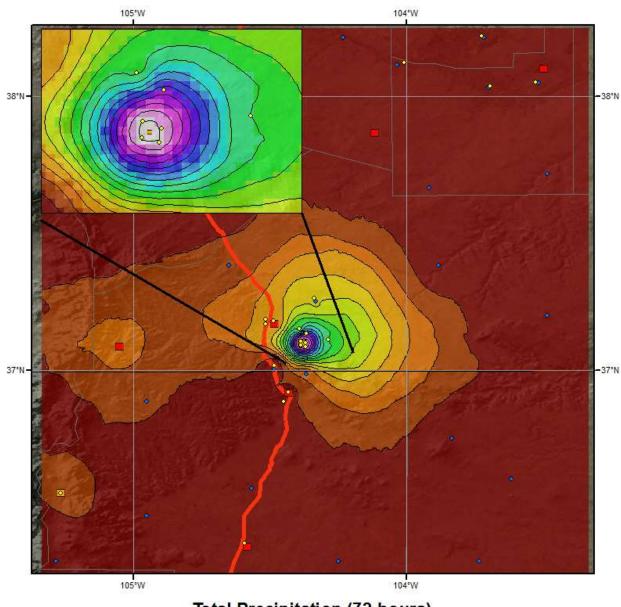
Appendix F: Table F.39: Depth-area-duration values for Frijole Creek, CO, July 3, 1981



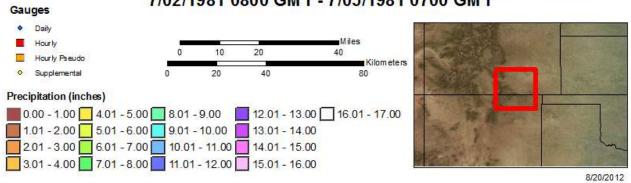
Appendix F: Figure F.55: Depth-area-duration chart for Frijole Creek, CO, July 3, 1981



Appendix F: Figure F.56: Mass curve chart for Frijole Creek, CO, July 3, 1981



Total Precipitation (72-hours) SPAS-Lite 1247 - Frijole Creek, CO 7/02/1981 0800 GMT - 7/05/1981 0700 GMT



Appendix F: Figure F.57: Total storm isohyetal analysis for Frijole Creek, CO, July 3, 1981

Albany, TX AWA 18

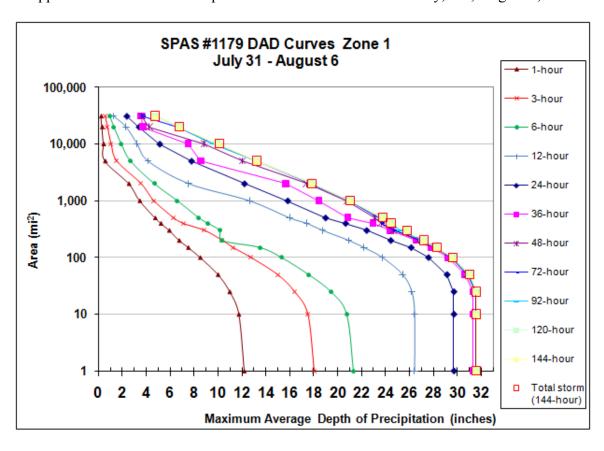
August 3, 1978 Storm Type: Frontal/Tropical Grid Points Used: 2-4

torm Name:		Amelia- Al	bany, TX		C/			4370	a		
orm Date:	8/1-5/1978				Storm .	Adjustr	nent fo	r ANO	Grid Po	int 2	
•	12/13/2013										
mporal Transpositio	on Date	15-Jul Lat				Maiatana I	nflow Direct	·	CCT (2.240		
			Long					ion:	SSE @ 260		
orm center location		32.74 N	99.33 W			Grid Point			550	feet	
orm Rep SST location		29.30 N	97.50 W				ter Elevation		1,500	feet	
ansposition Dew Po	int Location		93.65 W			Storm Rep	Analysis Du	ıration	12	hours	
id Point location		34.50 N	95.50 W								
The stor	m representa	tive SST is	78.0 F	with total r	orecipitable w	ater above s	sea level of			3.29	inches
	in-place maxi		80.0 F		orecipitable w					3.60	inches
The transpos	-		81.0 F	with total p	orecipitable w	ater above s	ea level of			3.76	inches
The in	-place storm	elevation is	1,500	wh	ich subtracts	0.41	inches of	f precipitabl	e water at	78.0 F	
The in	-place storm	elevation is	1,500	whi	ich subtracts	0.43	inches of	f precipitabl	e water at	80.0 F	
The transpo	sition storm	elevation at	550	wh	ich subtracts	0.175	inches of	f precipitabl	e water at	81.0 F	
The grid poir	nt/inflow barn	ier height is	550	wh	ich subtracts	0.175	inches of	f precipitabl	e water at	81.0 F	
					-	NT : 0:	D. Tivi		WALT WIOT	KATT	
	•	ce maximizati		1.10		Notes: Storn KSAT	n Kep 16 take	n from ave of	KSJT, KJCT,	KAII,	
74		e transpositi		1.13							-
The	elevation/bar	ner adjustme	ent factor is	1.00							
	The to	otal adjustme	ent factor is	1.24							
	1110 (rtar a ajastini	in factor is	1,24							-
Observed S	Storm Depth-										
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	20.8	26.4	-	29.7	-	31.4	31.5	-	31.6	<u> </u>
	100 sq miles	15.3	23.8	-	27.6	-	29.2	29.4	-	29.5	
	200 sq miles	10.3	20.9		24.4	-	26.6	26.8	-	27.0	
	500 sq miles	8.4	16.0	-	19.0	-	20.9	23.1	-	23.4	
	000 sq miles	6.6	12.6	-	15.8	-	18.4	20.8	-	21.0	<u> </u>
	000 sq miles	4.7	7.5	-	12.2	-	15.7	17.4	-	17.7	
	000 sq miles 000 sq miles	2.7 1.9	4.2 3.2	-	7.8 5.1	-	8.5 7.5	12.0 8.8	-	13.2 9.6	1
	0000 sq miles 0000 sq miles	1.3	2.3	-	3.4	-	3.7	4.3	-	6.7	
Adjusted S	torm Depth-	,									
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	25.8	32.9	-	37.0	-	39.0	39.2	-	39.3	-
	100 sq miles	19.1 12.9	29.6 26.1	-	34.3 30.4	-	36.4 33.1	36.6 33.3	-	36.7 33.6	
	200 sq miles 500 sq miles	10.5	19.9	-	23.6	-	26.0	28.8	-	29.1	1
1	000 sq miles	8.2	15.7		19.7	<u>-</u>	22.9	25.9	-	26.2	
	2000 sq miles	5.8	9.4		15.2		19.5	21.6	_	22.0	1
		,									
	000 sa miles	3.3	5.2	_	9.7	-	10.6	15.0	_	16.4	
	000 sq miles 000 sq miles	3.3 2.4		-		-	ģ	·····	-		
10	000 sq miles 0000 sq miles 0000 sq miles		5.2	<u>-</u> -	9.7	- - -	10.6	15.0	-	16.4	
10	0000 sq miles	2.4	5.2 4.0	-	9.7 6.3	- - -	10.6 9.3	15.0 11.0		16.4 12.0	
10	0000 sq miles	2.4 1.6	5.2 4.0	-	9.7 6.3 4.2	- - - - - - -	10.6 9.3	15.0 11.0	-	16.4 12.0	
10	0000 sq miles 0000 sq miles torm Center N	2.4 1.6	5.2 4.0	-	9.7 6.3 4.2	- - - -, TX	10.6 9.3	15.0 11.0	-	16.4 12.0	
10 20 Storm or St	0000 sq miles 0000 sq miles torm Center N	2.4 1.6	5.2 4.0	- - SPAS 1179 Ar	9.7 6.3 4.2 melia- Albany	- - -, TX	10.6 9.3	15.0 11.0	-	16.4 12.0	
Storm or St Storm Date	0000 sq miles 0000 sq miles torm Center N	2.4 1.6	5.2 4.0	- - SPAS 1179 Ar 8/1-5/1978	9.7 6.3 4.2 melia- Albany	- - - -,TX	10.6 9.3	15.0 11.0	-	16.4 12.0	
Storm or St Storm Date Storm Typ Storm Loca	0000 sq miles 0000 sq miles torm Center N	2.4 1.6	5.2 4.0 2.9	SPAS 1179 Ai 8/1-5/1978 Remnant Tropi 32.74 N 1500	9.7 6.3 4.2 melia- Albany cal-Frontal 99.33 W		10.6 9.3 4.6	15.0 11.0 5.3	-	16.4 12.0	
Storm or St Storm Date Storm Typ Storm Loca Storm Cent	0000 sq miles 0000 sq miles torm Center N e(s) e	2.4 1.6	5.2 4.0 2.9	SPAS 1179 Ar 8/1-5/1978 Remnant Tropi 32.74 N	9.7 6.3 4.2 melia- Albany cal-Frontal 99.33 W		10.6 9.3 4.6	15.0 11.0 5.3	- - -	16.4 12.0	
Storm or Si Storm Date Storm Typ Storm Loca Storm Cent Precipitatio	torm Center N e(s) e e e e e e e e e e e e e e e e e e e	2.4 1.6 Name	5.2 4.0 2.9	SPAS 1179 Ar 8/1-5/1978 Remnant Tropi 32.74 N 1500 32.5 inches in 4	9.7 6.3 4.2 melia- Albany cal-Frontal 99.33 W		10.6 9.3 4.6	15.0 11.0 5.3		16.4 12.0	
Storm or Si Storm Date Storm Typ Storm Loca Storm Cent Precipitatio	0000 sq miles 0000 sq miles torm Center N e(s) e attion ter Elevation	2.4 1.6 Name	5.2 4.0 2.9	SPAS 1179 Ai 8/1-5/1978 Remnant Tropi 32.74 N 1500	9.7 6.3 4.2 melia- Albany ical-Frontal 99.33 W		10.6 9.3 4.6	15.0 11.0 5.3		16.4 12.0	
Storm or Storm Date Storm Typ Storm Loca Storm Cent Precipitatio Storm Repr	1000 sq miles 10	2.4 1.6 Name wration (10 selection (ST SST Location)	5.2 4.0 2.9	SPAS 1179 Au 8/1-5/1978 Remnant Tropi 32.74 N 1500 32.5 inches in 4	9.7 6.3 4.2 melia- Albany ical-Frontal 99.33 W 48 hours, 29.5		10.6 9.3 4.6	15.0 11.0 5.3		16.4 12.0	
Storm or Storm Date Storm Typ Storm Loca Storm Cent Precipitatio Storm Rept Storm Rept In-place M	1000 sq miles 10	2.4 1.6 Name uration (10 selection)	5.2 4.0 2.9	SPAS 1179 At 8/1-5/1978 Remnant Tropi 32.74 N 1500 32.5 inches in 4 78.0 F 29.30 N	9.7 6.3 4.2 melia- Albany ical-Frontal 99.33 W 48 hours, 29.5		10.6 9.3 4.6	15.0 11.0 5.3		16.4 12.0	
Storm or Storm Date Storm Loca Storm Cent Precipitatio Storm Rept Storm Rept Storm Rept Storm Rept Storm Rept Moisture In-place M	torm Center N est S e e e e e e e e e e e e e e e e e e e	2.4 1.6 Name Paration (10 seconds)	5.2 4.0 2.9	SPAS 1179 Ar 8/1-5/1978 Remnant Tropi 32.74 N 1500 32.5 inches in 4 78.0 F 29.30 N 80.0 F	9.7 6.3 4.2 melia- Albany ical-Frontal 99.33 W 48 hours, 29.5		10.6 9.3 4.6	15.0 11.0 5.3		16.4 12.0	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Rept Storm Rept In-place M Moisture I	torm Center Nets) torm Center Nets) e ation Total & Dr. resentative S resentative S faximum SST reflow Vector	2.4 1.6 Name Paration (10 sector)	5.2 4.0 2.9	SPAS 1179 Ar 8/1-5/1978 Remnant Tropi 32.74 N 1500 32.5 inches in 4 78.0 F 29.30 N 80.0 F	9.7 6.3 4.2 melia- Albany ical-Frontal 99.33 W 48 hours, 29.5		10.6 9.3 4.6	15.0 11.0 5.3	- - -	16.4 12.0	
Storm or Si Storm Date Storm Loca Storm Cent Precipitation Storm Repr Storm Repr Storm Repr In-place M Moisture I In-place M Temporal T	torm Center Notes of the Control of	2.4 1.6 Name Paration (10 sector) SST SST Location actor actor (Date) t Location	5.2 4.0 2.9	SPAS 1179 Ar 8/1-5/1978 Remnant Tropi 32.74 N 1500 32.5 inches in 4 78.0 F 29.30 N 80.0 F SSE @ 260	9.7 6.3 4.2 melia- Albany ical-Frontal 99.33 W 48 hours, 29.5		10.6 9.3 4.6 12.47" in 1h	15.0 11.0 5.3		16.4 12.0	
Storm or Si Storm Date Storm Loca Storm Cent Precipitation Storm Repr Storm Repr Storm Repr In-place M Moisture I In-place M Temporal T Transposit	torm Center N (s) e ation ter Elevation on Total & De resentative S resentative S faximum SST faximuzation F Fransposition for Dewpoin for Maximum	2.4 1.6 Name Paration (10 sector actor actor a (Date) tt Location a SST	5.2 4.0 2.9	SPAS 1179 Au 8/1-5/1978 Remnant Tropi 32.74 N 1500 32.5 inches in 4 78.0 F 29.30 N 80.0 F SSE @ 260	9.7 6.3 4.2 melia- Albany ical-Frontal 99.33 W 48 hours, 29.5		10.6 9.3 4.6 12.47" in 1h	15.0 11.0 5.3		16.4 12.0	
Storm or Si Storm Date Storm Typ Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr In-place M Moisture I In-place M Temporal T Transposit Transposit	torm Center N (s) e ation ter Elevation or Total & Do resentative S resentative S resentative S randow Vector faximization F Transposition fon Dewpoint fon Maximum fon Adjustment	2.4 1.6 Name Paration (10 sector actor actor a (Date) tt Location a SST	5.2 4.0 2.9	SPAS 1179 Au 8/1-5/1978 Remnant Tropi 32.74 N 1500 32.5 inches in 4 78.0 F 29.30 N 80.0 F SSE @ 260	9.7 6.3 4.2 melia- Albany ical-Frontal 99.33 W 48 hours, 29.5		10.6 9.3 4.6 12.47" in 1h	15.0 11.0 5.3		16.4 12.0	
Storm or St Storm Date Storm Typ Storm Cent Precipitatio Storm Repr Storm Repr In-place M Moisture I In-place M Temporal T Transposit Transposit Grid Point	toom Center N e(s) e e attion ter Elevation on Total & De essentative S resentative S raximum SST inflow Vector faximization F fransposition ion Maximum ion Adjustme Elevation	2.4 1.6 Name Paration (10 selector actor a (Date) at Location a SST ent Factor	5.2 4.0 2.9	SPAS 1179 At 8/1-5/1978 Remnant Tropi 32.74 N 1500 32.5 inches in 4/78.0 F 29.30 N 80.0 F SSE @ 260 15-Jul 31.08 N 81.0 F	9.7 6.3 4.2 melia- Albany ical-Frontal 99.33 W 48 hours, 29.5		10.6 9.3 4.6 12.47" in 1h	15.0 11.0 5.3		16.4 12.0	
Storm or Si Storm Date Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr In-place M Moisture I In-place M Temporal T Transposit Transposit Transposit Grid Point Highest Ele	torm Center N e(s) e e attion ter Elevation on Total & De resentative S raximum SST inflow Vector faximization F fransposition from Adjustme Elevation evation in Ba	2.4 1.6 Name Paration (10 selector actor a (Date) at Location a SST ent Factor	5.2 4.0 2.9	SPAS 1179 Au 8/1-5/1978 Remnant Tropi 32.74 N 1500 32.5 inches in 4 78.0 F 29.30 N 80.0 F SSE @ 260	9.7 6.3 4.2 melia- Albany ical-Frontal 99.33 W 48 hours, 29.5		10.6 9.3 4.6 12.47" in 1h	15.0 11.0 5.3	hrs	16.4 12.0	
Storm or Si Storm Date Storm Loca Storm Cent Precipitatio Storm Rep Storm Rep In-place M Moisture I In-place M Temporal T Transposit Transposit Transposit Grid Point Highest El	toom Center N e(s) e e attion ter Elevation on Total & De essentative S resentative S raximum SST inflow Vector faximization F fransposition ion Maximum ion Adjustme Elevation	2.4 1.6 Name Paration (10 sector) SST Location Cactor a (Date) t Location a SST ent Factor sin	5.2 4.0 2.9	SPAS 1179 At 8/1-5/1978 Remnant Tropi 32.74 N 1500 32.5 inches in 4/78.0 F 29.30 N 80.0 F SSE @ 260 15-Jul 31.08 N 81.0 F	9.7 6.3 4.2 melia- Albany ical-Frontal 99.33 W 48 hours, 29.5		10.6 9.3 4.6 12.47" in 1h	15.0 11.0 5.3	hrs	16.4 12.0	

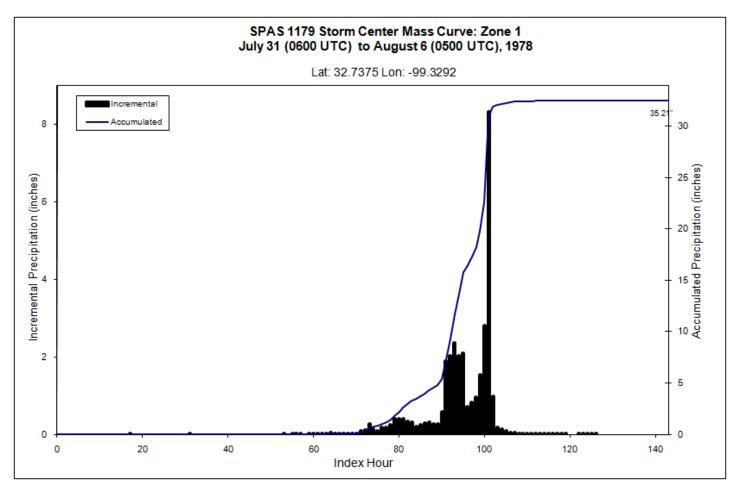
Appendix F: Table F.40: Storm spreadsheet for Albany, TX, August 3, 1978

Stori	m 1179 MA					- Augu ECIPITA			00 UTC	;)		
						Duration	(hours)	•				
Area (mi²)	1	3	6	12	24	36	48	72	96	120	144	Total
0.30	12.47	18.53	21.94	27.16	30.54	32.22	32.41	32.50	32.51	32.51	32.51	32.51
1	12.19	18.01	21.33	26.43	29.71	31.35	31.52	31.60	31.60	31.60	31.60	31.60
10	11.74	17.48	20.76	26.43	29.71	31.35	31.52	31.60	31.60	31.60	31.60	31.60
25	10.98	16.38	19.45	26.20	29.71	31.35	31.52	31.60	31.60	31.60	31.60	31.60
50	10.00	14.97	17.59	25.44	29.14	30.67	30.83	30.91	30.91	31.06	31.06	31.06
100	8.51	12.74	15.32	23.75	27.58	29.22	29.44	29.51	29.51	29.62	29.62	29.62
150	7.51	11.25	13.52	22.20	26.13	27.86	28.13	28.26	28.27	28.27	28.29	28.29
200	6.75	10.34	10.34	20.94	24.43	26.58	26.77	27.03	27.03	27.21	27.22	27.22
300	5.92	8.87	10.15	18.76	22.41	24.40	24.66	24.69	25.23	25.77	25.83	25.83
400	5.22	7.08	9.16	17.42	20.65	22.97	23.63	23.67	24.45	24.45	24.45	24.45
500	4.74	6.28	8.40	15.98	18.97	20.85	23.11	23.41	23.78	23.78	23.79	23.79
1,000	3.45	4.62	6.61	12.63	15.81	18.43	20.77	21.03	21.04	21.05	21.06	21.06
2,000	2.54	3.55	4.67	7.54	12.19	15.66	17.39	17.66	17.78	17.82	17.84	17.84
5,000	0.55	1.52	2.68	4.15	7.76	8.54	12.04	13.19	13.21	13.22	13.23	13.23
10,000	0.42	1.04	1.91	3.24	5.10	7.50	8.83	9.63	9.65	9.94	10.11	10.11
20,000	0.30	0.74	1.29	2.31	3.38	3.71	4.25	6.67	6.74	6.75	6.75	6.75
31,010	0.22	0.54	0.95	1.27	2.35	3.57	3.63	3.63	4.74	4.75	4.75	4.75

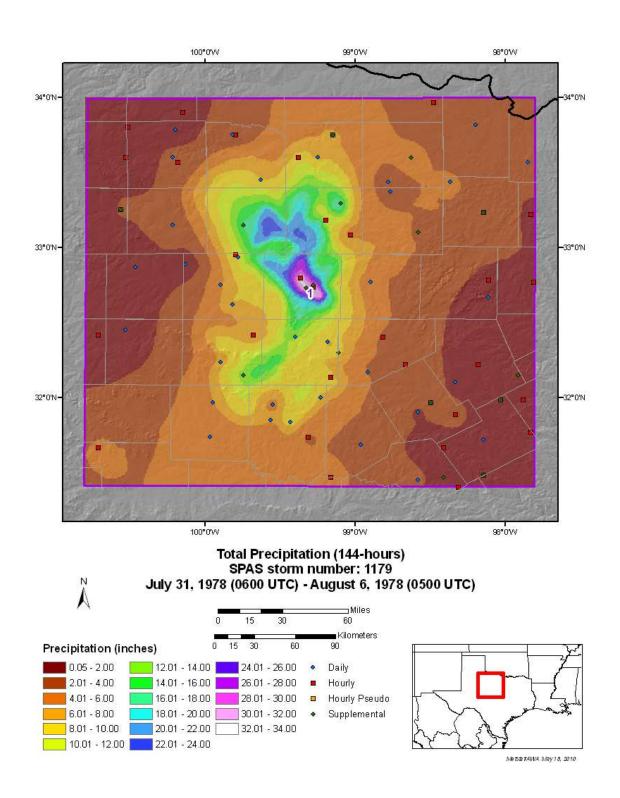
Appendix F: Table F.41: Depth-area-duration values for Albany, TX, August 3, 1978



Appendix F: Figure F.58: Depth-area-duration chart for Albany, TX, August 3, 1978



Appendix F: Figure F.59: Mass curve chart for Albany, TX, August 3, 1978



Appendix F: Figure F.60. Total storm isohyetal analysis for Albany, TX, August 3, 1978

Big Thompson Canyon, CO, AWA 19

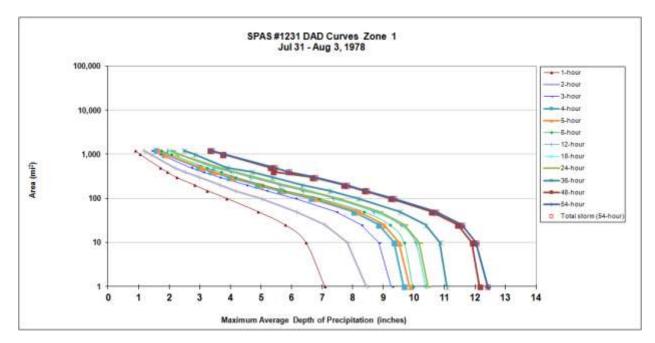
July, 31, 1976 Storm Type: 7, 13-14, 21

Storm Name: Storm Date:	: SPAS-123 7/31/1976	l Big Thomps - 8/3/1976	on, CO		Storm	Adinet	ment fo	r ANO	Grid Po	nint 7	
	ris Date: 12/20/2013				Storm	Aujust	шент т	л Ано	Gliu F	JIII /	
emporal Tra	ansposition Date	15-Jul									
		Lat	Long			Moisture In	ıflow Direct	ion:	ESE @ 165	miles	
torm center	location	40.48 N	105.43 W			Grid Point l	Elevation		7,500	feet	
torm Rep de	ew point location	39.80 N	102.40 W			Storm Cent	ter Elevation	1	8,133	feet	
	n dewpoint location	33.70 N	104.50 W			Storm Rep.	Analysis Du	uration	6	hours	
rid Point lo	cation	36.00 N	105.50 W								
The	e storm representative	dem point is	78.5 F	with tota	l precipitable	mater above	s can larval of	e e		3.37	inches
	The in-place maximum	_	80.0 F		il precipitable il precipitable					3.60	inches
	spositioned maximum	_	80.0 F		l precipitable					3.60	inches
	The in-place stom	n elevation is	8,133	whi	ich subtracts	1.78	inches o	f precipitabl	le water at	78.5 F	
	The in-place stom		8,133		ich subtracts	1.88		f precipitabl		80.0 F	
	he transposition basir		7,500		ich subtracts	1.79		of precipitabl		80.0 F	
Ine	e Grid Point/inflow bar	mer neight is	7,500	wn	ich subtracts	1.79	inches o	of precipitabl	e water at	80.0 F	
	The in-place s	storm maximiz	ation factor is	1.09		Notes: Used	6hr average fr	rom KGLD an	d KAKO. HMI	R55A used	
	The transposition			1.05		storm Td of 7	71 based on K	AKO, KGLD,	and KHLC, ma	x Td value	
	•		ment factor is	1.00			. In-place mo	oisture max ac	ijustment 1.34/	1.48 page	
						86 and 90.					
	Th	ie total adjust	ment factor is	1.14							4
0	Observed Storm Depth	Area Duneti	on								
	ooserveu Storm Depth	-Area-Durati 1 Hours	on 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
	1 sq miles	7.1	9.3	10.0	10.4	10.4	10.5	11.1	12.2	12.4	
	10 sq miles	6.5	8.9	9.7	10.1	10.1	10.2	10.9	11.9	12.0	1
	100 sq miles	4.9	7.4	8.3	8.7	8.7	8.9	9.5	10.6	10.7	
	200 sq miles	3.9	6.1	6.9	7.4	7.5	7.5	8.2	9.2	9.3	
	500 sq miles	2.8	4.5 2.7	5.0	5.6	5.7	5.8	6.3	7.7	7.8	1
	1000 sq miles 2000 sq miles	1.7 1.0	1.7	3.2 2.0	3.4 2.3	3.5 2.3	3.6 2.3	3.9 2.8	5.3 3.8	5.4 3.8	
 	5000 sq miles	-	-	-	-	-	-	-	-	-	1
	10000 sq miles	-	-	-	-	-	-	-	-	-	
	20000 sq miles	-	-	-	-	-	-	-	-	-	
A	djusted Storm Depth			C 11	12.77	10.77	24.77	2611	40.77	72.11	
	1 sq miles	1 Hours 8.1	3 Hours 10.6	6 Hours 11.4	12 Hours 11.9	18 Hours 11.9	24 Hours 11.9	36 Hours 12.6	48 Hours 13.9	72 Hours 14.2	1
 	10 sq miles	7.4	10.1	11.0	11.5	11.5	11.6	12.4	13.6	13.7	
	100 sq miles	5.6	8.5	9.5	9.9	10.0	10.1	10.9	12.1	12.2	
	200 sq miles	4.4	7.0	7.8	8.4	8.5	8.6	9.3	10.6	10.7	
	500 sq miles	3.2	5.1	5.8	6.4	6.5	6.6	7.2	8.8	8.9	
	1000 sq miles 2000 sq miles	1.9 1.2	3.1 1.9	3.7 2.3	3.9 2.6	4.0 2.6	4.1 2.6	4.4 3.2	6.1 4.3	6.2 4.3	1
	5000 sq miles	-	-	-	-	-	-	-	-	-	
ļ	10000 sq miles	-	-	-	-	-	-	-	-	-	1
	20000 sq miles	-	-	-	-	-	-	-	-	-	
	4 C C	VT		CDAC 1001	D:_ T!	CC					1
	torm or Storm Center] torm Date(s)	vame		7/31/1976 - 8/	Big Thompso /3/1976	m, CO					1
	torm Type			Convective	5,15,10						1
	torm Location			40.48 N	105.43 W						
	torm Center Elevation			8133							
Pı	recipitation Total & D	uration (10 so	mi)	12.52 inches	54 hour (SPA	AS 1231 DAI	D)				1
St	torm Representative I	Dewpoint		78.5 F	6	6hr ave fron	n KGLD and	KAKO			1
	torm Representative I		ation	39.80 N	102.40 W		uit	Jul	Aug		1
	n-place Maximum Dew			80.0 F				79.98	79.57		
	Ioisture Inflow Vector			ESE @ 165							
In M	n-place Maximization I	actor		1.09							-
In M	i-piace iviaxiiiization i			15-Jul							1
In N In	•	n (Data)						T. d	A		1
In M In T	emporal Transposition				104 50 W						
In M In T	emporal Transposition	nt Location		33.70 N 80.0 F	104.50 W			Jul 80	Aug 80		
In M. In Tr	emporal Transposition	nt Location n Dewpoint		33.70 N	104.50 W				_		
In I	emporal Transposition transposition Dewpoin transposition Maximum transposition Adjustment and Point Elevation	nt Location m Dewpoint ent Factor		33.70 N 80.0 F 1.05 7,500	104.50 W				_		
In I	emporal Transposition ransposition Dewpoin ransposition Maximun ransposition Adjustm rid Point Elevation lighest Elevation in Be	nt Location m Dewpoint ent Factor		33.70 N 80.0 F 1.05 7,500 14,344	104.50 W				_		
Iri M. Iri T. T. T. G. H.	emporal Transposition transposition Dewpoin transposition Maximum transposition Adjustment and Point Elevation	nt Location m Dewpoint lent Factor		33.70 N 80.0 F 1.05 7,500	104.50 W				_		

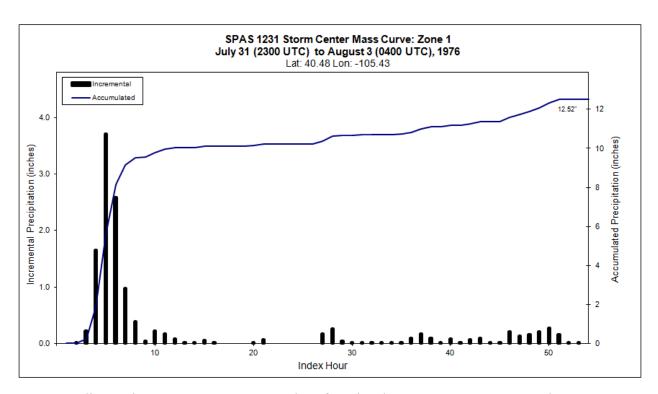
Appendix F: Table F.42: Storm spreadsheet for Big Thompson Canyon, CO, July 31, 1976

						2300 UT E DEPTH							
				- second	3,000 0000	D	aration (hou	rs)	April 1900				
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	54	Total
0.3	7.16	8.58	9.41	9.82	9.95	10.12	10.5	10.55	10.62	11.28	12.34	12.52	12.52
1	7.08	8.45	9.26	9.67	9.86	9.96	10.38	10.38	10.45	11.07	12.15	12.41	12.41
10	6.46	7,83	8.85	9.35	9.51	9.67	10.05	10.08	10.17	10.85	11.9	12.03	12.03
25	5.78	7.08	8.26	8.84	9.02	9.2	9.56	9.64	9.69	10.38	11.42	11.56	11.56
50	4.89	6.14	7.44	8.02	8.18	8.34	8.68	8.74	8.87	9.53	10.57	10.71	10.71
100	3.87	5	6.12	6.63	6.8	6.87	7.36	7.46	7.53	8.17	9.24	9.33	9.33
150	3.23	4.14	5.16	5.6	5.73	5.75	6.34	6.43	6.55	7.23	8.37	8.43	8.43
200	2.82	3.65	4.5	4.87	5	5.04	5.61	5.68	5.75	6.32	7.7	7.79	7.79
300	2.23	2.97	3.63	3.95	4.08	4.15	4.64	4.69	4.79	5.36	6.68	6.75	6.75
400	1.92	2.5	3.08	3.36	3.45	3.67	4	4.03	4.12	4.69	5.39	5.89	5.89
500	1.69	2.16	2.69	2.95	3 04	3.21	3.44	3.47	3.63	3.87	5.3	5.43	5.43
1,000	1.04	1.37	1.67	1.83	1.87	2.04	2.27	2.27	2.27	2.81	3.75	3.75	3.75
1,220	0.88	1.16	1.42	1.56	1.66	1.72	1.94	1.99	2.1	2.47	3.33	3.37	3.37

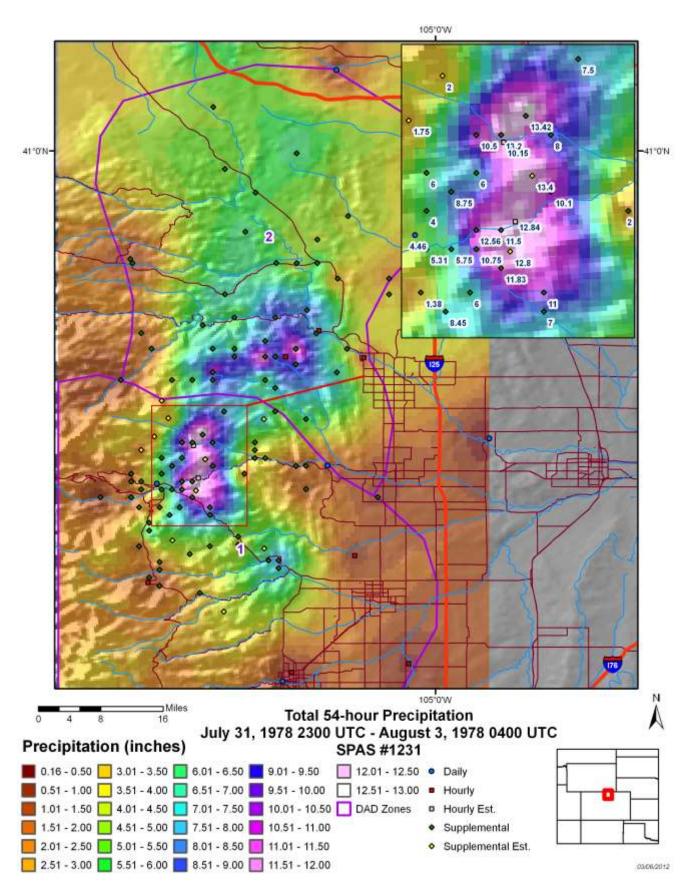
Appendix F: Table F.43: Depth-area-duration values for Big Thompson Canyon, CO, July 31, 1976



Appendix F: Figure F.61: Depth-area-duration chart for Big Thompson Canyon, CO, July 31, 1976



Appendix F: Figure F.62: Mass curve chart for Big Thompson Canyon, CO, July 31, 1976



Appendix F: Figure F.63: Total storm isohyetal analysis for Big Thompson Canyon, CO, July 31, 1976

Waterton Red Rock, Alberta, AWA 20

June 14, 1921

Storm Type: Frontal

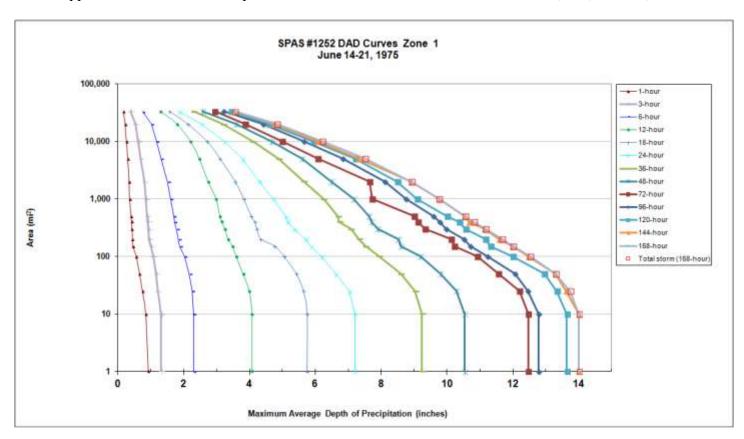
Grid Points Used: 7, 14, 21-22

	Red Rocks		Storm	dinet	nort C	, ANO	Cuid De	nt 22	
			Storm A	L ajustn	nent 10	r ANO	Gria Poi	nt 22	
	ı								
Lat	Long			Moisture I	nflow Direc	tion:	ESE @ 810	miles	
49.09 N	114.05 W			Grid Point	Elevation		11,300	feet	
43.15 N	99.95 W			Storm Cen	ter Elevatio	n	8,000	feet	
	94.23 W			Storm Rep	Analysis I	Ouration	24	hours	
36.00 N	105.50 W								
resentative SST is	71.0 F	with total	precipitable w	ater above	sea level of			2.36	inches.
								3.29	inches
d maximum SST is	79.5 F	with total	precipitable w	ater above	sea level of			3.52	inches
								71.0 F	
		-							
w barrer neight i	10,000	**1	acii subtracts	2.17	inches o	r precipitati	ic water at	17.01	
in-place maximizat	ion factor is	1.50		Notes: Sto	rm rep Td v	alue used fi	rom KMCK, K	LBF, and	
The transposit	ion factor is	0.87		KPIR 24hr	ave and 241	ır 100yr Td	climatology.		
on/barrier adjustm	ent factor is	1.00							
The total admister	ent factor is	1.31							\vdash
total aujustii	can ractor is	1.01							
ı Depth-Area-Dur	ation								
1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
•	1.3	2.3	4.1	5.7	7.2	9.2	10.5	12.5	
*·····	·· ! ·····					·			-
·	•••••••	•••••••							
<u>~~~~~</u> ;				}					
*·····	0.9	1.6	3.0	3.8	4.7	6.3	7.2	7.7	
miles 0.3	0.8	1.5	2.7	3.6	4.3	5.7	6.5	7.7	
<u>~~~~~~</u>	0.7	1.3	2.5	3.1	3.8	4.9	5.6	6.1	
······································	0.6	1.2	2.2	2.7	3.2	4.1	4.7	5.0	
q miles 0.2	0.5	1.0	1.8	2.1	2.5	3.2	3.6	3.9	
Denth-Area-Dur	ation								
1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
miles 1.2	1.7	3.0	5.3	7.5	9.4	12.1	13.8	16.3	
·	1.7	3.0	5.3	7.5	9.4	12.1	13.8	16.3	
*				b		÷			-
······································									
*·····			····•	·····			·· ••	10.1	
*·····	1.0	2.0	3.6	4.7	5.6	7.4	8.5	10.0	
miles 0.4	0.9	1.7	3.2	4.1	4.9	6.4	7.3	7.9	
	0.8	1.5	2.9	3.5	4.2	5.4	6.1	6.5	
q miles 0.3	0.7	1.3	2.3	2.8	3.3	4.2	4.7	5.1	
Center Name				Rocks, Alb	erta				
			75						
			114.05 777						-
			114.03 W						1
		14.46 Inches	144 hours						
		71.0 F	24						
	on	43.15 N	99.95 W			June	July	0	1
									1
									1
position (Date)		1-Jul							
CT Iti		33.33 N	94.23 W			June	July		
ST Location		70 C T							I
Maximum SST		79.5 F							
Maximum SST Adjustment Factor		0.87							
Maximum SST Adjustment Factor tion		0.87 10,000							
Maximum SST Adjustment Factor		0.87							
	tete 1-July 149.09 N 43.15 N 36.00 N 43.15 N 36.00 N 43.15 N 36.00 N 43.15 N 36.00 N 45.15 N 36.00 N 5 N 5 N 5 N 5 N 5 N 5 N 5 N 5 N 5 N	1	The total adjustment factor is 1.50 The transposition factor is 1.00	Storm A A A A A A A A A A	Storm Adjustn Adjustn Adjustn	Storm Adjustment for Storm Adjustment for Storm Adjustment for Storm Adjustment for Adjustment Ad	Storm Adjustment for ANO	Software Section Storm Adjustment for ANO Grid Poid Poid	Storm Adjustment for ANO Grid Point 22 2010

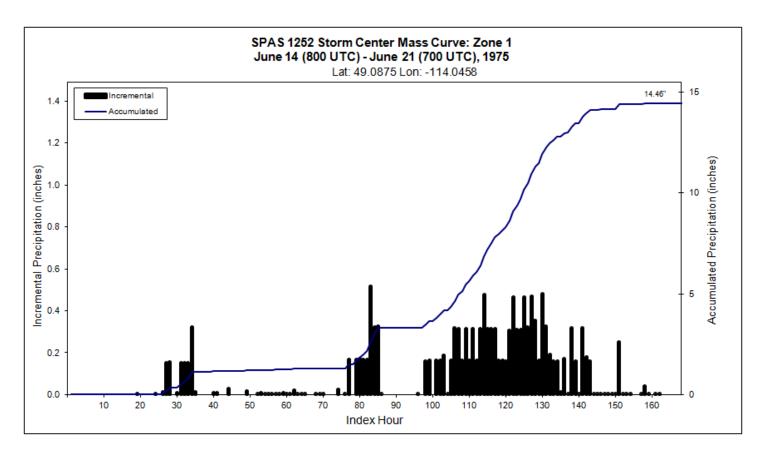
Appendix F: Table F.45: Storm spreadsheet for Waterton Red Rocks, AB, June 14, 1975

								June 21			i			
							Duratio	n (hours)						
Area (mi²)	1	3	6	12	18	24	36	48	72	96	120	144	168	Total
0.2	0.94	1.37	2.38	4.19	5.93	7.4	9.51	10.87	12.88	13.18	14.13	14.46	14.46	14.46
1	0.92	1.32	2.29	4.07	5.74	7.2	9.24	10.53	12.47	12.79	13.64	14.01	14.01	14.01
10	0.84	1.32	2.29	4.07	5.74	7.2	9.24	10.53	12.47	12.78	13.64	14.01	14.01	14.01
25	0.74	1.21	2.26	3.99	5.63	7.03	9.03	10.29	12.21	12.46	13.33	13.61	13.74	13.74
50	0.65	1.16	2.17	3.8	5.41	6.62	8.59	9.8	11.57	12.06	12.95	13.28	13.29	13.29
100	0.55	1.07	2.02	3.59	5.04	6.18	7.93	9.19	10.92	11.24	11.99	12.48	12.53	12.53
150	0.45	1.01	1.88	3.48	4.76	5.87	7.53	8.6	10.22	10.71	11.31	11.98	12	12.00
200	0.44	0.95	1.84	3.35	4.34	5.7	7.32	8.52	10.13	10.51	11.17	11.59	11.67	11.67
300	0.42	0.93	1.78	3.25	4.22	5.36	7.08	7.89	9.33	9.98	10.56	11.13	11.17	11.17
400	0.41	0.91	1.71	3.15	4.15	5.15	6.72	7.7	9.12	9.77	10.37	10.68	10.81	10.81
500	0.39	0.89	1.69	3.1	4.05	5.09	6.68	7.63	9	9.58	9.99	10.53	10.54	10.54
1,000	0.35	0.85	1.6	2.98	3.82	4.72	6.25	7,17	7.72	8.75	9.09	9.76	9.76	9.76
2,000	0.33	0.8	1.51	2.74	3.56	4.3	5.66	6.48	7.65	8.12	8.49	8.91	8.91	8.91
5.000	0.29	0.69	1.31	2.47	3.1	3.78	4.88	5.59	6.07	6.83	7.2	7.32	7.51	7.51
10,000	0.25	0.62	1.17	2.2	2.71	3.23	4.1	4.66	5	5.66	5.93	6.06	6.21	6.21
20,000	0.21	0.53	1.02	1.79	2.12	2.54	3.2	3.59	3.87	4.41	4.59	4.74	4.83	4.83
33,046	0.16	0.39	0.74	1.29	1.57	1.86	2.3	2.58	2.95	3.22	3:44	3.55	3.56	3.56

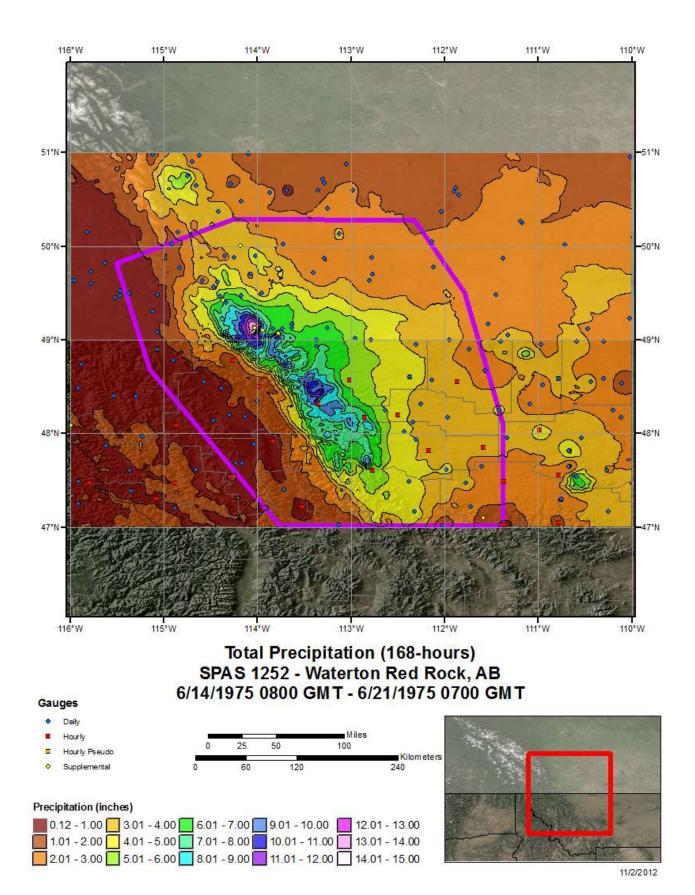
Appendix F: Table F.46: Depth-area-duration values for Waterton Red Rocks, AB, June 14, 1975



Appendix F: Figure F.64: Depth-area-duration chart for Waterton Red Rocks, AB, June 14, 1975



Appendix F: Figure F.65: Mass curve chart for Waterton Red Rocks, AB, June 14, 1975



Appendix F: Figure F.66: Total storm isohyetal analysis for Waterton Red Rocks, AB, June 14, 1975

Enid, OK, AWA 21

October 10, 1973 Storm Type: MCC

Grid Points Used: 1-4, 8-11, 16-18

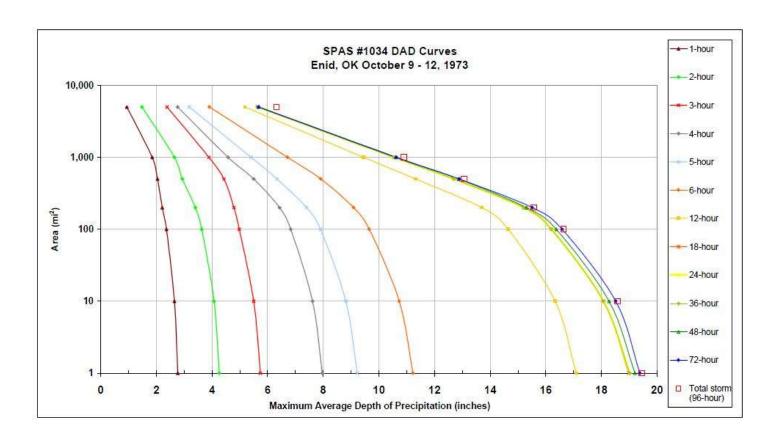
Storm Date: 10-Oct-19				Storn	Adjust	tment f	or ANO	Grid Po	oint 1	
WA Analysis Date: 12/14/201	3									
emporal Transposition Date	25-Sep	_							_	
	Lat	Long			Moisture I	nflow Direct	ion:	SSE @ 225	miles	
torm center location	36.38 N	97.87 W			Grid Point	Elevation		350	feet	
torm Rep dew point location	33.35 N	96.55 W			Storm Cen	ter Elevation	ı	1,250	feet	
ransposition dewpoint location	30.30 N	96.92 W			Storm Rep	Analysis Du	ıration	12	hrs	
rid Point location	35.31 N	93.23 W								
Th	Accession to	75.0.5		1					2.85	:t
The storm representative The in-place maximum	•	75.0 F 76.5 F		al precipitabl al precipitabl					3.07	inches
The transpositioned maximum	•	77.5 F		al precipitabl					3.22	inches
The in-place ston	-	1.250		ch subtracts			f precipitabl	e water at	75.0 F	Hiches
The in-place ston		1,250		ch subtracts			f precipitabl		76.5 F	
The transposition basis		0		ch subtracts			f precipitabl		77.5 F	
The Grid point/inflow ba		1,050		ch subtracts	0.285		f precipitabl		77.5 F	
				_						
The in-place st	orm maximizat	ion factor is	1.08					S 1034. 12hr		
The transposition/e	levation to ba	sin factor is	1.07		KDFW and	WACO from	n 2100CDT	10-9-73 to 090	0CDT10-10)-73
The b	arrier adjustm	ent factor is	1.00							
The	total adjustm	ent factor is	1.16							
Observed Storm Deptl	Anan Dume	ion								
Ooserved Storm Depti	6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	•	17.1	19.0	19.0	-	19.0	19.2	-	19.4	<u> </u>
10 sq miles		16.3	18.1	18.1	-	18.1	18.3	_	18.5	1
100 sq miles		14.6	16.2	16.2	-	16.2	16.4	-	16.6	1
200 sq miles		13.7	15.2	15.2	-	15.2	15.3	-	15.5	1
500 sq miles		11.3	12.7	12.7	\$:	12.7	12.9	:	12.9	-
1000 sq miles		9.5	10.5	10.5	-	10.5	10.6	-	10.6	
5000 sq miles	•	5.2	5.6	5.6		5.6	5.7	-	5.7	-
10000 sq miles		0.0	0.0	0.0	-	0.0	0.0	_	0.0	
20000 sq miles	ò	0.0	0.0	0.0	-	0.0	0.0	-	0.0	
Adjusted Storm Depth		,		· ·		· ·		· · · · · · · · · · · · · · · · · · ·		
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles		19.7	21.9	22.0	-	22.0	22.2	-	22.4	
10 sq miles	\$	18.9	20.9	20.9	-	20.9	21.1	-	21.4	
100 sq miles		16.9	18.7	18.7	-	18.7	18.9	-	19.2	
200 sq miles	ò	15.8	17.6	17.6	-	17.6	17.7	-	17.9	
500 sq miles		13.1	14.7	14.7	-	14.7	14.9	-	14.9	
1000 sq miles	\$	10.9	12.2	12.2	-	12.2	12.2	-	12.3	
5000 sq miles		6.0	6.5	6.5	-	6.5	6.6	-	6.6	
10000 sq miles		0.0	0.0	0.0	-	0.0	0.0	-	0.0	
20000 sq miles	0.0	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-
Storm or Storm Center	Name		SPAS -1034	4-Enid, OK						
Storm Date(s)			10/10/73							
Storm Type			MCC							1
Storm Location			36.38 N	97.87 W						1
Storm Center Elevation			1,250							1
Precipitation Total & I	Ouration		20.00 Inches	15-hours NO	CDC Storm I	Data report				1
Storm Representative I	Dewpoint		75.0 F	12						1
Storm Representative l		ation	33.35 N	96.55 W						
Maximum Dewpoint			76.5 F							
Moisture Inflow Vecto	r		SSE @ 225							
In-place Maximization	Factor		1.08							
T	n (Detr)		25 0			c	0			1
Temporal Transpositio			25-Sep	06.03.777		S	0			1
Transposition Dewpoi			30.30 N	96.92 W		78	77			1
Transposition Maximu			77.5 F							1
Transposition Adjustr Grid Point Elevation	ieni ractor		350							1
Highest Elevation in B	asin		14,344							1
Inflow Barrier Height	1110		+,5++							1
Elevation Adjustment	Factor									1
Total Adjustment Fact			1.16							1
■ Lotal Admistment Fact	or		1.10							

Appendix F: Table F.47: Storm spreadsheet for Enid, OK, October 10, 1973

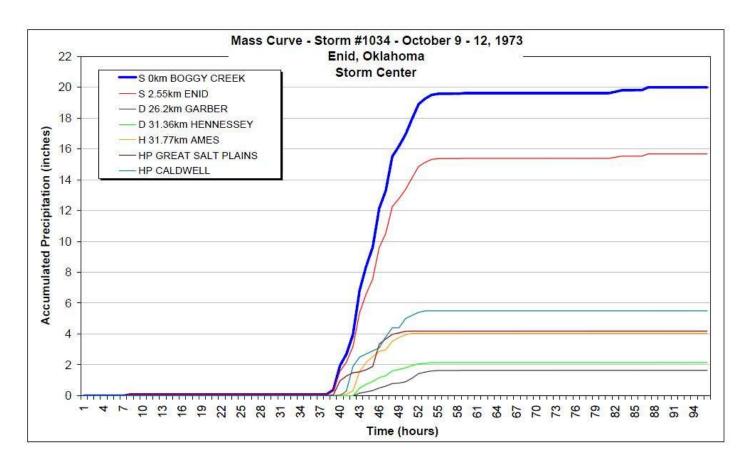
Storm 1034 - Enid OK, October 9 - 12, 1973

MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)

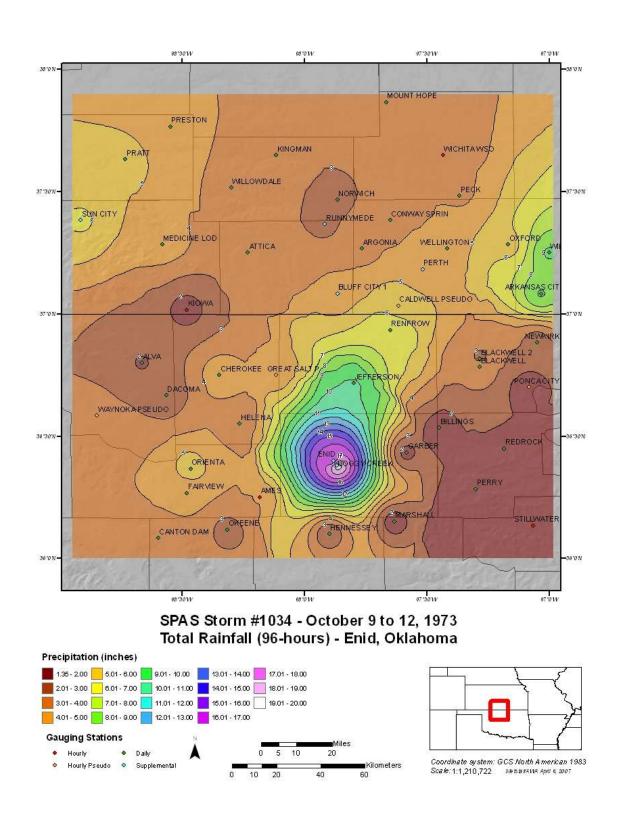
							Duration	(hours)						
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	72	96	total
1	2.77	4.26	5.74	7.96	9.22	11.22	17.09	18.98	19.02	19.02	19.20	19.38	19.45	19.45
10	2.65	4.07	5.50	7.61	8.81	10.73	16.33	18.07	18.07	18.07	18.27	18.51	18.58	18.58
100	2.36	3.63	4.98	6.83	7.90	9.65	14.64	16.19	16.20	16.20	16.37	16.58	16.64	16.64
200	2.21	3.40	4.79	6.43	7.40	9.09	13.69	15.19	15.21	15.21	15.30	15.51	15.57	15.57
500	2.04	2.93	4.43	5.50	6.33	7.91	11.32	12.69	12.69	12.69	12.86	12.89	13.06	13.06
1,000	1.85	2.65	3.89	4.58	5.40	6.71	9.45	10.53	10.53	10.53	10.60	10.63	10.89	10.89
5,000	0.94	1.48	2.38	2.76	3.18	3.91	5.18	5.63	5.63	5.63	5.67	5.68	6.32	6.32



Appendix F: Table F.48: Depth-area-duration values Appendix F: Figure F.63: Depth-area-duration chart for Enid, OK, October 10, 1973



Appendix F: Figure F.67: Mass curve chart for Enid, OK, October 10, 1973



Appendix F: Figure F.68: Total storm isohyetal analysis for Enid, OK, October 10, 1973

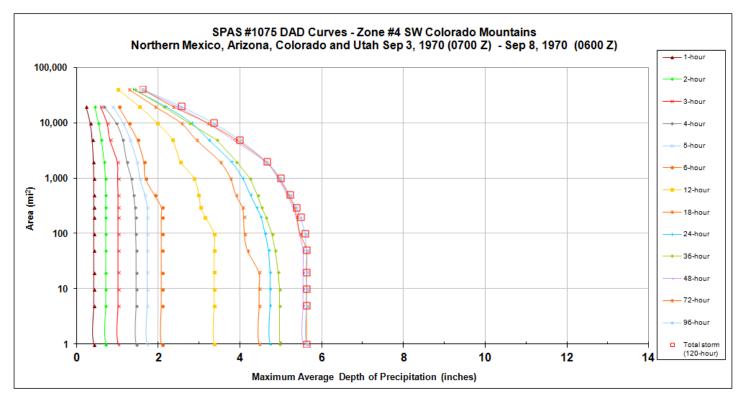
Bayfield, CO, AWA 22

September 3, 1970 Storm Type: Remnant Tropical Grid Points Used: 22

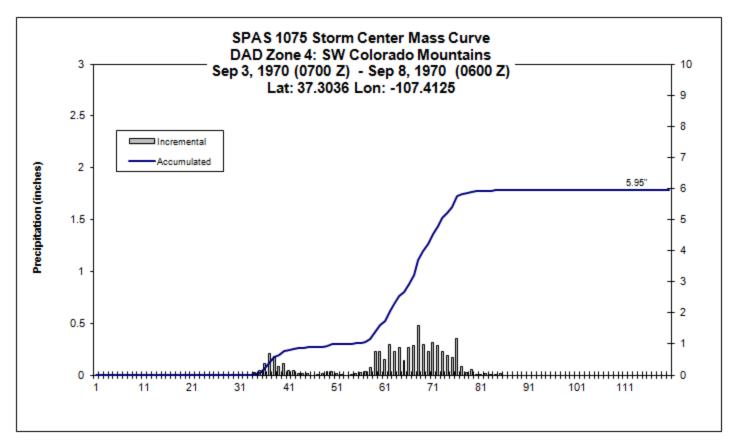
torm Date: 9/4-6/1970		one 4		Storm A	Adjustn	nent fo	r ANO	Grid Po	oint 22	
WA Analysis Date: 12/21/2013	3				_					
emporal Transposition Date	20-Aug								-	
	Lat	Long				nflow Direc	tion:	SW @ 410		
torm center location	37.56 N	107.88 W			Grid Point			9,871	feet	
torm Rep dew point location	32.79 N	112.13 W				ter Elevatio		9,825	feet	
ransposition dewpoint location	34.30 N	110.80 W			Storm Rep	Analysis D	uration	24	hours	
rid Point location	39.00 N	106.50 W								
The storm representative d	law point is	75.0 F	with total	precipitable	water abou	a saa larral o	·f		2.85	inches.
The in-place maximum d	-			precipitable					3.07	inches.
The transpositioned maximum d				precipitable					2.99	inches.
The in-place storm	•			ch subtracts	1.84		f precipitabl	e water at	75.0 F	micrics.
The in-place storm		-		ch subtracts	1.95		f precipitabl		76.5 F	
The transposition barrier			whi	ch subtracts	1.91		f precipitabl		76.0 F	
The Grid point/inflow barri		_	whi	ch subtracts	1.91		f precipitabl		76.0 F	
				_						
The in-plac	e maximizati	on factor is	1.11		Notes: Storr	n rep Td take	n from KGBI	V, KYUM 24h	ir ave	
The	transpositi	on factor is	0.96							
Orograph	ic Transpos	tion Factor	1.00							
										L
The to	tal adjustme	ent factor is	1.07							
Observed Comm. Do. of	Ans- D	ntlaw								
Observed Storm Depth	-Area-Dura 1 Hours	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	24 Hours	36 Hours	48 Hour
1 sq miles		2.3	3.3	3.8	4.1	4.6	7.9	24 Hours 11.1	11.5	48 Hour
10 sq miles	1.5	2.3	3.3	3.8	4.1	4.4	7.7	10.7	11.1	11.7
50 sq miles		2.3	3.1	3.5	3.7	4.0	6.6	9.8	10.0	10.2
100 sq miles	1.4	2.3	2.9	3.4	3.7	4.0	6.3	9.3	9.6	9.7
200 sq miles	1.3	2.2	2.8	3.2	3.6	3.9	6.1	8.8	9.0	9.1
500 sq miles	1.0	1.9	2.6	3.0	3.3	3.5	5.6	8.0	8.2	8.3
1000 sq miles	1.0	1.8	2.3	2.7	3.0	3.2	5.0	7.2	7.5	7.6
2000 sq miles	0.8	1.6	2.0	2.3	2.7	2.8	4.5	6.5	6.6	6.8
5000 sq miles	0.6	1.2	1.4	1.8	2.1	2.3	3.7	5.4	5.6	5.8
10000 sq miles	0.2	0.8	1.0	1.3	1.5	1.8	3.0	4.4	4.6	4.9
Adjusteded Storm Dep		:	2.11	4.77	611		12.11	24.17	2611	40.77
	1 Hours	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	24 Hours	36 Hours	
1 sq miles	1 Hours 1.6	2 Hours 2.5	3.5	4.0	4.3	5.0	8.5	11.9	12.3	12.5
1 sq miles 10 sq miles	1 Hours 1.6 1.6	2 Hours 2.5 2.5	3.5 3.5	4.0 4.0	4.3 4.3	5.0 4.7	8.5 8.3	11.9 11.5	12.3 11.8	12.5 12.0
1 sq miles 10 sq miles 50 sq miles	1 Hours 1.6 1.6 1.6	2 Hours 2.5 2.5 2.4	3.5 3.5 3.3	4.0 4.0 3.8	4.3 4.3 3.9	5.0 4.7 4.3	8.5 8.3 7.1	11.9 11.5 10.5	12.3 11.8 10.7	12.5 12.0 10.9
1 sq miles 10 sq miles 50 sq miles 100 sq miles	1 Hours 1.6 1.6	2 Hours 2.5 2.5	3.5 3.5	4.0 4.0	4.3 4.3	5.0 4.7	8.5 8.3 7.1 6.8	11.9 11.5	12.3 11.8	12.5 12.0
1 sq miles 10 sq miles 50 sq miles	1 Hours 1.6 1.6 1.6 1.5	2 Hours 2.5 2.5 2.4 2.4	3.5 3.5 3.3 3.0	4.0 4.0 3.8 3.7	4.3 4.3 3.9 3.9	5.0 4.7 4.3 4.2	8.5 8.3 7.1	11.9 11.5 10.5 10.0	12.3 11.8 10.7 10.2	12.5 12.0 10.9 10.4
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles	1 Hours 1.6 1.6 1.6 1.5 1.15	2 Hours 2.5 2.5 2.4 2.4 2.3	3.5 3.5 3.3 3.0 3.0	4.0 4.0 3.8 3.7 3.4	4.3 4.3 3.9 3.9 3.8	5.0 4.7 4.3 4.2 4.1	8.5 8.3 7.1 6.8 6.5	11.9 11.5 10.5 10.0 9.4	12.3 11.8 10.7 10.2 9.6	12.5 12.0 10.9 10.4 9.7
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles	1 Hours 1.6 1.6 1.6 1.5 1.1 1.1	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0	3.5 3.5 3.3 3.0 3.0 2.8	4.0 4.0 3.8 3.7 3.4 3.2	4.3 4.3 3.9 3.9 3.8 3.5	5.0 4.7 4.3 4.2 4.1 3.8	8.5 8.3 7.1 6.8 6.5 6.0	11.9 11.5 10.5 10.0 9.4 8.6	12.3 11.8 10.7 10.2 9.6 8.8	12.5 12.0 10.9 10.4 9.7 8.9
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles	1 Hours 1.6 1.6 1.6 1.5 1.1 1.1 1.1 0.8	2.5 2.5 2.4 2.4 2.3 2.0 1.9	3.5 3.5 3.3 3.0 3.0 2.8 2.5	4.0 4.0 3.8 3.7 3.4 3.2 2.8	4.3 4.3 3.9 3.9 3.8 3.5 3.5	5.0 4.7 4.3 4.2 4.1 3.8 3.4	8.5 8.3 7.1 6.8 6.5 6.0 5.4	11.9 11.5 10.5 10.0 9.4 8.6 7.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	1 Hours 1.6 1.6 1.6 1.5 1.1 1.1 1.1 0.8 0.6	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	1 Hours 1.6 1.6 1.6 1.5 1.1 1.1 1.1 0.8 0.6	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.5	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 1000 sq miles 1000 sq miles	1 Hours 1.6 1.6 1.5 1.4 1.1 0.8 0.6 0.3	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0	4,3 4,3 3,9 3,9 3,8 3,5 3,2 2,9 2,2 1,6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 2000 sq miles 1000 sq miles 5000 sq miles 10000 sq miles	1 Hours 1.6 1.6 1.5 1.4 1.1 0.8 0.6 0.3	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0	4,3 4,3 3,9 3,9 3,8 3,5 3,2 2,9 2,2 1,6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles	1 Hours 1.6 1.6 1.5 1.4 1.1 0.8 0.6 0.3	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0	4,3 4,3 3,9 3,9 3,8 3,5 3,2 2,9 2,2 1,6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 1000 sq miles 10000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles Storm or Storm Center Storm Date(s) Storm Type	1 Hours 1.6 1.6 1.5 1.4 1.1 0.8 0.6 0.3	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2	3.5 3.5 3.3 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4	4,3 4,3 3,9 3,9 3,8 3,5 3,2 2,9 2,2 1,6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 2000 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 5000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles 5000 sq miles 10000 sq miles 5000 sq miles 5000 sq miles	1 Hours 1.6 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2	3.5 3.5 3.3 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0	4,3 4,3 3,9 3,9 3,8 3,5 3,2 2,9 2,2 1,6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles	1 Hours 1.6 1.6 1.6 1.5 1.4 1.1 0.8 0.6 0.3	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2 0.9	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 1000 sq miles 10000 sq miles 5000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles 5000 sq miles 10000 sq miles 5000 sq miles	1 Hours 1.6 1.6 1.6 1.5 1.4 1.1 0.8 0.6 0.3	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2 0.9	3.5 3.5 3.3 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles	1 Hours 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2 0.9	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles	1 Hours 1.6 1.6 1.6 1.5 1.4 1.1 0.8 0.6 0.3	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2 0.9	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles	1 Hours 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2 0.9	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches 4	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 5000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles	1 Hours 1.6 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3 Name Puration (10 Dewpoint Lorpoint	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2 0.9	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches 4	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles	1 Hours 1.6 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3 Name Puration (10 Dewpoint Lorpoint	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2 0.9	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches 4 75.0 F 32.79 N 76.5 F	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles	1 Hours 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3 Name Duration (10 Dewpoint Loppoint	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2 0.9	3.5 3.5 3.3 3.0 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches 4 75.0 F 32.79 N 76.5 F SW @ 410	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 1000 sq miles 2000 sq miles 1000 sq miles 10000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles	1 Hours 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3 Name Duration (10 Dewpoint Lewpoint	2 Hours 2.5 2.5 2.4 2.4 2.3 2.0 1.9 1.7 1.2 0.9	3.5 3.5 3.3 3.0 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches 4 75.0 F 32.79 N 76.5 F SW @ 410	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone 107.88 W 18 hours 3.88 24 112.13 W	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles	1 Hours	2 Hours 2.5 2.5 2.4 2.3 2.0 1.9 1.7 1.2 0.9 sq mi)	3.5 3.5 3.3 3.0 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches 4 75.0 F 32.79 N 76.5 F SW @ 410	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles	1 Hours 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3 Name Duration (10 Dewpoint Location in (Date) int Location in Dewpoint	2 Hours 2.5 2.5 2.4 2.3 2.0 1.9 1.7 1.2 0.9 sq mi)	3.5 3.5 3.3 3.0 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches 4 75.0 F 32.79 N 76.5 F SW @ 410	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone 107.88 W 18 hours 3.88 24 112.13 W	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 5000 sq miles 10000 sq mile	1 Hours 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3 Name Duration (10 Dewpoint Location in (Date) int Location in Dewpoint	2 Hours 2.5 2.5 2.4 2.3 2.0 1.9 1.7 1.2 0.9 sq mi)	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches 4 75.0 F 32.79 N 76.5 F SW @ 410 20-Aug 34.30 N 76.0 F	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone 107.88 W 18 hours 3.88 24 112.13 W	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 10000 sq miles 5000 sq miles 10000 sq mil	1 Hours 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3 Name Puration (10 Dewpoint Location on (Date) on (Date) on t Location on Dewpoint nent Factor	2 Hours 2.5 2.5 2.4 2.3 2.0 1.9 1.7 1.2 0.9 sq mi)	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075-1 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches 4 75.0 F 32.79 N 76.5 F SW @ 410 20-Aug 34.30 N 76.0 F	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone 107.88 W 18 hours 3.88 24 112.13 W	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 10000 sq mi	1 Hours 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3 Name Puration (10 Dewpoint Location on (Date) on (Date) on t Location on Dewpoint nent Factor	2 Hours 2.5 2.5 2.4 2.3 2.0 1.9 1.7 1.2 0.9 sq mi)	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075- 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches 4 75.0 F 32.79 N 76.5 F SW @ 410 20-Aug 34.30 N 76.0 F	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone 107.88 W 18 hours 3.88 24 112.13 W	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.5 12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2
1 sq miles 10 sq miles 50 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 10000 sq m	1 Hours 1.6 1.6 1.6 1.5 1.4 1.1 1.1 0.8 0.6 0.3 Name Puration (10 Dewpoint Loppoint Loppoin	2 Hours 2.5 2.5 2.4 2.3 2.0 1.9 1.7 1.2 0.9 sq mi)	3.5 3.5 3.3 3.0 3.0 2.8 2.5 2.2 1.5 1.1 SPAS-1075-1 9/4-6/1970 Tropical 37.56 N 9825 12.01 inches 4 75.0 F 32.79 N 76.5 F SW @ 410 20-Aug 34.30 N 76.0 F	4.0 4.0 3.8 3.7 3.4 3.2 2.8 2.5 2.0 1.4 Norma-Zone 107.88 W 18 hours 3.88 24 112.13 W	4.3 4.3 3.9 3.9 3.8 3.5 3.2 2.9 2.2 1.6	5.0 4.7 4.3 4.2 4.1 3.8 3.4 3.0 2.5 2.0	8.5 8.3 7.1 6.8 6.5 6.0 5.4 4.8 4.0 3.2	11.9 11.5 10.5 10.0 9.4 8.6 7.7 6.9 5.8 4.7	12.3 11.8 10.7 10.2 9.6 8.8 8.0 7.1 6.0	12.0 10.9 10.4 9.7 8.9 8.2 7.3 6.2

	Storm	1075 - 1	Northe		co, Ariz						_ `	Z) - Se	p 8, 19	70 (06	00 Z)	
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																
		Duration (hours)														
Area (mi ²)	1	2	3	4	5	6	12	18	24	36	48	72	96			Total
0.27	0.82	1.07	1.4	1.77	2.12	2.37	3.71	4.83	5.07	5.27	5.9	5.95	5.95			5.95
1	0.42	0.71	1.02	1.46	1.73	2.08	3.36	4.47	4.73	4.96	5.54	5.62	5.62			5.62
5	0.42	0.71	1.02	1.46	1.73	2.08	3.36	4.47	4.73	4.96	5.54	5.62	5.62			5.62
10	0.42	0.71	1.02	1.46	1.73	2.08	3.36	4.47	4.73	4.96	5.54	5.62	5.62			5.62
20	0.42	0.71	1.02	1.46	1.73	2.08	3.36	4.46	4.73	4.93	5.54	5.62	5.62			5.62
50	0.42	0.71	1.02	1.46	1.73	2.08	3.36	4.18	4.69	4.86	5.54	5.62	5.62			5.62
100	0.42	0.71	1.02	1.45	1.73	2.08	3.36	4.11	4.61	4.78	5.45	5.46	5.58			5.58
200	0.42	0.71	1.02	1.44	1.73	2.08	3.14	4.09	4.51	4.63	5.37	5.38	5.47			5.47
300	0.42	0.71	1.02	1.43	1.73	2.08	3.03	4.06	4.4	4.52	5.29	5.32	5.36			5.36
500	0.42	0.71	1.02	1.4	1.67	1.91	2.99	3.9	4.25	4.43	5.15	5.18	5.21			5.21
1,000	0.42	0.7	1.01	1.34	1.55	1.69	2.87	3.77	4.06	4.24	4.93	4.95	4.98			4.98
2,000	0.41	0.67	1	1.23	1.48	1.65	2.54	3.51	3.78	3.91	4.61	4.63	4.64			4.64
5,000	0.38	0.6	0.82	1.13	1.31	1.49	2.34	2.93	3.23	3.42	3.82	3.9	3.98			3.98
10,000	0.33	0.53	0.75	0.97	1.14	1.27	1.97	2.56	2.81	2.75	3.2	3.2	3.34			3.34
20,000	0.23	0.44	0.59	0.67	0.88	1.03	1.53	1.92	2.17	2.12	2.44	2.35	2.55			2.55
40,779							1.01	1.28	1.38	1.42	1.59	1.61	1.61			1.6

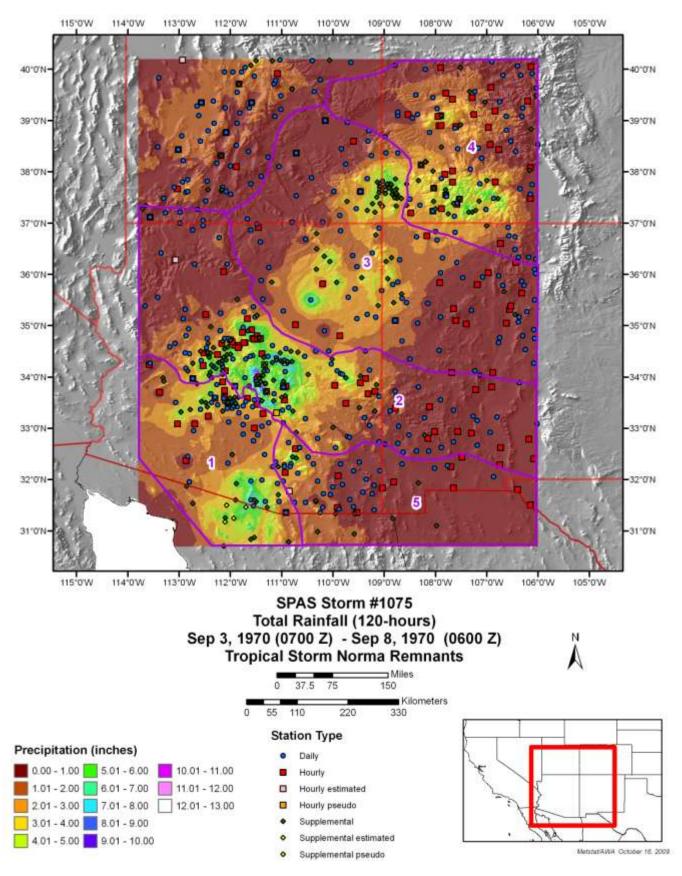
Appendix F: Table F.50: Depth-area-duration values for Bayfield, CO, September 3, 1970



Appendix F: Figure F.69: Depth-area-duration chart for Bayfield, CO, September 3, 1970



Appendix F: Figure F.70: Mass curve chart for Bayfield, CO, September 3, 1970



Appendix F: Figure F.71: Total storm isohyetal analysis for Bayfield, CO, September 3, 1970

Big Elk Meadow, CO, AWA 23

May 4, 1969

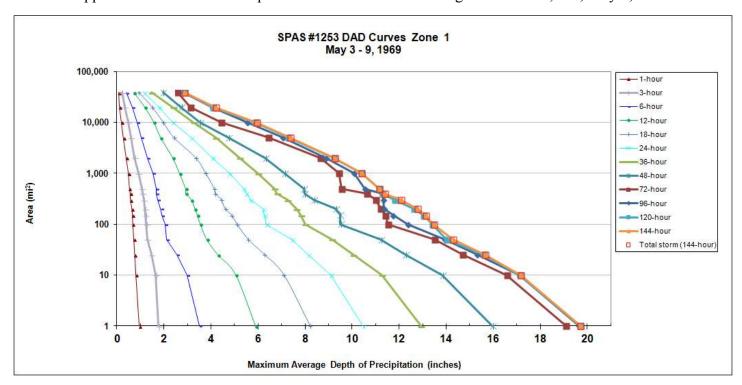
Storm Type: Frontal Grid Points Used: 7, 13-14, 21

		3-Big Elk Me	adre; CO		7625 9395.03	CA CANCOLI	MANUAL STATE				
torm Date:	5/3-9/1969		11000	Storm Adjustment for ANO Grid Point 7							
AWA Analysis Date:											_
Temporal Transpositio	on Date	20-May			-						
		Lat	Long			Moisture In	flow Direct	ion:	LSE @ 375	miles	
Storm center location		40.27 N	105.42 W			Grid Point l	Elevation		7,557	feet	
Storm Rep dew point lo	ocation	38.00 N	99.00 W			Storm Cent	er Elevation	ı	8,000	feet	
ransposition devpois	at location	33.75 N	99.45 W			Storm Rep Analyzia Duration			24	hours	
Grid Point location		36.00 N	105.50 W								
				1		15					
The storm rep	presentative	dew point is	65.0 F	with total	al precipitable	water above	sea level of			1.77	inches
The in-pla	ce maximum	dew point is	74.5 F	with tota	al precipitable	water above	sea level of	5		2.79	inches
The transpositions	ed maximum	dev point is	76.0 F	with tota	al precipitable	water above	sea level of			2.99	inches
The in	place stom	n elevation in	8,000	wh	eich subtracts	1.09	inches o	f precipitabl	e water at	65.0 F	
The in	a-place stom	n elevation is	8,000	wh	sich subtracts	1.55	inches o	f precipitabl	e water at	74.5 F	
The transpo	asition basin	elevation at	7,557	wb	nich subtracts	1.56	inclass o	f precipitable	e water at	76.0 F	
The Grid Poer	at Inflow bar	nier height is	7,557	wh	sich subtracts	1.56	inches o	f precipitabl	e water at	76.0 F	
The state of the s		ATTA COSTA	0.000	- 00			- 140709-0	estenos((()))	ttomocota-		14
- 71	he in-place r	toen maximiz	ation factor is	1.50	1				RSL, and KDD		1
The to	1.15	1.15 max factor of 1.82 mas capped at 1.50 based on HMK guidano HMR 55A has a max factor of 1.82 (pg239).									
27.5030	The	barrier adjust	ment factor is	1.00		nauk 328 fü	a a man facto	er 1,62 (pg2	23/3/		
	Th	e total adjust	ment factor is	1.73							_
14					115	-				- 1	
Otnerned S	sterm Depth	-Arra-Durati									
	THE PERSON NAMED IN COLUMN 1	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	mentals, by the man is	36 Hours	48 Hours	72 Hours	
	1 sq miles	0.9	1.8	3.5	5.9	8.2	10.5	12.9	15.9	19.1	
	10 sq miles	0.8	1.7	3.0	5.1	7.1	9.1	11.3	13.8	16.6	1
	100 sq miles	0.7	1.3	2.1	3.6	5.1	6.4	8.0	9.5	11.5	
	200 sq miles	0.6	1.2	1.9	3.3	4.6	6.2	7.6	9.3	11.2	
	500 sq miles	0.5	1.1	1.7	2.9	4.1	5.4	6.7	7.9	9.5	
	ooo aq milea	0.5	0.9	1.5	2.7	3.8	4.8	6.0	17.1	9.4	
	oot sq miles	9.4	0.8	1.3	2.4	3.4	4.1	5.2	6.3	8.7	-
	oon sq miles	0.3	0.6	1.0	1.9	2.4	3.2	4.2	4.7	6.4	
	000 sq miles	0.2	0.5	0.9	1.6	2.0	2.4	3.3	3.5	4.4	
200	oot sq miles	0.1	0.3	0.7	1.2	1.5	1.8	2.4	2.7	3.1	_
				*****	11.						133
Adjusted S	iurm Depth-	Area-Derati			-	and the same of					
	V	1 Hours	3 Hours	å Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
	1 sq miles	1.6	3.1	6.1	10.2	14.2	18.1	22.3	27.6	33.0	-
	10 sq miles	1.4	2.9	5.1	8.8	12.3	15.7	19.5	23.9	28.7	1
	100 sq miles	1.2	2,2	3.6	6.1	8.8	11.0	13.8	16.4	19.9	-
	200 sq miles	1.1	2.1	3.2	5.7	8.0	10.7	13.2	16.1	19,4	
	500 sq miles	0.9	1.8	2.9	5.1	7.1	9.3	11.6	13.7	16.5	1
		0.8	1.6	2.6	4.6	6.5	8.3	10.3	29.6	16.3	1
	estins pe 000						7.0	9.0	10.9		-
20	estim pe 000	0.7	1.3	2.2	4.1	5.8					1
20 30	000 sq miles 000 sq miles	0.5	1.0	1.8	3.2	4.2	5.4	7.3	8.2	11.1	
30 30 100	000 sq miles 000 sq miles 000 sq miles	0.5 0.3	1.0 0.8	1.8 1.5	3.2 2.7	4.2 3.4	4.1	5.6	8.2 6.1	7,7	1
30 30 100	000 sq miles 000 sq miles	0.5	1.0	1.8	3.2	4.2		-	8.2	11.1	
30 30 100	000 sq miles 000 sq miles 000 sq miles	0.5 0.3	1.0 0.8	1.8 1.5	3.2 2.7	4.2 3.4	4.1	5.6	8.2 6.1	7,7	
20 50 100 200	000 sq miles 000 sq miles 000 sq miles 000 sq miles	0.5 0.3 0.2	1.0 0.8 0.6	1.8 1.5 1.1	3.2 2.7 2.0	4.2 3.4 2.6	4.1	5.6	8.2 6.1	7,7	
200 50 100 200 Storm or Se	000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles	0.5 0.3 0.2	1.0 0.8 0.6	1.8 1.5 1.1	3.2 2.7	4.2 3.4 2.6	4.1	5.6	8.2 6.1	7,7	
20 30 100 200 Storm or St Storm Date	000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles com Center?	0.5 0.3 0.2	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969	3.2 2.7 2.0 1-Big Ilk Mea	4.2 3.4 2.6	4.1	5.6	8.2 6.1	7,7	
200 30 100 200 Storm Outo Storm Type	000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles com Center (s)	0.5 0.3 0.2	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Symoptic Sto	3.2 2.7 2.0 I-Big Elk Mea	4.2 3.4 2.6	4.1	5.6	8.2 6.1	7,7	
Storm Loca Storm Loca Storm Loca	000 sq miles 000 sq miles 000 sq miles 000 sq miles com Center I ((s) e	0.5 0.3 0.2 Name	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Synoptic Sto 40.27 N	3.2 2.7 2.0 2.8 3-Big Elk Mea 0em 105.42 W	4.2 3.4 2.6	4.1	5.6	8.2 6.1	7,7	
30 100 200 Storm or St Storm Date Storm Loca Storm Loca Storm Cent	000 sq miles (s) (s) e ention ter Elevation	0.5 0.3 0.2 Name	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Symoptic Str 40.27 N 8,000	3.2 2.7 2.0 2.0 3-Big Elk Mea 6em 105.42 W orographic	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6	8.2 6.1	7,7	
30 100 200 Storm or St Storm Date Storm Loca Storm Loca Storm Cent	000 sq miles (s) (s) e ention ter Elevation	0.5 0.3 0.2 Name	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Symoptic Str 40.27 N 8,000	3.2 2.7 2.0 2.8 3-Big Elk Mea 0em 105.42 W	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6	8.2 6.1	7,7	
Storm Cent Precipitation	000 sq miles toms Center I (s) e thion ter Elevation on Total & D	0.5 0.3 0.2 Name	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Symoptic Str 40.27 N 8,000	3.2 2.7 2.0 3-Big Elk Mea cem 105.42 W arographic 120 hour (SP.	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6	8.2 6.1 4.7	7,7	
Storm Cent Precipitatio Storm Repr	000 sq miles come Center ! (s) e thion ter Elevation on Total & D resentative I	0.5 0.3 0.2 Name	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Symoptic Ste 40.27 N 8,000 20.01 inches	3.2 2.7 2.0 3-Big Elk Mea cem 105.42 W arographic 120 hour (SP.	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6 4.1	8.2 6.1 4.7	7,7	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Repr	000 sq miles come Center ! (s) e thion ter Elevation on Total & D resentative I	0.5 0.3 0.2 Name	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Symoptic Str 40.27 N 8,000 20.01 inches	3.2 2.7 2.0 Seg Elk Mea cem 105.42 W crographic 120 hour (SP.	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6	8.2 6.1 4.7	7,7	
Storm or St. Storm Date Storm Local Storm Repe Storm Repe In-place Mi	000 sq miles com Center? (a) e e tition ter Elevation on Total & D cesentative E	0.5 0.3 0.2 Name Puration (10 so Despoint Loc point Loc	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Symoptic Str 40.27 N 8,000 20.01 inches 65.0 F 38.00 N 74.3 F	3.2 2.7 2.0 Seg Elk Mea cem 105.42 W crographic 120 hour (SP.	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6 4.1 RSL, and KD	8.2 6.1 4.7 OC	7,7	
Storm or St. Storm Date Storm Loca Storm Loca Storm Rept Storm Rept Storm Rept Storm Loca Storm Rept	000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles (a) e e thorn ter Elevation on Total & D resentative D resentative D	0.5 0.3 0.2 Name Duration (10 so Despoint Despoint Despoint	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Symoptic Str 40.27 N 8,000 20.01 inches 65.0 F 38.00 N	3.2 2.7 2.0 Seg Elk Mea cem 105.42 W crographic 120 hour (SP.	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6 4.1 RSL, and KD	8.2 6.1 4.7 OC	7,7	
Storm or St. Storm Date Storm Loca Storm Loca Storm Rept Storm Rept Storm Rept Storm Loca Storm Rept	000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles com Center I (s) e e e stion or Total & D essentative D essentative D essentative D essentative D	0.5 0.3 0.2 Name Duration (10 so Despoint Despoint Despoint	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Synoppic Sto 40.27 N 8,000 20.01 inches 65.0 F 38.00 N 74.5 F ESE @ 375	3.2 2.7 2.0 Seg Elk Mea cem 105.42 W crographic 120 hour (SP.	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6 4.1 RSL, and KD	8.2 6.1 4.7 OC	7,7	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr Storm Repr In-place Mi	000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles com Center I (s) e e e stion or Total & D essentative D essentative D essentative D essentative D	0.5 0.3 0.2 Name Name Oewpoint Devpoint Loc Devpoint Factor	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Synoppic Sto 40.27 N 8,000 20.01 inches 65.0 F 38.00 N 74.5 F ESE @ 375	3.2 2.7 2.0 Seg Elk Mea cem 105.42 W crographic 120 hour (SP.	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6 4.1 RSL, and KD	8.2 6.1 4.7 OC	7,7	
Storm or St. Storm Lots Storm Lots Storm Lots Storm Cent Precipitatio Storm Repr In-place Mi Mainture In In-place Mi	000 sq miles (s) e e tions Center F (s) e e tions no Total & D essentative D essentative D accimum Dewnfilow Vector accimum Dew	0.5 0.3 0.2 Name Name Overpoint Locapoint Locapoint of Actor or (Dute)	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Synoptic Sto 40.27 N 8,000 20.01 inches 65.0 F 38,00 N 74.5 F ESSE @ 375	3.2 2.7 2.0 Seg Elk Mea cem 105.42 W crographic 120 hour (SP.	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6 4.1 RSL, and KD	8.2 6.1 4.7	7,7	
Storm or St. Storm Date Storm Pype Storm Loca Storm Repr Storm Repr Storm Repr In-place Mi Maisture in In-place Mi Temporal T	000 sq miles come Center I (a) e e e e e e e e e e e e e e e e e e e	0.5 0.3 0.2 Name Auration (10 so Despoint Despoint Corporat Factor in (Date) nt Location	1.0 0.8 0.6	1.8 1.5 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1	3.2 2.7 2.0 3-Big Elk Mea corn 105.42 W orographic 120 hour (SP/ 99.00 W	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6 4.1 RSL, and KD May. 73.53	8.2 6.1 4.7 DC June 78.2	7,7	
Storm or St Storm Coat Storm Coat Storm Coat Storm Coat Storm Coat Storm Repe Storm Repe In-place M Mointure Ir In-place M Temporal T Transpositi Transpositi	000 sq miles (s) e thion ter Elevation on Total & D essentative E accinnam Dew offlow Vector accinization F fransposition from Azonam on Adjustm on Adjustm	0.5 0.3 0.2 Name Auration (10 to Compoint Location of Factor of (Date) of Location of Despoint	1.0 0.8 0.6	1.8 1.5 1.1 1.1 1.3 91969 Symoptic Ste 40.27 N 8,000 20.01 inches 65.0 F 38.00 N 74.5 F SSE @ 375 1.50	3.2 2.7 2.0 3-Big Elk Mea corn 105.42 W orographic 120 hour (SP/ 99.00 W	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6 4.1 RSL, and KD May. 73.53	8.2 6.1 4.7 DC June 78.2	7,7	
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Storm or Ste Storm Duto Storm Type Storm Loca Storm Cent Precipitatio Storm Repp In-place Mi Moisture In In-place Mi Transpositi Transpositi Transpositi Transposit Transposit Transposit Transposit Transposit Transposit	000 sq miles 000 s	0.5 0.3 0.2 Name Paration (10 so Dewpoint Location on (Dute) on Location on Dewpoint sent Factor	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9-1969 Synoptic Str. 40.27 N 8,000 20.01 inches 65.0 F 858.00 N 74.5 F ESE @ 375 1.50	3.2 2.7 2.0 3-Big Elk Mea corn 105.42 W orographic 120 hour (SP/ 99.00 W	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6 4.1 RSL, and KD May. 73.53	8.2 6.1 4.7 DC June 78.2	7,7	
Storm or Storm Type Storm Loca Storm Type Storm Loca Storm Repr Storm Repr In-place Mi Moisture Ir In-place Mi Temporal T Transpositi Transpositi Transpositi Highest Ele Inflow Bar	000 sq miles (s) e toms Center ! (s) e toms Center ! (s) e toms Total & D essentative I accimum Dewentative I composition 10 mon Total & D essentative I composition 10 mon Aginatu	0.5 0.3 0.2 Name Ouration (10 so Despoint Loc Despoint Loc Tactor In (Date) In Location In Despoint Location In Despoint Location In Despoint Location Loc	1.0 0.8 0.6	1.8 1.5 1.1 1.5 1.1 1.1 1.5 1.1 1.1 1.1 1.1	3.2 2.7 2.0 3-Big Elk Mea corn 105.42 W orographic 120 hour (SP/ 99.00 W	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6 4.1 RSL, and KD May. 73.53	8.2 6.1 4.7 DC June 78.2	7,7	
Storm or St Storm Date Storm Loca Storm Loca Storm Repr Storm Repr Storm Repr Storm Repr In-place M Mointure Ir In-place M I remporal I Transpositi Transpositi Grid Point I Highest Ele Inflow Ban Elevation A	000 sq miles 000 s	0.5 0.3 0.2 Name Name Overpoint Location of Deteyont Location of Deteyont Location of Deteyont Location of Deteyont sent Factor	1.0 0.8 0.6	1.8 1.5 1.1 SPAS-1253 5/3-9/1969 Synoptic Sto 40.27 N 8,000 20.01 inches 65.0 F 38.00 N 74.5 F SSE @ 375 1.50 20.May 33.75 N 76.0 F 1.18 77.557 14,344	3.2 2.7 2.0 3-Big Elk Mea corn 105.42 W orographic 120 hour (SP/ 99.00 W	4.2 3.4 2.6 daw, CO	4.1 3.1	5.6 4.1 RSL, and KD May. 73.53	8.2 6.1 4.7 DC June 78.2	7,7	

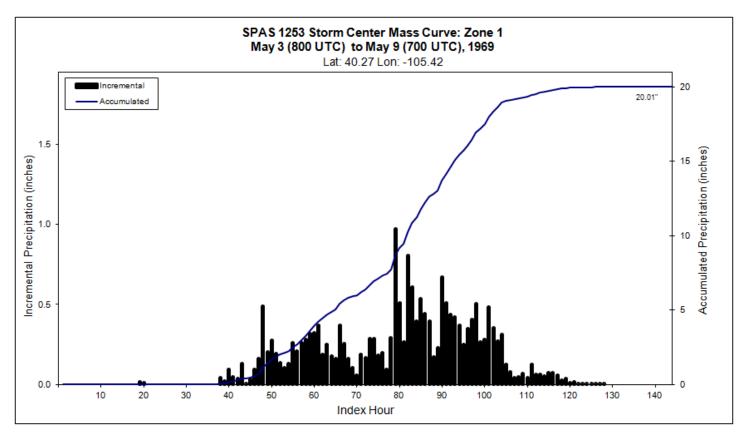
Appendix F: Table F.51: Storm spreadsheet for Big Elk Meadow, CO, May 4, 1969

			SI	PAS 125	3 - May 3	(800 UT	ГС) - Мау	/ 9 (700 l	JTC), 19	69			
				MAXIMUN	AVERAG	E DEPTH	OF PREC	IPITATION	(INCHES)				
						D	uration (hou	rs)					
Area (mi ²)	1	3	6	12	18	24	36	48	72	96	120	144	Total
0.3	0.97	1.82	3.56	6.00	8.34	10.64	13.13	16.21	19.41	19.97	20.01	20.01	20.01
1	0.94	1.77	3.50	5.90	8.20	10.46	12.92	15.94	19.09	19.65	19.69	19.69	19.69
10	0.80	1.65	2.97	5.06	7.09	9.08	11.26	13.83	16.57	17.10	17.12	17.16	17.16
25	0.75	1.47	2.55	4.29	6.27	8.13	10.04	12.25	14.70	15.32	15.58	15.64	15.64
50	0.71	1.30	2.11	3.82	5.57	7.42	9.14	11.22	13.51	13.93	14.01	14.28	14.28
100	0.67	1.25	2.06	3.55	5.10	6.36	8.00	9.49	11.53	12.37	13.41	13.46	13.46
150	0.65	1.22	1.91	3.42	4.87	6.27	7.81	9.48	11.40	11.73	13.01	13.11	13.11
200	0.63	1.19	1.86	3.32	4.60	6.21	7.63	9.29	11.21	11.36	12.61	12.76	12.76
300	0.57	1.14	1.74	3.17	4.43	5.67	7.25	8.36	11.00	11.32	11.80	12.06	12.06
400	0.56	1.09	1.66	2.93	4.18	5.50	6.80	7.97	10.63	11.26	11.27	11.36	11.36
500	0.53	1.05	1.66	2.92	4.13	5.38	6.70	7.94	9.54	10.54	11.14	11.14	11.14
1,000	0.48	0.91	1.52	2.66	3.77	4.77	5.98	7.11	9.43	10.07	10.38	10.38	10.38
2,000	0.39	0.75	1.29	2.37	3.35	4.06	5.21	6.30	8.65	8.87	9.20	9.23	9.23
5,000	0.27	0.60	1.04	1.86	2.42	3.15	4.20	4.72	6.44	7.05	7.27	7.35	7.35
10,000	0.19	0.47	0.85	1.57	1.97	2.38	3.25	3.52	4.44	5.54	5.87	5.93	5.93
20,000	0.11	0.32	0.65	1.18	1.50	1.79	2.38	2.73	3.12	4.06	4.08	4.18	4.18
38,492	0.08	0.21	0.39	0.72	0.93	1.15	1.47	1.95	2.58	2.82	2.86	2.86	2.86

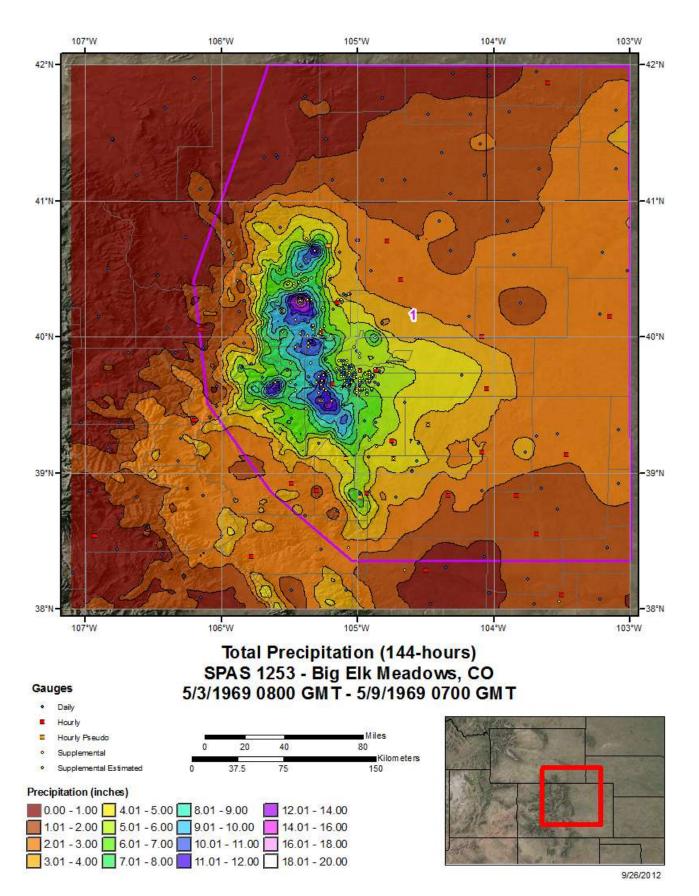
Appendix F: Table F.52: Depth-area-duration values for Big Elk Meadow, CO, May 4, 1969



Appendix F: Figure F.72: Depth-area-duration chart for Big Elk Meadow, CO, May 4, 1969



Appendix F: Figure F.73: Mass curve chart for Big Elk Meadow, CO, May 4, 1969



Appendix F: Figure F.74: Total storm isohyetal analysis for Big Elk Meadow, CO, May 4, 1969

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Wooster, OH, AWA 24

July 4, 1969

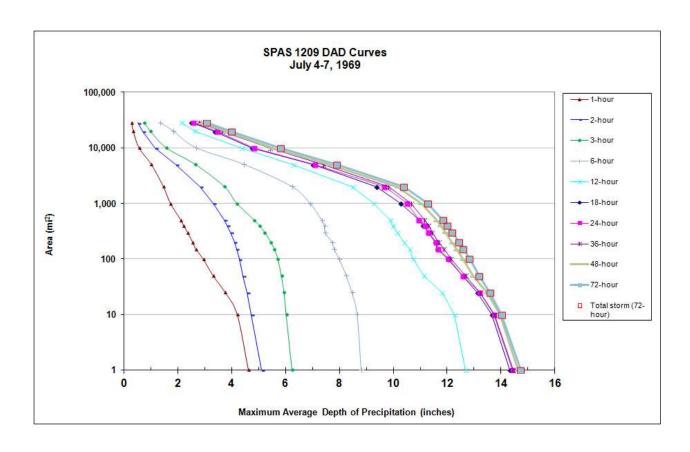
Storm Type: Frontal/MCC Grid Points Used: 8-11, 16-18

	H SPAS 120	19		~ :				~		
rm Date: 7/4-7/1969 VA Analysis Date: 12/14/2013				Storm	ı Adjust	tment fo	or ANO	Grid Po	oint 8	
nporal Transposition Date	15-Jul									
	Lat	Long			Moisture In	ıflow Directi	on	SW @ 140	miles	
rm Center Location	40.91 N	81.97 W			Grid Point	Elevation		1,200	feet	
orm Rep Dew Point Location	39.43 N	83.80 W			Storm Cent	ter Elevation		1,150	feet	
ansposition Dew Point Location	41.25 N	94.46 W			Storm Rep.	Analysis Du	ration	24	hours	
id Point Location	37.50 N	93.00 W			<u>-</u>					
The storm representative	dew point is	76.0 F	with tot	al precipitable	water abou	ra saa lawal o	£		2.99	inches
The in-place maximum	•	78.0 F		al precipitable					3.29	inches
The transpositioned maximum	•	80.5 F		al precipitable					3.68	inches
The in-place storm	elevation is	1,150	whi	ich subtracts	0.30	inches o	f precipitabl	e water at	76.0 F	
The in-place storm		1,150		ich subtracts	0.32		f precipitabl		78.0 F	
The transposition basin		1,200 1,000		ich subtracts ich subtracts	0.30		f precipitabl f precipitabl		80.5 F 80.5 F	
The Grid point/inflow ban	ner neight is	1,000	WI	ich subtracts	0.30	inches o	i precipitabl	e water at	1 6.00	
The in-place sto	rm maximizat	ion factor is	1.10		Notes: DAD) values taken	from SPAS	209. Storm re	presentative	
The transposition/el	evation to ba	sin factor is	1.14					i 24-hr Td valu	es between	
The ba	rrier adjustm	ent factor is	1.00		July 4-5, 196	59 at KILN, K	FFO, and K	CVG.		
The	total adjustm	ent factor is	1.25							
Observed Storm Depth-				12.77	10.77	24.77	2677	40.77	72.77	
4 4	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles 10 sq miles	4.6 4.2	6.2 6.0	8.8 8.7	12.7 12.3	14.3 13.7	14.4 13.7	14.5 13.8	14.6 14.0	14.7 14.0	1
100 sq miles	2.9	5.7	8.0	10.7	12.0	12.1	12.1	12.6	12.8	
200 sq miles	2.5	5.5	7.7	10.4	11.6	11.6	11.7	12.2	12.4	
500 sq miles	2.1	4.8	7.3	9.9	11.0	11.0	11.2	11.6	11.8	
1000 sq miles	1.7	4.2	6.9	9.3	10.3	10.5	10.7	11.0	11.3	
2000 sq miles	1.5	3.7	6.2	8.5	9.4	9.7	9.8	10.2	10.4	
5000 sq miles	1.0	2.6	4.5	6.3	7.0	7.1	7.4	7.6	7.9	
10000 sq miles 20000 sq miles	0.5 0.3	1.6 1.0	2.7 1.8	4.4 2.6	4.7 3.4	4.8 3.5	5.4 3.7	5.5 3.8	5.8 4.0	
Adjusted Storm Depth-	Area-Durati 1 Hours	on 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles	5.8	7.8	11.0	15.9	18.0	18.1	18.1	18.3	18.5	
10 sq miles	5.3	7.6	10.9	15.4	17.1	17.2	17.3	17.5	17.6	
100 sq miles	3.7	7.2	10.0	13.4	15.1	15.1	15.2	15.8	16.1	
200 sq miles	3.2	6.8	9.7	13.0	14.5	14.5	14.7	15.3	15.6	
500 sq miles	2.6	6.1	9.2	12.4	13.7	13.7	14.0	14.6	14.8	
1000 sq miles	2.1	5.2	8.7	11.6	12.9	13.2	13.4	13.8	14.1	
2000 sq miles 5000 sq miles	1.8 1.3	4.7 3.3	7.8 5.6	10.6 7.9	11.8 8.8	12.1 8.9	12.3 9.3	12.7 9.6	13.0 9.9	
10000 sq miles	0.7	1.9	3.3	5.5	5.9	6.1	6.8	6.9	7.3	
20000 sq miles	0.4	1.2	2.3	3.3	4.2	4.4	4.6	4.7	5.0	
Storm or Storm Center N	Name		Wooster, O	H SPAS 120	9					
Storm or Storm Center N Storm Date(s)	Vame		7/4-7/1969	H SPAS 120	9					
Storm Date(s) Storm Type	Name		7/4-7/1969 Synoptic		9					
Storm Date(s) Storm Type Storm Location	Name		7/4-7/1969 Synoptic 40.91 N	9H SPAS 120 81.97 W	9					
Storm Date(s) Storm Type Storm Location Storm Center Elevation			7/4-7/1969 Synoptic 40.91 N 1,150	81.97 W	9					
Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & D	uration		7/4-7/1969 Synoptic 40.91 N	81.97 W	9					
Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & December 2015	uration ewpoint		7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches	81.97 W s 72-hours	9					
Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & Di Stom Representative D Stom Representative D	uration ewpoint	ation	7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N	81.97 W s 72-hours	9					
Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & Di Stom Representative D Stom Representative D Maximum Dewpoint	uration ewpoint ewpoint Loc	ation	7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inche: 76.0 F 39.43 N 78.0 F	81.97 W s 72-hours 24 83.80 W	9					
Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & Di Stom Representative D Stom Representative D	uration ewpoint ewpoint Loc	ation	7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N	81.97 W s 72-hours 24 83.80 W	9					
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Drecipitation Representative Drecipitation In-place Maximization Free Storm Representative Drecipitation Free Procipitation In-place Maximization Free Storm Total Representative Drecipitation Free Storm Drecipitation Free Storm Total Representative Drecipitation Free Storm Representative Drecipitation Free Free Free Free Free Free Free Fre	ewpoint Loc actor	ation	7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10	81.97 W s 72-hours 24 83.80 W	9					
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F	ewpoint Loc factor	ation	7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10	81.97 W s 72-hours 24 83.80 W Miles	9					
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & December 20 Storm Representative December 20 Maximum Dewpoint Moisture Inflow Vector In-place Maximization Femporal Transposition Transposition Dewpoint	ewpoint lewpoint Loc actor a (Date)	ation	7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10	81.97 W s 72-hours 24 83.80 W	9					
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & December	ewpoint Loc factor a (Date) It Location Dewpoint	ation	7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10	81.97 W s 72-hours 24 83.80 W Miles	9					
Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & Drecipitation Total & Drecipitation Total & Drecipitation Total & Drecipitation Description Maximum Dewpoint Moisture Inflow Vector In-place Maximization Format Transposition Dewpoin Transposition Maximum Transposition Adjustm Grid Point Elevation	ewpoint Loc actor n (Date) tt Location n Dewpoint ent Factor	ation	7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10 15-Jul 41.25 N 80.5 F 1.14 1,200	81.97 W s 72-hours 24 83.80 W Miles	9					
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoin Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	ewpoint Loc actor n (Date) tt Location n Dewpoint ent Factor	ation	7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10 15-Jul 41.25 N 80.5 F 1.14 1,200 14,344	81.97 W s 72-hours 24 83.80 W Miles	9					
Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & Drecipitation Total & Drecipitation Total & Drecipitation Total & Drecipitation Description Maximum Dewpoint Moisture Inflow Vector In-place Maximization Format Transposition Dewpoin Transposition Maximum Transposition Adjustm Grid Point Elevation	ewpoint Loc actor actor (Date) It Location Dewpoint ent Factor	ation	7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10 15-Jul 41.25 N 80.5 F 1.14 1,200	81.97 W s 72-hours 24 83.80 W Miles	9					

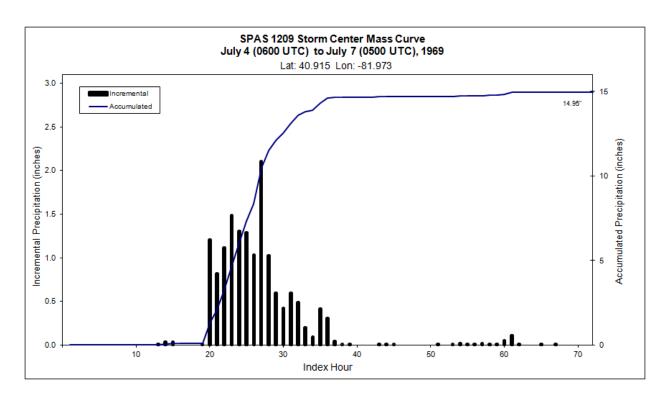
Appendix F: Table F.53: Storm spreadsheet for Wooster, OH July 4, 1969

	Sto	orm 12	09 - Jul	y 4 (06	00 UTC) - July	7 (050	0 UTC)	,1969		
		MAXIMU	JM AVEF	RAGE DE	EPTH OF	PRECI	OITATIO	N (INCHÉ	ES)		
					Dui	ration (ho	urs)				
Area (mi²)	1	2	3	6	12	18	24	36	48	72	Total
0.3	4.82	5.33	6.41	8.95	13.02	14.58	14.67	14.69	14.94	14.95	14.95
1	4.62	5.11	6.24	8.81	12.67	14.32	14.44	14.45	14.63	14.73	14.73
10	4.2	4.72	6.02	8.66	12.26	13.66	13.74	13.77	13.97	14.02	14.02
25	3.75	4.56	5.94	8.46	11.81	13.13	13.21	13.23	13.47	13.58	13.58
50	3.3	4.42	5.84	8.25	11.14	12.57	12.59	12.69	12.97	13.19	13.19
100	2.93	4.27	5.71	7.99	10.72	12.02	12.06	12.14	12.59	12.83	12.83
150	2.66	4.17	5.58	7.81	10.59	11.63	11.66	11.88	12.35	12.6	12.60
200	2.54	4.09	5.45	7.72	10.4	11.56	11.6	11.69	12.18	12.44	12.44
300	2.35	3.96	5.22	7.46	10.14	11.3	11.3	11.44	11.94	12.19	12.19
400	2.2	3.83	5.02	7.44	9.97	11.1	11.18	11.31	11.75	12	12.00
500	2.1	3.72	4.83	7.34	9.88	10.95	10.96	11.16	11.61	11.84	11.84
1,000	1.71	3.31	4.18	6.9	9.27	10.28	10.52	10.66	11.04	11.27	11.27
2,000	1.45	2.82	3.72	6.23	8.48	9.38	9.67	9.83	10.15	10.39	10.39
5,000	1	1.93	2.64	4.45	6.27	7.02	7.09	7.4	7.62	7.9	7.90
10,000	0.54	1.14	1.55	2.66	4.35	4.74	4.83	5.42	5.52	5.81	5.81
20,000	0.33	0.69	0.97	1.82	2.64	3.37	3.47	3.65	3.78	3.98	3.98
28,279	0.27	0.51	0.74	1.33	2.13	2.5	2.59	2.79	2.89	3.06	3.06

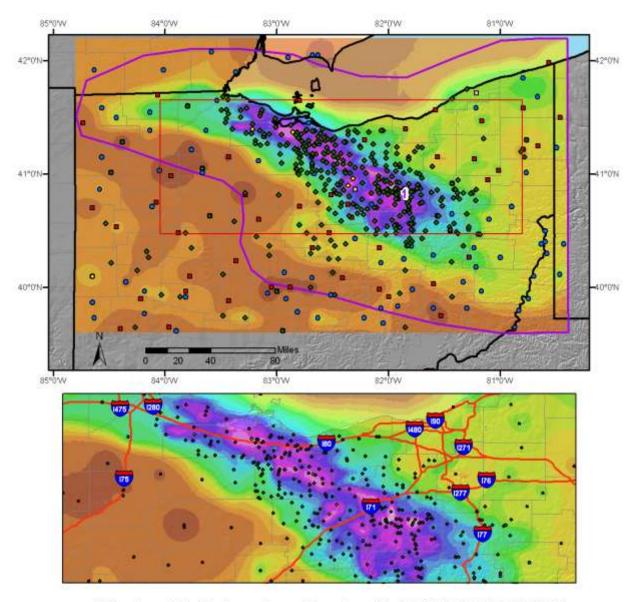
Appendix F: Table F.54: Depth-area-duration values for Wooster, OH July 4, 1969



Appendix F: Figure F.74: Depth-area-duration chart for Wooster, OH July 4, 1969



Appendix F: Figure F.75: Mass curve chart for Wooster, OH July 4, 1969



Wooster, Ohio "Independence Day storm" - ISOHYETAL FROM SPAS



Appendix F: Figure F.76: Total storm isohyetal analysis for Wooster, OH July 4, 1969

Gladewater, TX, AWA 25

April 27, 1966 Storm Type: Frontal

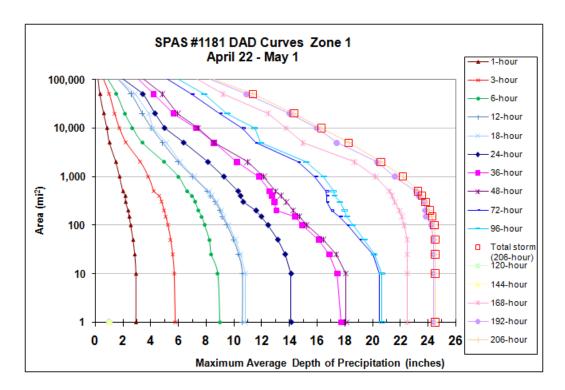
Grid Points Used: 1-3, 8-10, 16-17

	SPAS 1181-GI	adewater, TX			~.					_	
Date:	4/22-5-1/1966				Sto	rm Adjus	stment fo	r ANO G	rid Point 1	l	
Analysis Date:	12/14/2013										
oral Transposition Da	ite	15-May									
		Lat	Long			Moisture Infl	ow Direction:		SSE @ 130	miles	
center location		32.80 N	94.71 W			Grid Point Ele	evation		350	feet	
Rep SST location		31.00 N	94.00 W			Storm Center	Elevation		250	feet	
position SST location	n	31.52 N	97.49 W			Storm Rep Ar	nalysis Duratio	n	24	hours	
Point location		35.31 N	93.23 W			•	•				
I	The storm represer	ntative SST is	71.5 F	with total	precipitable wate	r above sea lev	vel of			2.42	inche
	The in-place ma	aximum SST is	77.0 F	with total	precipitable wate	r above sea lev	vel of			3.14	inche
The tr	anspositioned ma	ximum SST is	77.0 F	with total	precipitable wate	r above sea lev	vel of			3.14	inche
	The in-place stor	m elevation is	250		which subtracts	0.06	inches	of precipitable	water at	71.5 F	
	The in-place stor		250		which subtracts	0.07		of precipitable		77.0 F	
	transposition stor		350		which subtracts	0.28		of precipitable		77.0 F	
The G	rid point/inflow ba	arrier height is	1,050		which subtracts	0.28	inches	of precipitable	water at	77.0 F	
					_						
	The is	n-place maximiz	ation factor is	1.30		Notes:					
		The transpos	sition factor is	0.93							
	The elevatio	n/barrier adjust	tment factor is	1.00							<u> </u>
		The total adjust	tment factor is	1.21							1
Observed St	orm Depth-Area-I				· ·		·	·	· ·		
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	8.8	10.6	10.8	14.1	-	17.5	18.1	-	20.5	
	100 sq miles	7.9	9.5	9.6	12.5	-	14.9	15.2	-	18.2	-
	200 sq miles	7.4	9.0	9.1	11.6	-	13.1	14.3	-	17.0	
	500 sq miles	6.6	8.1	8.2	10.3	-	12.6	13.0	-	16.7	-
	1000 sq miles	6.0	7.0	7.1	9.3	-	11.8	12.2	-	15.9	
	2000 sq miles	4.9	6.0	6.1	8.1	-	10.2	11.0	-	14.6	
	5000 sq miles	3.4	4.8	5.1	6.4	-	8.6	8.6	-	11.6	
	10000 sq miles 20000 sq miles	2.7 2.1	4.0 3.4	4.1 3.9	5.0 4.3	-	7.3 5.6	7.4 6.0	-	10.6 9.0	-
	20000 sq nines	2.1	3.4	3.5	4.3	-	5.0	0.0	- 1	9.0	
Adimeted Ste	Dth. A D	41									
Adjusted Sto	orm Depth-Area-D	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	10.7	12.8	13.1	17.1	- 30 Hours	21.1	21.9	- OU HOURS	24.8	
	To sq nines	9.5	11.5	11.6	15.1	-	18.1	18.5	-	22.1	
	100 sa miles	··············		>	14.1		15.8	17.3	-		
	100 sq miles 200 sq miles	9.0		11.0		_				20.6	
	200 sq miles	9.0 8.0	10.9 9.8	11.0 9.9	····•	-	··•	·•	÷	20.6	
	200 sq miles 500 sq miles	8.0	9.8	9.9 8.7	12.5 11.2		15.3 14.3	15.8 14.7	-	20.6 20.2 19.2	
	200 sq miles 500 sq miles 1000 sq miles			9.9	12.5	-	15.3	15.8	-	20.2	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	8.0 7.2	9.8 8.5	9.9 8.7	12.5 11.2	-	15.3 14.3	15.8 14.7	-	20.2 19.2	
	200 sq miles 500 sq miles 1000 sq miles	8.0 7.2 6.0	9.8 8.5 7.2	9.9 8.7 7.4	12.5 11.2 9.9	-	15.3 14.3 12.4	15.8 14.7 13.3		20.2 19.2 17.7	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles	8.0 7.2 6.0 4.1	9.8 8.5 7.2 5.9	9.9 8.7 7.4 6.2	12.5 11.2 9.9 7.7	-	15.3 14.3 12.4 10.4	15.8 14.7 13.3 10.4	- - -	20.2 19.2 17.7 14.0	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	8.0 7.2 6.0 4.1 3.2	9.8 8.5 7.2 5.9 4.9	9.9 8.7 7.4 6.2 5.0	12.5 11.2 9.9 7.7 6.1	-	15.3 14.3 12.4 10.4 8.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	8.0 7.2 6.0 4.1 3.2	9.8 8.5 7.2 5.9 4.9	9.9 8.7 7.4 6.2 5.0	12.5 11.2 9.9 7.7 6.1	-	15.3 14.3 12.4 10.4 8.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm or Sto	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	8.0 7.2 6.0 4.1 3.2	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7,4 6,2 5,0 4,7	12.5 11.2 9.9 7.7 6.1	-	15.3 14.3 12.4 10.4 8.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	8.0 7.2 6.0 4.1 3.2	9.8 8.5 7.2 5.9 4.9	9.9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-0 4/22-5-1/1966	12.5 11.2 9.9 7.7 6.1 5.2	-	15.3 14.3 12.4 10.4 8.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles	8.0 7.2 6.0 4.1 3.2	9.8 8.5 7.2 5.9 4.9	9.9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm	12.5 11.2 9.9 7.7 6.1 5.2	-	15.3 14.3 12.4 10.4 8.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	8.0 7.2 6.0 4.1 3.2	9.8 8.5 7.2 5.9 4.9	9.9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-0 4/22-5-1/1966	12.5 11.2 9.9 7.7 6.1 5.2	-	15.3 14.3 12.4 10.4 8.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	8.0 7.2 6.0 4.1 3.2	9.8 8.5 7.2 5.9 4.9	9.9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm	12.5 11.2 9.9 7.7 6.1 5.2	-	15.3 14.3 12.4 10.4 8.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	8.0 7.2 6.0 4.1 3.2 2.6	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250	12.5 11.2 9.9 7.7 6.1 5.2	- - - - - - -	15.3 14.3 12.4 10.4 8.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Stom Date(s Stom Type Stom Locati Stom Center Precipitation	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Total & Duration	8.0 7.2 6.0 4.1 3.2 2.6	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-0 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in	12.5 11.2 9.9 7.7 6.1 5.2 Sladewater, TX	- - - - - - -	15.3 14.3 12.4 10.4 8.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Total & Duration Total & Duration	8.0 7.2 6.0 4.1 3.2 2.6	9.8 8.5 7.2 5.9 4.9	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in	12.5 11.2 9.9 7.7 6.1 5.2 Fladewater, TX	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Total & Duration Total & Duration Sentative SST Local	8.0 7.2 6.0 4.1 3.2 2.6	9.8 8.5 7.2 5.9 4.9	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N	12.5 11.2 9.9 7.7 6.1 5.2 Sladewater, TX	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres Storm Repres In-place Max	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Total & Duration Total & Duration Sentative SST Locimum SST	8.0 7.2 6.0 4.1 3.2 2.6	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 25.0 25.35 inches in 71.5 F 31.00 N 77.0 F	12.5 11.2 9.9 7.7 6.1 5.2 Fladewater, TX	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres Storm Repres In-place May Moisture Inf	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles sentative SST Lockimum SST Lockimum SST low Vector	8.0 7.2 6.0 4.1 3.2 2.6	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N	12.5 11.2 9.9 7.7 6.1 5.2 Fladewater, TX	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres Storm Repres In-place May Moisture Inf	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Total & Duration Total & Duration Sentative SST Locimum SST	8.0 7.2 6.0 4.1 3.2 2.6	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 25.0 25.35 inches in 71.5 F 31.00 N 77.0 F	12.5 11.2 9.9 7.7 6.1 5.2 Fladewater, TX	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres Storm Repres In-place Mas Moisture Inf In-place Mas	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.0 7.2 6.0 4.1 3.2 2.6 (10 sq mi)	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-0 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N 77.0 F SSE @ 130	12.5 11.2 9.9 7.7 6.1 5.2 Fladewater, TX	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres Storm Repres In-place May Moisture Inf In-place May Temporal Tra	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.0 7.2 6.0 4.1 3.2 2.6 (10 sq mi)	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N 77.0 F SSE @ 130	12.5 11.2 9.9 7.7 6.1 5.2 Sladewater, TX 94.71 W 1206 hours, 18.57	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres Storm Repres In-place Man Moisture Inf In-place Man Temporal Transpositio	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.0 7.2 6.0 4.1 3.2 2.6 (10 sq mi)	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N 77.0 F SSE @ 130	12.5 11.2 9.9 7.7 6.1 5.2 Fladewater, TX	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres Storm Repres In-place May Moisture Inf In-place May Temporal Transpositio Transpositio	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.0 7.2 6.0 4.1 3.2 2.6 (10 sq m)	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N 77.0 F SSE @ 130	12.5 11.2 9.9 7.7 6.1 5.2 Sladewater, TX 94.71 W 1206 hours, 18.57	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres Storm Repres In-place Max Moisture Inf In-place Max Temporal Transpositio Transpositio Transpositio	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mile	8.0 7.2 6.0 4.1 3.2 2.6 (10 sq m)	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-6 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N 77.0 F SSE @ 130	12.5 11.2 9.9 7.7 6.1 5.2 Sladewater, TX 94.71 W 1206 hours, 18.57	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres Storm Repres In-place Max Moisture Inf In-place Max Temporal Tr. Transpositio Transpositio Transpositio	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.0 7.2 6.0 4.1 3.2 2.6 (10 sq m)	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches ir 71.5 F 31.00 N 77.0 F SSE @ 130	12.5 11.2 9.9 7.7 6.1 5.2 Sladewater, TX 94.71 W 1206 hours, 18.57	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres Storm Repres In-place May Moisture Inf In-place May Temporal Transpositio Transpositio Transpositio Grid Point El Highest Elev	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.0 7.2 6.0 4.1 3.2 2.6 (10 sq m)	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-6 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N 77.0 F SSE @ 130	12.5 11.2 9.9 7.7 6.1 5.2 Sladewater, TX 94.71 W 1206 hours, 18.57	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	
Storm Date(s Storm Type Storm Locati Storm Center Precipitation Storm Repres Storm Repres In-place May Moisture Inf In-place May Temporal Transpositio Transpositio Transpositio Grid Point El Highest Elev Inflow Barrie	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.0 7.2 6.0 4.1 3.2 2.6 (10 sq m)	9.8 8.5 7.2 5.9 4.9 4.1	9,9 8.7 7.4 6.2 5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches ir 71.5 F 31.00 N 77.0 F SSE @ 130	12.5 11.2 9.9 7.7 6.1 5.2 Sladewater, TX 94.71 W 1206 hours, 18.57	- - - - - - -	15.3 14.3 12.4 10.4 8.8 6.8	15.8 14.7 13.3 10.4 9.0	- - -	20.2 19.2 17.7 14.0 12.9	

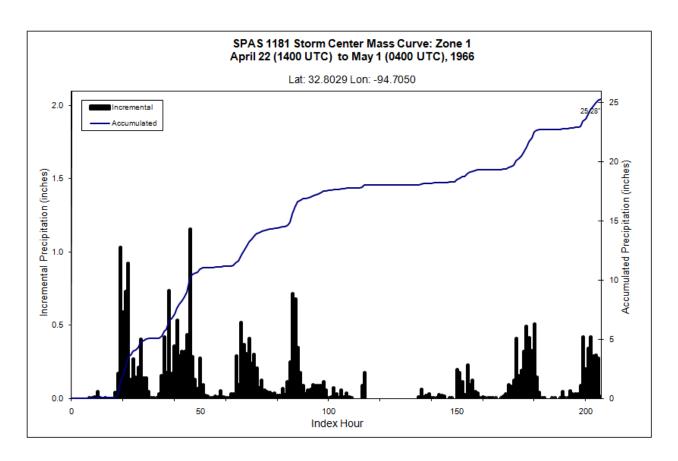
Appendix F: Table F.55: Storm spreadsheet for Gladewater, TX, April 27, 1966

			Sto	rm 118 MA						y 1, 196 TION (IN		0 UTC)				
								Duration	n (hours)							
Area (mi²)	1	3	6	12	18	24	36	48	72	96	120	144	168	192	206	Total
0.30	2.98	5.88	9.17	10.89	11.12	14.53	18.21	18.57	21.04	21.17	21.17	21.59	23.27	25.21	25.28	25.28
1	2.92	5.75	8.97	10.59	10.80	14.13	17.74	18.09	20.49	20.68	20.69	21.10	22.51	24.41	24.52	24.52
10	2.92	5.68	8.82	10.59	10.80	14.12	17.45	18.07	20.49	20.68	20.69	21.10	22.51	24.41	24.52	24.52
25	2.83	5.57	8.35	10.32	10.47	13.69	16.88	17.38	20.01	20.13	20.13	20.61	22.51	24.41	24.52	24.52
50	2.71	5.43	8.21	9.96	10.13	13.16	16.14	16.47	19.11	19.42	19.46	19.53	22.51	24.41	24.52	24.52
100	2.54	5.23	7.87	9.48	9.61	12.46	14.93	15.23	18.20	18.57	18.57	19.35	22.28	24.22	24.46	24.46
150	2.44	5.08	7.67	9.15	9.24	11.98	14.43	14.74	17.64	18.15	18.15	19.02	22.12	23.84	24.30	24.30
200	2.36	4.96	7.42	8.98	9.09	11.60	13.07	14.28	17.02	17.98	18.02	18.89	21.95	23.80	24.14	24.14
300	2.18	4.77	7.19	8.63	8.74	10.67	12.91	13.78	16.67	17.65	17.88	18.63	21.61	23.72	23.82	23.82
400	2.16	4.61	6.99	8.31	8.38	10.48	12.75	13.39	16.67	17.27	17.30	18.31	21.41	23.32	23.55	23.55
500	1.99	4.23	6.62	8.08	8.19	10.31	12.59	13.01	16.66	17.19	17.26	17.90	21.21	23.15	23.29	23.29
1,000	1.74	3.82	5.97	7.01	7.14	9.28	11.83	12.17	15.85	16.49	16.70	17.35	20.22	21.60	22.20	22.20
2,000	1.48	3.24	4.94	5.97	6.10	8.13	10.22	10.97	14.62	15.22	15.34	16.02	18.68	20.32	20.60	20.60
5,000	1.02	2.21	3.38	4.84	5.13	6.38	8.56	8.56	11.57	11.93	13.28	13.60	14.97	17.43	18.28	18.28
10,000	0.84	1.73	2.68	4.04	4.14	5.01	7.27	7.41	10.61	11.50	11.87	12.20	13.75	15.98	16.30	16.30
20,000	0.61	1.38	2.11	3.38	3.88	4.32	5.64	5.95	8.98	9.52	9.53	9.92	12.48	14.03	14.34	14.34
50,000	0.34	1.00	1.52	2.57	2.88	3.44	4.20	4.84	6.94	7.86	7.97	8.44	9.21	10.90	11.37	11.37
110,790	0.20	0.52	0.81	1.50	1.50	1.77	2.92	3.28	4.96	5.68	5.80	6.18	7.06	7.87	8.14	8.14

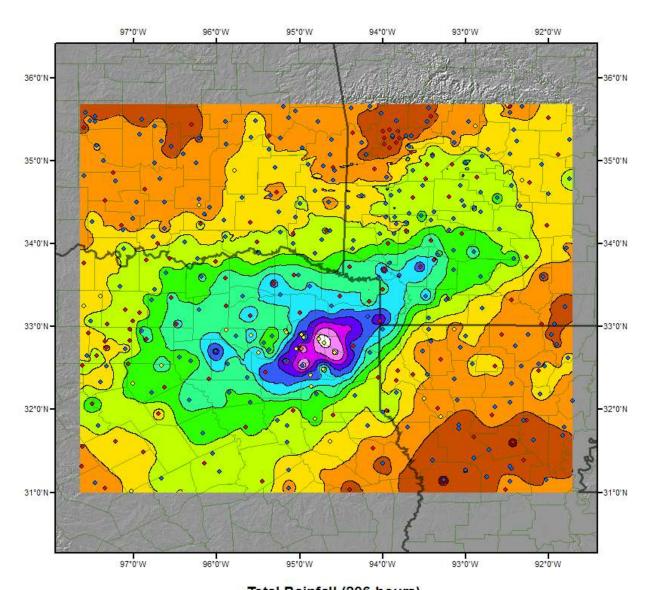
Appendix F: Table F.56: Depth-area-duration values for Gladewater, TX, April 27, 1966



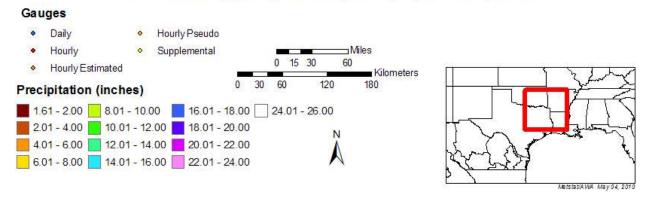
Appendix F: Figure F.77: Depth-area-duration chart for Gladewater, TX, April 27, 1966



Appendix F: Figure F.78: Mass curve chart for Gladewater, TX, April 27, 1966



Total Rainfall (206-hours)
Gladewater, TX 1966 Storm
SPAS #1181 April 22 (1400 UTC) to May 1 (0400 UTC), 1966



Appendix F: Figure F.79: Total storm isohyetal analysis for Gladewater, TX, April 27, 1966

Edgerton, MO, AWA 26

July 18, 1965

Storm Type: Frontal/MCC

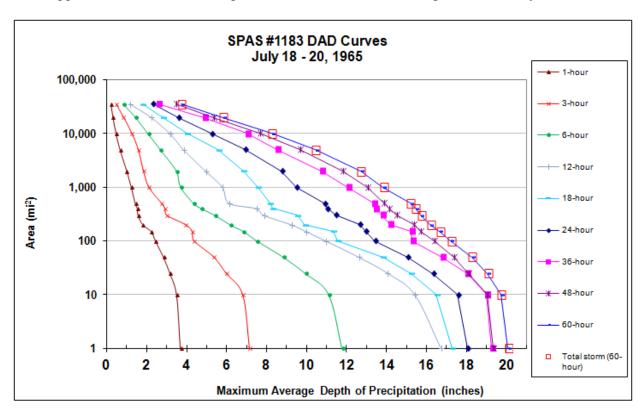
Grid Points Used: 1-4, 8-11, 16-18

Storm Nan Storm Date AWA Anal		65	MU		Storm A	Adjustn	nent fo	r ANO	Grid Po	oint 1	
	Transposition Date	15-Jul									
		Lat	Long			Moisture I	nflow Direc	tion	SW @ 100	miles	
torm Cer	nter Location	40.41 N	95.51 W			Grid Point			350	feet	
	Dew Point Location	39.22 N	96.58 W			Storm Cen	ter Elevatio	n	950	feet	
	tion Dew Point Location		93.69 W				Analysis D		24	hours	
•	t Location	35.31 N	93.23 W			•					
T1.			7605				11-6			2.00	i.e.t
	ie storm representative d The in-place maximum d	_	76.0 F 80.5 F		precipitable w precipitable w					2.99 3.68	inches.
	nspositioned maximum d	_	80.5 F		precipitable w precipitable w					3.68	inches.
	The in-place storm	_	950		ich subtracts	0.25		f precipitabl	e water at	76.0 F	michies.
	The in-place storm		950	whi	ich subtracts	0.29		f precipitabl		80.5 F	
	The transposition storm of		350	whi	ich subtracts	0.30		f precipitabl		80.5 F	
Th	ne Grid Point/inflow barri	er height is	1,000	whi	ich subtracts	0.30	inches o	f precipitabl	e water at	80.5 F	
	The in other		64	124	1	Notes:					1
	The in-place	e maximizati transpositi				Notes:					
	The elevation/barr	•									
	The cievador bar	ici adjasani	III IUCIOI IS	2100							
	The to	tal adjustme	nt factor is	1.23							
	0116:	A	41								
	Observed Storm Depth	-Area-Dura 1 Hours	tion 6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hou
	1 sq miles	3.7	11.8	12 Hours 16.7	18 Hours	18.0	30 Hours	19.3	48 Hours 19.4	20.1	/2 Hou
	10 sq miles	3.5	11.1	15.4	16.5	17.6	-	19.0	19.1	19.7	-
	100 sq miles	2.4	7.5	11.0	11.5	13.4	-	15.3	16.4	17.2	-
	200 sq miles	1.8	6.2	9.2	9.9	12.7	-	14.2	15.4	16.2	_
	500 sq miles	1.4	4.4	6.1	8.2	10.9	-	13.4	13.9	15.2	-
	1000 sq miles	1.2	3.7	5.8	7.6	9.5	-	12.1	13.0	13.8	-
	2000 sq miles	1.0	3.5	4.9	6.8	8.7	-	10.8	11.8	12.7	-
	5000 sq miles 10000 sq miles	0.6 0.4	2.7	3.8 3.2	5.6 4.0	6.9 5.2	-	8.5 7.0	9.7 7.7	10.4 8.2	-
	20000 sq miles	0.3	1.4	2.2	2.8	3.6	-	4.9	5.4	5.8	-
	Adjusted Storm Depth-				····		y	·	·	,	·
		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hou
	1 sq miles 10 sq miles	4.5 4.3	14.5 13.7	20.6 19.0	21.3 20.3	22.2 21.6	-	23.7 23.4	23.8 23.4	24.7 24.2	-
	100 sq miles	3.0	9.2	13.5	14.2	16.5	-	18.8	20.2	21.2	-
	200 sq miles	2.2	7.6	11.4	12.2	15.6	-	17.4	18.9	19.9	-
	500 sq miles	1.7	5.4	7.5	10.0	13.4	-	16.4	17.1	18.7	-
	1000 sq miles	1.5	4.6	7.1	9.3	11.7	-	14.9	16.0	17.0	-
	2000 sq miles	1.2	4.3	6.1	8.4	10.8	-	13.2	14.5	15.6	-
	5000 sq miles	0.8	3.3	4.7	6.9	8.5	-	10.5	11.9	12.8	-
	10000 sq miles 20000 sq miles	0.5 0.4	2.5 1.8	3.9 2.7	4.9 3.5	6.4 4.4	-	8.6 6.0	9.4 6.6	10.1 7.1	-
	20000 sq nmes	0.4	1.0	2.7	3.3	4.4	-	0.0	0.0	7.1	_
	Storm or Storm Center	Name		SPAS 1183-E	dgerton, MO						
	Storm Date(s)			7/18-20/1965	2.000						-
	Storm Type			General Storm/ 40.41 N	95.51 W						1
					93.31 W						
	Storm Location Storm Center Flevation			470							1
	Storm Location Storm Center Elevation Precipitation Total & D		sq mi)	950 20.76 inches in	60hrs, 18.59'	in 24hrs					
	Storm Center Elevation		sq mi)		60hrs, 18.59'	in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I	uration (10 Dew Point		20.76 inches in 76.0 F	24	in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I Stom Representative I	uration (10 Dew Point		20.76 inches in 76.0 F 39.22 N		in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I Stom Representative I Maximum Dew Point	Puration (10 Dew Point Dew Point L		20.76 inches in 76.0 F 39.22 N 80.5 F	24	in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I Stom Representative I Maximum Dew Point Moisture Inflow Vector	Puration (10 Dew Point Dew Point Lorent T		20.76 inches in 76.0 F 39.22 N 80.5 F SW @ 100	24	in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I Stom Representative I Maximum Dew Point	Puration (10 Dew Point Dew Point Lorent T		20.76 inches in 76.0 F 39.22 N 80.5 F	24	in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I Stom Representative I Maximum Dew Point Moisture Inflow Vector	Puration (10 Dew Point Dew Point L r Factor		20.76 inches in 76.0 F 39.22 N 80.5 F SW @ 100	24	in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I Stom Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I	Dew Point Dew Point L Factor (Date)	ocation	20.76 inches in 76.0 F 39.22 N 80.5 F SW @ 100 1.24	24	in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I Stom Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum	Puration (10 Dew Point L Dew Point L Factor In (Date) Int Location In Dew Point L Dew Poin	ocation	20.76 inches in 76.0 F 39.22 N 80.5 F SW @ 100 1.24 15-Jul 41.54 N 80.5 F	24 96.58 W	in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I Stom Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm	Puration (10 Dew Point L Dew Point L Factor In (Date) Int Location In Dew Point L Dew Poin	ocation	20.76 inches in 76.0 F 39.22 N 80.5 F SW @ 100 1.24 15-Jul 41.54 N 80.5 F 1.00	24 96.58 W	in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I Stom Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm Grid Point Elevation	Puration (10 Dew Point L Dew Point L Factor In (Date) Int Location In Dew Point Internation Internatio	ocation	20.76 inches in 76.0 F 39.22 N 80.5 F SW @ 100 1.24 15-Jul 41.54 N 80.5 F 1.00 350	24 96.58 W	in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Point Transposition Maximut Transposition Adjustm Grid Point Elevation In Highest Elevation in Ba	Puration (10 Dew Point L Dew Point L Factor In (Date) Int Location In Dew Point Internation Internatio	ocation	20.76 inches in 76.0 F 39.22 N 80.5 F SW @ 100 1.24 15-Jul 41.54 N 80.5 F 1.00 350 14,344	24 96.58 W	in 24hrs					
	Stom Center Elevation Precipitation Total & D Stom Representative I Stom Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm Grid Point Elevation	Puration (10 Dew Point Dew Point L Factor In (Date) Int Location In Dew Point Internation	ocation	20.76 inches in 76.0 F 39.22 N 80.5 F SW @ 100 1.24 15-Jul 41.54 N 80.5 F 1.00 350	24 96.58 W	in 24hrs					

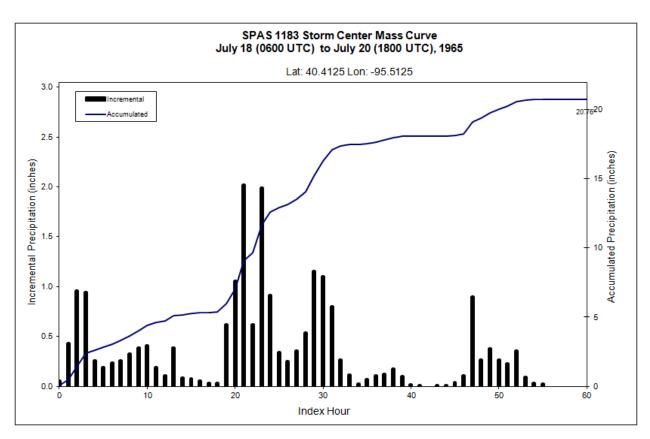
Appendix F: Table F.57: Storm spreadsheet for Edgerton, MO July 18, 1965

Stor	m 1183 MA	: - July XIMUM A	18, 196 VERAG	5 (060) E DEPT	UTC)	to July ECIPITA	/ 20 (18 TION (IN	OO UTO	C), 196	5
						n (hours)	(
Area (mi²)	1	3	6	12	18	24	36	48	60	Total
0.30	3.77	7.34	12.06	17.13	17.80	18.59	19.82	19.86	20.76	20.76
1	3.68	7.13	11.77	16.72	17.29	18.04	19.27	19.35	20.08	20.08
10	3.49	6.79	11.11	15.41	16.49	17.56	19.00	19.06	19.71	19.71
25	3.15	5.96	9.93	14.05	15.23	16.32	18.04	18.12	19.06	19.06
50	2.83	5.35	8.83	12.60	13.81	15.05	16.79	17.37	18.27	18.27
100	2.43	4.36	7.52	10.95	11.54	13.41	15.27	16.39	17.22	17.22
150	2.21	4.26	6.84	9.96	11.34	12.96	15.23	15.69	16.66	16.66
200	1.79	3.94	6.18	9.23	9.90	12.66	14.18	15.38	16.18	16.18
300	1.55	2.99	5.41	7.86	9.53	11.45	13.80	14.49	15.71	15.71
400	1.52	2.90	4.74	7.48	8.30	11.04	13.43	14.13	15.44	15.44
500	1.41	2.73	4.35	6.13	8.17	10.88	13.37	13.88	15.17	15.17
1,000	1.21	2.09	3.71	5.79	7.57	9.48	12.08	13.04	13.83	13.83
2,000	0.98	1.82	3.49	4.94	6.83	8.74	10.76	11.80	12.70	12.70
5,000	0.64	1.56	2.69	3.84	5.57	6.92	8.50	9.66	10.42	10.42
10,000	0.44	1.24	2.06	3.16	4.00	5.23	7.03	7.67	8.24	8.24
20,000	0.29	0.82	1.44	2.21	2.81	3.59	4.86	5.36	5.81	5.81
35,221	0.19	0.45	0.83	1.17	1.78	2.29	2.57	3.46	3.72	3.72

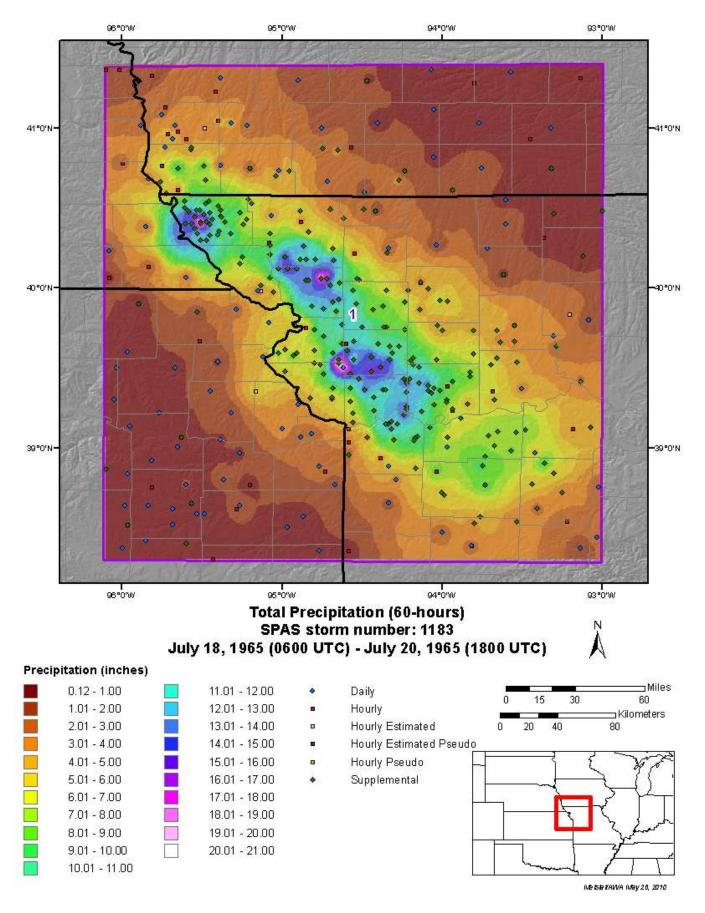
Appendix F: Table F.58: Depth-area-duration values for Edgerton, MO July 18, 1965



Appendix F: Figure F.80: Depth-area-duration chart for Edgerton, MO July 18, 1965



Appendix F: Figure F.81: Mass curve chart for Edgerton, MO July 18, 1965



Appendix F: Figure F.82: Total storm isohyetal analysis for Edgerton, MO July 18, 1965

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Holly, CO, AWA 27

June 16, 1965 Storm Type: MCC

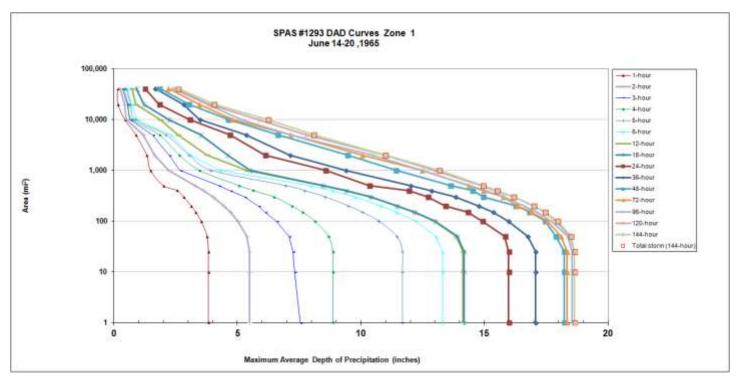
Grid Points Used: 5-6, 12, 15, 19-20

Storm Name: Storm Date:	6/14-18/19		one 1		Storm	Adjust	ment fo	or ANO	Grid Po	int 5	
WA Analysis I	•										
emporal Trans	position Date	1-Jul				Y	a n: /		CCT C 440	-	
		Lat	Long			Moisture In		ion:	SSE @ 320	miles	
torm center loc		37.71 N	102.40 W			Grid Point l			3,700	feet	
torm Rep dew p	oint location	33.50 N	100.00 W			Storm Cent			4,100	feet	
•	ewpoint location	30.80 N	99.67 W			Storm Rep	Analysis Du	ıration	24	hours	
asin location		35.00 N	102.00 W								
The	torm representative	dom point is	75.5 F	with tota	ıl precipitable	water above	con lovel of	:		2.92	inches.
	e in-place maximum	•	78.5 F		il precipitable il precipitable					3.37	inches.
	ositioned maximum	•	79.0 F		ıl precipitable					3.44	inches.
	The in-place stom	•	4,100		ich subtracts			f precipitabl	e water at	75.5 F	
	The in-place stom		4,100		ich subtracts			f precipitabl		78.5 F	
The	transposition basin		3,700	wh	ich subtracts	0.97		f precipitabl		79.0 F	
	barrier/basin elevat		3,700	wh	ich subtracts	0.97		f precipitabl		79.0 F	
					_						
	The in-place sto			1.17					293 Zone 1. S		
Т	The transposition/el	levation to ba	isin factor is	1.06					ed on maximur		
	The ba	arrier adjustm	ent factor is	1.00		values betwe	en June 14-1), 1965 at KL	BB, KABI, KI	FWH,	
	-					KIVIWL.					
	The	total adjustm	ent factor is	1.25							
Ob	awad Stown Donat	Area Drugg	on.								
Unse	erved Storm Depth-	Area-Durati 1 Hours	on 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hom
	1 sq miles	3.8	7.5	13.3	12 Hours	14.2	16.0	17.1	18.2	18.4	18.6
	10 sq miles	3.8	7.3	13.3	14.1	14.2	16.0	17.1	18.2	18.4	18.6
	100 sq miles	3.5	6.6	12.2	13.0	13.0	14.9	16.0	17.5	17.5	17.7
	200 sq miles	3.1	5.8	10.8	11.5	11.5	13.4	14.8	16.3	16.3	16.6
	500 sq miles	2.0	4.2	7.9	8.5	8.5	10.3	12.0	13.6	14.4	14.4
	1000 sq miles	1.5	2.7	4.3	5.4	5.5	8.6	9.4	11.4	12.5	12.5
	2000 sq miles	1.3	2.2	3.1	3.8	4.6	6.1	7.1	9.5	10.0	10.5
	5000 sq miles	0.9	1.6	2.3	2.6	3.5	4.7	5.3	6.6	7.1	7.1
	10000 sq miles	0.4	0.6	0.9	1.9	2.2	3.1	3.5	4.6	4.8	5.2
	20000 sq miles	0.2	0.6	0.7	0.9	1.2	1.8	2.8	3.0	3.4	3.8
Adju	sted Storm Depth-					Y		Y			
		1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	· · · · · · · · · · · · · · · · · · ·
	1 sq miles	4.8 4.8	9.4	16.6	17.6	17.7 17.7	19.9 19.9	21.3 21.3	22.8 22.8	22.9 22.9	23.1 23.1
	10 sq miles	4.4	9.1 8.2	16.6 15.2	17.6 16.2	16.2	18.6	19.9	21.8	21.9	22.1
	100 sq miles 200 sq miles	3.9	7.3	13.5	14.3	14.3	16.7	18.4	20.3	20.4	20.7
	500 sq miles	2.5	7.3 5.3	9.9	10.6	10.6	12.9	15.0	17.0	17.9	18.0
	1000 sq miles	1.8	3.3	5.3	6.7	6.9	10.7	11.7	14.3	15.5	15.5
	2000 sq miles	1.6	2.8	3.9	4.7	5.7	7.6	8.9	11.8	12.5	13.0
	5000 sq miles	1.1	1.9	2.9	3.2	4.4	5.9	6.6	8.3	8.9	8.9
	10000 sq miles	0.5	0.8	1.2	2.3	2.8	3.8	4.3	5.8	6.0	6.4
	20000 sq miles	0.2	0.7	0.9	1.1	1.5	2.3	3.5	3.8	4.3	4.7
	m or Storm Center N	ame			Holly, CO Z	one 1					
	m Date(s)			6/14-18/1965							-
	n Type			MCC	102 10 777						
	n Location n Center Elevation			37.71 N 4,100	102.40 W						
		wation		19.18 Inches	120 hours						
Deca		нации		19.10 HICHES	120-110018						1
Preci	ipitation Total & Du				24						1
	n Representative D	ewpoint		75.5 F	24			-	T1		1
Ston	•			75.5 F 33.50 N	100.00 W			Jun	Jul		
Ston Ston	n Representative D							78	79		
Ston Ston Maxi	m Representative D m Representative D	ewpoint Loca		33.50 N							
Storn Storn Maxi Mois	n Representative D n Representative D imum Dewpoint	ewpoint Loca		33.50 N 78.5 F	100.00 W						
Ston Ston Maxi Mois In-pl	m Representative D m Representative D imum Dewpoint sture Inflow Vector ace Maximization F	ewpoint Loca		33.50 N 78.5 F SSE @ 320 1.17	100.00 W						
Ston Ston Maxi Mois In-pl	m Representative D m Representative D imum Dewpoint sture Inflow Vector ace Maximization F poral Transposition	ewpoint Loca actor 1 (Date)		33.50 N 78.5 F SSE @ 320 1.17	100.00 W Miles			78	79		
Storn Storn Maxi Mois In-pl Tem Tran	m Representative D m Representative D imum Dewpoint sture Inflow Vector ace Maximization F poral Transposition sposition Dewpoin	ewpoint Loca actor I (Date) t Location		33.50 N 78.5 F SSE @ 320 1.17 1-Jul 30.80 N	100.00 W			78 Jun	79 Jul		
Storn Storn Maxi Mois In-pl Temp Tran Tran	m Representative D in Representative D imum Dewpoint sture Inflow Vector ace Maximization F poral Transposition sposition Dewpoin sposition Maximum	actor (Date) t Location Dewpoint		33.50 N 78.5 F SSE @ 320 1.17 1-Jul 30.80 N 79.0 F	100.00 W Miles			78	79		
Ston Ston Maxi Mois In-pl Tem Tran Tran	m Representative D n Representative D imum Dewpoint sture Inflow Vector ace Maximization F poral Transposition sposition Dewpoin sposition Maximum sposition Adjustme	actor (Date) t Location Dewpoint ent Factor		33.50 N 78.5 F SSE @ 320 1.17 1-Jul 30.80 N 79.0 F 1.06	100.00 W Miles			78 Jun	79 Jul		
Ston Ston Maxi Mois In-pl Tem Tran Tran Aver	m Representative D in Representative D imum Dewpoint sture Inflow Vector ace Maximization F poral Transposition isposition Dewpoin isposition Maximum isposition Adjustme irage Basin Elevation	actor (Date) t Location Dewpoint ent Factor		33.50 N 78.5 F SSE @ 320 1.17 1-Jul 30.80 N 79.0 F 1.06 3,700	100.00 W Miles			78 Jun	79 Jul		
Stom Stom Maxi Mois In-pl Temp Tran Tran Tran Aver	m Representative D in Representative D imum Dewpoint sture Inflow Vector ace Maximization F poral Transposition sposition Dewpoin sposition Maximum sposition Adjustme rage Basin Elevation lest Elevation in Ba	actor (Date) t Location Dewpoint ent Factor		33.50 N 78.5 F SSE @ 320 1.17 1-Jul 30.80 N 79.0 F 1.06 3,700 14,344	100.00 W Miles			78 Jun	79 Jul		
Ston Ston Maxi Moi: In-pl Tem Tran Tran Aver High	m Representative D in Representative D imum Dewpoint sture Inflow Vector ace Maximization F poral Transposition isposition Dewpoin isposition Maximum isposition Adjustme irage Basin Elevation	actor actor (Date) t Location n Dewpoint ent Factor n	ation	33.50 N 78.5 F SSE @ 320 1.17 1-Jul 30.80 N 79.0 F 1.06 3,700	100.00 W Miles			78 Jun	79 Jul		

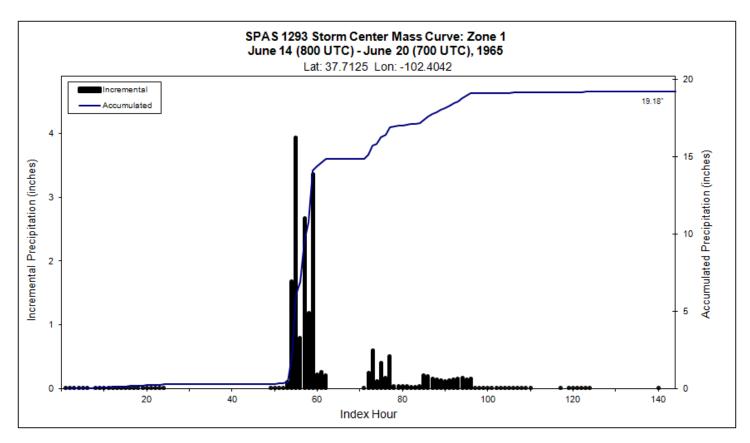
Appendix F: Table F.59: Storm spreadsheet for Holly, CO, June 16, 1965

										TION (INC		9				
								Duration	n (hours)	- 25	yr (8)	9 7		-,-		II.
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	72	96	120	144	Total
0.3	3.94	5.65	7.72	9.1	11.98	13.66	14.52	14.55	16.45	17.55	18.8	18.9	19.09	19.18	19.18	19.18
1	3.81	5.5	7.54	8.86	11.67	13.3	14.14	14.17	15.98	17.06	18.24	18.35	18.55	18.65	18.65	18.65
10	3.81	5.5	7.31	8.86	11.67	13.3	14.14	14.17	15.98	17.06	18.24	18.35	18.55	18.65	18.65	18:65
25	3.81	5.49	7.24	8.86	11.67	13.3	14.14	14.17	15.98	17.06	18.24	18.35	18.55	18.65	18.65	18.65
50	3.76	5.37	7.08	8.68	11.44	13.04	13.86	13.89	15.82	16:74	17.9	18.09	18.36	18.47	18.5	18.50
100	3.52	5.02	6.57	8.13	10.71	12.21	12.97	12.99	14.91	15.96	17.45	17.54	17.7	17.89	17.95	17.95
150	3.3	4.71	6.11	7.62	10.04	11.44	12.15	12:16	14.32	15.34	16.83	16.91	17.12	17.43	17.45	17.45
200	3.11	4.44	5.84	7.18	9.47	10.8	11.45	11.45	13.4	14.75	16.28	16.33	16.6	16.98	16.99	16.99
300	2.81	4.01	5.28	6.46	8.54	9.75	10.38	10.4	12.7	13.81	14.96	15.75	15.79	16.17	16.18	16.18
400	2.54	3.62	4.7	5.61	7.72	8.81	9.38	9.39	11.93	12.84	14.53	14.96	15.03	15.4	15.51	15.51
500	1.99	3.27	4.23	5.05	6.96	7.94	8.46	8:46	10.33	11.99	13.63	14.36	14.41	14.96	14.93	14.93
1,000	1.47	2.2	2.67	3.45	3.92	4.28	5.38	5.52	8.56	9.37	11.43	12.46	12.46	12.96	13.17	13.17
2,000	1.32	1.64	2.23	2.64	3.03	3.09	3.76	4.6	6.11	7.11	9.45	10.04	10.45	10.93	10.98	10.98
5,000	0.88	1.19	1.55	1.83	2.09	2.3	2.59	3.5	4.69	5.33	6.63	7.13	7.13	7.76	8.09	8.09
10,000	0.44	0.5	0.64	0.73	0.85	0.93	1.86	2.22	3.06	3.47	4.64	4.81	5.16	5.83	6.23	6.23
20,000	0.16	0.44	0.55	0.56	0.66	0.71	0.89	1.21	1.82	2.8	3.03	3.44	3.78	3.84	4.05	4.05
40,556	0.15	0.25	0.35	0.4	0.49	0.54	0.74	0.92	1.25	1.66	1.86	2.2	2.37	2.47	2.6	2.60

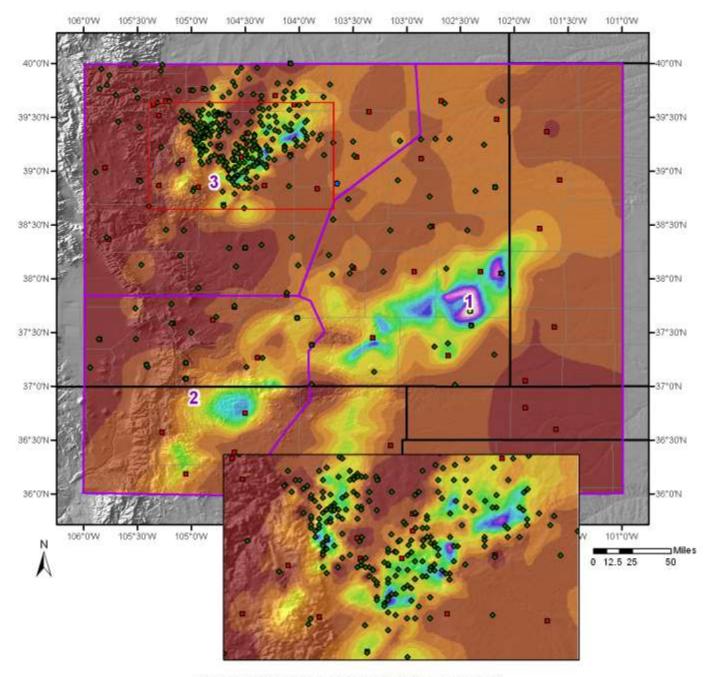
Appendix F: Table F.60: Depth-area-duration values for Holly, CO, June 16, 1965



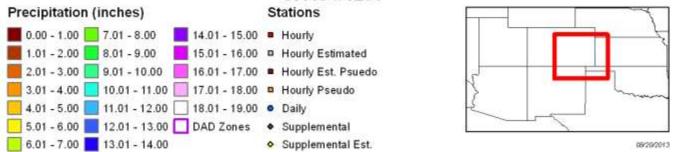
Appendix F: Figure F.83: Depth-area-duration chart for Holly, CO, June 16, 1965



Appendix F: Figure F.84: Mass curve chart for Holly, CO, June 16, 1965



Total 144-hour Precipitation (inches) 06/14/1965 08 UTC - 06/20/1965 07 UTC SPAS #1293



Appendix F: Figure F.85: Total storm isohyetal analysis for Holly, CO, June 16, 1965 Page **146** of **346**

Plum Creek, CO, AWA 28

June 15, 1965 Storm Type: MCC

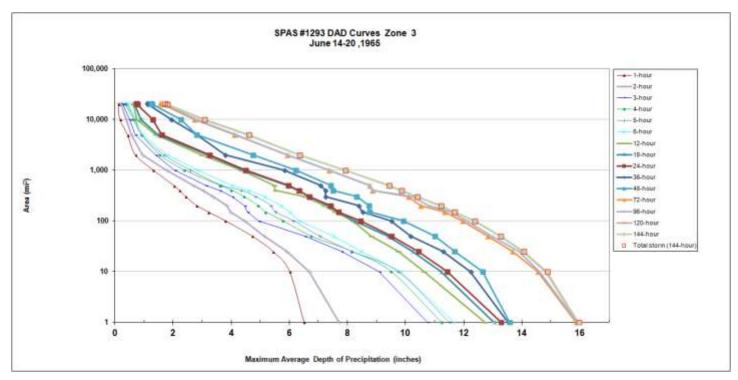
Grid Points Used: 6, 13, 15, 21

Storm Name: SPAS 129	3 Plum Creel	k, CO Zone 3								
Storm Date: 6/14-18/19 AWA Analysis Date: 12/14/201				Storm	Adjust	ment fo	r ANO	Grid Po	oint 5	
Temporal Transposition Date	1-Jul									
	Lat	Long			Moisture Ir	ıflow Direct	ion:	SE @ 460	miles	
Storm center location	39.19 N	104.30 W			Grid Point	Elevation		3,700	feet	
Storm Rep dew point location	33.50 N	100.00 W			Storm Cent	ter Elevation	ı	6,220	feet	
Transposition dewpoint location	29.30 N	97.88 W			Storm Rep	Analysis Du	ration	24	hours	
Basin location	35.00 N	102.00 W								
The storm representative	. dow point is	75.5 F	with tota	l precipitable	mater about	s con loved of			2.92	inches.
The in-place maximum	•			i precipitable I precipitable					3.37	inches.
The transpositioned maximum				l precipitable					3.52	inches.
The in-place stor	•			ich subtracts			f precipitabl	e water at	75.5 F	
The in-place stor	m elevation is	6,220	wh	ich subtracts	1.04	inches o	f precipitabl	e water at	78.5 F	
The transposition basi			wh	ich subtracts	0.99	inches o	f precipitabl	e water at	79.5 F	
The inflow barrier/basin eleva	tion height is	3,700	wh	ich subtracts	0.99	inches o	f precipitabl	e water at	79.5 F	
T1 : 1			117	1	Notes: DAD	reduce telese	from CDAC 1	293 Zone 1. S	Lorm	
The in-place st			1.17 1.09					293 Zone 1. 8 ed on maximur		
•	arrier adjustr		1.09					BB, KABI, K		
The	arrier adjusti	ient factor is	1.00		KMWL.				•	
The	e total adjustr	nent factor is	1.28							
Oleman I Company	Aug- D	_								
Observed Storm Depth	-Area-Durati 1 Hours	on 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours
1 sq miles	·	3 Hours 7.7	0 Hours 11.7	12 Hours	18 Hours	13.3	30 Hours 13.5	48 Hours 13.6	15.9	90 Hours 15.9
10 sq miles	•	6.7	9.8	10.6	11.2	11.4	12.2	12.7	14.5	14.6
100 sq miles	· •	4.5	6.3	8.2	8.2	8.4	9.5	9.9	12.0	12.1
200 sq miles	•	3.9	5.7	7.2	7.3	7.4	8.4	8.7	10.5	10.8
500 sq miles	· •	2.7	4.0	5.5	5.9	6.0	7.1	7.4	8.8	8.8
1000 sq miles	1.3	1.8	2.8	4.3	4.4	4.5	5.8	6.2	7.4	7.4
2000 sq miles	0.7	1.0	1.8	3.0	3.2	3.3	3.8	4.8	5.9	5.9
5000 sq miles	0.4	0.6	1.0	1.4	1.5	1.6	2.8	2.8	4.1	4.2
10000 sq miles	0.2	0.4	0.7	0.8	0.9	1.3	1.9	2.3	2.7	2.8
20000 sq miles	0.1	0.2	0.4	0.6	0.7	0.8	1.1	1.3	1.6	1.7
Adjusted Storm Depth-	Area-Duratio	nn .								
	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours
1 sq miles	8.3	9.9	14.9	16.3	16.7	17.0	17.3	17.4	20.3	20.3
	7.7	8.5	12.6	13.6		14.6	15.6	16.2	18.6	18.7
10 sq miles					14.3		10.1			
		5.7	8.1	10.4	14.3 10.5	10.8	12.1	12.7	15.3	15.5
10 sq miles 100 sq miles 200 sq miles	3.6	4.9	7.3	10.4 9.2	10.5 9.4	9.5	10.7	11.2	15.3 13.4	13.8
10 sq miles 100 sq miles 200 sq miles 500 sq miles	3.6 2.6	4.9 3.5	7.3 5.1	10.4 9.2 7.0	10.5 9.4 7.6	9.5 7.6	10.7 9.0	11.2 9.5	15.3 13.4 11.2	13.8 11.2
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles	3.6 2.6 1.7	4.9 3.5 2.3	7.3 5.1 3.6	10.4 9.2 7.0 5.5	10.5 9.4 7.6 5.6	9.5 7.6 5.7	10.7 9.0 7.4	11.2 9.5 7.9	15.3 13.4 11.2 9.4	13.8 11.2 9.4
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	3.6 2.6 1.7 0.9	4.9 3.5 2.3 1.2	7.3 5.1 3.6 2.3	10.4 9.2 7.0 5.5 3.8	10.5 9.4 7.6 5.6 4.1	9.5 7.6 5.7 4.2	10.7 9.0 7.4 4.9	11.2 9.5 7.9 6.1	15.3 13.4 11.2 9.4 7.6	13.8 11.2 9.4 7.6
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles	3.6 2.6 1.7 0.9 0.5	4.9 3.5 2.3 1.2 0.7	7.3 5.1 3.6 2.3 1.2	10.4 9.2 7.0 5.5 3.8 1.8	10.5 9.4 7.6 5.6 4.1 1.9	9.5 7.6 5.7 4.2 2.0	10.7 9.0 7.4 4.9 3.6	11.2 9.5 7.9 6.1 3.6	15.3 13.4 11.2 9.4 7.6 5.3	13.8 11.2 9.4 7.6 5.3
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles	3.6 2.6 1.7 0.9 0.5 0.2	4.9 3.5 2.3 1.2 0.7 0.5	7.3 5.1 3.6 2.3 1.2 0.9	10.4 9.2 7.0 5.5 3.8 1.8	10.5 9.4 7.6 5.6 4.1 1.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5	11.2 9.5 7.9 6.1 3.6 2.9	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles	3.6 2.6 1.7 0.9 0.5 0.2	4.9 3.5 2.3 1.2 0.7	7.3 5.1 3.6 2.3 1.2	10.4 9.2 7.0 5.5 3.8 1.8	10.5 9.4 7.6 5.6 4.1 1.9	9.5 7.6 5.7 4.2 2.0	10.7 9.0 7.4 4.9 3.6	11.2 9.5 7.9 6.1 3.6	15.3 13.4 11.2 9.4 7.6 5.3	13.8 11.2 9.4 7.6 5.3
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles	3.6 2.6 1.7 0.9 0.5 0.2	4.9 3.5 2.3 1.2 0.7 0.5	7.3 5.1 3.6 2.3 1.2 0.9 0.6	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5	11.2 9.5 7.9 6.1 3.6 2.9	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles	3.6 2.6 1.7 0.9 0.5 0.2	4.9 3.5 2.3 1.2 0.7 0.5	7.3 5.1 3.6 2.3 1.2 0.9 0.6	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5	11.2 9.5 7.9 6.1 3.6 2.9	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles	3.6 2.6 1.7 0.9 0.5 0.2	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5	11.2 9.5 7.9 6.1 3.6 2.9	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles	3.6 2.6 1.7 0.9 0.5 0.2	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5	11.2 9.5 7.9 6.1 3.6 2.9	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type Storm Location	3.6 2.6 1.7 0.9 0.5 0.2 0.2	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5	11.2 9.5 7.9 6.1 3.6 2.9	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles	3.6 2.6 1.7 0.9 0.5 0.2 0.2	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC	10.4 9.2 7.0 5.5 3.8 1.0 0.8 Plum Creek,	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5	11.2 9.5 7.9 6.1 3.6 2.9	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	3.6 2.6 1.7 0.9 0.5 0.2 0.2	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.919 N 6,220 16.29 Inches	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5	11.2 9.5 7.9 6.1 3.6 2.9	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles Storm O Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I	3.6 2.6 1.7 0.9 0.5 0.2 0.2	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 3000 sq miles 20000 sq miles 2000	3.6 2.6 1.7 0.9 0.5 0.2 0.2	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches 75.5 F 33.50 N	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles	3.6 2.6 1.7 0.9 0.5 0.2 0.2 Name Dewpoint Dewpoint Loc	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches 75.5 F 33.50 N 78.5 F	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W 120-hours 24 100.00 W	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 3000 sq miles 20000 sq miles 2000	3.6 2.6 1.7 0.9 0.5 0.2 0.2 0.2 Name Dewpoint Doewpoint Loc	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches 75.5 F 33.50 N	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 2000	3.6 2.6 1.7 0.9 0.5 0.2 0.2 0.2 Name Pewpoint Dewpoint Loc	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches 75.5 F 33.50 N 78.5 F SE @ 460 1.17	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W 120-hours 24 100.00 W	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 2000	3.6 2.6 1.7 0.9 0.5 0.2 0.2 0.2 Name Pewpoint Dewpoint Loc r Factor In (Date)	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches 75.5 F 33.50 N 78.5 F SE @ 460 1.17	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W 120-hours 24 100.00 W Miles	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 3000 sq miles 20000 sq miles 2000	3.6 2.6 1.7 0.9 0.5 0.2 0.2 0.2 Name Pewpoint Dewpoint Location in (Date) int Location	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches 75.5 F 33.50 N 78.5 F SE @ 460 1.17 1-Jul 29.30 N	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W 120-hours 24 100.00 W	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000	Name Name Dewpoint Doepoint Loc Factor In (Date) It Location Dewpoint	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches 75.5 F 33.50 N 78.5 F SE @ 460 1.17 1-Jul 29.30 N 79.5 F	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W 120-hours 24 100.00 W Miles	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000	3.6 2.6 1.7 0.9 0.5 0.2 0.2 0.2 Name Name Pewpoint Loc Factor In (Date) Int Location In Dewpoint In	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches 75.5 F 33.50 N 78.5 F SE @ 460 1.17 1-Jul 29.30 N 79.5 F 1.09	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W 120-hours 24 100.00 W Miles	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000	Name	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches 75.5 F 33.50 N 78.5 F SE @ 460 1.17 1-Jul 2-Jul 2-Jul 2-Jul 2-Jul 3,700	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W 120-hours 24 100.00 W Miles	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000	Name	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches 75.5 F 33.50 N 78.5 F SE @ 460 1.17 1-Jul 29.30 N 79.5 F 1.09 3,700 14,344	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W 120-hours 24 100.00 W Miles	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 20000 sq miles 200	3.6 2.6 1.7 0.9 0.5 0.2 0.2 0.2 Name Variation Dewpoint Loc Factor In (Date)	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.19 N 6,220 16.29 Inches 75.5 F 33.50 N 78.5 F SE @ 460 1.17 1-Jul 2-Jul 2-Jul 2-Jul 2-Jul 3,700	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W 120-hours 24 100.00 W Miles	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6
10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000	3.6 2.6 1.7 0.9 0.5 0.2 0.2 0.2 Name Pewpoint Dewpoint Location In (Date) Int Location In Dewpoint Interest Factor Interest F	4.9 3.5 2.3 1.2 0.7 0.5 0.3	7.3 5.1 3.6 2.3 1.2 0.9 0.6 SPAS 1293 6/14-18/1965 MCC 39.919 N 6,220 16.29 Inches 75.5 F 33.50 N 78.5 F 33.50 N 78.5 F 1.01 1-Jul 29.30 N 79.5 F 1.09 1.09 1.09 1.09 1.09 1.09 1.00 1.17	10.4 9.2 7.0 5.5 3.8 1.8 1.0 0.8 Plum Creek, 104.30 W 120-hours 24 100.00 W Miles	10.5 9.4 7.6 5.6 4.1 1.9 1.2 0.9	9.5 7.6 5.7 4.2 2.0 1.6	10.7 9.0 7.4 4.9 3.6 2.5 1.4	11.2 9.5 7.9 6.1 3.6 2.9 1.6	15.3 13.4 11.2 9.4 7.6 5.3 3.5	13.8 11.2 9.4 7.6 5.3 3.6

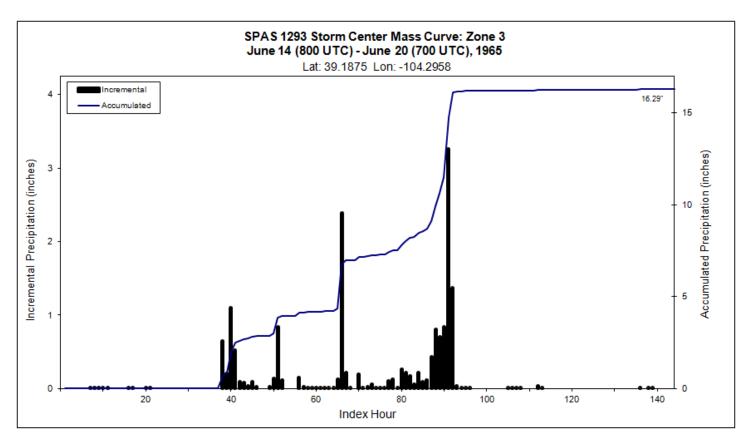
Appendix F: Table F.61: Storm spreadsheet for Plum Creek, CO, June 15, 1965

										(700 UT						
								Duration	n (hours)	- 23	(I)	3				100
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	72	96	120	144	Total
0.3	6.64	8.06	10.98	11.46	11.76	11.86	12.99	13.31	13.56	13.81	13.86	16.19	16.25	16.27	16.29	16.29
1	6.5	7.71	10.75	11.23	11.51	11.66	12.72	13.04	13.28	13.53	13.58	15.86	15.91	15.93	15.95	15.95
10	- 6	6.68	9.09	9.5	9.74	9.83	10.63	11.21	11.42	12.23	12.65	14.54	14.6	14.81	14.86	14.86
25	5.43	5.9	7.79	8.14	8.14	8.46	9.75	10.23	10.43	11:28	11.68	13.68	13.89	14.03	14.04	14.04
50	4.71	5.13	6.52	6.74	7.04	7.52	8.82	9.38	9.51	10.17	11.01	12.83	12.96	13.24	13.26	13.26
100	3.79	4.45	4.94	5.78	6.14	6.33	8.17	8.24	8.44	9.5	9.91	11.96	12.11	12.35	12.37	12.37
150	3.2	3.98	4.56	5.18	5.52	6	7.58	7.67	7.68	8.51	8.75	11:34	11.55	11.67	11.67	11.67
200	2.8	3.85	4.46	4.92	5.36	5.71	7.2	7.34	7.42	8.39	8.73	10.51	10.79	11.18	11.21	11.21
300	2.43	3.37	4.03	4.44	4.84	5.15	6.52	6.68	6.68	7.24	8.32	10.1	10.24	10.38	10.39	10.39
400	2.21	3.03	3.6	4	4.34	4.59	5.52	6.29	6.32	7.24	7.49	8.86	8.86	9.83	9.85	9.85
500	2.01	2.7	3.12	3.6	3.66	4.01	5.48	5.91	5.96	7.07	7,41	8.75	8.75	9.4	9.41	9.41
1,000	1.31	1.77	2.06	2.38	2.59	2.84	4.34	4.42	4.49	5.82	6.22	7.37	7.37	7.91	7.91	7.91
2,000	0.7	0.95	1.4	1.54	1.67	1.8	2.99	3.2	3.25	3.8	4.75	5.92	5.92	6.33	6.34	6.34
5,000	0.43	0.57	0.7	0.91	0.91	0.95	1.4	1.47	1.6	2.81	2.81	4.11	4.15	4.55	4.6	4.60
10,000	0.17	0.39	0.51	0.63	0.69	0.72	0.76	0.9	1.29	1.94	2.27	2.73	2.79	3.02	3.07	3.07
20,000	0.12	0.22	0.28	0.35	0.39	0.44	0.63	0.68	0.76	1.12	1.27	1.62	1.74	1.79	1.79	1.79
20,732	0.12	0.21	0.27	0.35	0.39	0.42	0.63	0.67	0.74	1.11	1.25	1.56	1.67	1.7	1.7	1.70

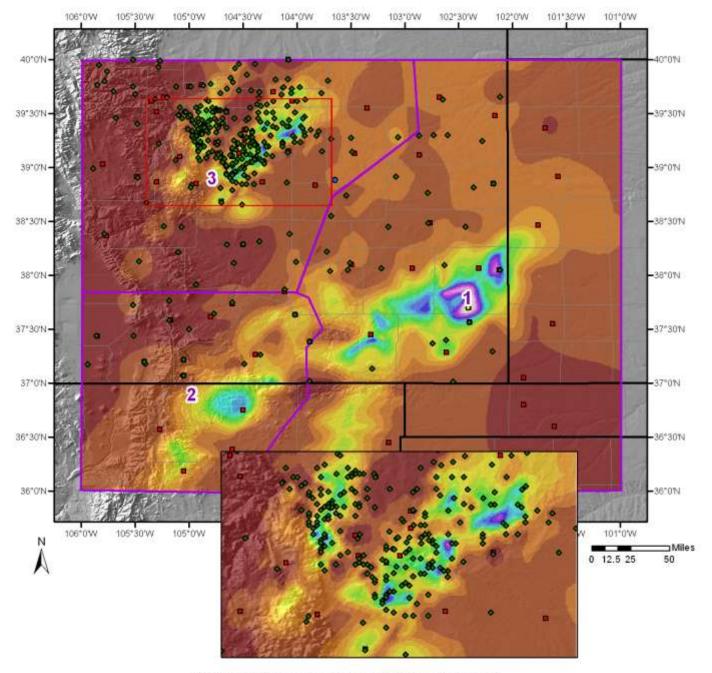
Appendix F: Table F.62: Depth-area-duration values for Plum Creek, CO, June 15, 1965



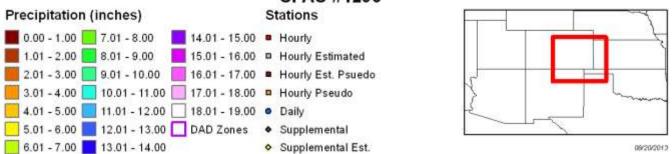
Appendix F: Figure F.86: Depth-area-duration chart for Plum Creek, CO, June 15, 1965



Appendix F: Figure F.87: Mass curve chart for Plum Creek, CO, June 15, 1965



Total 144-hour Precipitation (inches) 06/14/1965 08 UTC - 06/20/1965 07 UTC SPAS #1293



Appendix F: Figure F.88: Total storm isohyetal analysis for Plum Creek, CO, June 15, 1965
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College Hill, OH, AWA 30

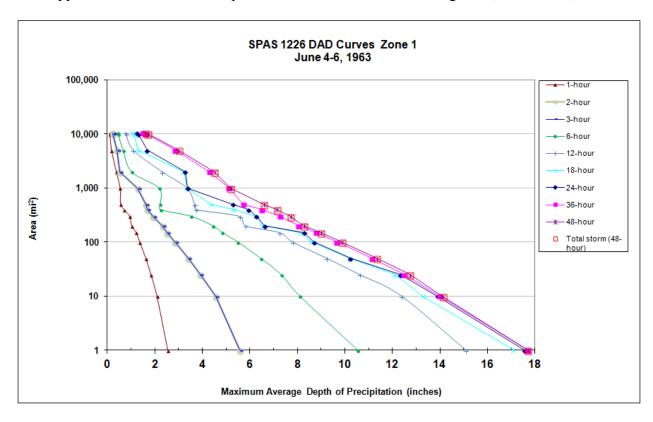
June 3, 1963 Storm Type: MCC Grid Points Used: 8

	II, OH SPAS	1226		Storm	n Adina	tmont f	or ANO	Crid Do	int Q	
orm Date: 6/3-5/1963 WA Analysis Date: 12/14/2013				Storn	n Aajus	ımenı 1	or ANU	Grid Po	int 8	
mporal Transposition Date	15-Jun									
	Lat	Long			Moisture In	flow Direct	on	SW @ 95	miles	
orm Center Location	40.09 N	81.65 W			Grid Point	Elevation		1,200	feet	
torm Rep Dew Point Location	39.20 N	83.00 W			Storm Cent	ter Elevation		1,000	feet	
ransposition Dew Point Location		93.99 W			Storm Rep	Analysis Du	ration	12	hours	
rid Point Location	37.50 N	93.00 W								
The storm representative	dew point is	68.5 F	with tota	al precipitable	water above	sea level of			2.10	inches.
The in-place maximum		76.5 F		al precipitable					3.07	inches.
The transpositioned maximum	_	78.0 F		al precipitable					3.29	inches
The in-place stom The in-place stom		1,000 1,000		iich subtracts iich subtracts			f precipitable f precipitable		68.5 F 76.5 F	
The transposition basin		1,200		ich subtracts			f precipitable		78.0 F	
The Grid point/inflow bar		1,000		ich subtracts	0.28		f precipitable		78.0 F	
				_						
The in-place st						-	_	nt value was b		
The transposition/e	levation to ba arrier adjustm				maximum 12 KILN, and I		s between Ju	me 4-5, 1963 at	KLCK,	
The b	arrer adjustin	cin ractor is	1.00		and I					
The	total adjustm	ent factor is	1.60							
O1 10 P 4	1 75 (1									
Observed Storm Depth	-Area-Durati 1 Hours	on 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles	2.5	5.6	10.5	15.1	17.1	17.6	17.7	17.7	- 12 Hours	1
10 sq miles	2.1	4.6	8.1	12.4	13.3	13.9	14.0	14.1	-	
100 sq miles	1.4	2.9	5.5	7.8	8.6	8.7	9.7	9.9	-	
200 sq miles	1.0	2.3	4.5	5.8	6.5	6.6	8.1	8.3	-	
500 sq miles 1000 sq miles	0.6 0.5	1.6 1.3	2.2	3.7	4.4 3.4	5.3 3.4	5.7 5.1	6.6 5.2	-	
2000 sq miles	0.4	0.5	1.0	2.3	3.2	3.3	4.3	4.5	-	
5000 sq miles	0.2	0.4	0.7	1.1	1.3	1.7	2.9	3.0	-	
10000 sq miles	0.1	0.2	0.5	0.8	1.1	1.3	1.6	1.7	-	
20000 sq miles	-	-	-	-	-	-	-	-	-	_
Adjusted Storm Depth-	-Area-Duratio	on								
	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles	4.1	8.9	16.8	24.1	27.3	28.0	28.3	28.3	-	
10 sq miles 100 sq miles	3.3 2.2	7.3 4.6	12.9 8.8	19.8 12.4	21.2 13.7	22.2 13.9	22.4 15.4	22.5 15.7	-	
200 sq miles	1.6	3.7	7.1	9.3	10.4	10.6	12.9	13.7	-	
500 sq miles	0.9	2.6	3.6	5.8	7.0	8.4	9.1	10.5	-	
1000 sq miles	0.8	2.0	3.5	5.3	5.4	5.4	8.2	8.3	-	
2000 sq miles	0.6	0.8	1.6	3.7	5.1	5.2	6.9	7.2	-	
5000 sq miles 10000 sq miles	0.3 0.2	0.7 0.4	1.1 0.7	1.7	2.1 1.8	2.7 2.1	4.6 2.6	4.8 2.7	-	
20000 sq miles		-	-	-	-	-	-	-	-	
			~ " ****							•
Storm or Storm Center I Storm Date(s)	Name		6/3-5/1963	I, OH SPAS 1	226					
Storm Type			MCC							1
Storm Location			40.09 N	81.65 W						
Storm Center Elevation			1,000	10.1						1
Precipitation Total & D	uration		19.39 Inches	48-hours						-
Storm Representative I	Dew Point		68.5 F	12						1
Storm Representative I		ation	39.20 N	83.00 W						
Maximum Dew Point			76.5 F							
Moisture Inflow Vector			SW @ 95 1.48							1
In-place Maximization I	actor		1.40							1
Temporal Transposition	n (Date)		15-Jun							
Transposition Dew Poi			42.84 N	93.99 W						
Transposition Maximus			78.0 F							1
Transposition Adjustm Grid Point Elevation	ient ractor		1.08 1,200							1
Highest Elevation in Ba	asin		14,344							1
Inflow Barrier Height			1,000							
			1,000 1.00 1.60							

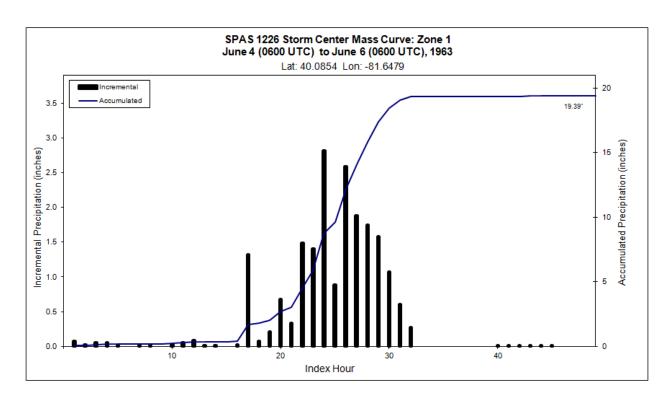
Appendix F: Table F.63: Storm spreadsheet for College Hill, OH, June 3, 1963

Storm 1226 - June 4 (0600 UTC) - June 6 (0600 UTC), 1963												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
	Duration (hours)											
Area (mi²)	1	3	6	12	18 24		36	48	Total			
0.1	2.81	6.28	11.5	17.08	18.99	19.16	19.37	19.39	19.39			
1	2.54	5.56	10.53	15.07	17.09	17.56	17.7	17.7	17.70			
10	2.08	4.56	8.1	12.37	13.28	13.9	14	14.11	14.11			
25	1.83	3.9	7.32	10.61	12.1	12.33	12.49	12.72	12.72			
50	1.61	3.4	6.46	9.23	10.18	10.23	11.13	11.34	11.34			
100	1.36	2.85	5.5	7.79	8.59	8.69	9.66	9.86	9.86			
150	1.2	2.5	4.85	7.23	8.14	8.28	8.79	8.98	8.98			
200	1.02	2.32	4.45	5.8	6.54	6.62	8.06	8.26	8.26			
300	0.93	1.93	3.54	5.55	6.26	6.28	7.28	7.7	7.70			
400	0.7	1.67	2.24	3.73	5.31	5.93	6.5	7.13	7.13			
500	0.55	1.61	2.23	3.66	4.37	5.28	5.73	6.57	6.57			
1,000	0.53	1.28	2.18	3.34	3.37	3.39	5.12	5.19	5.19			
2,000	0.37	0.52	1.03	2.3	3.22	3.28	4.3	4.5	4.50			
5,000	0.17	0.41	0.67	1.09	1.31	1.67	2.86	3	3.00			
10,000	0.1	0.24	0.46	0.78	1.12	1.3	1.61	1.7	1.70			
10,512	0.1	0.24	0.44	0.75	1.08	1.26	1.5	1.6	1.60			

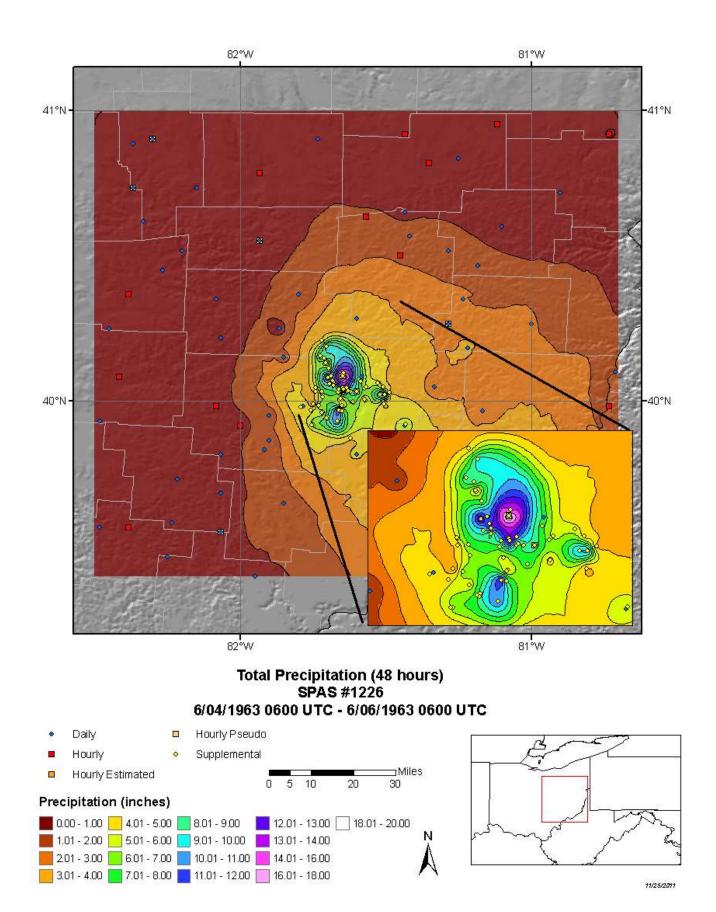
Appendix F: Table F.64: Depth-area-duration values for College Hill, OH June 3, 1963



Appendix F: Figure F.89: Depth-area-duration chart for College Hill, OH, June 3, 1963



Appendix F: Figure F.90: Mass curve chart for College Hill, OH, June 3, 1963



Appendix F: Figure F.91: Total storm isohyetal analysis for College Hill, OH June 1963

David City, NE, AWA 31

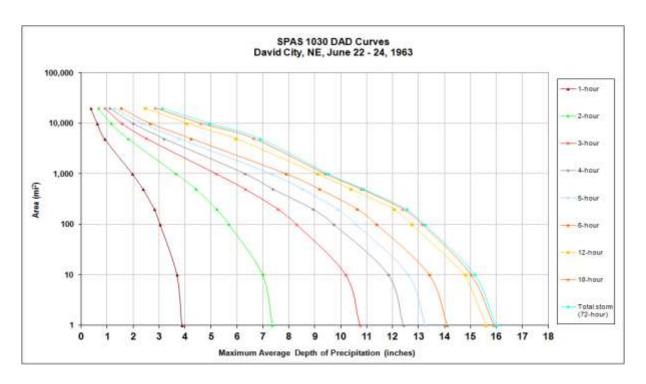
June 24, 1963 Storm Type: MCC Grid Points Used:

	Storm Name: SPAS 1030-David City, NE Storm Date: 24-Jun-1963 AWA Analysis Date: 12/14/2013					Storm Adjustment for ANO Grid Point 2								
emporal Transposition Date						Storm Adjustment for ANO Grid Fount 2								
	9-Jul													
	Lat	Long			Moisture Ir	ıflow Directi	on	SE @ 175	miles					
torm Center Location	97.11 W			Grid Point	Elevation		550	feet						
torm Rep Dew Point Location	94.83 W			Storm Cent	ter Elevation		1,650	feet						
ransposition Dew Point Location	90.24 W				Analysis Du		6	hours						
rid Point Location	95.50 W				,			nouis						
The storm representative	73.5 F		l precipitable					2.67	inches.					
The in-place maximum	81.0 F		l precipitable					3.76	inches.					
The transpositioned maximum	80.5 F		l precipitable					3.68	inches.					
The in-place storm	1,650 1,650	which subtracts				f precipitable water at		73.5 F 81.0 F						
The in-place storm		550	which subtracts which subtracts											
The transposition basin The Grid point/inflow ban	1,000		ch subtracts	0.30		f precipitable f precipitable		80.5 F 80.5 F						
The one point antow our	ner neight is	1,000	WIL	cii subtracts	0.50	micries o.	precipitable	water at	00.51					
The in-place sto	orm maximizat	ion factor is	1.43		Notes: In p	place of 1.56	adjusted to	1.50 based o	n HMR 51					
The transposition/el	sin factor is	1.04		and 55A gu	idance. DAI	D values tak	en from SPA							
The ba	arrier adjustm	ent factor is	1.00											
The	tatal adimetus	ant factoria	1.49											
THE	total adjustm	ent factor is	1.47											
Observed Storm Depth-				·		·		·		· · · · · · · · · · · · · · · · · · ·				
	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hou				
1 sq miles	3.9	14.1	15.6	15.9	16.0	-	16.0	16.0	-	16.0				
10 sq miles	3.7	13.3	14.6	15.0	15.2	-	15.2	15.2	-	15.2				
100 sq miles	3.0	11.2	12.7	13.1	13.2	-	13.2	13.2	-	13.2				
200 sq miles	2.8	10.5	12.0	12.4	12.5	-	12.5	12.5	-	12.5				
500 sq miles	2.4	9.0	10.4	10.8	10.8	-	10.8	10.9	-	10.9				
1000 sq miles	2.0	7.8	9.0	9.4	9.5	-	9.5	9.5	-	9.5				
5000 sq miles	0.9	4.2	5.9	6.6	6.8	-	6.9	6.9	-	6.9				
10000 sq miles 20000 sq miles	0.6 0.4	2.6 1.5	4.1 2.4	4.6 2.9	4.9 3.1	-	4.9 3.1	5.0 3.1	-	5.0 3.1				
20000 sq nmes	0.4	1.0	2.7	2.7	3.1		5.1	3.1	-	3.1				
Adjusted Storm Depth	Area-Duratio	n												
	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hou				
1 sq miles	5.7	20.9	23.2	23.6	23.7	-	23.7	23.7	-	23.7				
10 sq miles	5.5	19.8	21.8	22.3	22.5	-	22.6	22.6	-	22.5				
100 sq miles	4.5	16.7	18.9	19.5	19.7	-	19.7	19.7	-	19.7				
200 sq miles	4.2	15.5	17.8	18.4	18.6	-	18.6	18.6	-	18.6				
500 sq miles	3.5	13.4	15.5	16.0	16.1	-	16.1	16.1	-	16.1				
1000 sq miles	2.9	11.5	13.3	14.0	14.0	-	14.1	14.1	-	14.1				
5000 sq miles	1.3	6.2	8.8	9.8	10.1	-	10.2	10.2	-	10.2				
10000 sq miles 20000 sq miles	0.9 0.5	3.9 2.2	6.1 3.6	6.8 4.2	7.3 4.6	-	7.3 4.6	7.4 4.7	-	7.4 4.7				
20000 sq miles	0.5	2.2	3.0	4.2	4.0	-	4.0	4.7	-	4.7				
Storm or Storm Center N	Name		SPAS 1030-	David City, N	Œ									
			24-Jun-1963											
Storm Date(s)			MCC	97.11 W										
Storm Type			41.23 N	97.11 W						-				
Storm Type Storm Location			1.650											
Storm Type Storm Location Storm Center Elevation			1,650 16.50 Inches	24-hours US	ACE Bucket	Survey Data	1							
Storm Type Storm Location Storm Center Elevation Precipitation Total & D	uration		16.50 Inches		ACE Bucket	Survey Data	ı							
Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr	uration Dew Point		16.50 Inches 73.5 F	6	ACE Bucket	Survey Data	1							
Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D	uration Dew Point	ation	73.5 F 39.41 N		ACE Bucket	Survey Data	L							
Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point	uration Dew Point Dew Point Loc	ation	73.5 F 39.41 N 81.0 F	6	ACE Bucket	Survey Data	i							
Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector	uration Dew Point Dew Point Loc	ation	73.5 F 39.41 N 81.0 F SE @ 175	6	ACE Bucket	Survey Data								
Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point	uration Dew Point Dew Point Loc	ation	73.5 F 39.41 N 81.0 F	6	ACE Bucket	Survey Data								
Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F	uration Dew Point Dew Point Loc Factor (Date)	ation	73.5 F 39.41 N 81.0 F SE @ 175 1.43	6	ACE Bucket	Survey Data								
Storm Type Storm Location Storm Center Elevation Precipitation Total & Drecipitation Total & Drecipitation Total & Drecipitation Elevation Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Point	Dew Point Dew Point Loc Factor In (Date) Int Location	ation	73.5 F 39.41 N 81.0 F SE @ 175 1.43 9-Jul 40.91 N	6	ACE Bucket	June	July							
Storm Type Storm Location Storm Center Elevation Precipitation Total & Drecipitation Total & Drecipitation Total & Drecipitation Total & Drecipitation Elevation Description of the Communication of t	Dew Point Dew Point Loc Factor In (Date) Int Location In Dew Point	ation	73.5 F 39.41 N 81.0 F SE @ 175 1.43 9-Jul 40.91 N 80.5 F	6 94.83 W	ACE Bucket		July							
Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Point Transposition Maximum Transposition Adjustm	Dew Point Dew Point Loc Factor In (Date) Int Location In Dew Point	ation	16.50 Inches 73.5 F 39.41 N 81.0 F SE @ 175 1.43 9-Jul 40.91 N 80.5 F 1.04	6 94.83 W	ACE Bucket	June	July							
Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum Transposition Adjustm Grid Point Elevation	Dew Point Dew Point Loc Factor In (Date) Int Location In Dew Point Int Location In Dew Point Int Factor	ation	16.50 Inches 73.5 F 39.41 N 81.0 F SE @ 175 1.43 9-Jul 40.91 N 80.5 F 1.04	6 94.83 W	ACE Bucket	June	July							
Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	Dew Point Dew Point Loc Factor In (Date) Int Location In Dew Point Int Location In Dew Point Int Factor	ation	16.50 Inches 73.5 F 39.41 N 81.0 F SE @ 175 1.43 9-Jul 40.91 N 80.5 F 1.04 550 14,344	6 94.83 W	ACE Bucket	June	July							
Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum Transposition Adjustm Grid Point Elevation	Dew Point Dew Point Loc Tractor In (Date) In Dew Point Location In Dew Point Lent Factor	ration	16.50 Inches 73.5 F 39.41 N 81.0 F SE @ 175 1.43 9-Jul 40.91 N 80.5 F 1.04	6 94.83 W	ACE Bucket	June	July							

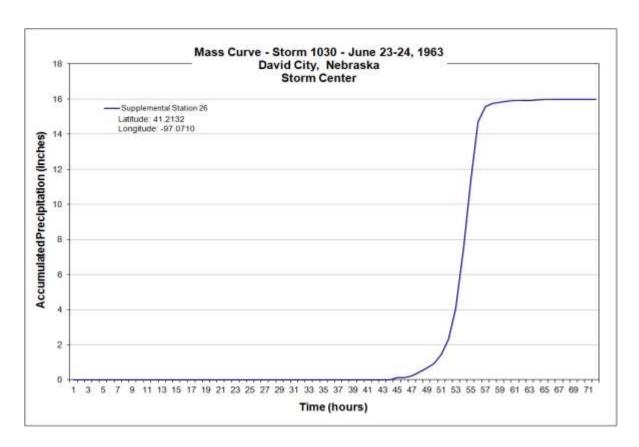
Appendix F: Table F.65: Storm spreadsheet for David City, NE June 24, 1963

SPAS Storm 1030 - David City, NE, June 22 - 24, 1963 MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
	Duration (hours)												
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	72	total
1	3.87	7.36	10.73	12.40	13.26	14.10	15.61	15.90	15.98	15.98	15.98	15.98	15.98
10	3.68	6.98	10.18	11.82	12.60	13.40	14.80	15.02	15.15	15.13	15.13	15.16	15.16
100	3.03	5.68	8.28	9.72	10.59	11.37	12.75	13.14	13.23	13.23	13.23	13.23	13.23
200	2.81	5.21	7.57	8.91	9.87	10.63	12.07	12.39	12.49	12.49	12.50	12.52	12.52
500	2.37	4.41	6.30	7.38	8.52	9.17	10.39	10.79	10.82	10.84	10.86	10.87	10.87
1,000	1.96	3.65	5.19	6.31	7.32	7.89	9.10	9.39	9.45	9.47	9.48	9.51	9.51
5,000	0.89	1.80	2.50	3.18	3.77	4.22	5.96	6.64	6.80	6.83	6.87	6.87	6.87
10,000	0.61	1.15	1.56	1.99	2.35	2.65	4.07	4.60	4.84	4.91	4.92	4.93	4.93
20,000	0.36	0.66	0.89	1.09	1.27	1.53	2.46	2.85	3.04	3.09	3.10	3.10	3.10

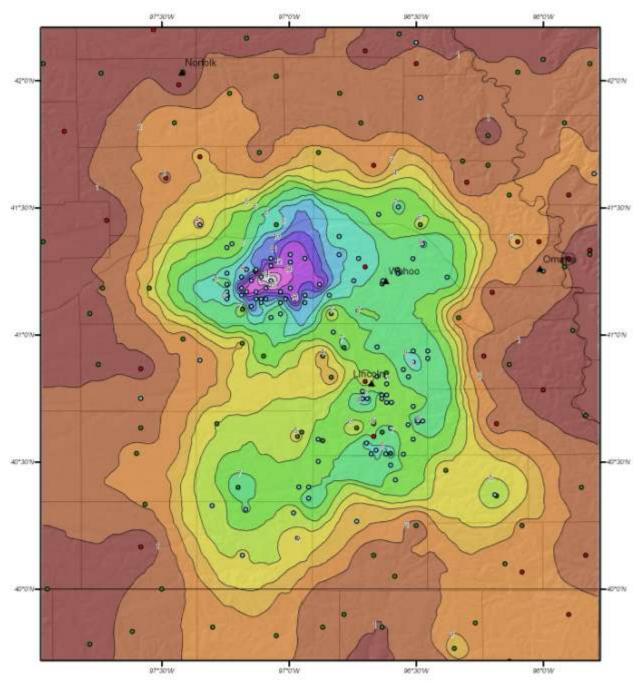
Appendix F: Table F.66: Depth-area-duration values David City, NE June 24, 1963



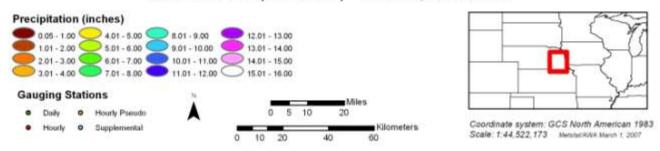
Appendix F: Figure C.92: Depth-area-duration chart for David City, NE June 24, 1963



Appendix F: Figure F.93: Mass curve chart for David City, NE June 24, 1963



SPAS Storm #1030 - June 22 to 24, 1963 Total Rainfall (72-hours) - Wahoo, Nebraska



Appendix F: Figure F.94: Total storm isohyetal analysis for David City, NE June 24, 1963

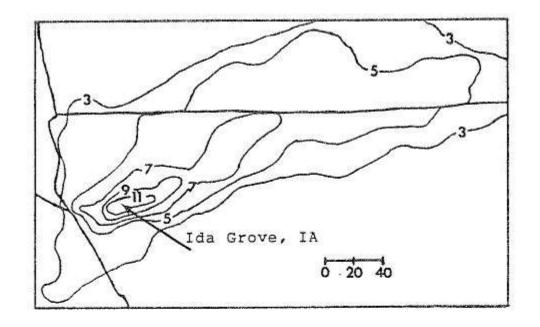
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Ida Grove, IA, AWA 32

August 30, 1962 Storm Type: Frontal/MCC

torm Name: EPRI Storm torm Date: 30-Aug-190 WA Analysis Date: 12/14/2013		e, IA		Storm	Adjust	ment fo	r ANO	Grid Po	oint 1	
emporal Transposition Date	15-Aug									
emporar Transposition Date	Lat	Long			Moisture In	flow Directi	on	S @ 225	miles	
torm Center Location	42.32 N	95.47 W			Grid Point			350	feet	
	39.10 N	95.47 W				ter Elevation		1,200	feet	
torm Rep Dew Point Location		95.47 W 92.58 W						24	hours	
ransposition Dew Point Location rid Point Location	35.31 N	93.23 W			Storm Kep	Analysis Du	ганоп	24	nours	
The storm representative	dew point is	71.0 F	with total	l precipitable	water above	sea level of			2.36	inches
The in-place maximum	•	80.0 F		l precipitable					3.60	inches
The transpositioned maximum	•	80.5 F		l precipitable					3.68	inches
The in-place stom				ch subtracts			f precipitable		71.0 F	
The in-place stom				ch subtracts			f precipitable		80.0 F	
The transposition basin The Grid point/inflow bar				ch subtracts ch subtracts			f precipitable f precipitable		80.5 F 80.5 F	
The in-place sto	orm maximizat	ion factor is	1.50		Notes: DAD	values taken	from EPRI St	orm Number	19. Storm	1
The transposition/el			1.04		representativ	e dew point v	alue was base	ed on average	24-hr Td	
	arrier adjustm		1.00					CGVW, KIXI		
					KFOE. In page calculated at		r held to 1.50	based on HIV	IR guidance,	
The	total adjustm	ent factor is	1.56		calculated at	1.30.				
Observed Storm Depth	-Area-Durati 6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	-	-	-	-	-	-	-	-	72 Hours	
100 sq miles	5.7	8.0	-	12.2	-	12.9	-	-	-	1
200 sq miles	5.4	7.6	-	11.7	-	12.3	-	-	-	
500 sq miles	4.8	7.0	-	10.8	-	11.3	-	-	-	
1000 sq miles	4.2	6.3	-	9.8	-	10.3	-	-	-	
5000 sq miles	2.6	4.3	-	7.0	-	7.6	-	-	-	
10000 sq miles	2.1	3.5	-	5.8	-	6.6	-	-	-	
20000 sq miles	-	-	-	-	-	-	-	-	-	
Adjusted Storm Depth-	Area-Durati 6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	-	-	-	-	-	-	-	-	-	
100 sq miles	8.9	12.5	-	19.0	-	20.1	-	-	-	
200 sq miles	8.4	11.9	-	18.3	-	19.2	-	-	-	
500 sq miles	7.5	10.9	-	16.8	-	17.6	-	-	-	
1000 sq miles	6.6	9.8	-	15.3	-	16.1	-	-	-	
5000 sq miles	4.1	6.7	-	10.9	-	11.9	-	-	-	
10000 sq miles 20000 sq miles	3.3 -	5.5 -	-	9.0	<u>-</u> -	10.3	<u>-</u> -	-	-	
20000 sq nines	-	-	-	-	-	-	-	-	-	
										1
Storm or Storm Center 1	Name		EPRI Storm	19 Ida Grove	, IA					1
Storm or Storm Center 1 Storm Date(s)	Name		EPRI Storm 30-Aug-1962		, IA					
Storm Date(s) Storm Type	Name		30-Aug-1962 Synoptic		, IA					
Storm Date(s) Storm Type Storm Location			30-Aug-1962 Synoptic 42.32 N		, IA					
Storm Date(s) Storm Type Storm Location Storm Center Elevation			30-Aug-1962 Synoptic 42.32 N 1,200	95.47 W						
Storm Date(s) Storm Type Storm Location			30-Aug-1962 Synoptic 42.32 N	95.47 W		nber 19				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative L	uration Dewpoint		30-Aug-1962 Synoptic 42.32 N 1,200 12.85 Inches	95.47 W 48-hours EPF 24		nber 19				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Storm Representative E	uration Dewpoint	ation	30-Aug-1962 Synoptic 42.32 N 1,200 12.85 Inches 71.0 F 39.10 N	95.47 W 48-hours EPF		mber 19				
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Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Storm Representative E Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoir Transposition Maximum Transposition Adjustm	Dewpoint Dewpoint Loc Factor In (Date) Int Location In Dewpoint	ation	30-Aug-1962 Synoptic 42.32 N 1,200 12.85 Inches 71.0 F 39.10 N 80.0 F 8 @ 225 1.50 15-Aug 39.51 N 80.5 F 1.04	95.47 W 48-hours EPF 24 95.47 W		nber 19				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Storm Representative E Maximum Dewpoint Moisture Inflow Vector In-place Maximization E Temporal Transposition Transposition Dewpoir Transposition Maximum Transposition Adjustm Grid Point Elevation	Dewpoint Loc Factor In (Date) In Location In Dewpoint Location In Dewpoint Location In Dewpoint Location	ation	30-Aug-1962 Synoptic 42.32 N 1,200 12.85 Inches 71.0 F 39.10 N 80.0 F 8 @ 225 1.50 15-Aug 39.51 N 80.5 F 1.04	95.47 W 48-hours EPF 24 95.47 W		nber 19				
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Appendix F: Table F.67: Storm spreadsheet for Ida Grove, IA August 30, 1962



ISOHYETAL ANALYSIS

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area in	Duration	n of Rainfall	in Hours	
Sq. Miles	6	12	24	48
100	5.73	7.97	12.2	12.85
200	5.42	7.62	11.65	12.34
500	4.82	6.98	10.82	11.3
1000	4.18	6.25	9.78	10.32
5000	2.59	4.31	7.01	7.6
10000	2.1	3.51	5.82	6.58

Appendix F: Figure F.95 and Table F.68: Total storm isohyetal analysis and Depth-area-duration values for Ida Grove, IA August 30, 1962

Prague, NE, AWA 33

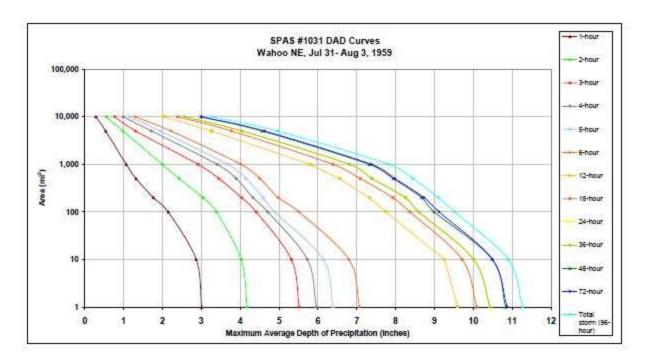
August 1, 1959

Storm Type: Frontal/MCC

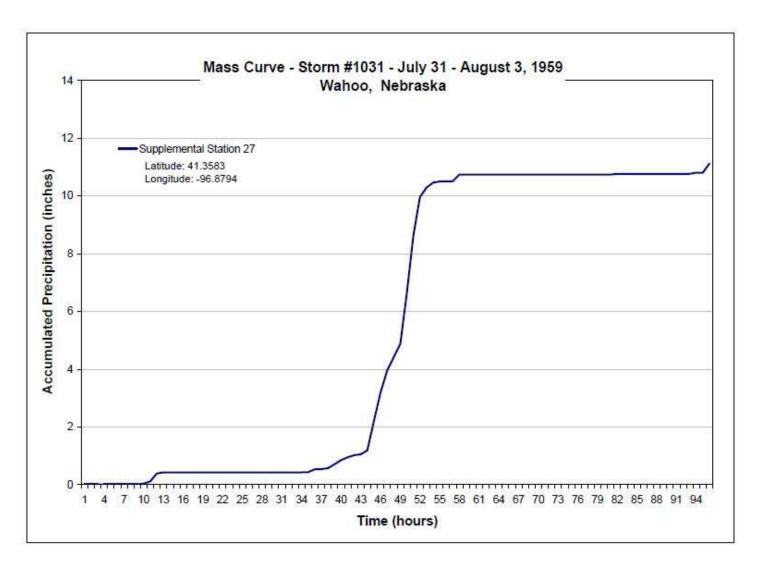
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The	barrier adjusts the total adjusts th-Area-Dura 6 Hours 7.1 6.8 5.5 5.5 5.0 6.8 6.8 6.8 6.8 6.8 6.8 6.8 6.8 6.8 6.8	ment factor is ment factor is 12 Hours 9.6 9.3 7.8 7.3 6.6	1.00 1.58 18 Hours 10.1 9.7 8.4 7.9	10.4 10.0	was adopte from HMRs	36 Hours	er limit for the DAD value 48 Hours 10.8	is study through g is taken from SPAS 60 Hours	guidance S 1031. 72 Hours 10.9	
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1 sq mil 10 sq mil 100 sq mil 200 sq mil 500 sq mil 500 sq mil 5000 sq mil 10000 sq mil 20000 sq mil 10000 sq mil 20000 sq mil 10 sq mil	6 Hours 5 7.1 6 6.8 5 5.5 6 5.0 6 4.5 6 4.0	9.6 9.3 7.8 7.3 6.6	10.1 9.7 8.4 7.9	10.4 10.0	-	10.4	10.8	-	10.9	
1 sq mil 10 sq mil 100 sq mil 200 sq mil 500 sq mil 500 sq mil 5000 sq mil 10000 sq mil 20000 sq mil 10000 sq mil 20000 sq mil 10 sq mil	6 Hours 5 7.1 6 6.8 5 5.5 6 5.0 6 4.5 6 4.0	9.6 9.3 7.8 7.3 6.6	10.1 9.7 8.4 7.9	10.4 10.0	-	10.4	10.8	-	10.9	
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200 sq mil 500 sq mil 1000 sq mil 1000 sq mil 10000 sq mil 20000 sq mil 20000 sq mil Adjusted Storm Dep 1 sq mil 10 sq mil 100 sq mil 200 sq mil	es 5.0 es 4.5 es 4.0	7.3 6.6	7.9	. 0.0	i -	10.0 8.6	9.0	-	9.1	1
500 sq mil 1000 sq mil 5000 sq mil 5000 sq mil 10000 sq mil 20000 sq mil 20000 sq mil Adjusted Storm Dep 1 sq mil 10 sq mil 100 sq mil 200 sq mil	es 4.5 es 4.0	6.6		8.3	-	8.3	8.7	-	8.7	1
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10000 sq mil 20000 sq mil 20000 sq mil Adjusted Storm Dep 1 sq mil 10 sq mil 100 sq mil 200 sq mil	es 2.2		6.4	6.8	-	6.8	7.3	-	7.4	
Adjusted Storm Dep 1 sq mil 10 sq mil 200 sq mil		3.3	3.8	4.1	-	4.1	4.6	-	4.6	
Adjusted Storm Dep 1 sq mil 10 sq mil 100 sq mil 200 sq mil	•••••	2.0	2.4	2.6	<u>-</u>	2.6	3.0	-	3.0	
1 sq mil 10 sq mil 100 sq mil 200 sq mil	es -	-	-	-	-	-	-	-		
1 sq mil 10 sq mil 100 sq mil 200 sq mil										
10 sq mil 100 sq mil 200 sq mil			10.77		20.77	26.11	40.77	60.11	70.77	
10 sq mil 100 sq mil 200 sq mil	6 Hours 11.2	12 Hours 15.2	18 Hours 15.9	24 Hours 16.5	30 Hours	36 Hours 16.5	48 Hours 17.1	60 Hours	72 Hours 17.2	-
100 sq mil 200 sq mil	•••••	14.6	15.3	15.8	-	15.8	16.6		16.6	-
200 sq mil	•••••	12.2	13.2	13.6	-	13.6	14.2	-	14.4	1
500 ag mil	•••••	11.6	12.5	13.0	-	13.1	13.7	-	13.8	
500 sq mil	es 7.1	10.3	11.2	11.7	-	11.7	12.5	_	12.6	
1000 sq mil		9.2	10.1	10.8	<u>-</u>	10.8	11.6	-	11.7	
5000 sq mil	•••••	5.2	6.0	6.4	-	6.4	7.2	-	7.3	
10000 sq mil	•••••	3.2	3.8	4.1	-	4.1	4.7	-	4.8	-
20000 sq mil	-	-	-	-	-	-	-	-	-	_
										+
Storm or Storm Cent	er Name		SPAS 1031	-Prague, NE						1
Storm Date(s)			1-Aug-1959							1
Storm Type			MCC							
Storm Location			41.36 N	96.88 W						
Storm Center Elevati			1,500	244						₩
Precipitation Total &	Duration		13.09 Inches	s 24-hours U	SACE Bucke	t Survey Da	ta			1
Storm Representativ	e Deumoint		72.5 F	12						+-
Storm Representativ			39.22 N	95.71 W						1
Maximum Dewpoint			78.5 F							1
Moisture Inflow Vec			SSE @ 160							
In-place Maximizatio	n Factor		1.35							
										—
Temporal Transposi			1-Aug	04.55-55-		July	Aug			1
Transposition Dewp			40.59 N	91.39 W		81	80.5			1
Transposition Adjust Transposition Maxin			1.17 81.0 F							+-
Grid Point Elevation	ATTENDED TO A CONTRACTOR		550						+	+
Highest Elevation in	num Dewpoint		14,344							1
Inflow Barrier Heigh			1,000						+	1
Elevation Adjustmen	Basin		1.00							
Total Adjustment Fa	Basin		-100							1

Appendix F: Table F.69: Storm spreadsheet for Prague, NE August 1, 1959

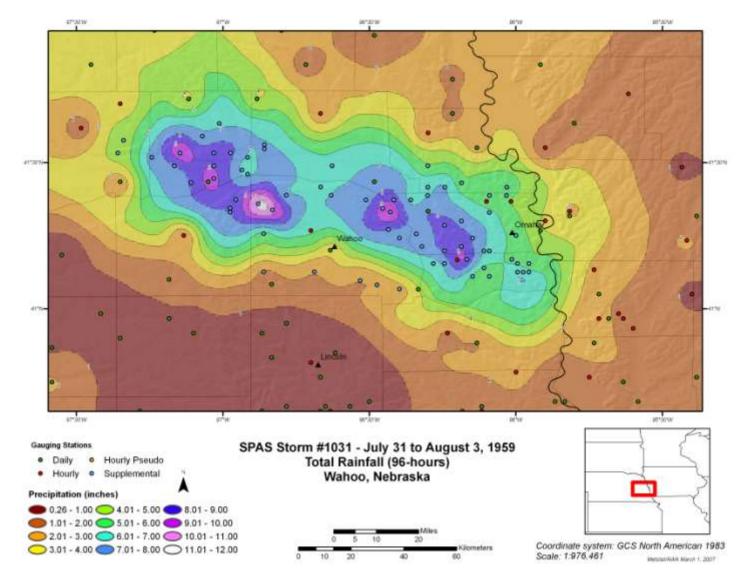
- 59	9						Duration	n (hours)						
Area (ml²)	1	2	3	4	5	6	12	18	24	36	48	72	96	total
1	3.01	4.18	5.52	5.96	6.39	7.07	9.60	10.09	10.43	10.43	10.83	10.87	11.27	11.27
10	2.87	4.03	5.32	5.73	6.14	6.80	9.26	9.71	10.01	10.01	10.49	10.49	10.90	10.90
100	2.15	3.39	4.41	4.71	4.89	5.51	7.75	8.37	8.60	8.60	8.99	9.12	9.52	9.52
200	1.77	3.05	4.04	4.33	4.59	4.98	7.33	7.93	8.25	8.26	8.67	8.73	9.10	9.10
500	1.32	2.43	3.45	3.90	4.15	4.51	6.55	7.09	7.39	7.39	7.94	7.98	8.45	8,45
1,000	1.07	2.00	2.92	3.41	3.68	4.02	5.80	6.39	6.82	6.82	7.32	7.38	7.83	7.83
5,000	0.54	0.99	1.31	1.72	1.95	2.22	3.27	3.78	4.05	4.05	4.56	4.63	4.96	4.96
10,000	0.29	0.56	0.77	0.99	1.15	1.30	2.04	2.39	2.57	2.57	2.99	3.01	3.27	3.27



Appendix F: Table F.70 and Figure F.96: Depth-area-duration values and Depth-area-duration chart for Prague, NE August 1, 1959



Appendix F: Figure F.97: Mass curve chart for Prague, NE August 1, 1959



Appendix F: Figure F.98: Total storm isohyetal analysis for Prague, NE August 1, 1959

Paris Waterworks, IN, AWA 34

June 27, 1957

Storm Type: Frontal/Tropical Grid Points Used: 1-2, 8-9, 16

	Paris Water	works, IN		04	A 3!		ANO	Cuid D	:4 1	
torm Date: 6/27-28/19 WA Analysis Date: 12/15/2013				Storm	Adjust	ment id	or ANO	Grid Po	oint 1	
emporal Transposition Date	13-Jul									
composition Date	Lat	Long			Moisture Ir	ıflow Directi	ion:	SSE @ 215	miles	
torm Center Location	39.05 N	87.70 W			Grid Point	Elevation		350	feet	
torm Rep Dew Point Location	36.00 N	86.70 W			Storm Eleva	ation		500	feet	
ransposition Dew Point Location		91.52 W				Analysis Du	ration	12	hours	
rid Point Location	35.31 N	93.23 W			_					
The storm representative The in-place maximum The transpositioned maximum The in-place storn The in-place storn	dew point is dew point is n elevation is	74.0 F 81.5 F 81.0 F 500	with tota with tota whi	al precipitable al precipitable al precipitable ich subtracts ich subtracts	e water above water above 0.12 0.15	re sea level o re sea level o inches o inches o	of of f precipitabl f precipitabl	e water at	2.73 3.84 3.76 74.0 F 81.5 F	inches inches inches
The transposition basis				ch subtracts	0.30		f precipitabl		81.0 F	
The Grid point/Inflow ba	mer neight is	1,000	wni	ch subtracts	0.30	inches o	f precipitabl	e water at	81.0 F	
The in-place st	orm maximizat	ion factor is	1.41		Notes: DAI) values taken	from EPRI S	torm Number	18, HMB V-	
The transposition/e			0.94					based on maxi		
The b	arrier adjustm	ent factor is	1.00		Td values be	tween June 2	7-28, 1957 at	KBNA, and K	MQY.	
	4-4-1 - 4"	6 ·	1.44							
Ine	total adjustm	ent factor is	1.33							
Observed Storm Depth	-Area-Durati	ion								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	-	-	-	-	_	-	-	-		-
100 sq miles	8.0	10.9	-	11.5	-	-	-	-	-	
200 sq miles 500 sq miles	7.6 6.8	10.3 9.3	-	11.1 10.2	-	-	-	-	-	
1000 sq miles	6.2	9.3 8.4	-	9.4	-	-	-	-	-	
5000 sq miles	4.4	5.9	-	7.1	-	-	-	-	-	1
10000 sq miles	3.6	4.7	-	6.0	-	-	-	-	-	
20000 sq miles	-	-	-	-	-	-	-	-	-	
Adjusted Storm Depth				:		:		:		
10 1	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles 100 sq miles	- 10.6	- 14.4	-	15.2	-	-	-	-	-	
200 sq miles	10.1	13.7		14.7	-	-	-	-	-	
500 sq miles	9.0	12.3		13.5	-	-	-		-	
1000 sq miles	8.2	11.1	-	12.5	-	-	-	-	-	1
5000 sq miles	5.8	7.8		9.4	-	<u>-</u>	-	-	-	
10000 sq miles	4.8	6.2		8.0			_	_	_	1
20000 sq miles	-	-	-	-	-	-	-	-	-	
Storm or Storm Center	Mama		UMD VIOT	Paris Waterv	rowlen IN					
Storm Or Storm Center :	valite		6/27-28/1957		or Ka, IIV					
Storm Date(s) Storm Type			Synoptic	'						1
Storm Lype Storm Location			39.05 N	87.70 W						1
Storm Center Elevation			500	57.70 W						1
Precipitation Total & D				24-hours HI	VIB V-18					1
1100-pitation 10tal te B			mone	us III	10					1
Storm Representative 7	Γd		74.0 F	12						1
Storm Representative 7			36.00 N	86.70 W						
Maximum Td			81.5 F							
Moisture Inflow Vector	r		SSE @ 215	Miles						
In-place Maximization l	Factor		1.41							
Temporal Transpositio	n (Date)		13-Jul							-
Transposition Td Loca			39.68 N	91.52 W						1
Transposition Maximus			81.0 F	21.32 W						1
Transposition Adjustm			0.94							1
Grid Point Elevation	CILL I GOLDI		350							1
Highest Elevation in Ba	asin		14,344							1
Inflow Barrier Height			1,000							
Elevation Adjustment 1	Factor		1.00							
Total Adjustment Fact	or		1.33							

Appendix F: Table F.71: Storm spreadsheet for Paris Waterworks, IN June 27, 1957

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Prelimino	ary Iso	hyetal	map, i	n	_sheet	sca	le					and Discourse
Precipita	tion d	ata an	d mas	s curv	1851				(Numbe	r of She	eets)
Form	5001-	C (Hou	rly pre	cip. d	ata)							2222
Form	5001-	B (24-1	hour		" }							
204.50.000		D 200713			1.7				-	-	****	
Miscl.	precip	. reco	rds, me	eteoral	ogical o	lata, e	itc					
Miscl. Form	precip 5002	, reco (Mass	rds, me roinfa	steoral Il curv	es)	lata, e	tc					
Form	5002	(Mass	roinfa	ll curv	PAR	lata, e T II	:tc					
Form Final is	5002 ohyeta	(Mass	roinfa , in	II curv	PAR	lata, e T II	:tc					
Final iso	5002 ohyeta i comp	(Mass I maps outatio (Data	rainfa s, in n shee fram r	sh	PAR PAR eet s	T II cale	etc					
Final is Data and Form	5002 ohyeta i comp S-10 ((Mass I maps outatio (Data (Depth	roinfa s, in n shee from r -area	shets:	PAR' eet s rainfall from is	T II cale_	es)					
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Final is Data and Form Form Form Maxin	5002 ohyeta f comp S-10 S-11 S-12 num d relatir	(Mass utatio (Data (Depth (Maximuration ig to p	roinfa i, in n shee from r -area num de periods	shets: mass data pth-d th-are of m	PAR' PAR' eet s rainfall from is luration ea curv aximum	T II cale	es)))				
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Final isonate Data and Form Form Maxim Data	sons solveta s	(Mass utatio (Data (Depth (Maxim uratio uratio uratio uratio	roinfa i, in n shee from r -area num de n-dept periods AVERA	shets: mass data pth-d th-are of m	PAR' eet s rainfall from is luration ea curv aximum DEPTH uration 24	T II cale curve sohyet data es raint OF	s) ral map) fall Rainfa	NFAL	IN Hours	INCH	+ES	
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Final iso Data and Form Form Form Maxim Data Area in So	solveta solveta solves	(Mass I maps outatio (Data (Depth (Maximuration uration uration g to p	roinfa s, in n shee from r -area num de n-depi periods AVERA 12 12 12 16 17 70 79	shets: mass data pth-d th-are of m	PAR' eet s rainfall from is luration ea curv aximum DEPTH uration 24 12-/ 12-/ 11-5 11.1	T II cale curve sohyet data es raint OF	s) ral map) fall Rainfa	NFAL	IN Hours	INCH	+ES	
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Appendix F: Table F.72: Depth-area-duration values for Paris Waterworks, IN June 27, 1957

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area in	Duration of F	Rainfall in Ho	urs
Sq. Miles	6	12	24
100	8	10.9	11.5
200	7.6	10.3	11.1
500	6.8	9.3	10.2
1000	6.2	8.4	9.4
5000	4.4	5.9	7.1
10000	3.6	4.7	6



Table F.73 and Figure F.99: Depth-area-duration Table and synoptic analysis for Paris Waterworks, IN June 27, 1957

Lake Maloya, NM, AWA 35

May 19, 1955

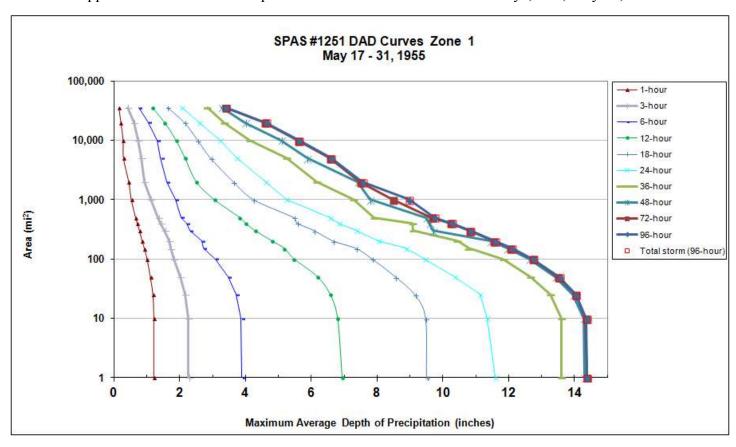
Storm Type: Frontal Grid Points Used: 7, 13-14, 21

orm Date: 05/17-05/		oya, NM		Storm	Adjustı	nent fo	r ANO	Grid Po	oint 7	
VA Analysis Date: 9/11/2012										
mporal Transposition Date	5-Jun	T			M-1-4 T	nflow Direc	4	CT (0.530		
111	Lat	Long					tion:	SE @ 520 11,300	miles	
orm center location	37.01 N	104.34 W			Grid Point			7,900	feet	
orm Rep Td location	31.50 N	98.10 W				ter Elevatio		24	feet	
ansposition Td location rid Point location	37.37 N 36.00 N	92.35 W 105.50 W			Storm Kep	Analysis D	uration	24	hours	
	2010011	100.00 11								
The storm represer	ntative Td is	70.5 F	with total p	orecipitable w	ater above	sea level of			2.31	inche
The in-place ma		78.0 F		recipitable w					3.29	inche
The transpositioned ma	ximum Tdis	65.0 F	with total p	recipitable w	ater above	sea level of			1.77	inche
The in-place stom	elevation is	7,900	whi	ch subtracts	1.34	inches of	precipitabl	e water at	70.5 F	
The in-place stom		7,900		ch subtracts	1.73		precipitabl		78.0 F	
The transposition storm				ch subtracts	XX		precipitabl		65.0 F	
The Grid point/inflow bar	ner height is	1,150	whi	ch subtracts	XX	inches of	precipitabl	e water at	65.0 F	
The in oth		6	1.62	1	Notes: Storm	rancasantati	va daw noint	value was based	lon	1
	ce maximizati ie transpositi		_					17 at KATT, I		
The elevation/ba			#VALUE!					of 1.62, held t		
The devador/ba	aujusuli	140101 15	TILUE:		on HMR agu	idance and pr	evious AWA	analyses.		
The t	otal adjustme	ent factor is	#VALUE!							
Observed Storm Dept	;									
	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq mile	•••	2.3	3.9	6.9	9.5	11.6	13.6	14.3	14.4	1
10 sq mile	•••	2.3 1.8	3.9 3.1	6.8 5.5	9.5 7.9	11.3 9.5	13.6 11.8	14.3 12.6	14.3 12.7	1
100 sq mile 200 sq mile	••••	1.7	2.7	4.8	6.7	9.5 8.0	10.4	11.4	11.5	1
500 sq mile	···•	1.4	2.0	3.8	5.5	6.6	7.9	9.5	9.7	1
1000 sq mile	•••	1.1	1.9	3.1	4.2	5.2	7.3	7.8	8.5	1
2000 sq mile	•••	0.9	1.6	2.5	3.6	4.6	6.2	7.4	7.5	
5000 sq mile	•••	0.8	1.4	2.2	2.9	3.7	5.3	5.9	6.6	
10000 sq mile	s 0.3	0.7	1.3	1.9	2.6	3.2	4.1	5.1	5.6	
20000 sq mile	s 0.2	0.6	1.0	1.5	2.1	2.6	3.4	4.0	4.6	<u> </u>
Adinated Steams Denti	h Amer Dune	41								
Adjusted Storm Dept	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sa mile	s #VALUE!		#VALUE!	··•	#VALUE!	·····	¢		#VALUE!	1
***************************************	s #VALUE!	·····	#VALUE!		#VALUE!				#VALUE!	
100 sq mile	s #VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	
200 sq mile	s #VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	
	s #VALUE!	>	#VALUE!		#VALUE!				#VALUE!	
	s #VALUE!		#VALUE!		#VALUE!			¢	#VALUE!	
	s #VALUE!	·····	#VALUE! #VALUE!	#VALUE!	#VALUE!	#VALUE!		#VALUE! #VALUE!	#VALUE!	-
10000 sq mile	s #VALUE!		#VALUE!		#VALUE!	>	¢		#VALUE!	
20000 sq mile	····	>	#VALUE!		#VALUE!				#VALUE!	
α, σ, σ	27		OD 10 3255		7.5					
Storm or Storm Center Storm Date(s)	r Name		SPAS 1251 La 05/17-05/21/19:		NM					1
Storm Date(s) Storm Type			Synoptic							1
Storm Location			37.01 N	104.34 W						1
Storm Center Elevatio	n		7900							1
Precipitation Total &	Duration		14.4 Inches	72						
n	T.1		70 F F	24						1
Storm Representative Storm Representative			70.5 F 31.50 N	24 98.10 W			mar:	inne	77.354839	1
In-place Maximum Td			78.0 F	90.10 W			76	june 79	11.334839	1
Moisture Inflow Vector			SE @ 520				, 0	12		1
In-place Maximization			1.62							1
•										
Temporal Transpositi			5-Jun							
Transposition Td Loc			37.37 N	92.35 W			may	june 70		1
Transposition Maximu			65.0 F				75	79		1
Transposition Adjust Grid Point Elevation	ment ractor		#VALUE! 11,300							1
Highest Elevation in I	Basin		14,344							t
Inflow Barrier Height			1.150							1
			*							1
Elevation Adjustment	Factor		#VALUE!							

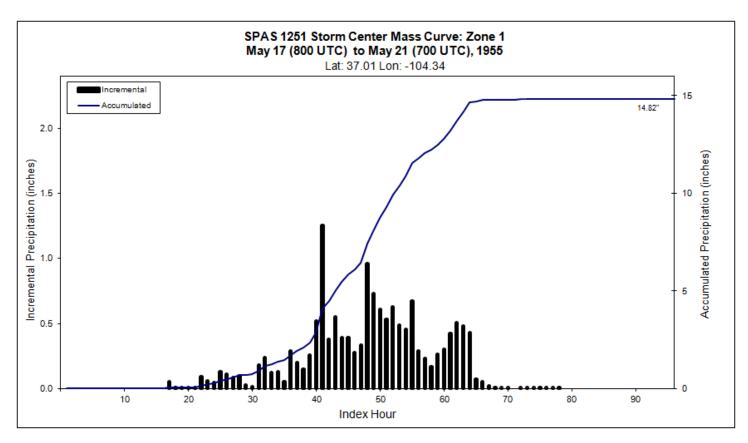
Appendix F: Table F.74: Storm spreadsheet for Lake Maloya, NM, May 19, 1955

					•		/ 21 (700				
			MAXIMUN	AVERAG	E DEPTH	OF PREC	IPITATION	(INCHES)			
					Di	uration (hou	rs)				
Area (mi ²)	1	3	6	12	18	24	36	48	72	96	Total
0.3	1.26	2.32	3.98	7.09	9.77	11.90	14.04	14.74	14.82	14.82	14.82
1	1.21	2.27	3.89	6.93	9.51	11.60	13.60	14.30	14.38	14.38	14.38
10	1.21	2.25	3.87	6.79	9.48	11.34	13.60	14.27	14.34	14.36	14.36
25	1.18	2.16	3.71	6.57	9.15	11.14	13.26	13.95	14.03	14.04	14.04
50	1.10	2.02	3.47	6.18	8.56	10.36	12.65	13.41	13.49	13.54	13.54
100	1.00	1.82	3.08	5.47	7.85	9.45	11.84	12.63	12.73	12.74	12.74
150	0.92	1.73	2.72	5.18	7.37	8.87	10.78	11.95	12.05	12.10	12.10
200	0.85	1.67	2.66	4.81	6.67	8.04	10.44	11.44	11.54	11.57	11.57
300	0.77	1.54	2.30	4.29	6.09	7.37	9.10	9.69	10.80	10.83	10.83
400	0.70	1.42	2.20	4.00	5.57	6.85	9.08	9.59	10.23	10.26	10.26
500	0.65	1.35	2.04	3.82	5.46	6.58	7.91	9.49	9.66	9.74	9.74
1,000	0.52	1.11	1.86	3.05	4.24	5.24	7.28	7.78	8.47	8.97	8.97
2,000	0.44	0.93	1.60	2.50	3.63	4.62	6.16	7.40	7.48	7.55	7.55
5,000	0.28	0.83	1.42	2.16	2.94	3.73	5.25	5.86	6.56	6.59	6.59
10,000	0.27	0.73	1.31	1.89	2.55	3.22	4.12	5.08	5.59	5.63	5.63
20,000	0.20	0.60	1.04	1.54	2.14	2.60	3.35	3.98	4.58	4.62	4.62
35,752	0.14	0.41	0.75	1.17	1.63	2.06	2.83	3.27	3.40	3.40	3.40

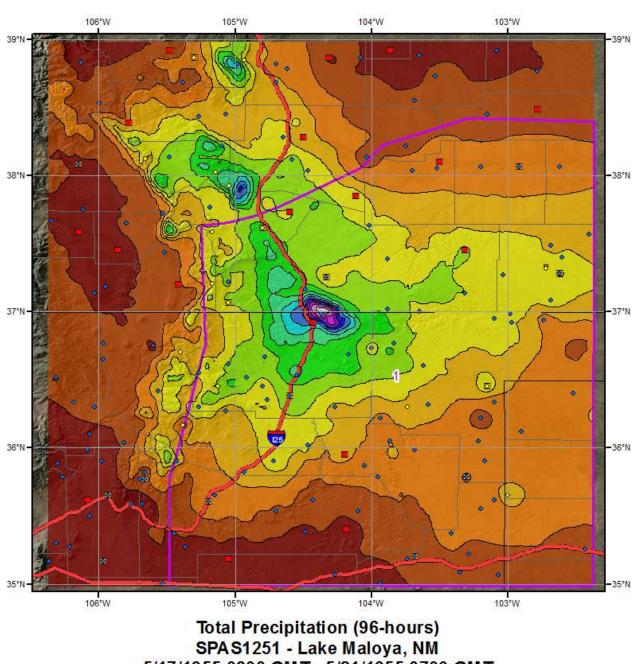
Appendix F: Table F.75: Depth-area-duration values for Lake Maloya, NM, May 19, 1955



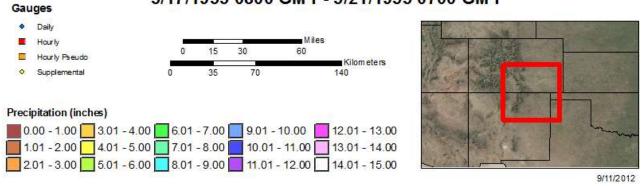
Appendix F: Figure F.100: Depth-area-duration chart for Lake Maloya, NM, May 19, 1955



Appendix F: Figure F.101: Mass curve chart for Lake Maloya, NM, May 19, 1955



5/17/1955 0800 GMT - 5/21/1955 0700 GMT



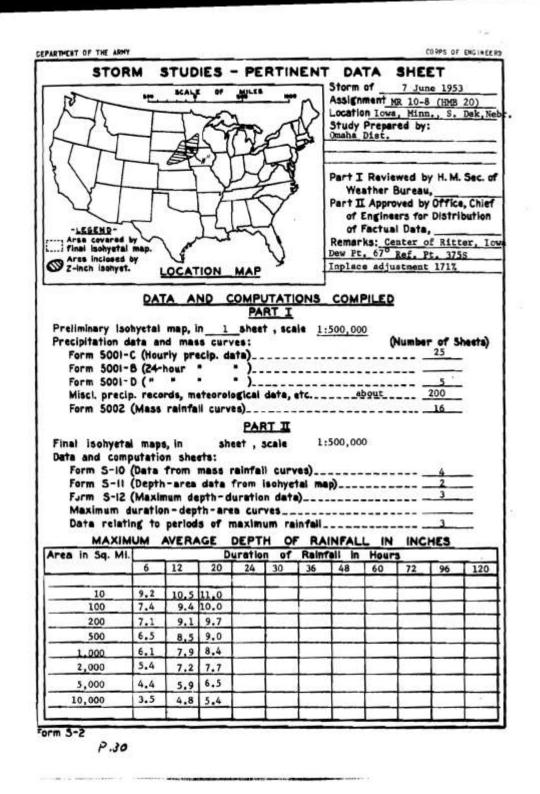
Appendix F: Figure F.102: Total storm isohyetal analysis Lake Maloya, NM, May 19, 1955

Ritter, IA, AWA 36

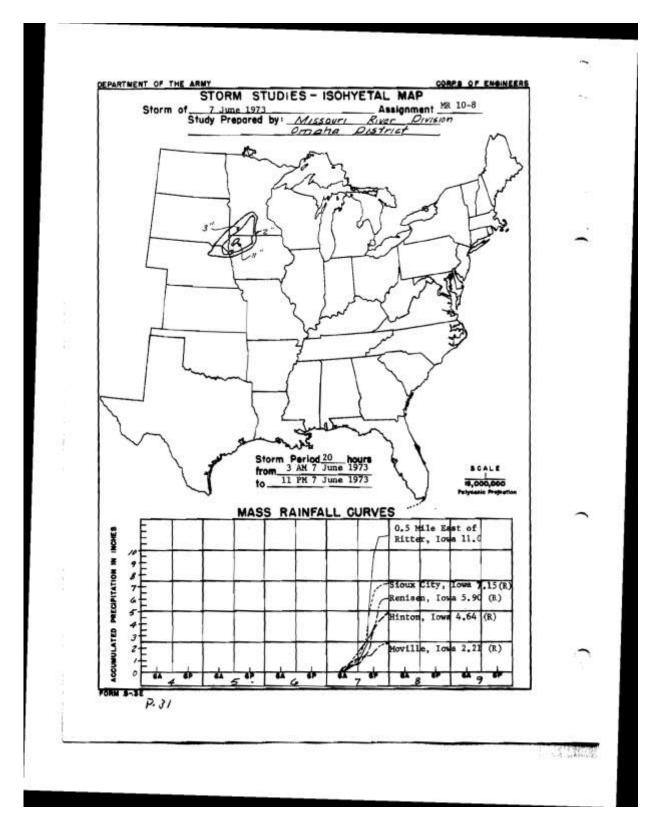
June 7, 1953 Storm Type: MCC

Storm Name: Ritter, IA				G/	A .11	4	A NTO	- C I D		
form Date: 07-Jun-195				Storn	n Adjus	tment f	or ANO	Grid P	oint 1	
WA Analysis Date: 12/15/2013					l				l	
emporal Transposition Date	30-Jun									
	Lat	Long				nflow Direct	ion	S @ 375	miles	
torm Center Location	43.24 N	95.82 W			Grid Point	Elevation		350	feet	
torm Rep Dew Point Location	37.82 N	95.82 W			Storm Cen	ter Elevation	1	1,400	feet	
ransposition Dew Point Location	40.39 N	91.33 W			Storm Rep	Analysis Du	ıration	6	hours	
rid Point Location	35.31 N	93.23 W								
ma		=40E	24				•		2.72	
The storm representativ	_	74.0 F				ve sea level			2.73	inches
The in-place maximu The transpositioned maximu	-	81.0 F 80.0 F				ove sea level ove sea level			3.76 3.60	inche
The in-place sto	•	1,400		ch subtracts	0.34		f precipitabl	e water at	74.0 F	HICHE
The in-place sto		1,400		ch subtracts	0.42		f precipitabl		81.0 F	
The transposition bas		350		ch subtracts			f precipitabl		80.0 F	
The Grid point/inflow b		1,000		ch subtracts			f precipitabl		80.0 F	
The in-place	storm maximizat	ion factor is	1.40			D values ta	ken from US	SACE MR 1	0-8 (HMB	
The transposition					20)					
	barrier adjustm									
Th	ie total adjustm	ent factor is	1.38							
Observed Steems Parel	Anna Daniel									
Observed Storm Depth	-Area-Duration 6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	1
10 sq miles	9.1	10.5	18 Hours	24 Hours	30 Hours	- 30 Hours	48 Hours	00 Hours	/2 nours	1
100 sq miles	7.4	9.4	-	-	-	-	-	-	_	
200 sq miles	-	-	-	_	_	_	_	-	_	1
500 sq miles	6.5	8.5	-	-	-	-	-	-	-	
1000 sq miles	6.1	7.9	-	-	-	-	-	-	-	1
5000 sq miles	4.4	5.9	-	-	-	-	-	-	-	
10000 sq miles	3.5	4.8	-	-	-	-	-	-	-	
20000 sq miles	-	-	-	-	-	-	-	-	-	
Adjusted Storm Depth-			·		·		·	:	· · · · · · · · · · · · · · · · · · ·	
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	12.6	14.5	-	-	-	-	-	-	-	1
100 sq miles 200 sq miles	10.2	13.0	-	-	-	-	-	-	-	
500 sq miles	9.0	11.8	-	-	-	-	-	-	<u>-</u>	1
1000 sq miles	8.4	10.9								1
5000 sq miles	6.1	8.2			_					1
10000 sq miles	4.8	6.6	-	-	-	-	-	-	-	
20000 sq miles	-	-	-	-	-	-	-	-	-	1
Storm or Storm Center N	Vame		Ritter, IA							
Storm Date(s)			7-Jun-1953							1
Storm Type			MCS							1
Storm Location			43.24 N	95.82 W						1
Storm Center Elevation			1,400	- 12 5 *	CACE ME	10.0 / TD / D 2	0)			1
Precipitation Total & D	uration		11.00 Inche	s 12-nours U	SACE MR	10-8 (HMB 2	u)			1
Storm Representative D	ew Point		74.0 F	6hr average	L 71 added to UK	L BACE storm rep	Td based on I	EPBLand Mag.	l ahoo quidaee	
Storm Representative D			37.82 N	95.82 W	. Gadea to Or	to _ stommer	a pased on I	and walk	oo gardanic	ì
Maximum Dew Point			81.0 F							1
Moisture Inflow Vector			S @ 380 Mi	les						1
In-place Maximization F	actor		1.40							
Temporal Transposition			30-Jun							1
Transposition Dew Poir			40.39 N	91.33 W		June	July			1
Transposition Maximum			80.0 F			78.5	81.5			1
Transposition Adjustm	ent Factor		0.99							-
Grid Point Elevation			350							1
Highest Elevation in Ba Inflow Barrier Height	Sif1		14,344							1
	actor		1.00							1
Elevation Adjustment F										
Elevation Adjustment F Total Adjustment Fact	actor		1.38							1

Appendix F: Table F.76: Storm spreadsheet for Ritter, IA June 7, 1953



Appendix F: Table F.77: Depth-area-duration values for Ritter, IA June 7, 1953



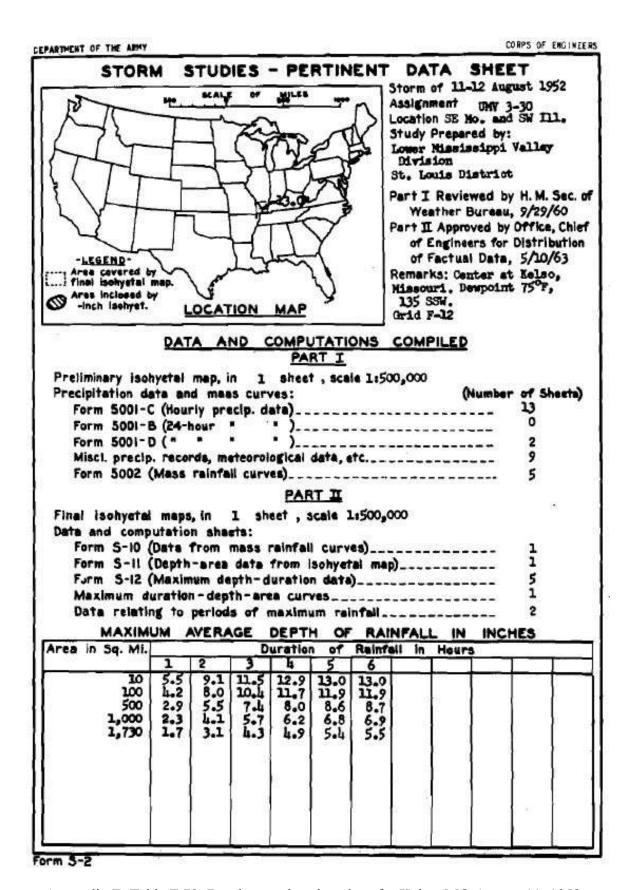
Appendix F: Figure F.103 and Figure F.104: Total storm isohyetal analysis and Mass curve chart for Ritter, IA June 7, 1953

Kelso, MO, AWA 37

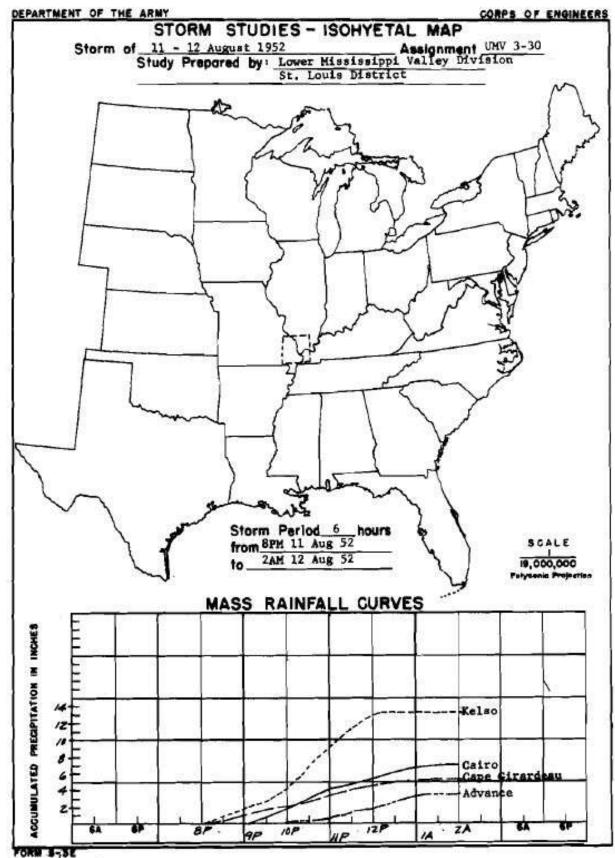
August 11, 1952 Storm Type: MCC

	IV 3-30-Kels	o, MO		C)			4.376	a		
orm Date: 11-Aug-19				Storm	Adjust	ment fo	r ANO	Grid Po	oint 1	
WA Analysis Date: 12/15/201										
emporal Transposition Date	25-Jul	-						~ ~ ~		_
	Lat	Long				ıflow Directi	on	S @ 140	miles	
torm Center Location	37.19 N	89.55 W			Grid Point			350	feet	
torm Rep Dew Point Location	35.17 N	89.50 W				ter Elevation		500	feet	
ransposition Dew Point Location		92.53 W			Storm Rep	Analysis Du	ration	6	hours	
rid Point Location	35.31 N	93.23 W								
The starm representative	a sint is	76.5 F	with total	l neoninitable		1 1 . 4			3.07	inches.
The storm representative The in-place maximum	•	81.0 F		l precipitable l precipitable					3.75	inches.
The transpositioned maximum	•	81.5 F		l precipitable l precipitable					3.83	inches
The in-place store	-	500		ch subtracts	0.14		f precipitabl	e water at	76.5 F	nicires
The in-place store		500		ch subtracts			f precipitabl		81.0 F	
The transposition basis	n elevation at	350	whi	ch subtracts	0.31		f precipitabl		81.5 F	
The Grid point/inflow ba	rrier height is	1,000	whi	ch subtracts	0.31	inches o	f precipitabl	e water at	81.5 F	
The in-place st			1.23					CE UMV 3-3		
The transposition/e			0.98		•			on maximum		
The b	arrier adjustm	ent factor is	1.00			_	11, 1952 at I	KMEM, KNO	QA, KMKL,	
	And a direct	C	1.00		and KDYR.					
The	total adjustm	erit ractor is	1.20	J						1
Observed Storm Depth	-Area Durati	on								
Observed Storing Depth	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	1
10 sq miles	5.5	11.5	13.0	-	-	-	-	-		
100 sq miles	4.2	10.4	11.9	-	-	-	-	-	-	1
200 sq miles	0.0	0.0	0.0	-	-	-	-	-	-	
500 sq miles	2.9	7.4	8.7	-	-	-	-	-	-	1
1000 sq miles	2.3	5.7	6.9	-	-	-	-	-	-	
5000 sq miles	-	-	-	-	-	-	-	-	-	
10000 sq miles	-	-	-	-	-	-	-	-	-	
20000 sq miles	-	-	-	-	-	-	-	-	-	J
111 (10) D. 4	4 B //									
Adjusted Storm Depth	-Area-Durati 1 Hours	on 3 Hours	6 Uaues	12 Uaure	18 Hours	24 Hauss	26 U	48 Hours	72 Hours	
10 sq miles		13.8	6 Hours 15.6	12 Hours	- 18 HOURS	24 Hours	36 Hours	40 HOURS	/2 Hours	•
100 sq miles	•	12.5	14.3	-	-	-	-	-	-	1
200 sq miles	0.0	0.0	0.0	-	-	-	-	-	-	1
500 sq miles	3.5	8.9	10.5	-	-	-	-	-	-	
	2.8	6.9	8.3	-	_	-	-	-	_	1
1000 sq miles										
5000 sq miles	-	-	-	-	-	-	-	-	-	
5000 sq miles 10000 sq miles	-	-	-	-	-	-	-	-	-	
5000 sq miles	-	- - -	-		- - -	- - -	- - -	- - -	- - -	
5000 sq miles 10000 sq miles	-	-	_			- - -		-		
5000 sq miles 10000 sq miles 20000 sq miles	-	-	-	-	-	- - -	-	-		
5000 sq miles 10000 sq miles 20000 sq miles Storm or Storm Center	-	-	- - USACE UMV	- / 3-30-Kelso,	-	-	-	-		
5000 sq miles 10000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s)	-	-	-	- / 3-30-Kelso,	-	-	-	-		
5000 sq miles 10000 sq miles 20000 sq miles Storm or Storm Center	-	-	USACE UMV	- / 3-30-Kelso,	-	-	-			
5000 sq miles 10000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type	- - Name	-	USACE UMV 11-Aug-1952 MCC	- 7 3-30-Kelso,	-	-	-	-		
Storm Oate(s) Storm Type Storm Location	Name	-	- USACE UMV 11-Aug-1952 MCC 37.19 N	- 7 3-30-Kelso ,	мо		-	-		
Storm Center Storm Date(s) Storm Center Storm Type Storm Location Storm Center Elevation Precipitation Total & D	Name	-	USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches	7 3-30-Kelso, 89.55 W 6-hours USA	мо			-		
Storm Center Storm Coation Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative	- Name	-	- USACE UMV 11-Aug-1952 MCC 37-19 N 500 13.00 Inches	7 3-30-Kelso, 89.55 W 6-hours USA	мо		-	-		
Storm Center Elevation Storm Center Elevation Storm Center Elevation Precipitation Total & D Storm Representative	- Name	-	- USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N	7 3-30-Kelso, 89.55 W 6-hours USA	мо		-	-		
Storm Center Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative Storm Representative Maximum Td	Name Duration Ed Td Location	-	USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F	7 3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W	мо		-	-		
Storm or Storm Center Storm Date(s) Storm Location Storm Center Elevation Precipitation Total & D Storm Representative Storm Representative Maximum Td Moisture Inflow Vecto	Name Duration Td Td Location	-	USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F S @ 140	7 3-30-Kelso, 89.55 W 6-hours USA	мо		-	-		
Storm Center Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative Storm Representative Maximum Td	Name Duration Td Td Location	-	USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F	7 3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W	мо		-	-		
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative Maximum Td Moisture Inflow Vecto In-place Maximization	Name Duration Id Id Id If d If d Location r Factor	-	USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F S @ 140	7 3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W	мо		-	-		
Storm or Storm Center Storm Date(s) Storm Location Storm Center Elevation Precipitation Total & D Storm Representative Storm Representative Maximum Td Moisture Inflow Vecto	Name Duration Fd Location r Factor n (Date)	-	USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F 8 @ 140 1.23	7 3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W	мо		August	-		
Storm Center Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative Maximum Td Moisture Inflow Vecto In-place Maximization Temporal Transpositio	Name Duration Id Location r Factor n (Date) ation	-	USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F 8 @ 140 1.23	7 3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W	мо	30		-		
Stom or Stom Center Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & D Stom Representative Maximum Td Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Td Loc	Name Puration Id Location r Factor n (Date) ation m Td		USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F S @ 140 1.23	7 3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W	мо	30 July	August	-		
Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative Maximum Td Moisture Inflow Vecto In-place Maximization Transposition Td Loc Transposition Td Loc Transposition Maximu Transposition Adjustn Grid Point Elevation	Name Duration Id Id Location r Factor In (Date) ation m Td ment Factor	-		7 3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W	мо	30 July	August	-		
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative T Maximum Td Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Td Loc Transposition Td Loc Transposition Adjustn Grid Point Elevation Highest Elevation in B	Name Duration Id Id Location r Factor In (Date) ation m Td ment Factor	-	USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F S @ 140 1.23 25-Jul 40.71 N 81.5 F 0.98 350 14,344	7 3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W	мо	30 July	August	-		
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative T Maximum Td Moisture Inflow Vecto In-place Maximization Transposition Td Loc Transposition Td Loc Transposition Maximu Transposition Adjustn Grid Point Elevation	Name Duration Id Id Location r Factor In (Date) ation m Td ment Factor			7 3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W	мо	30 July	August	-		

Appendix F: Table F.78: Storm spreadsheet for Kelso, MO August 11, 1952



Appendix F: Table F.79: Depth-area-duration chart for Kelso, MO August 11, 1952



Appendix F: Figure F.105 and Figure F.106: Total storm isohyetal and Mass curve chart for Kelso, MO August 11, 1952

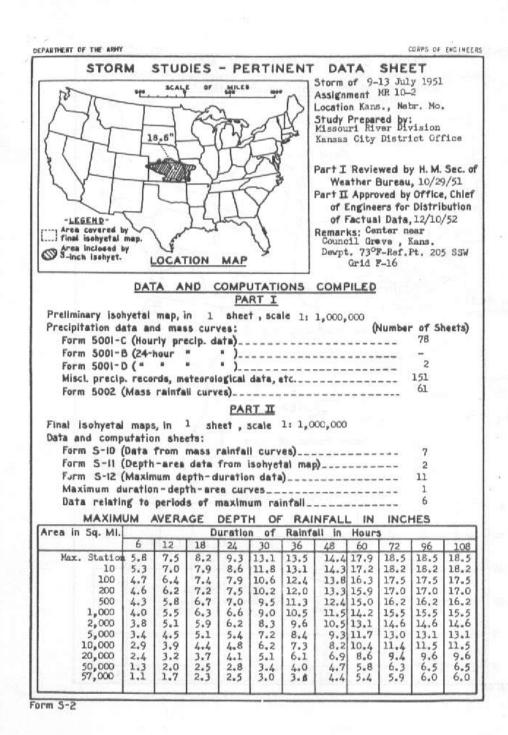
Council Grove, KS, AWA 38

July 9, 1951

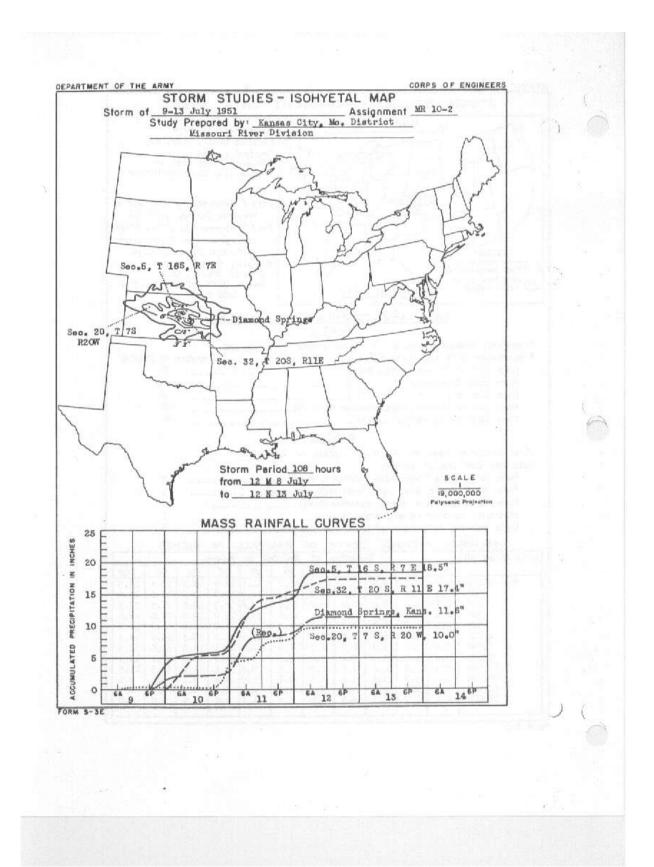
Storm Type: Frontal

Storm Name: MR 10-2-C Storm Date: 7/9-12/195	ouncil Grove 1	, АЭ		Storn	a Adine	tment f	or ANO	Grid Po	int 1	
WA Analysis Date: 12/15/2013				Storn	i Aujus	ішені і	or Arvo	Oliu I u	int 1	
emporal Transposition Date	15-Jul									
	Lat	Long			Moisture In	flow Direct	ion	SE @ 250	miles	
torm Center Location	38.66 N	96.49 W			Grid Point	Elevation		350	feet	
torm Rep Dew Point Location	36.05 N	93.32 W			Storm Cent	ter Elevation		1,150	feet	
ransposition Dew Point Location		89.23 W				Analysis Du		24	hours	
rid Point Location	35.31 N	93.23 W			Storm Kep	Allalysis Di	ii ation		nours	
The storm representative	dew point is	75.0 F	with total	precipitable	water above	sea level of			2.85	inches
The in-place maximum	dew point is	80.5 F	with total	precipitable	water above	sea level of			3.68	inches
The transpositioned maximum	dew point is	80.0 F	with total	precipitable	water above	sea level of			3.60	inches
The in-place storn	n elevation is	1,150	which	ch subtracts	0.29		f precipitabl		75.0 F	
The in-place storm		1,150		ch subtracts			f precipitabl		80.5 F	
The transposition basin				ch subtracts			f precipitabl		80.0 F	
The Grid Point/inflow bar	rier height is	1,000	whi	ch subtracts	0.29	inches o	f precipitabl	e water at	80.0 F	
										-
The in-place sto			1.30					-2. Storm repre		
The transposition/el			0.99			ilue was baseo 951 at KFSM		n 24-hr Td value KEIP	s between	1
The ba	arrier adjustm	ent factor is	1.00	-	July 2-10, 15	or at KE SIVI	, ar i v, and	and Lat .		1
TN	total adicat	ent foot:-	1.29							
Ine	total adjustm	ent ractor is	1.29	I .						4
Observed Comm. D. 1	Anne Description									
Observed Storm Depth	-Area-Durati 6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	5.3	7.0	7.9	8.6	11.8	13.1	48 Hours	17.2	18.2	
100 sq miles	4.7	6.4	7.4	7.9	10.6	12.4	13.8	16.3	17.5	
200 sq miles	4.6	6.2	7.2	7.5 7.5	10.0	12.0	13.3	15.9	17.0	1
500 sq miles	4.3	5.8	6.7	7.0	9.5	11.3	12.4	15.0	16.2	
1000 sq miles	4.0	5.5	6.3	6.6	9.0	10.5	11.5	14.2	15.5	
2000 sq miles	3.8	5.1	5.9	6.2	8.3	9.6	10.5	13.1	14.6	
5000 sq miles	3.4	4.5	5.1	5.4	7.2	8.4	9.3	11.7	13.0	"
10000 sq miles	2.9	3.9	4.4	4.8	6.2	7.3	8.2	10.4	11.4	
20000 sq miles	2.4	3.2	3.7	4.1	5.1	6.1	6.9	8.6	9.4	
Adjusted Storm Depth-	Area-Durati	o n								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	6.9	9.1	10.2	11.1	15.3	16.9	18.5	22.2	23.5	
100 sq miles	6.1	8.3	9.6	10.2	13.7	16.0	17.8	21.1	22.6	
200 sq miles	5.9	8.0	9.3	9.7	13.2	15.5	17.2	20.6	22.0	
500 sq miles	5.6	7.5	8.7	9.1	12.3	14.6	16.0	19.4	20.9	
1000 sq miles	5.2	7.1	8.1	8.5	11.6	13.6	14.9	18.4	20.0	
2000 sq miles	4.9	6.6	7.6	8.0	10.7	12.4	13.6	16.9	18.9	
5000 sq miles	4.4	5.8	6.6	7.0	9.3	10.9	12.0	15.1	16.8	
10000 sq miles	3.7	5.0	5.7	6.2	8.0	9.4	10.6	13.4	14.7	
20000 sq miles	3.1	4.1	4.8	5.3	6.6	7.9	8.9	11.1	12.2	4
Storm or Storm Center 1	Vame		MR 10-2-Cou	incil Grove	KS					1
Storm Date(s)	······		7/9-12/1951	Store,						1
Storm Type			General Stom	1						1
Storm Location			38.66 N	96.49 W						1
Storm Center Elevation			1150							
Precipitation Total & D	uration (10 so	ı mi)	18.2 Inches in	72-hours						
										1
Storm Representative D			75.0 F	24		_				1
Storm Representative D	Dew Point Loc	ation	36.05 N	93.32 W		J	A			-
Maximum Dew Point			80.5 F			80.4	80.1			1
Moisture Inflow Vector			SE @ 250							1
In-place Maximization F	actof		1.30							1
Temporal Transposition	n (Date)		15-Jul							1
Transposition Dew Poi	`		40.12 N	89.23 W						1
Transposition Maximum			80.0 F	07.23 W						1
Transposition Adjustm			0.99							1
Grid Point Elevation			350							1
	sin		14,344							1
Highest Elevation in Ba	ISHI									-
Highest Elevation in Ba Inflow Barrier Height	15111		1,000							1
			•							+
Inflow Barrier Height	actor		1,000							

Appendix F: Table F.80: Storm spreadsheet for Council Grove, KS July 9, 1951



Appendix F: Table F.81: Depth-area-duration values for Council Grove, KS July 9, 1951



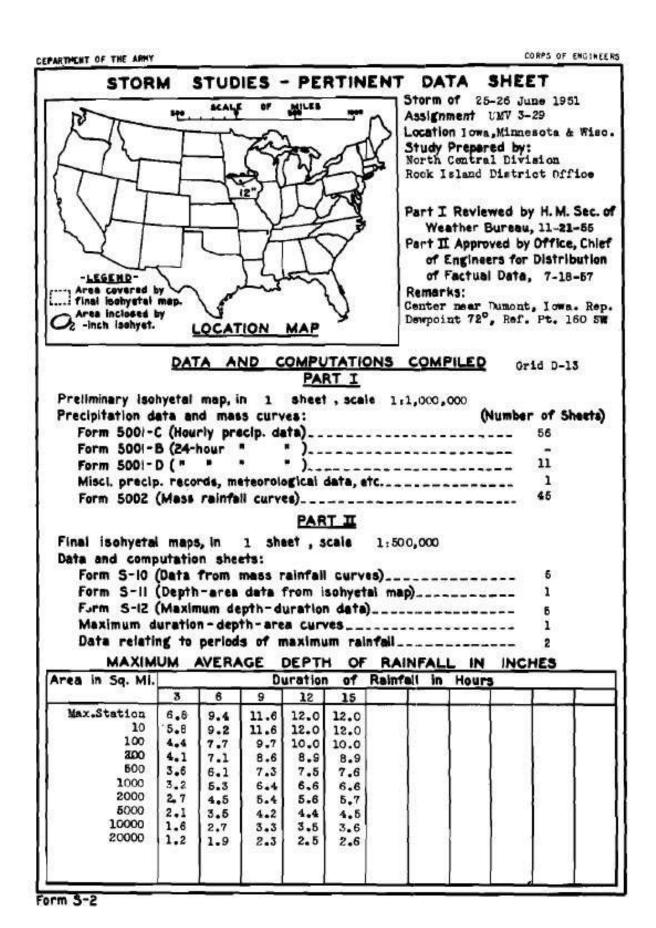
Appendix F: Figure F.107 and Figure F.108: Total storm isohyetal analysis and mass curve chart for Council Grove, KS July 9, 1951

Dumont, IA, AWA 39

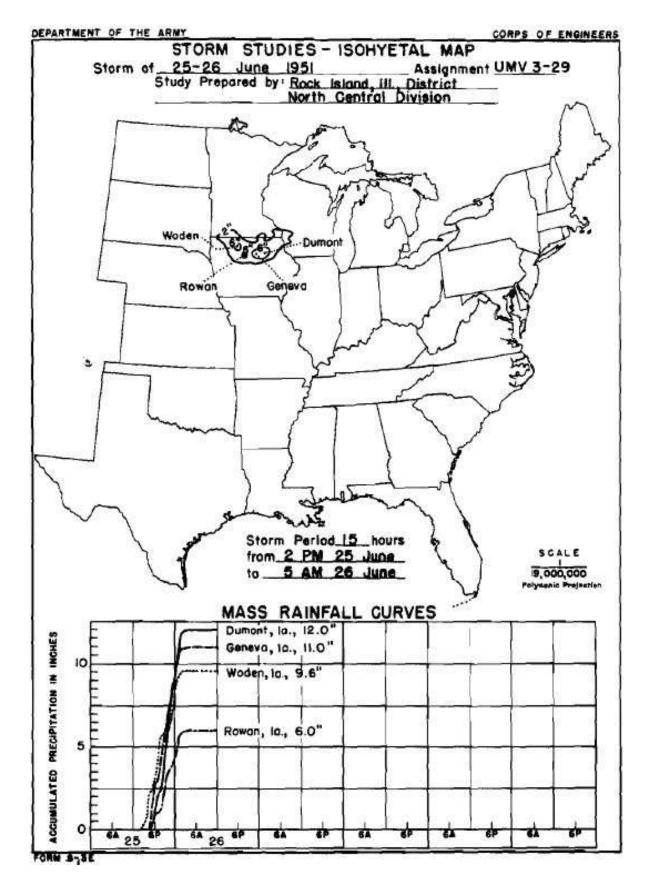
June 25, 1951 Storm Type: MCC

Storm Name: USACE UMV 3-29-Dumont, IA Storm Date: 25-Jun-1951				Storm Adjustment for ANO Grid Point 1							
WA Analysis Date: 12/15/2013				Storm	Aujust	шені іс	I ANO	GHu F	лис 1		
emporal Transposition Date	10-Jul										
	Lat	Long			Moisture II	nflow Direct	ion	SSW @ 25	miles		
torm Center Location	42.75 N	92.98 W			Grid Point	Elevation		350	feet		
torm Rep Dew Point Location 39.40 N		94.80 W			Storm Cen	ter Elevation	ı	1,000	feet		
ransposition Dew Point Location 39.36 N		94.33 W			Storm Rep	Analysis Du	ıration	6	hours		
rid Point Location	35.31 N	93.23 W			•	•					
								1	• • •		
The storm representative The in-place maximum	_	75.5 F 81.5 F			e water above sea level of e water above sea level of				2.92 3.84	inches	
The transpositioned maximum	-	81.5 F			e water above sea level of				3.84	inches	
The in-place storm	_	1,000	which subtracts				e water at	75.5 F			
The in-place storm elevation is		1,000	which subtracts		0.31 inches of precipitable			81.5 F			
The transposition basin elevation at		350	which subtracts		0.31	inches o	f precipitabl	e water at	81.5 F		
The Grid point/inflow barrier height is		1,000	whi	ch subtracts	0.31	inches o	f precipitabl	e water at	81.5 F		
The instance			1.00	1	Natara DAI	D1 41	C TIC A	CE IDAGE 2	0 64	1	
The in-place storm maximization The transposition/elevation to basin			1.33 1.00		Notes: DAD values taken from USACE UMV 3-29. S						
The transposition elevation to basin to The barrier adjustment f			1.00		representative Td value was based on maximum of values between June 25, 1951 at KSTJ, KMKC, ar						
The banici adjustilent		can ractor 15	1.00		values between suite 23, 1931 at KS13, KIVIKO,						
The	total adjustm	ent factor is	1.33								
Observed Storm Depth-	-Area-Durati 3 Hours	on 6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hours		
1 sq miles	6.8	9.4	12.10415	-	24 Hours -	-	-	-	- 12 Hours		
10 sq miles	5.8	9.2	12.0	-	-	-	-	-	-	1	
100 sq miles	4.4	7.7	10.0	-	-	-	-	-	-		
200 sq miles	4.1	7.1	8.9	-	-	-	-	-	-		
500 sq miles	3.6	6.1	7.5	-	-	-	-	-	-		
1000 sq miles	3.2	5.3	6.6	-	-	-	-	-	-		
5000 sq miles	2.1	3.5	4.4	-	-	-	-	-	-		
10000 sq miles	1.6 1.2	2.7 1.9	3.5 2.5	-	-	-	-	-	-		
20000 sq miles	1.2	1.9	2.5	-	-	<u> </u>	-	-	-	_	
Adjusted Storm Depth-	Area-Duratio	n									
	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hours		
1 sq miles	9.0	12.5	15.9	-	-	-	_	-	-		
10 sq miles	7.7	12.2	15.9	-	-	-	-	-	-		
100 sq miles	5.8	10.2	13.3	-	-	-	-	-	-		
200 sq miles 500 sq miles	5.4 4.8	9.4 8.1	11.8 10.0	-	-	-	-	-	-		
1000 sq miles	4.2	7.0	8.8	-	-	-	-	-	-		
5000 sq miles	2.8	4.6	5.8	-	-	-	-	-	-		
	2.1	3.6	4.6	-	-	-	-	-	-		
***************************************								<u> </u> ا			
10000 sq miles 20000 sq miles	1.6	2.5	3.3	-	-	-	-	-	-		
10000 sq miles			3.3	· ·	:	:	-	-	-		
10000 sq miles 20000 sq miles	1.6			-	-	:	-	-	-		
10000 sq miles 20000 sq miles Storm or Storm Center N	1.6		3.3 USACE UMV 25-Jun-1951	-	-	:	-	-	-		
10000 sq miles 20000 sq miles	1.6		USACE UMV	-	-	:	-	-	-		
10000 sq miles 20000 sq miles Storm or Storm Center N Storm Date(s)	1.6		USACE UMV 25-Jun-1951	-	-	:	-	-	-		
Storm or Storm Center N Storm Date(s) Storm Location Storm Center Elevation	1.6 Name		USACE UMV 25-Jun-1951 MCC 42.75 N 1,000	- 7 3-29-Dumo 92.98 W	nt, IA	-	-	-			
Storm Or Storm Center N Storm Date(s) Storm Type Storm Location	1.6 Name		USACE UMV 25-Jun-1951 MCC 42.75 N	- 7 3-29-Dumo 92.98 W	nt, IA	-	-	-	-		
Storm or Storm Center N Storm Date(s) Storm Location Storm Center Elevation	1.6		USACE UMV 25-Jun-1951 MCC 42.75 N 1,000	- 7 3-29-Dumo 92.98 W	nt, IA	-	-	-	-		
Storm Or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr	1.6 Name uration	2.5	USACE UMV 25-Jun-1951 MCC 42.75 N 1,000 12.00 Inches	7 3-29-Dumo 92.98 W 6-hours USA	nt, IA	-	Jul	-	-		
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point	1.6 Name uration ew Point	2.5	USACE UMV 25-Jun-1951 MCC 42.75 N 1,000 12.00 Inches	7 3-29-Dumo 92.98 W 6-hours USA	nt, IA	29		-	-		
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector	1.6 Name uration New Point	2.5	USACE UMV 25-Jun-1951 MCC 42.75 N 1,000 12.00 Inches 75.5 F 39.40 N 81.5 F SSW @ 250	7 3-29-Dumo 92.98 W 6-hours USA 6 94.80 W	nt, IA	- 29 Jun	Jul	-	-		
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point	1.6 Name uration New Point	2.5	USACE UMV 25-Jun-1951 MCC 42.75 N 1,000 12.00 Inches 75.5 F 39.40 N 81.5 F	7 3-29-Dumo 92.98 W 6-hours USA 6 94.80 W	nt, IA	- 29 Jun	Jul	-	-		
Storm Ostorm Center N Storm Date(s) Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Dew Point Moisture Inflow Vector In-place Maximization F	1.6 Name Pew Point Dew Point Locator	2.5	USACE UMV 25-Jun-1951 MCC 42.75 N 1,000 12.00 Inches 75.5 F 39.40 N 81.5 F SSW @ 250 1.33	7 3-29-Dumo 92.98 W 6-hours USA 6 94.80 W	nt, IA		Jul 82.5		-		
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F	1.6 Name Pew Point Local Poi	2.5	USACE UMV 25-Jun-1951 MCC 42.75 N 1,000 12.00 Inches 75.5 F 39.40 N 81.5 F SSW @ 250 1.33	7 3-29-Dumo 92.98 W 6-hours USA 6 94.80 W Miles	nt, IA	- 29 Jun 79	Jul 82.5	-	-		
Storm Or Storm Center N Storm Date(s) Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Dew Point Moisture Inflow Vector In-place Maximization F	1.6 Name Point Location (Date) Int Location	2.5	USACE UMV 25-Jun-1951 MCC 42.75 N 1,000 12.00 Inches 75.5 F 39.40 N 81.5 F SSW @ 250 1.33	7 3-29-Dumo 92.98 W 6-hours USA 6 94.80 W	nt, IA		Jul 82.5		-		
Storm Or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Point	Name Dew Point Location (Date) Int Location Dew Point Location Dew Point	2.5	USACE UMV 25-Jun-1951 MCC 42.75 N 1,000 12.00 Inches 75.5 F 39.40 N 81.5 F SSW @ 250 1.33	7 3-29-Dumo 92.98 W 6-hours USA 6 94.80 W Miles	nt, IA	- 29 Jun 79	Jul 82.5		-		
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Poin Transposition Maximum	Name Dew Point Location (Date) Int Location Dew Point Location Dew Point	2.5	USACE UMV 25-Jun-1951 MCC 42.75 N 1,000 12.00 Inches 75.5 F 39.40 N 81.5 F SSW @ 250 1.33 10-Jul 39.36 N 81.5 F 1.00	7 3-29-Dumo 92.98 W 6-hours USA 6 94.80 W Miles	nt, IA	- 29 Jun 79	Jul 82.5				
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum Transposition Adjustme Grid Point Elevation Highest Elevation in Ba	Name Dew Point Location In (Date) In Dew Point Location In Dew Point Location In Dew Point Location Location Location Location Location	2.5	USACE UMV 25-Jun-1951 MCC 42.75 N 1,000 12.00 Inches 75.5 F 39.40 N 81.5 F SSW @ 250 1.33 10-Jul 39.36 N 81.5 F 1.00 350	7 3-29-Dumo 92.98 W 6-hours USA 6 94.80 W Miles	nt, IA	- 29 Jun 79	Jul 82.5		-		
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Poin Transposition Maximum Transposition Adjustm Grid Point Elevation	1.6 Name Dew Point Dew Point Location In (Date) In Location In Dew Point In Textor In Coation In Dew Point In Textor In Coation In Textor In Coation In Dew Point In Textor In Coation	2.5	USACE UMV 25-Jun-1951 MCC 42.75 N 1,000 12.00 Inches 75.5 F 39.40 N 81.5 F SSW @ 250 1.33 10-Jul 39.36 N 81.5 F 1.00	7 3-29-Dumo 92.98 W 6-hours USA 6 94.80 W Miles	nt, IA	- 29 Jun 79	Jul 82.5				

Appendix F: Table F.82: Storm spreadsheet for Dumont, IA June 25, 1951



Appendix F: Table F.83: Depth-area-duration chart for Dumont, IA June 25, 1951



Appendix F: Figure F.109 and Figure F.110: Total storm isohyetal and Mass curve chart for Dumont, IA June 25, 1951

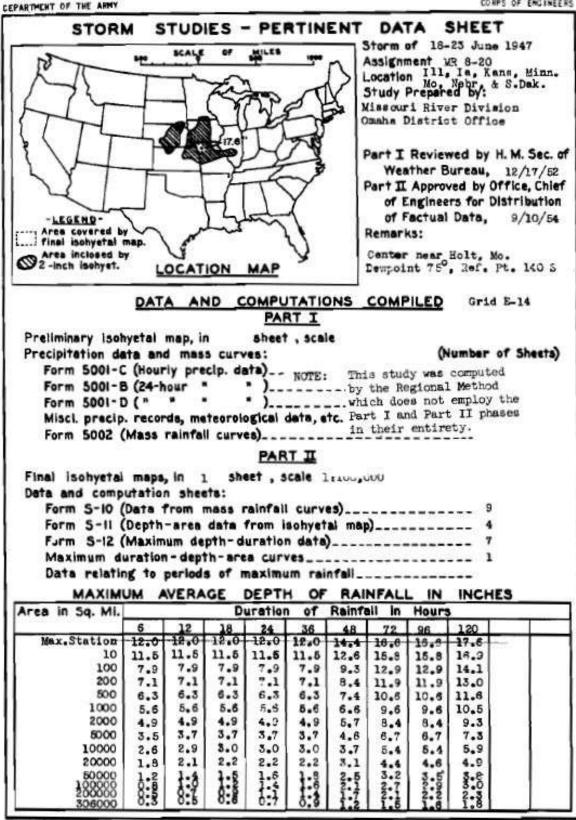
Holt, MO, AWA 40

June 18, 1947 Storm Type: MCC

	R 8-20-Holt, N	10		Store	. A diss.	tmont f	on ANO	Crid Da	int 1	
orm Date: 6/18-22/19 WA Analysis Date: 12/15/2013				Storn	ı Aajus	tment 1	or ANO	Grid Po	int 1	
mporal Transposition Date	5-Jul									
	Lat	Long			Moisture I	nflow Direct	ion	SSW @ 230	miles	
orm Center Location	39.45 N	94.34 W			Grid Point	Elevation		350	feet	
orm Rep Dew Point Location	36.18 N	95.25 W			Storm Center Elevation			1,000	feet	
ansposition Dew Point Location	39.46 N	93.53 W				p Analysis Duration		6	hours	
id Point Location	35.31 N	93.23 W				,				
Th	4	70.0 F				1 1	d		3.44	inches
The storm representative The in-place maximum	•	79.0 F 81.5 F		precipitable precipitable					3.84	inches
The transpositioned maximum	•	81.0 F		precipitable					3.76	inches
The in-place stom	-	1,000		ch subtracts			f precipitabl	e water at	79.0 F	
The in-place stom	n elevation is	1,000	whi	ch subtracts	0.30		f precipitabl		81.5 F	
The transposition basin	n elevation at	350	whi	ch subtracts	0.30	inches o	f precipitabl	e water at	81.0 F	
The Grid point/inflow bar	mier height is	1,000	whi	ch subtracts	0.30	inches o	f precipitabl	e water at	81.0 F	
The in other st		: 64:-	1.12	1	Notes: DAI	D vialuas tals	on from TTC A	CE MD 0 20 1	cami	1
The in-place sto The transposition/el			0.98		Notes: DAD values taken from USACE MR 8-20, 1sqmi amount taken from Holt, MO world record rainfall within the					
•	arrier adjustm		1.00					Td value was		
The be			1100		maximum 6-			ne 22-23, 1947		
The	The total adjustment factor				and KTUL.					
Observed Storm Depth	-Area Durati	on								
Ouscried Storm Depth	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	12.0	12.0	12.0	12.0	-	12.0	14.4	-	16.6	1
10 sq miles	11.5	11.5	11.5	11.5	-	11.5	12.6	-	15.8	
100 sq miles	7.9	7.9	7.9	7.9	-	7.9	9.3	-	12.9	
200 sq miles	7.1	7.1	7.1	7.1	-	7.1	8.4	-	11.9	
500 sq miles	6.3	6.3	6.3	6.3	-	6.3	7.4	-	10.6	
1000 sq miles	5.6	5.6	5.6	5.6	-	5.6	6.6	-	9.6	
5000 sq miles	3.5	3.7	3.7	3.7 3.0	-	3.7	4.6	-	6.7	
10000 sq miles 20000 sq miles	2.6 1.8	2.9 2.1	2.2	2.2	-	3.0 2.2	3.7 3.1	-	5.4 4.4	1
Adjusted Storm Depth-	·		40.77		20.77		10.77		72.11	
1 sq miles	6 Hours 13.1	12 Hours 13.1	18 Hours 13.1	24 Hours 13.1	30 Hours	36 Hours 13.1	48 Hours 15.8	60 Hours	72 Hours 18.2	
10 sq miles	12.6	12.6	12.6	12.6	<u>-</u>	12.6	13.8	-	17.3	
100 sq miles	8.7	8.7	8.7	8.7	-	8.7	10.2	_	14.1	
200 sq miles	7.8	7.8	7.8	7.8	-	7.8	9.2	-	13.0	
500 sq miles	6.9	6.9	6.9	6.9	-	6.9	8.1	-	11.6	
1000 sq miles	6.1	6.1	6.1	6.1	-	6.1	7.2	-	10.5	
5000 sq miles	3.8	4.1	4.1	4.1	-	4.1	5.0	-	7.3	
				*		·				
10000 sq miles	2.8	3.2	3.3	3.3	-	3.3	4.1	-	5.9	1
10000 sq miles 20000 sq miles	2.8 2.0	3.2 2.3	3.3 2.4	3.3 2.4		·	4.1 3.4	-	5.9 4.8	
		b			-	3.3	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
20000 sq miles Storm or Storm Center	2.0	2.3	2.4 USACE MR 8	2.4	-	3.3	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
20000 sq miles Storm or Storm Center I Storm Date(s)	2.0	2.3	2.4 USACE MR 8 6/18-22/1947	2.4	-	3.3	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type	2.0	2.3	2.4 USACE MR 8 6/18-22/1947 MCC	2.4 3-20-Holt, M	-	3.3	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
20000 sq miles Storm or Storm Center I Storm Date(s)	2.0 Name	2.3	2.4 USACE MR 8 6/18-22/1947	2.4	-	3.3	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type Storm Location	2.0 Name	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N	2.4 3-20-Holt, M 94.34 W	0	3.3 2.4	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation	Name Ouration	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000	2.4 3-20-Holt, M 94.34 W	0	3.3 2.4	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
Storm Or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	Name Puration Dew Point	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000 17.6 Inches 6	2.4 3-20-Holt, M 94.34 W -hours USA(0	3.3 2.4	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Storm Representative E Maximum Dew Point	Name Duration Dew Point Dow Point Loc	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000 17.6 Inches 6	2.4 3-20-Holt, M 94.34 W -hours USA(0	3.3 2.4	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Storm Representative E Maximum Dew Point Moisture Inflow Vector	Name Duration Dew Point Locur	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000 17.6 Inches 6 79.0 F 36.18 N 81.5 F SSW @ 230	2.4 3-20-Holt, M 94.34 W -hours USA(6 95.25 W	0	3.3 2.4	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Storm Representative E Maximum Dew Point	Name Duration Dew Point Locur	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000 17.6 Inches 6 79.0 F 36.18 N 81.5 F	2.4 3-20-Holt, M 94.34 W -hours USA(6 95.25 W	0	3.3 2.4	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Storm Representative E Maximum Dew Point Moisture Inflow Vector	2.0 Name Duration Dew Point Loc r Factor	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000 17.6 Inches 6 79.0 F 36.18 N 81.5 F SSW @ 230	2.4 3-20-Holt, M 94.34 W -hours USA(6 95.25 W	0	3.3 2.4	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
Storm Or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I	Name Duration Dew Point Loc r Factor n (Date)	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000 17.6 Inches 6 79.0 F 36.18 N 81.5 F SSW @ 230 1.12	2.4 3-20-Holt, M 94.34 W -hours USA(6 95.25 W	0	3.3 2.4	• • • • • • • • • • • • • • • • • • • •	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum	Name Description Description Description Factor In (Date) Int Location In Description In Description	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000 17.6 Inches 6 79.0 F 36.18 N 81.5 F SSW @ 230 1.12 5-Jul 39.46 N 81.0 F	2.4 3-20-Holt, M 94.34 W 2-hours USA(6 95.25 W Miles	0	3.3	3.4	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm	Name Description Description Description Factor In (Date) Int Location In Description In Description	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000 17.6 Inches 6 79.0 F 36.18 N 81.5 F SSW @ 230 1.12 5-Jul 39.46 N 81.0 F 0.98	2.4 3-20-Holt, M 94.34 W 2-hours USA(6 95.25 W Miles	0	3.3 2.4 June	July	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm Grid Point Elevation	Name Duration Dew Point Dow Point Location In (Date) Int Location In Dew Point Dew Point Location Dew Point	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000 17.6 Inches 6 79.0 F 36.18 N 81.5 F SSW @ 230 1.12 5-Jul 39.46 N 81.0 F 0.98 350	2.4 3-20-Holt, M 94.34 W 2-hours USA(6 95.25 W Miles	0	3.3 2.4 June	July	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	Name Duration Dew Point Dow Point Location In (Date) Int Location In Dew Point Dew Point Location Dew Point	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000 17.6 Inches 6 79.0 F 36.18 N 81.5 F SSW @ 230 1.12 5-Jul 39.46 N 81.0 F 0.98 350 14,344	2.4 3-20-Holt, M 94.34 W 2-hours USA(6 95.25 W Miles	0	3.3 2.4 June	July	<u> </u>		
Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm Grid Point Elevation	Name Puration Dew Point Loc r Factor in (Date) int Location m Dew Point ment Factor	2.3	2.4 USACE MR 8 6/18-22/1947 MCC 39.45 N 1,000 17.6 Inches 6 79.0 F 36.18 N 81.5 F SSW @ 230 1.12 5-Jul 39.46 N 81.0 F 0.98 350	2.4 3-20-Holt, M 94.34 W 2-hours USA(6 95.25 W Miles	0	3.3 2.4 June	July	<u> </u>		

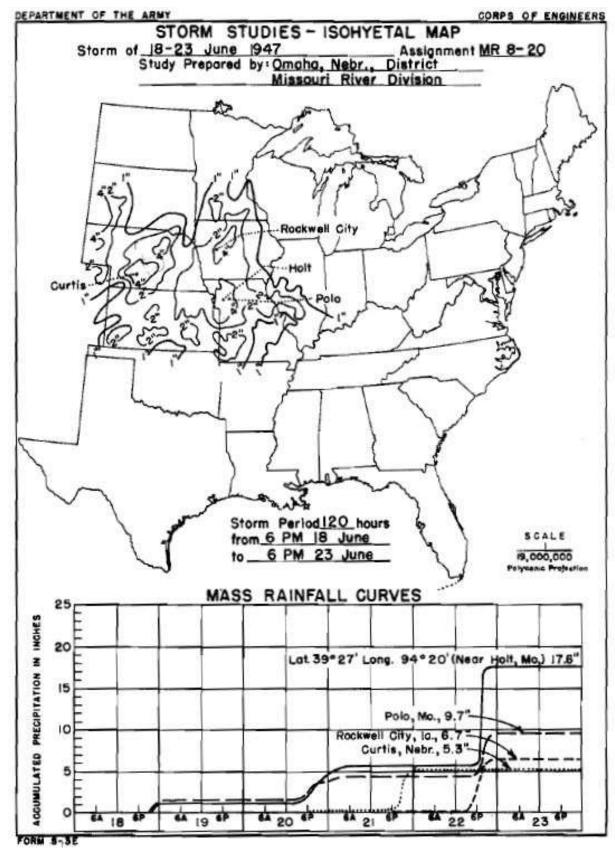
Appendix F: Table F.84: Storm spreadsheet for Holt, MO June 18, 1947





Form 5-2

Appendix F: Table F.85: Depth-area-duration chart for Holt, MO June 18, 1947



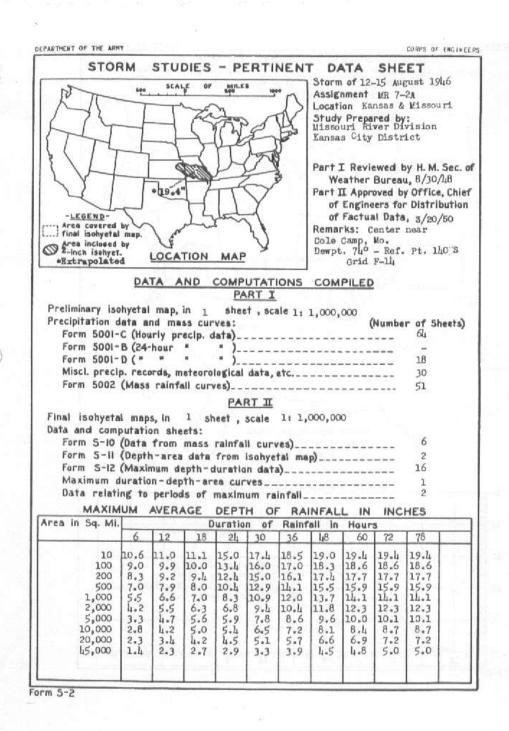
Appendix F: Figure F.111 and Figure F.112: Total storm isohyetal and Mass curve chart for Holt, MO June 1947

Cole Camp, MO, AWA 41

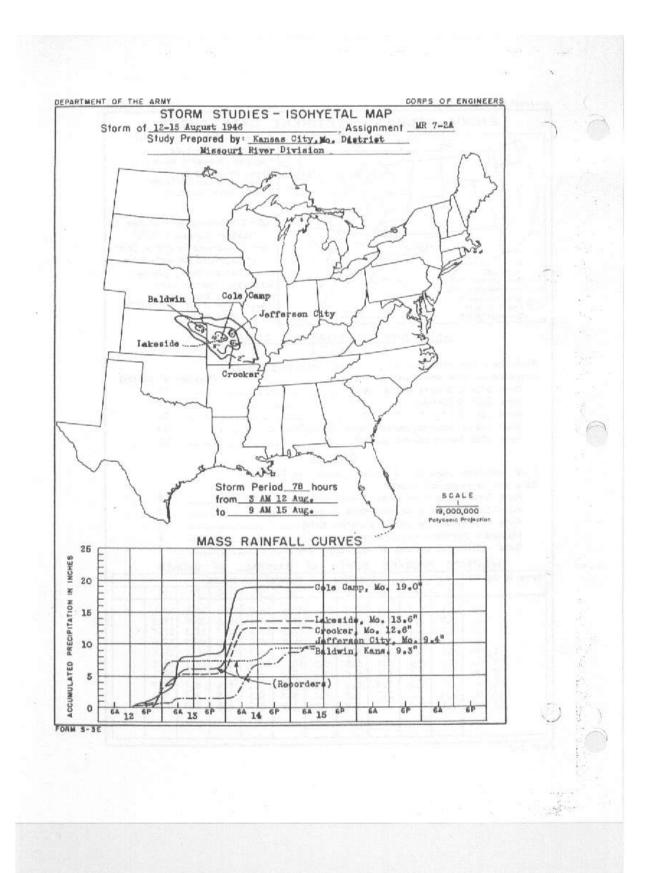
August 12, 1946 Storm Type: Frontal

Storm Name: Storm Date:	USACE MR 8/12-15/19		Camp, MC		Storm A	Adinetr	nent fo	r ANO	Grid Pa	nint 1	
	Date: 12/15/2013			•	Storm 2	Aujusti	пент то	ANO	Giiu I (mit 1	
	sposition Date	1-Aug									
		Lat	Long			Moisture I	nflow Direc	tion	S @ 410	miles	
torm Center I	ocation	38.46 N	93.20 W			Grid Point	Elevation		350	feet	
	Point Location	32.55 N	93.00 W			Storm Cen	iter Elevatio	n	1,000	feet	
•	Dew Point Location		92.37 W				Analysis D		24	hours	
rid Point Loc		35.31 N	93.23 W				,				
The sto	m representative d	ew point is	76.0 F	with total p	recipitable w	vater above	sea level of			2.99	inches
The	in-place maximum d	ew point is	80.5 F	with total p	recipitable w	vater above	sea level of			3.68	inches
_	sitioned maximum d	_	80.5 F		recipitable w					3.68	inches
	The in-place storm		1,000		ch subtracts			f precipitabl		76.0 F	
	The in-place storm		1,000 350		ch subtracts ch subtracts	0.29		f precipitabl		80.5 F 80.5 F	
	ansposition storm e d Point/inflow barri		1,000		ch subtracts			f precipitabl f precipitabl		80.5 F	
THE OIL	d Foliic lilliow Dalli	er neight is	1,000	WIII	cii subtracts	0.30	miches o	i precipitati	e water at	00.3 F	
	The in-place	o mavimizati	on factor is	1.24	1	Notes: DAI	D values take	n from HMR	51 DAD Table	Storm	1
	•	transpositi							representative		
	The elevation/barr	-			1				values betwee:	n August 10-	
		-,				11, 1946 at	KBAD and K	MLU.			
	The to	tal adjustme	nt factor is	1.24		L					
Obs	erved Storm Depth	-Area-Dura	tion								
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	10.6	11.0	11.1	15.0	17.4	18.5	19.0	19.4	19.4	
	100 sq miles	9.0	9.9	10.0	13.4	16.0	17.0	18.3	18.6	18.6	
	200 sq miles	8.3	9.2	9.4	12.4	15.0	16.1	17.4	17.7	17.7	
	500 sq miles	7.0	7.9	8.0	10.4	12.9	14.1	15.5	15.9	15.9	
	1000 sq miles	5.5 4.2	6.6 5.5	7.0 6.3	8.3 6.8	10.9 9.4	12.0 10.4	13.7 11.8	14.1 12.3	14.1 12.3	
	2000 sq miles 5000 sq miles	3.3	4.7	5.6	5.9	7.8	8.6	9.6	10.0	10.1	
	10000 sq miles	2.8	4.2	5.0	5.4	6.5	7.2	8.1	8.4	8.7	1
	20000 sq miles	2.3	3.4	4.2	4.5	5.1	5.7	6.6	6.9	7.2	
	•										
Adj	usted Storm Depth-	Area-Dura	tion								
	•	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	13.1	13.6	13.7	18.6	21.5	22.9	23.5	24.0	24.0	
	100 sq miles	11.1	12.3	12.4	16.6	19.8	21.0	22.7	23.0	23.0	
	200 sq miles	10.3	11.4	11.6	15.4	18.6	19.9	21.5	21.9	21.9	
	500 sq miles	8.7	9.8	9.9	12.9	16.0	17.5	19.2	19.7	19.7	
	1000 sq miles 2000 sq miles	6.8 5.2	8.2 6.8	8.7 7.8	10.3 8.4	13.5 11.6	14.9 12.9	17.0 14.6	17.5 15.2	17.5 15.2	1
	5000 sq miles	4.1	5.8	6.9	7.3	9.7	10.6	11.9	12.4	12.5	
	10000 sq miles	3.5	5.2	6.2	6.7	8.0	8.9	10.0	10.4	10.8	1
	20000 sq miles	2.8	4.2	5.2	5.6	6.3	7.1	8.2	8.5	8.9	
Sto	m or Storm Center l	Name		USACE MR 7-2	2A-Cole Car	np, MO					
	m Date(s)			8/12-15/1946							
	m Type			General Storm							1
	m Location			38.46 N	93.20 W						1
	m Center Elevation		>	1000	60.1						-
Pre	cipitation Total & D	uration (10	sq mı)	19.40 Inches in	ou-hours						1
Stor	m Representative D)ew Point		76.0 F	24						1
	m Representative L m Representative D		ocation	32.55 N	93.00 W		Jul	Aug			1
	simum Dew Point	J. I VAIL D		80.5 F	22.00 11		80.5	80			1
	isture Inflow Vector	r		S @ 410			<u> </u>				1
In-p	lace Maximization I	Factor		1.24							
	poral Transposition			1-Aug							
	nsposition Dew Poi			36.82 N	92.37 W		Jul	Aug			1
	nsposition Maximur		ıt	80.5 F			80.5	80.5			1
	nsposition Adjustm	ent Factor		250							1
	l Point Elevation hest Elevation in Ba	sein		350 14,344							1
nig	nest Elevation in Ba ow Barrier Height	10111		1,000							1
Infl				2,000							
	vation Adjustment I	actor		1.00							

Appendix F: Table F.86: Storm spreadsheet for Cole Camp, MO August 12, 1946



Appendix F: Table F.87: Depth-area-duration values for Cole Camp, MO August 12, 1946



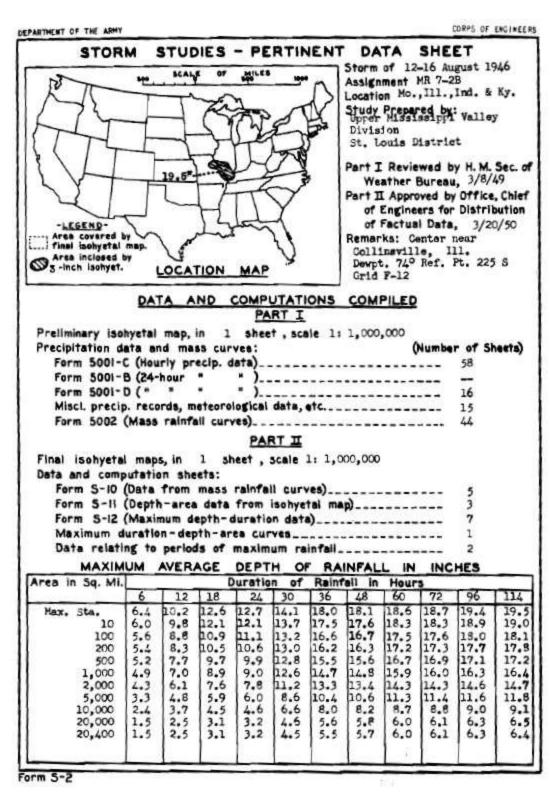
Appendix F: Figure F.113 and Figure F.114: Isohyetal map and mass curve chart for Cole Camp, MO August 12, 1946

Collinsville, IL, AWA 42

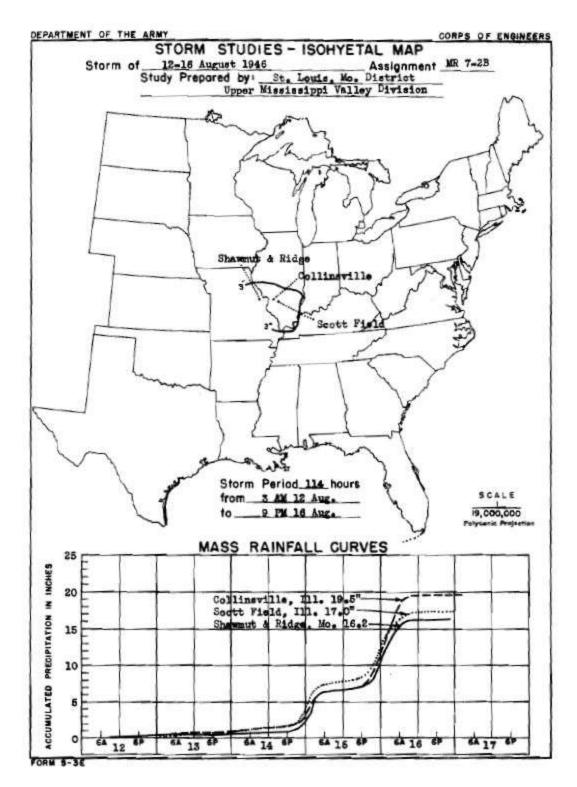
August 12, 1946 Storm Type: Frontal

torm Date: 8/12-15/19		insville, IL		Storm Adjustment for ANO Grid Point 1							
WA Analysis Date: 12/15/201	3			1							
emporal Transposition Date	1-Aug										
	Lat	Long				nflow Direc	tion	SSW @ 455	miles		
torm Center Location	38.67 N	89.98 W			Grid Point			350	feet		
torm Rep Dew Point Location	32.55 N	93.00 W			Storm Cen	iter Elevatio	n	500	feet		
ransposition Dew Point Location		95.75 W			Storm Rep	Analysis D	Ouration	24	hours		
rid Point Location	35.31 N	93.23 W									
The storm represer	tative Td is	76.0 F	with total t	orecipitable v	vater above	sea level of	,		2.99	inches	
The in-place ma		80.5 F		orecipitable v					3.68	inches	
The transpositioned ma		80.0 F		orecipitable v					3.60	inches	
The in-place storm	elevation is	500	whi	ich subtracts	0.13	inches of	f precipitabl	e water at	76.0 F		
The in-place storm	elevation is	500	whi	ich subtracts	0.16	inches of	f precipitabl	e water at	80.5 F		
The transposition storm	elevation at	350	whi	ich subtracts	0.29	inches of	f precipitabl	e water at	80.0 F		
The Grid Point/inflow barr	ier height is	1,000	whi	ich subtracts	0.29	inches of	f precipitabl	e water at	80.0 F		
					Matana DAI	D 1 1	ID /D	61 DAD T-11- 0	T-1	-	
	e maximizati		1.23					51 DAD Table St entative dew poin			
	e transpositi							ween August 10-1			
The elevation/bar	ner adjustme	ant ractor is	1.00	1	KBAD and I			-			
The to	otal adjustme	nt factor is	1.16	1	İ						
	,										
Observed Storm Dept	Ÿ										
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours		
1 sq miles	\$	10.2	12.6	12.7	14.1	18.0	18.1	18.6	18.7	1	
10 sq miles		9.8	12.1	12.1	13.7	17.5	17.6	18.3	18.3	1	
100 sq miles	\$	8.8	10.9	11.1	13.2	16.6	16.7	17.5	17.6		
200 sq miles		8.3 7.7	10.5 9.7	10.6 9.9	13.0 12.8	16.2	16.3	17.2 16.7	17.3 16.9	-	
500 sq miles 1000 sq miles	\$	7.0	8.9	9.0	12.6	15.5 14.7	15.6 14.8	15.9	16.0		
2000 sq miles		6.1	7.6	7.8	11.2	13.3	13.4	14.3	14.3		
5000 sq miles		4.8	5.9	6.0	8.6	10.4	10.6	11.3	11.4		
10000 sq miles		3.7	4.5	4.6	6.6	8.0	8.2	8.7	8.8		
20000 sq miles	\$	2.5	3.1	3.2	4.6	5.6	5.8	6.0	6.1		
Adjusted Storm Depth	-Area-Dura 6 Hours	tion 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours		
1 sq miles	÷	11.8	14.6	14.7	16.3	20.8	20.9	21.5	21.6		
10 sq miles		11.3	14.0	14.0	15.9	20.3	20.4	21.2	21.2	1	
100 sq miles	•	10.2	12.6	12.8	15.3	19.2	19.3	20.3	20.4		
200 sq miles		9.6	12.2	12.3	15.0	18.7	18.9	19.9	20.0	1	
500 sq miles	6.0	8.9	11.2	11.5	14.8	17.9	18.1	19.3	19.6		
1000 sq miles	5.7	8.1	10.3	10.4	14.6	17.0	17.1	18.4	18.5		
2000 sq miles		7.1	8.8	9.0	13.0	15.4	15.5	16.6	16.6		
5000 sq miles	·	5.6	6.8	6.9	10.0	12.0	12.3	13.1	13.2		
10000 sq miles		4.3	5.2	5.3	7.6	9.3	9.5	10.1	10.2		
20000 sq miles	1.7	2.9	3.6	3.7	5.3	6.5	6.7	6.9	7.1		
Storm or Storm Center	Name		USACE MR 7-	2B-Collinsv	ille, IL						
Storm Date(s)			8/12-15/1946								
Storm Type			General Storm								
Storm Location			38.67 N	89.98 W						1	
Storm Center Elevation		>	500	73.1						1	
Precipitation Total & I	ouration (10	sq mı)	18.7 Inches in	/2-nours						1	
Storm Representative	Dew Point		76.0 F	24						1	
Storm Representative		ocation	32.55 N	93.00 W		Jul	Aug				
Maximum Dew Point			80.5 F			80.5	80				
Moisture Inflow Vector			SSW @ 455							1	
In-place Maximization	Factor		1.23							-	
Temporal Transposition	n (Date)		1-Aug							1	
Transposition Dew Po			36.61 N	95.75 W		Jul	Aug			1	
Transposition Maximu			80.0 F			80	80			1	
Transposition Adjustr			0.94								
			350								
Grid Point Elevation											
Grid Point Elevation Highest Elevation in B	asin		14,344								
Grid Point Elevation			14,344 1,000 1.00								

Appendix F: Table F.88: Storm spreadsheet for Collinsville, IL August 12, 1946



Appendix F: Table F.89: Depth-area-duration values for Collinsville, IL August 12, 1946



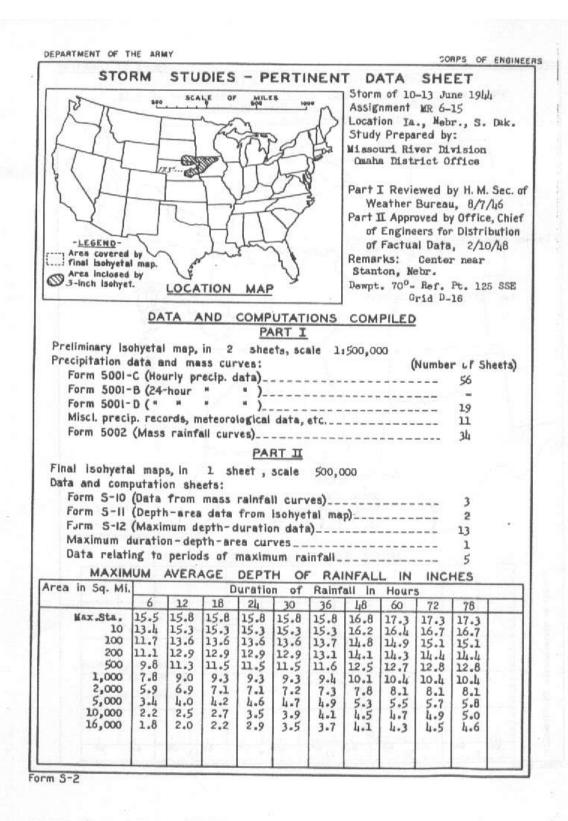
Appendix F: Figure F.115 and Figure F.116: Isohyetal map and mass curve chart for Collinsville, IL August 12, 1946

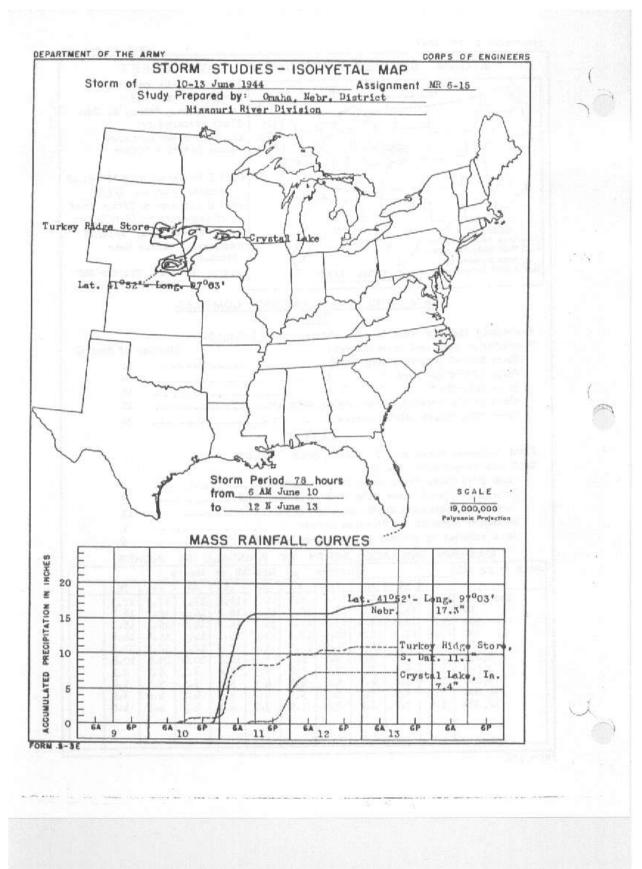
Stanton, NE, AWA 43

June 10, 1944 Storm Type: MCC

Storm Name: USACE ME Storm Date: 6/10-11/19	R-6-15-Stanto	on, NE		Storm	n Adina	tment f	or ANO	Grid Po	int 2	
WA Analysis Date: 12/15/2013				Storn	n Aujus	ишени і	OI AINO	GHu F	mt 2	
emporal Transposition Date	25-Jun									
	Lat	Long			Moisture I	nflow Direct	ion	SSW @ 530	miles	
torm Center Location	41.87 N	97.05 W			Grid Point	Elevation		550	feet	
torm Rep Dew Point Location	34.40 N	99.50 W			Storm Cen	ter Elevation	1	1,700	feet	
ransposition Dew Point Location	35.25 N	95.02 W			Storm Rep	Analysis D	uration	6	feet	
rid Point Location	34.50 N	95.50 W								
The storm representative	dew point is	76.0 F	with tot	al precipitable	e water ahov	ve sea level (of		2.99	inches
The in-place maximum				al precipitable					3.60	inches.
The transpositioned maximum	•			al precipitabl					3.68	inches
The in-place storn	n elevation is	1,700	whi	ich subtracts	0.43	inches o	of precipitabl	e water at	76.0 F	
The in-place stom				ich subtracts			of precipitabl		80.0 F	
The transposition basis				ich subtracts ich subtracts			of precipitabl of precipitabl		80.5 F 80.5 F	
The Grid point/inflow ba	mer neight is	1,000	WII	ich subtracts	0.30	miches c	n precipitabl	e water at	1 6.00	
The in-place st	orm maximizat	ion factor is	1.22	1	Notes: DA	D values tal	en from USA	ACE Storm Stu	dies MR 6-	1
The transposition/e			1.08		15. Storm r	representativ	e Td value v	was based on r	naximum 6-	
The b	arrier adjustm	ent factor is	1.00		•		une 10, 1944	at mid-point of	fKCDS,	
			,		KLTS and I	KFDR.				L
The	total adjustm	ent factor is	1.32		<u> </u>					<u> </u>
Observed Storm Depth	-Area-Durat	ion								
озстан зотт Бери	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	15.5	15.8	15.8	15.8	15.8	15.8	16.8	17.3	17.3	
10 sq miles	13.4	15.3	15.3	15.3	15.3	15.3	16.2	16.4	16.7	
100 sq miles	11.7	13.6	13.6	13.6	13.6	13.7	14.8	14.9	15.1	
200 sq miles	•	12.9	12.9	12.9	12.9	13.1	14.1	14.3	14.4	
500 sq miles		11.3 9.0	11.5 9.3	11.5	11.5	11.6	12.5 10.1	12.7 10.4	12.8 10.4	-
1000 sq miles 2000 sq miles	7.8 5.9	6.9	7.1	9.3 7.1	9.3 7.2	9.4 7.3	7.8	8.1	8.1	
5000 sq miles		4.0	4.2	4.6	4.7	4.9	5.3	5.5	5.7	
10000 sq miles		2.5	2.7	3.5	3.9	4.1	4.5	4.7	4.9	
20000 sq miles	-	-	-	-	-	-	-	-	-	
Adjusted Storm Depth	-Area-Durati 6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	20.4	20.8	20.8	20.8	20.8	20.8	22.2	22.8	22.8	
10 sq miles	17.7	20.2	20.2	20.2	20.2	20.2	21.4	21.6	22.0	
100 sq miles	15.4	17.9	17.9	17.9	17.9	18.1	19.5	19.7	19.9	
200 sq miles		17.0	17.0	17.0	17.0	17.3	18.6	18.9	19.0	
500 sq miles	¢	14.9	15.2	15.2	15.2	15.3	16.5	16.7	16.9	
1000 sq miles 2000 sq miles	10.3 7.8	11.9 9.1	12.3 9.4	12.3 9.4	12.3 9.5	12.4 9.6	13.3 10.3	13.7 10.7	13.7 10.7	1
5000 sq miles	¢	5.3	5.5	6.1	6.2	6.5	7.0	7.3	7.5	
10000 sq miles		3.3	3.6	4.6	5.1	5.4	5.9	6.2	6.5	
20000 sq miles	-	-	-	-	-	-	-	-	-	
Storm or Storm Center	Name		USACE MR	-6-15-Stanto	n. NE					1
Storm Date(s)			6/10-11/1944							
Storm Type			MCC							
Storm Location			41.87 N	97.05 W						1
Storm Center Elevation Precipitation Total & D			1,700 17.3 Inches	60-hours US	ACE Storm	Studies MP	6-15			1
1100phadon 10tal & D	auvii		-/ mones	-110dis 05	LOD STORM	Junes Will				1
Storm Representative 1			76.0 F	6						
Storm Representative 7	d Location		34.40 N	99.50 W						
Maximum Td			80.0 F							1
Moisture Inflow Vector In-place Maximization I			SSW @ 530 1.22	1						1
Proce Manufacturi										1
•			25-Jun							
Temporal Transpositio						June	July			
Transposition Td Loca	ation		35.25 N	95.02 W						
Transposition Td Loca Transposition Maximus	ation m Td		80.5 F	95.02 W		79.5	82.5			
Transposition Td Loca Transposition Maximus Transposition Adjustm	ation m Td		80.5 F 1.08	95.02 W		79.5	82.5			
Transposition Td Loc: Transposition Maximu Transposition Adjustr Grid Point Elevation	ation m Td nent Factor		80.5 F 1.08 550	95.02 W		79.5	82.5			
Transposition Td Loca Transposition Maximus Transposition Adjustm	ation m Td nent Factor		80.5 F 1.08	95.02 W		79.5	82.5			
Transposition Td Loc: Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in B	ation m Td nent Factor asin		80.5 F 1.08 550 14,344	95.02 W		79.5	82.5			
Transposition Td Loc: Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in Ba Inflow Barner Height	ation m Td nent Factor asin Factor		80.5 F 1.08 550 14,344 1,000	95.02 W		79.5	82.5			

Appendix F: Table F.89: Storm spreadsheet for Stanton, NE June, 10, 1944





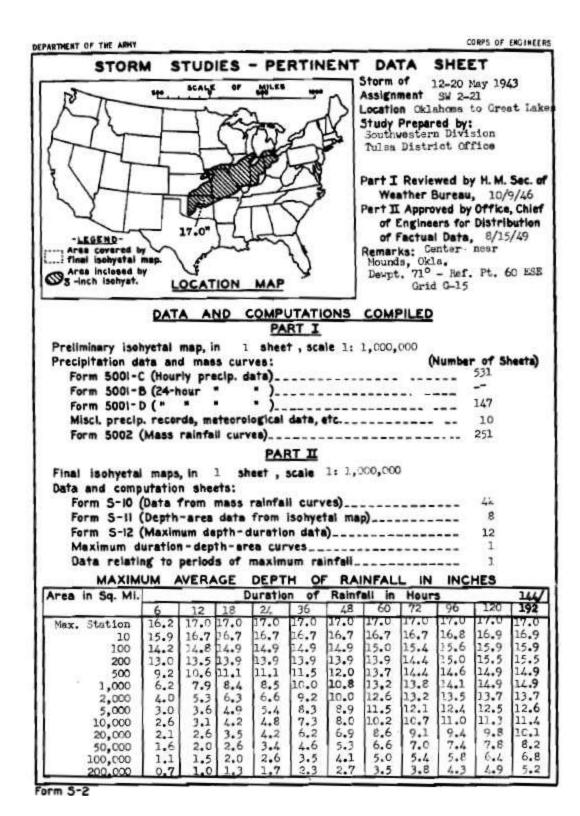
Appendix F: Figure F.117 and Figure F.118: Isohyetal map and mass curve chart for Stanton, NE June 10, 1944

Mounds, OK, AWA 44

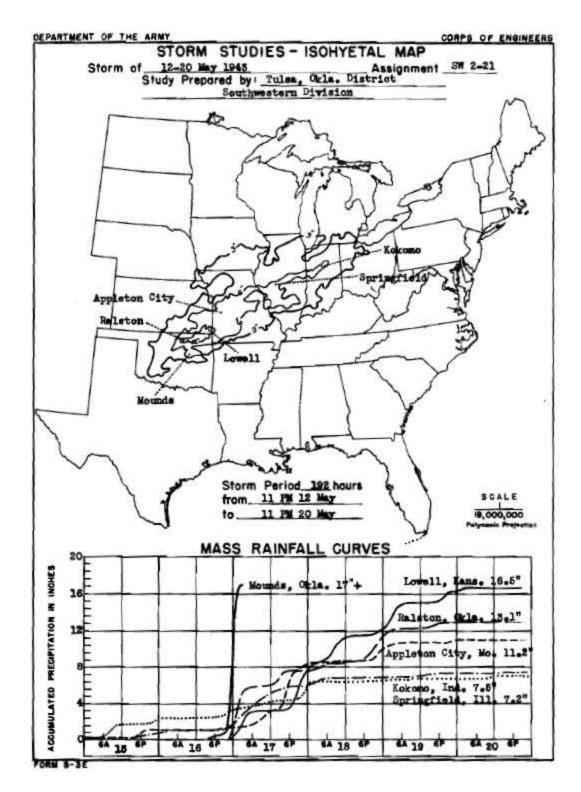
May 16, 1943 Storm Type: MCC

orm Name: orm Date:	SW 2-21-M 5/15-20/19	Iounds, OK			Storm	Adinet	mont fo	r ANO	Crid Do	int 1	
orm Date: VA Analysis Date:					Storm	Aajust	ment 10	or ANO	Grid Po	Int 1	
mporal Transposi	_	1-Jun									
		Lat	Long			Moisture I	nflow Direc	tion	SSW @ 150	miles	
orm Center Locati	on	35.88 N	96.06 W			Grid Point	Elevation		350	feet	
orm Rep Dew Poin	t Location	33.84 N	96.98 W			Storm Cen	iter Elevatio	n	750	feet	
ansposition Dew P		40.69 N	93.58 W			Storm Rep	Analysis I	Ouration	6	hours	
id Point Location		35.31 N	93.23 W			•	•				
	presentative d	•	73.0 F		precipitable w					2.60	inches
•	ce maximum d	•	78.5 F		precipitable v					3.37	inches
The transposition		-	77.0 F 750		precipitable w ich subtracts					3.14 73.0 F	inches
	i-place storm (i-place storm (750		ich subtracts ich subtracts	0.18		f precipitabl f precipitabl		78.5 F	
	sition storm		350		ich subtracts			f precipitabl		77.0 F	
•	nt/inflow barri		1,000		ich subtracts			f precipitabl		77.0 F	
•								•			
	The in-plac	e maximizati	on factor is	1.30		Notes: Store	m rep Tå re-a	nalyzed using	hourly surface o	bservations.	1
	-	transpositi				-	WH, and KGV	T used to der	ive the 6 hour av	erage storm	
The	elevation/barr	rier adjustme	nt factor is	1.00		rep Td.					
			_	_							
	The to	tal adjustme	nt factor is	1.19							
Observed	Storm Depth			10.77	24.77	20.77	26.11	40.77		72.77	
	10 as mile	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	•	48 Hours	60 Hours	72 Hours 16.7	
	10 sq miles 100 sq miles	15.9 14.2	16.7 14.8	16.7 14.9	16.7 14.9	-	16.7 14.9	16.7 14.9	16.7 15.0	15.4	1
	200 sq miles	٥	13.5	13.9	13.9	-	13.9	13.9	13.9	15.4	
	500 sq miles		10.6	11.1	11.1	-	11.5	12.0	13.7	14.4	
	1000 sq miles	ò	7.9	8.4	8.5	-	10.0	10.8	13.2	13.8	
	2000 sq miles	4.0	5.3	6.3	6.6	-	9.2	10.0	12.6	13.2	
	5000 sq miles		3.6	4.9	5.4	-	8.3	8.9	11.5	12.1	
	0000 sq miles	·····	3.1	4.2	4.8	-	7.3	8.0	10.2	10.7	
2	0000 sq miles	2.1	2.6	3.5	4.2	-	6.2	6.9	8.6	9.1	
Adjusted	Storm Depth-	;		10.77	24.77	20.11	2611	40.77	CO 11	72.11	
	10	6 Hours 18.9	12 Hours 19.8	18 Hours 19.8	24 Hours 19.8	30 Hours	36 Hours 19.8	48 Hours 19.8	60 Hours 19.8	72 Hours 19.8	
	10 sq miles 100 sq miles	16.8	17.6	17.7	17.7	-	17.7	17.7	17.8	18.3	
	200 sq miles	15.4	16.0	16.5	16.5	-	16.5	16.5	16.5	17.1	
	500 sq miles	10.9	12.6	13.2	13.2	-	13.6	14.2	16.2	17.1	
	1000 sq miles	7.4	9.4	10.0	10.1	-	11.9	12.8	15.7	16.4	
	2000 sq miles	\$	6.3	7.5	7.8	-	10.9	11.9	14.9	15.7	
•••••	5000 sq miles		4.3	5.8	6.4	-	9.8	10.6	13.6	14.4	
	0000 sq miles	o	3.7	5.0	5.7	-	8.7	9.5	12.1	12.7	
2	0000 sq miles	2.5	3.1	4.2	5.0	-	7.4	8.2	10.2	10.8	
Storm or	Storm Center 1	Name		SW 2-21-Mou	nds OK						
Storm Da		· · ame		5/15-20/1943	aus, OR						1
Storm Ty				MCC							1
Storm Lo				35.88 N	96.06 W						
Storm Cer	nter Elevation			750							
Precipitat	ion Total & D	uration (10	sq mi)	17.0 inches in	12 hours						
				70.00							
	presentative '			73.0 F	6		M	T			
	presentative ' Maximum Td			33.84 N 78.5 F	96.98 W		May 77	June 79			-
_	Inflow Vector			SSW @ 150				13			1
	Maximization I			1.30							1
											1
Temporal	Transpositio	n (Date)		1-Jun							
	ition Dewpoir			40.69 N	93.58 W		May	June			
	ition Maximus			77.0 F			74.5	79			
	ition Adjustm	nent Factor		0.91							-
	t Elevation			350							-
Grid Poin				14.244							
Grid Poin Highest E	levation in Ba	asin		14,344							
Grid Poin Highest E Inflow Ba				14,344 1,000 1.00							

Appendix F: Table F.91: Storm spreadsheet for Mounds, OK May 16, 1943



Appendix F: Table F.92: Depth-area-duration chart for Mounds, OK May 16, 1943



Appendix F: Figure F.119 and Figure F.120: Isohyetal map and mass curve chart for Mounds, OK May 16, 1943

Silver Lake, TX AWA 45

June 5, 1943 Storm Type: MCC

torm Name: U	SACE SW 3-3	Siber Lake,	IX								
	/5-6/1943				Sto	rm Adju	stment for	r ANO G	rid Point 1	k:	
VA Analysis Date: 1	2/15/2013									-	
mporal Transposition Date		15-Jun									
		Lat	Long			Moisture Infl	sw Direction:		5SW @ 200	miles	
orm center location		32.67 N	95.60 W			Grid Point El			350	feet	
					-				400		
orm Rep SST location		30.05 N	97.00 W		_	Storm Center				feet	
ransposition SST location		30.65 N	99.60 W			Storm Rep At	nalysis Duratio	a	6	hours	
rid Point location		35.31 N	93,23 W								_
The	storm represen	stative SST is	77.0 F	with total	precipitable water	r above sealer	vel of			3.14	inche
1	he in-place ma	stimum SST is	80.0 F	with total	precipitable wate	r above sea le	vel of			3.60	inche
The trans	positioned ma	simum SST is	79.0 F	with total	precipitable water	r above sea let	vel of			3.44	inche
Th	e in-place ston	m elevation is	400		which subtracts	0.10	inches	of precipitable	water at	77.0 F	
Th	e in-place ston	m elevation is	400		which subtracts	0.12	inches	of precipitable	water at	80.0 F	
The tran	sposition ston	m elevation at	350		which subtracts	0.295	inches	of precipitable	water at	79.0 F	
The Grid p	point inflow ba	unier height is	1,050		which subtracts	0.295	inches	of precipitable	water at	79.0 F	
70		100			15 - 5	2	-	9. 9.			lui.
	Their	n-place maximiz	ation factor is	1.14	7	Notes: Item r	ep Tő re-analyzeő	using hourly surf	ace observations at	KBSM, KEFD,	1
			sition factor is	0.90			he 6 hour distation				
	The elevation	n barner adjust		1.00							
	Acceptant to the control	0.0000000000000000000000000000000000000		100000							
		The total adjust	ment factor is	1.03							
		and the second	and the sales of the	2.00	d d						-
April 100 miles	The Assessment	Downston.									1
Observed Storm	Depth Area L	and the state of t	12.22	10 17	74.17	30.17	1 14 17	10.17	60 17	22.17	
	10.00	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	1
	10 sq miles	14.2	16.5	16.5	16.5	16.5	16.5	16.5			1
	100 sq miles	11.1	14.8	15.0	15.1	15.1	15.1	15,1	-		1
	200 sq miles	9.7	14.1	14.3	14.6	14.6	14.6	14.6			1
-	500 sq miles	8.0	12.9	13.4	13.7	13.7	13.7	13.7			1
	1000 sq miles	6.8	11.6	12.5	12.8	12.8	12.8	12.8	-		1
	2000 sq miles	5.6	9.9	10.9	11.0	11.0	11.0	11.0	-		1
	5000 sq miles	4.1	7.0	7.8	8.0	8.1	8.1	8.1	-	- 4	1
	0000 sq miles	2.9	4,3	5.4	5.7	5.8	5.8	5.9	4		
	0000 sq miles	+	+3	- 2	1.7		-	-		+	
Adjusted Starm	Depth-Area-D	Paration:	the second				V				
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	14.7	17.1	17.1	17.1	17.1	17.1	17.1	-		1
	100 sq miles	11.5	15.3	15.5	15.6	15.6	15.6	15.6			1
	200 sq miles	10.0	14.6	14.8	15.1	15.1	15.1	15.1			1
	500 sq miles	8.3	13.3	13.9	14.2	14.2	14.2	14.2	141		
7	1000 sq miles	7.0	12.0	12.9	13.2	13.2	13.2	13.2			1
	2000 sq miles	5.8	10.2	11.3	11.4	11.4	11.4	11.4			1
	5000 sq miles	4.2	7.2	8.1	8.3	8.4	8.4	8.4	-	-	1
		3.0	4.4	5.6	5.9	6.0	6.0	6.1	-		1
	WOOD BIG SHIPES										1
10	0000 sq miles 0000 sq miles	-	,		1 -						1
10	0000 sq miles	-	,	-	-			-			
10		-	7.	-	-	-					
20	0000 sq miles	-	7,	ISACT SW 4	3. Silver Lake 3	TX.					1
26 Storm or Storm C	0000 sq miles		7		3-Silver Lake, 1	X					1
Storm or Storm C Storm Date(s)	0000 sq miles	7	T	6/5-6/1943	3-Silver Lake, 1	TX					1
Storm or Storm C Storm Date(5) Storm Type	0000 sq miles	7	7	6/5-6/1943 MCC		X					
Storm or Storm C Storm Date(s) Storm Location Storm Location	0000 sq miles Center Name	1	7	6/5-6/1943 MCC 32.67 N	95.60 W	TX.					
Storm or Storm C Storm Date(s) Storm Location Storm Center Ele	Center Name	7.0	7	6/5-6/1943 MCC 32.67 N 400	95.60 W	TX.					
Storm or Storm C Storm Date(s) Storm Type Storm Location	Center Name	7.0	7	6/5-6/1943 MCC 32.67 N	95.60 W	TX.					
Storm or Storm C Storm Date(2) Storm Type Storm Center Ele Precipitation Tot	Center Name Center Name evation tal & Duration	7.0	7	6/5-6/1943 MCC 32.67 N 400 16.5 inches in	95.60 W	X					
Storm or Storm C Storm Date(s) Storm Type Storm Location Storm Center Ele Precipitation Tot	Center Name evation tal & Duration tative SST	(10 sq mi)	Ψ,	6/5-6/1943 MCC 32.67 N 400 16.5 inches in	95.60 W 12 hours	TX					
Storm or Storm C Storm Date(s) Storm Location Storm Control Storm Center Ele Precipitation Tot Storm Represent Storm Represent	Center Name evation tal & Duration tative SST	(10 sq mi)	Ŧ.	6/5-6/1943 MCC 32.67 N 400 16.5 inches in 17.0 F 30.05 N	95.60 W	TX .	J				
Storm or Storm C Storm Date(s) Storm Type Storm Location Storm Center Ele Precipitation Tot Storm Represent Storm Represent	Center Name evetion tal & Duration tative SST tative SST Loc m SST	(10 sq mi)	7	6/5-6/1943 MCC 32.67 N 400 16.5 inches in 17.0 F 30.05 N 80.0 F	95.60 W 12 hours	X	1				
Storm or Storm C Storm Date(2) Storm Type Storm Location Storm Center Ele Precipitation Tot Storm Represent Storm Represent In-place Maxima Moisture Inflow	Center Name Center Name vection tal & Duration tative SST tative SST Loc an SST Vector	(10 sq mi)	7	6/5-6/1943 MCC 32.67 N 400 16.5 inches in 17.0 F 30.05 N	95.60 W 12 hours	TX					
Storm or Storm C Storm Date(s) Storm Location Storm Center Ele Precipitation Tot Storm Represent Storm Represent	Center Name Center Name vection tal & Duration tative SST tative SST Loc an SST Vector	(10 sq mi)	7	6/5-6/1943 MCC 32.67 N 400 16.5 inches in 17.0 F 30.05 N 80.0 F	95.60 W 12 hours	X					
Storm or Storm C Storm Date(s) Storm Date(s) Storm Location Storm Center Ele Precipitation Tot Storm Represent Storm Represent In-place Maxima Moisture Inflow In-place Maxima	Center Name Center Name vection tal & Duration tative SST Loc as SST Vector tation Factor	(10 sq mi)	Ŧ,	6/5-6/1943 MCC 12.87 N 400 16.5 inches in 77.0 F 30.05 N 80.0 F SSW @ 200	95.60 W 12 hours	X					
Storm or Storm C Storm Date(s) Storm Lype Storm Location Storm Center Ele Precipitation Tot Storm Represent Storm Represent In-place Maximiz Moisture Inflow In-place Maximiz Temporal Transp	Center Name Center Name vection tal & Duration tative SST tative SST Loc as SST Vector tation Factor position (Date)	(10 sq mi)	*	6/5-6/1943 MCC 12.67 N 400 16.3 inches in 17.0 F 30.05 N 80.0 F SSW @ 200	95.60 W 12 hours 97.00 W	TX .	80				
Storm or Storm C Storm Date(s) Storm Type Storm Location Storm Center Ele Precipitation Tot Storm Represent Storm Represent In-place Maximia Moisture Inflow In-place Maximia Temporal Transp	Center Name evetion tal & Duration tative SST tative SST Loc m SST Vector tation Factor position (Date) empount Locat	(10 sq mi)	*	6/5-6/1943 MCC 32.57 N 400 16.3 inches in 17.0 F 30.05 N 80.0 F SSW @ 200	95.60 W 12 hours	TX	30 J				
Storm or Storm C Storm Date(s) Storm Location Storm Conter Ele Precipitation Tot Storm Represent Storm Represent In-place Maxima Moisture Inflow In-place Maximi Temporal Transposition D Transposition M	Center Name SST Vector Institute SST Local SST Vector Institute Factor Description (Date) Center point Local Lo	(10 sq mi) cation	*	6/5-6/1943 MCC 12.67 N 400 16.3 inches in 17.0 F 30.05 N 80.0 F SSW @ 200	95.60 W 12 hours 97.00 W	X	80				
Storm or Storm C Storm Date(s) Storm Date(s) Storm Location Storm Center Ele Precipitation Tot Storm Represent Storm Represent In-place Maximia Moisture Inflow In-place Maximia Temporal Transposition D Transposition M Iransposition A	Center Name Center Name Evention Italia & Duration Italia & SST Location In SST Vector Interior Factor position (Date) ewpoint Locat Location Factor (10 sq mi) cation	*	6/5-6/1943 MCC 32.67 N 400 16.3 inches in 77.0 F 30.05 N 80.0 F SSW @ 200 15.Jun 30.65 N 79.0 F	95.60 W 12 hours 97.00 W	TX .	30 J					
Storm or Storm C Storm Date(s) Storm Type Storm Location Storm Center Ele Precipitation Tot Storm Represent Storm Represent In-place Maximiz Moisture Inflow In-place Maximiz Temporal Transp Transposition D Transposition A Grid Point Elevat	Center Name Center Name Vection Italia & Duration Italia & SST Local Italia & SST Local Italia & Control Italia &	(10 sq mi) cation	*	6/5-6/1943 MCC 32.57 N 400 16.3 inches in 77.0 F 30.05 N 80.0 F SSW @ 200 15.Jun 30.65 N 19.0 F	95.60 W 12 hours 97.00 W	TX .	30 J				
Storm or Storm C Storm Date(s) Storm Type Storm Location Storm Center Ele Precipitation Tot Storm Represent In-place Maximia Moisture Inflow In-place Maximia Temporal Transp Transposition M Transposition M Transposition M Grid Point Elevat Highest Elevatio	Center Name Center Name Center Name Center Name Center Name Center Name SST SST Vector SST Loc SST Vector Cation Factor Document Locat L	(10 sq mi) cation	*	6/5-6/1943 MCC 32.67 N 400 16.3 inches in 77.0 F 30.05 N 80.0 F SSW @ 200 15.Jun 30.65 N 79.0 F	95.60 W 12 hours 97.00 W	IX	30 J				
Storm or Storm C Storm Date(s) Storm Type Storm Location Storm Center Ele Precipitation Tot Storm Represent Storm Represent In-place Maximum Moisture Inflow In-place Maximum Temporal Transposition D Transposition D Transposition A Gnid Point Elevant Highest Elevantio Inflow Barrier He	Center Name Center Name Center Name Center Name Center Name Center Name Lative SST Lative SST Local Lative Local Local Lative Local Lative Local Local Lative Local Loc	(10 sq mi) cation	*	6/5-6/1943 MCC 32.57 N 400 16.3 inches in 77.0 F 30.05 N 80.0 F SSW @ 200 15.Jun 30.65 N 19.0 F	95.60 W 12 hours 97.00 W	X	30 J				
Storm or Storm C Storm Date(s) Storm Type Storm Location Storm Center Ele Precipitation Tot Storm Represent Storm Represent In-place Maximia Moisture Inflow In-place Maximia Temporal Transp Transposition M Transposition M Transposition M Geid Point Elevatio Highest Elevatio	Center Name Center SST Local Center Name	(10 sq mi) cation	*	6/5-6/1943 MCC 32.57 N 400 16.3 inches in 77.0 F 30.05 N 80.0 F SSW @ 200 15.Jun 30.65 N 19.0 F	95.60 W 12 hours 97.00 W	TX .	30 J				

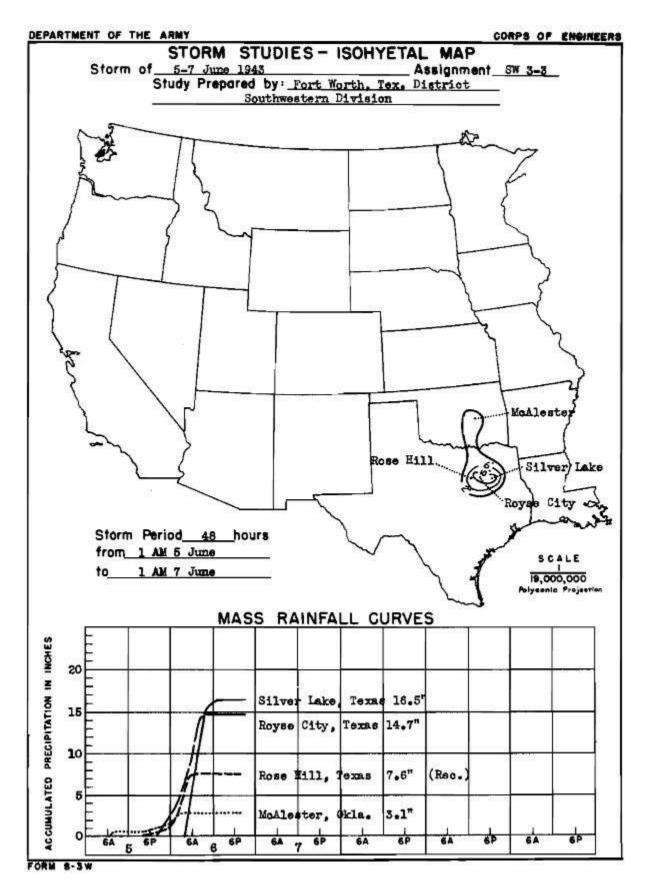
Appendix F: Table F.92: Storm spreadsheet for Silver Lake, TX June 5, 1943

DEPARTMENT OF THE ARMY CORPS OF ENGINEERS STUDIES - PERTINENT DATA SHEET STORM Storm of 5-7 June 1943 Assignment SW 3-3 Location Texas & Oklahoma Study Prepared by: Southwestern Division Fort Worth, Texas Part I Reviewed by H. M. Sec. of Weather Bureau, 7/7/49 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 10/17/51 -LEGEND-.... final isobystal map. Remarks: Center at Silver Lake, Texas Dewpt. 750- Ref. Pt. 230 S Area inclosed by 2-Inch isohyet. LOCATION MAP Grid I-15 DATA AND COMPUTATIONS COMPILED PART I Preliminary isohyetal map, in 1 sheet, scale 1: 1,000,000 Precipitation data and mass curves: (Number of Sheets) Form 5001-C (Hourly precip. data) 15 Form 5001-B (24-hour " 0 Form 5001-D (" 8 Miscl. precip. records, meteorological data, etc._____ 23 Form 5002 (Mass rainfall curves)______ PART II Final isohyetal maps, in 1 sheet, scale 1: 1,000,000 Data and computation sheets: Form S-10 (Data from mass rainfail curves)_____ Form S-II (Depth-area data from isohyetal map)_____ Form S-12 (Maximum depth-duration data)_____ Maximum duration-depth-area curves______ Data relating to periods of maximum rainfall______ MAYIMIM AVERAGE DEPTH OF RAINFALL IN INCHES

Area in Sq.	Mi.	Duration of Rainfall in Hours										
176	. 6	12	18	24	30	36	48					
1	0 14.2	16.5	16.5	16.5	16.5	16.5	16.5					
10	0 11.1	14.8	15.0	15.1	15.1	15.1	15.1					
20	0 9.7	14.1	14.3	14.6	14.6	14.6	14.6					
50	0 8.0	12.9	13.4	13.7	13.7	13.7	13.7					
100	0 6.8	11.6	12.5	12.8	12.8	12.8	12.8			ll		
200	0 5.6	9.9	10.9	11.0	11.0	11.0	11.0			ll		
500	0 4.1	7.0	7.8	8.0	8.1	8.1	8.1			1 1		
10,00	0 2.9	4.3	5.4	5.7	5.8	5.8	5.9		C-0			
16,00			3.7	4.0	4.1	4.1	4.2					

Form 5-2

Appendix F: Table F.93: Depth-area-duration chart for Silver Lake, TX June 5, 1943



Appendix F: Figure F.121 and Figure F.122: Total storm isohyetal and mass curve chart for Silver Lake, TX June 5, 1943

Warner, OK, AWA 46

May 6, 1943 Storm Type: Frontal

Storm Nan Storm Dat					Storm	Adjust	ment fo	r ANO	Grid Po	int 1	
WA Ana	dysis Date: 12/15/2013	3				•					
emporal '	Transposition Date	24-May									
		Lat	Long				nflow Direc	tion	S @ 160	miles	
	nter Location	35.49 N	95.31 W			Grid Point			350	feet	
	p Dew Point Location	33.20 N	95.00 W				ter Elevatio		600	feet	
	ition Dew Point Location t Location	40.44 N 35.31 N	92.24 W 93.23 W			Storm Rep	Analysis D	uration	24	hours	
Iu I om	Location	55.5111	75.25 11								
Th	ne storm representative d	ew point is	72.0 F	with total	precipitable w	ater above	sea level of			2.47	inches
	The in-place maximum d	ew point is	77.0 F	with total p	precipitable w	ater above	sea level of			3.14	inches
The tran	nspositioned maximum d	•	74.0 F		precipitable w					2.73	inches
	The in-place storm		600 600		ich subtracts	0.14 0.16		f precipitable		72.0 F 77.0 F	
т	The in-place storm of The transposition storm of		350		ich subtracts ich subtracts	0.16		f precipitable f precipitable		74.0 F	
	he Grid point/inflow barri		1,000		ich subtracts	0.24		f precipitable		74.0 F	
	The in-place	e maximizati	on factor is	1.28					ep Td based on		
		transpositi			1		d TRWD gui ng to average		noptic storm go	ing from	<u> </u>
	The elevation/barr	ier adjustme	nt factor is	1.00		F.3.3331	g.				
	The to	tal adjustme	nt factor is	1.07							
		,									
	Observed Storm Depth	-Area-Dura	tion	V						V	
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours		48 Hours	60 Hours	72 Hours	
	1 sq miles	10.0	12.5	15.0	17.6	20.0	21.8	24.6	25.0	25.0	
	10 sq miles 100 sq miles	9.9 8.7	12.3 10.8	14.6 12.4	17.2 14.9	19.5 17.1	21.5 19.3	24.4 21.8	24.9 22.5	24.9 22.5	1
	200 sq miles	7.4	9.5	11.4	13.8	16.0	18.3	20.6	21.3	21.3	
	500 sq miles	5.4	7.6	10.0	12.3	14.5	16.7	18.6	19.4	19.4	
	1000 sq miles	4.3	6.3	9.0	11.1	13.3	15.4	17.1	18.0	18.0	
	2000 sq miles	3.6	5.4	8.0	9.9	12.1	14.0	15.5	16.5	16.5	
	5000 sq miles	3.0	4.5	6.8	8.3	10.5	12.1	13.4	14.4	14.4	
	10000 sq miles 20000 sq miles	2.6 2.1	3.9 3.3	5.8 4.9	7.2 6.1	9.1 7.6	10.4 8.7	11.7 10.0	12.6 10.7	12.6 10.8	
	20000 Sq mmcs		0.0	712	0.1	7.0	0.7	10.0	10.7	10.0	
	Adjusted Storm Depth-	Area-Dura	tion								
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	1 sq miles	10.7	13.4	16.0	18.8	21.4	23.3	26.3	26.7	26.7	
	10 sq miles 100 sq miles	10.6 9.3	13.1 11.5	15.6 13.3	18.4 15.9	20.8 18.3	23.0 20.6	26.1 23.3	26.6 24.0	26.6 24.0	
	200 sq miles	7.9	10.2	12.2	14.7	17.1	19.6	22.0	22.8	22.8	
	500 sq miles	5.8	8.1	10.7	13.1	15.5	17.8	19.9	20.7	20.7	
	1000 sq miles	4.6	6.7	9.6	11.9	14.2	16.5	18.3	19.2	19.2	
	2000 sq miles	3.8	5.8	8.5	10.6	12.9	15.0	16.6	17.6	17.6	
	5000 sq miles 10000 sq miles	3.2 2.8	4.8 4.2	7.3 6.2	8.9 7.7	11.2 9.7	12.9 11.1	14.3 12.5	15.4 13.5	15.4 13.5	
	20000 sq miles	2.2	3.5	5.2	6.5	8.1	9.3	10.7	11.4	11.5	
	Storm or Storm Center I	Name		SW 2-20-War	ner, OK						1
	Storm Date(s) Storm Type			5/6-10/1943 General Storm							
	Storm Location			35.49 N	95.31 W						
	Storm Center Elevation			600							
	Precipitation Total & D	uration (10	sq mi)	24.00 inches in	12 hours						
	Stame Daniel Co.	r.a		72.0 E	24						1
	Storm Representative 7 Storm Representative 7		<u> </u>	72.0 F 33.20 N	24 95.00 W		May	June			1
	In-place Maximum Td		•	77.0 F	22.00 11		75.9	79.3			1
	Moisture Inflow Vector	r		S @ 160							
	In-place Maximization I	actor		1.28							
	III-piace Maximization i										-
		n (Dat-)		24 Mar-							
	Temporal Transposition			24-May 40.44 N	92.24 W		May	June			
		nt Location		24-May 40.44 N 74.0 F	92.24 W		May 72.5	June 77.5			
	Temporal Transposition Transposition Dewpoir Transposition Maximus Transposition Adjustm	nt Location n Td		40.44 N 74.0 F 0.84	92.24 W						
	Temporal Transposition Transposition Dewpoir Transposition Maximur Transposition Adjustm Grid Point Elevation	nt Location n Td ent Factor		40.44 N 74.0 F 0.84 350	92.24 W						
	Temporal Transposition Transposition Dewpoir Transposition Maximus Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	nt Location n Td ent Factor		40.44 N 74.0 F 0.84 350 14,344	92.24 W						
	Temporal Transposition Transposition Dewpoir Transposition Maximur Transposition Adjustm Grid Point Elevation	nt Location n Td lent Factor		40.44 N 74.0 F 0.84 350	92.24 W						

Appendix F: Table F.94: Storm spreadsheet for Warner, OK May 6, 1943

12.8

11.1

8.9

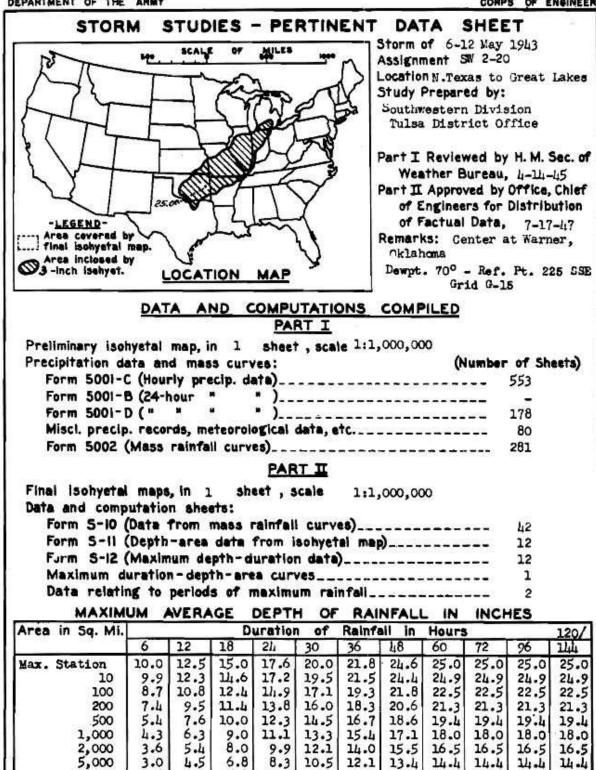
12.8

11.1

8.8

7.0

5.0



Form 5-2

2.6

2.1

1.6

0.6

10,000

20,000

50,000

100,000

212,000

Appendix F: Table F.95: Depth-area-duration chart for Warner, OK May 6, 1943

7.2

6.1

4.6

3.4

2.2

10.4

8.7

6.5

3.0

12.6

10.7

8.1

6.2

4.2

11.7

10.0

7.7

3.7

12.6

10.8

8.3

6.4

4.4

9.1

7.6

5.7

2.6

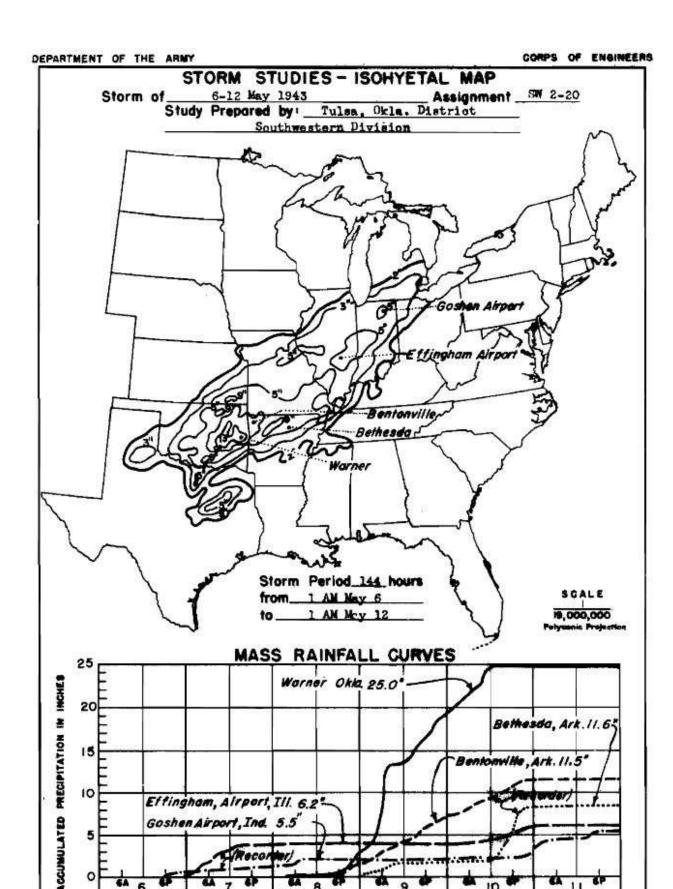
5.8

4.9

3.9

3.3

2.5



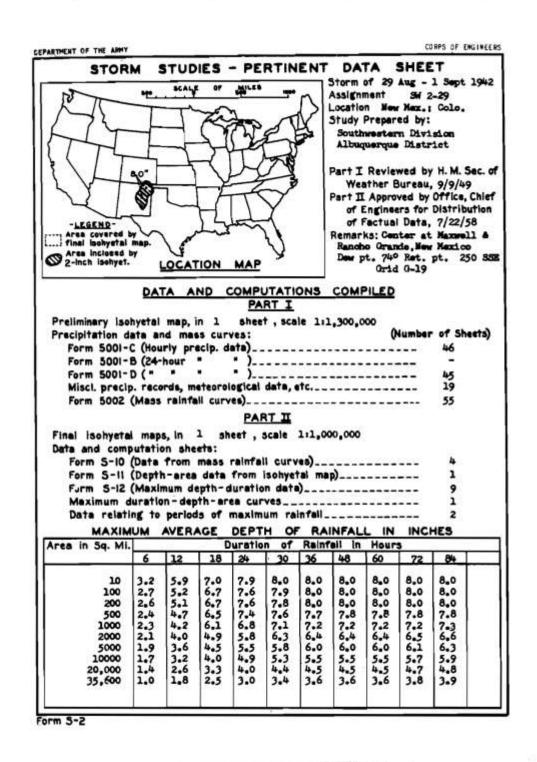
Appendix F: Figure F.123 and Figure F.124: Total storm isohyetal and mass curve chart for Warner, OK May 6, 1943

Rancho Grande, NM, AWA 47

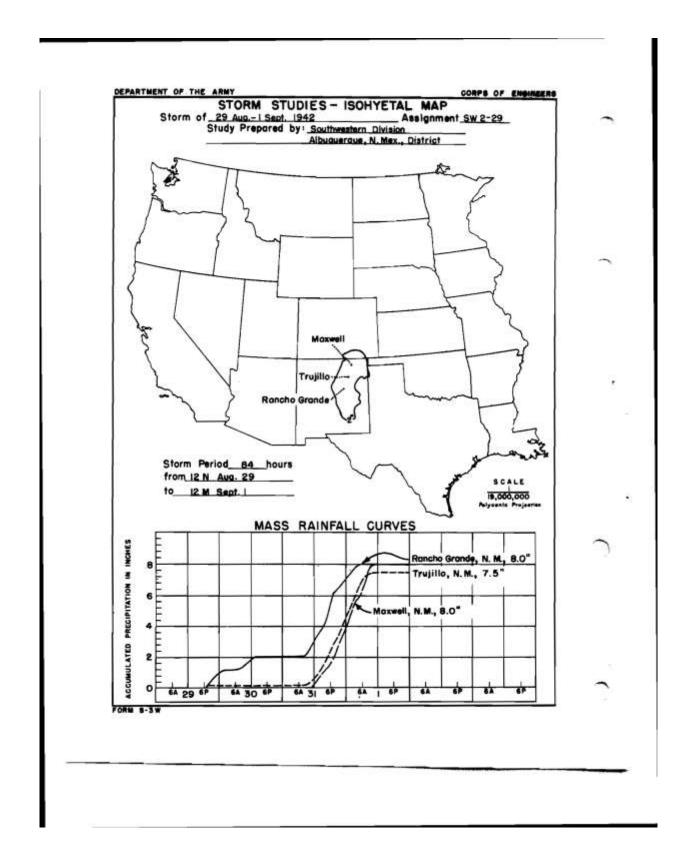
August 29, 1942 Storm Type: Tropical Grid Points Used: 6, 13

	Grande, NM US	ACE 2-29		04		t	ou ANIO	Cuid D	int C	
orm Date: 8/29-9/1 WA Analysis Date: 12/21/2				Storm	ı Aajusi	tment 10	or ANO	Grid Po	int 6	
emporal Transposition Date	15-Aug									
	Lat	Long			Moisture In	ıflow Directi	on:	SE @ 140	miles	
torm center location	34.95 N	105.10 W			Grid Point	Elevation		4,400	feet	
torm Rep dew point location	33.50 N	103.35 W			Storm Cent	er Elevation		5,600	feet	
ransposition dewpoint location		102.75 W			Storm Rep	Analysis Du	ration	24	hours	
rid Point location	34.50 N	104.00 W								
The storm representat	ive dew point is	74.0 F	with total	precipitable	water above	sea level of			2.73	inches.
The in-place maxim	•			precipitable					3.37	inches.
The transpositioned maxim	•			precipitable					3.44	inches.
•	orm elevation is orm elevation is			ch subtracts	1.16		f precipitable f precipitable		74.0 F 78.5 F	
The transposition be				ch subtracts	1.12		f precipitable		79.0 F	
The Grid Point/Inflow				ch subtracts	1.12		f precipitable		79.0 F	
	storm maximiza		1.30					 Storm repres ir Td values bet 		
The transposition			1.14			vas based on i at KROW and		n 10 values del	ween August	-
In In	e barrier adjustn	ierit ractor is	1.00		,					
Т	he total adjustn	nent factor is	1.48							
Observed Sterm De	nth Aven Duvet	i								
Observed Storm De	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq mi	••••••	-	-	-	-	-	-	-	-	
10 sq mi	······································	5.9	7.0	7.9	8.0	8.0	8.0	8.0	8.0	
100 sq mi	•••••	5.2	6.7	7.6	7.9	8.0	8.0	8.0	8.0	-
200 sq mi 500 sq mi	······	5.1 4.7	6.7 6.5	7.6 7.4	7.8 7.6	8.0 7.7	8.0 7.8	8.0 7.8	8.0 7.8	-
1000 sq mi	·······	4.2	6.1	6.8	7.1	7.2	7.2	7.2	7.0	
2000 sq mi	···········	4.0	4.9	5.8	6.3	6.4	6.4	6.4	6.5	
5000 sq mi	•••••	3.6	4.5	5.5	5.8	6.0	6.0	6.0	6.1	
10000 sq mi	•••••	3.2	4.0	4.9	5.3	5.5	5.5	5.5	5.7	
20000 sq mi	les 1.4	2.6	3.3	4.0	4.4	4.5	4.5	4.5	4.7	
Adjusted Storm De	oth-Area-Durati	ion								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq mi	•••••	8.7	- 10.2	- 11.7	-	-	-	- 11.8	- 11.8	
10 sq mi 100 sq mi	•••••	7.7	10.3 9.9	11.7	11.8 11.7	11.8 11.8	11.8 11.8	11.8	11.8	
200 sq mi	······	7.5	9.9	11.2	11.5	11.8	11.8	11.8	11.8	
	•••••	6.9	9.6	10.9	11.2	11.4	11.5	11.5	11.5	
500 sq mi		6.2	9.0	10.0	10.5	10.6	10.6	10.6	10.6	
500 sq mi 1000 sq mi	les 3.4	0.2			10.5				20.0	
1000 sq mi 2000 sq mi	es 3.1	5.9	7.2	8.6	9.3	9.5	9.5	9.5	9.6	
1000 sq mi 2000 sq mi 5000 sq mi	es 3.1 es 2.8	5.9 5.3	7.2 6.6	8.6 8.1	9.3 8.6	9.5 8.9	8.9	9.5 8.9	9.6 9.0	
1000 sq mi 2000 sq mi	les 2.8 les 2.5	5.9	7.2	8.6	9.3	9.5	þ	9.5	9.6	
1000 sq mi 2000 sq mi 5000 sq mi 10000 sq mi	les 2.8 les 2.5	5.9 5.3 4.7	7.2 6.6 5.9	8.6 8.1 7.2	9.3 8.6 7.8	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
1000 sq mi 2000 sq mi 5000 sq mi 10000 sq mi 20000 sq mi	les 3.1 les 2.8 les 2.5 les 2.1	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9	8.6 8.1 7.2 5.9	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
1000 sq mi 2000 sq mi 5000 sq mi 10000 sq mi 20000 sq mi	les 3.1 les 2.8 les 2.5 les 2.1	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9	8.6 8.1 7.2 5.9	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
1000 sq mi 2000 sq mi 5000 sq mi 10000 sq mi 20000 sq mi 20000 sq mi 20000 sq mi	les 3.1 les 2.8 les 2.5 les 2.1	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942	8.6 8.1 7.2 5.9 de, NM USA	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
1000 sq mi 2000 sq mi 5000 sq mi 10000 sq mi 20000 sq mi	les 3.1 les 2.8 les 2.5 les 2.1	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9	8.6 8.1 7.2 5.9 de, NM USA	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
1000 sq mi 2000 sq mi 5000 sq mi 10000 sq mi 20000 sq mi 20000 sq mi 20000 sq mi Storm or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat	les 3.1 les 2.8 les 2.5 les 2.1 les 2.1	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Troj 34.95 N 5,600	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
1000 sq mi 2000 sq mi 5000 sq mi 10000 sq mi 20000 sq mi 20000 sq mi 20000 sq mi Storm or Storm Cent Storm Date(s) Storm Type Storm Location	les 3.1 les 2.8 les 2.5 les 2.1 les 2.1	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Troj 34.95 N	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
1000 sq mi 2000 sq mi 5000 sq mi 10000 sq mi 20000 sq mi 20000 sq mi 20000 sq mi Storm or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat	les 3.1 les 2.8 les 2.5 les 2.1 les 2.1 les Duration	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Troj 34.95 N 5,600	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm Center Elevat Precipitation Total & Storm Representativ Storm Representativ Storm Representativ	les 3.1 les 2.8 les 2.5 les 2.1 ler Name lion le Duration le Dewpoint to Dewpoint Local	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Tro 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm Center Elevat Precipitation Total & Storm Representativ Storm Representativ Maximum Dewpoint	les 3.1 les 2.8 les 2.5 les 2.1 ler Name lion à Duration re Dewpoint Loc	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Tro 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N 78.5 F	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm Center Elevat Precipitation Total & Storm Representativ Maximum Dewpoint Moisture Inflow Vee	les 3.1 les 2.8 les 2.5 les 2.1 ler Name lion è Duration re Dewpoint Locator	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Troj 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N 78.5 F SE @ 140	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm Center Elevat Precipitation Total & Storm Representativ Storm Representativ Maximum Dewpoint	les 3.1 les 2.8 les 2.5 les 2.1 ler Name lion è Duration re Dewpoint Locator	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Tro 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N 78.5 F	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm Center Elevat Precipitation Total & Storm Representativ Maximum Dewpoint Moisture Inflow Vee	les 3.1 les 2.8 les 2.5 les 2.1 les Duration re Dewpoint re Dewpoint Locator on Factor	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Troj 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N 78.5 F SE @ 140	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm or Storm Cent Storm Date(s) Storm Center Elevat Precipitation Total d Storm Representativ Maximum Dewpoint Moisture Inflow Vec	les 3.1 les 2.8 les 2.5 les 2.1 les Duration les Dewpoint les Dewpoint Loc	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Troj 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N 78.5 F SE @ 140 1.30	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm or Storm Cent Storm Date(s) Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Maximum Dewpoint Moisture Inflow Ve. In-place Maximizatio Temporal Transposition Dewy Transposition Daxi	les 3.1 les 2.8 les 2.5 les 2.1 ler Name lion le Deupoint le Deupoint Location litton (Date) looint Location limit Deupoint Location	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Tro 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N 78.5 F SE @ 140 1.30 15-Aug 33.05 N 79.0 F	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W 0-hours 24 103.35 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm or Storm Cent Storm Date(s) Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Maximum Dewpoint Moisture Inflow Vec In-place Maximization Transposition Dewy Transposition Maximum Dawy Transposition Adju	les 3.1 les 2.8 les 2.5 les 2.1 ler Name lion le Duration ler Dewpoint Location mum Dewpoint Location mum Dewpoint Stment Factor	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Tro 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N 78.5 F SE @ 140 1.30 15-Aug 33.05 N 79.0 F 1.14	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W 0-hours 24 103.35 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm or Storm Cent Storm Date(s) Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Maximum Dewpoint Moisture Inflow Vec In-place Maximizatio Temporal Transposition Dewy Transposition Maximum Dewy Transposition Maximum Dewy Transposition Maximum Dewy Transposition Adju Grid Point Elevation	les 3.1 les 2.8 les 2.5 les 2.1 les Duration les Dewpoint Location for Factor les Description (Date) les Descripti	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Tro 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N 78.5 F SE @ 140 1.30 15-Aug 33.05 N 79.0 F 1.14 4,400	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W 0-hours 24 103.35 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm or Storm Cent Storm Date(s) Storm Center Elevat Precipitation Total d Storm Representativ Maximum Dewpoint Moisture Inflow Vec In-place Maximization Temporal Transposition Dewy Transposition Dewy Transposition Adju Grid Point Elevation Highest Elevation ir	les 3.1 les 2.8 les 2.5 les 2.1 les 2.	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Tro 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N 78.5 F SE @ 140 1.30 15-Aug 33.05 N 79.0 F 1.14 4,400 14,344	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W 0-hours 24 103.35 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm Center Elevat Precipitation Total & Storm Representativ Maximum Dewpoint Moisture Inflow Vec In-place Maximizatio Transposition Maximum Dewy Transposition Maximum Dewy Transposition Adju Grid Point Elevation	les 3.1 les 2.8 les 2.5 les 2.1 les 2.	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Tro 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N 78.5 F SE @ 140 1.30 15-Aug 33.05 N 79.0 F 1.14 4,400	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W 0-hours 24 103.35 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	
Storm or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Maximum Dewpoint Moisture Inflow Vet In-place Maximization Temporal Transposition Adult Transposition Maximization Dewy Transposition Dewy Transposition Dewy Transposition Dewy Transposition Dewy Transposition Dewy Transposition	les 3.1 les 2.8 les 2.5 les 2.1 les 2.	5.9 5.3 4.7 3.8	7.2 6.6 5.9 4.9 Rancho Gran 8/29-9/1/1942 Remnant Tro 34.95 N 5,600 8.00 Inches 30 74.0 F 33.50 N 78.5 F SE @ 140 1.30 15-Aug 33.05 N 79.0 F 1.14 4,400 14,344 xx	8.6 8.1 7.2 5.9 de, NM USA pical 105.10 W 0-hours 24 103.35 W	9.3 8.6 7.8 6.5	9.5 8.9 8.1	8.9 8.1	9.5 8.9 8.1	9.6 9.0 8.4	

Appendix F: Table F.96: Storm spreadsheet for Rancho Grande, NM August, 29, 1942



Appendix F: Table F.97: Depth-area-duration values for Rancho Grande, NM August, 29, 1942



Appendix F: Figure F.125 and Figure F.126: Total storm isohyetal analysis Mass curve chart for Rancho Grande, NM August, 29, 1942

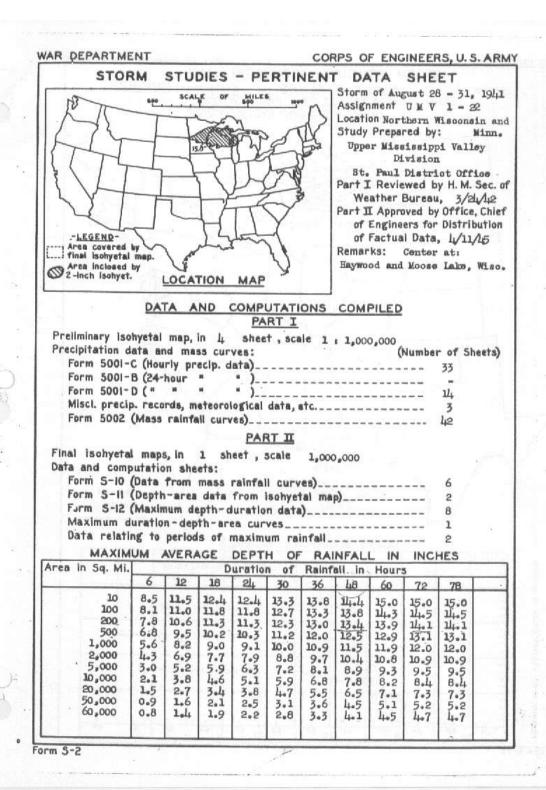
Hayward, WI, AWA 48

August 28, 1941 Storm Type: MCC

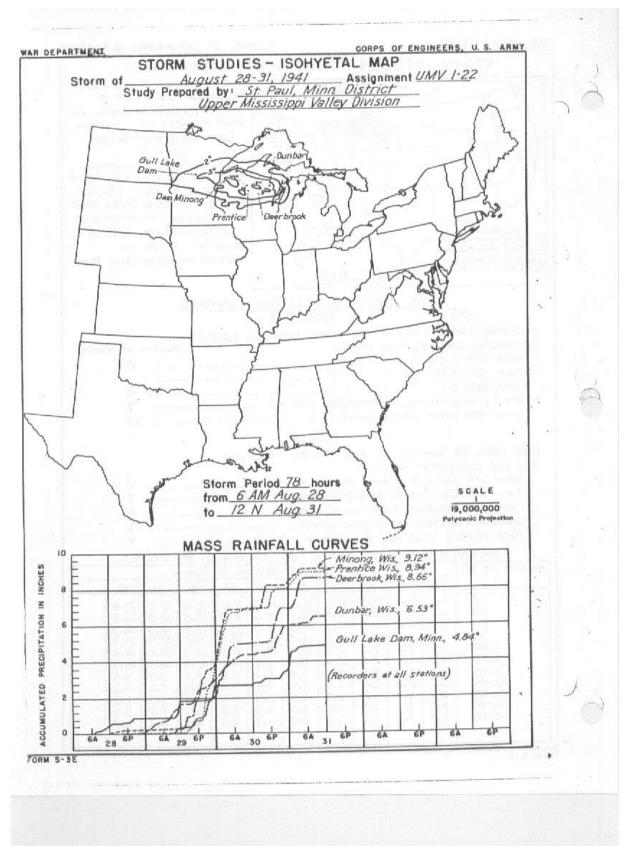
Grid Points Used: 8-11, 16-18

Storm Name: UMV 1-22- Storm Date: 8/28-30/19 AWA Analysis Date: 12/15/2013			:	Storm A	djustm	ent for	For AN	O Grid	Point 8	3
emporal Transposition Date	15-Aug				16 day 1	G D'		CCT C 225		
	Lat	Long			Moisture Inflow Direction			SSE @ 225	miles	
torm Center Location	46.01 N	91.48 W			Grid Point Elevation			1,200	feet	
storm Rep Dew Point Location	42.99 N	89.78 W			Storm Cen	ter Elevation	l	1,200	feet	
ransposition Dew Point Location		90.96 W			Storm Rep	Analysis Du	ration	24	hours	
rid Point Location	37.50 N	93.00 W								
The storm representative	daw point is	73.0 F	with tota	ıl precipitable	water above	a saa lawal of			2.60	inches
The in-place maximum		79.0 F		ıl precipitable ıl precipitable					3.44	inches
The transpositioned maximum	•	80.5 F		ıl precipitable					3.68	inches
The in-place stom	•	1,200		ich subtracts			f precipitabl	e water at	73.0 F	micric.
The in-place stom		1,200		ich subtracts			f precipitabl		79.0 F	
The transposition basin		1,200		ich subtracts			f precipitabl		80.5 F	
The Grid point/inflow bar		1,000		ich subtracts			f precipitabl		80.5 F	
The in-place sto	orm maximizat	ion factor is	1.30					CE UMV 1-2		
The transposition/el	levation to ba	sin factor is						based on add	_	
The ba	arrier adjustm	ent factor is	1.00					ollowing EPR	I,	L
	4-4-1 - C :		1.42		Nebraska, a	and TRWD s	tudies.			
The	total adjustm	ent factor is	1.42	J						
Observed Storm Depth	-Area-Durati	on								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	1
10 sq miles	8.5	11.5	12.4	12.4	13.3	13.8	14.4	15.0	15.0	1
100 sq miles	8.1	11.0	11.8	11.8	12.7	13.3	13.8	14.3	14.5	1
200 sq miles	7.8	10.6	11.3	11.3	12.3	13.0	13.4	13.9	14.1	1
500 sq miles	6.8	9.5	10.2	10.3	11.2	12.0	12.5	12.9	13.1	1
1000 sq miles	5.6	8.2	9.0	9.1	10.0	10.9	11.5	11.9	12.0	
2000 sq miles	4.3	6.9	7.7	7.9	8.8	9.7	10.4	10.8	10.9	
5000 sq miles	3.0	5.2	5.9	6.3	7.2	8.1	8.9	9.3	9.5	
10000 sq miles	2.1	3.8	4.6	5.1	5.9	6.0	7.8	8.2	8.4	1
20000 sq miles	1.5	2.7	3.4	3.8	4.7	5.5	6.5	7.1	7.3	
Adjusted Storm Depth-	Area-Duration 6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	12.0	16.3	17.6	17.6	18.9	19.6	20.4	21.3	21.3	
100 sq miles	11.5	15.6	16.7	16.7	18.0	18.9	19.6	20.3	20.6	-
200 sq miles	11.1	15.0	16.0	16.0	17.4	18.4	19.0	19.7	20.0	
500 sq miles	9.6	13.5	14.5	14.6	15.9	17.0	17.7	18.3	18.6	1
1000 sq miles	7.9	11.6	12.8	12.9	14.2	15.4	16.3	16.9	17.0	
2000 sq miles	6.1	9.8	10.9	11.2	12.5	13.7	14.7	15.3	15.4	1
5000 sq miles	4.3	7.4	8.4	8.9	10.2	11.5	12.6	13.2	13.5	
10000 sq miles	3.0	5.4	6.5	7.2	8.4	8.5	11.1	11.6	11.9	1
20000 sq miles	2.1	3.8	4.8	5.4	6.7	7.8	9.2	10.1	10.3	
	-									•
Storm Or Storm Center I	Name		8/28-30/1941	layward, WI						1
Storm Date(s)										1
Storm Type Storm Location			Synoptic 46.01 N	91.48 W						1
Storm Location Storm Center Elevation			46.01 N 1.200	91.48 W						1
Precipitation Total & D				72-hours US	ACE UMV 1	-22				1
Storm Representative I			73.0 F	24						1
Storm Representative I	Dew Point Loc	ation	42.99 N	89.78 W			Α			1
Maximum Dew Point			79.0 F				Aug			1
Moisture Inflow Vector			SSE @ 225				78.5			1
In-place Maximization I	actor		1.30							1
Temporal Transposition	n (Date)		15-Aug							1
Transposition Dew Poi			39.71 N	90.96 W						1
Transposition Maximus			80.5 F							1
Transposition Adjustm			1.09							1
Grid Point Elevation			1,200							1
Highest Elevation in Ba	isin		14,344							1
Inflow Barrier Height			1,000							
Elevation Adjustment I	actor		1.00							
			2 40							
Total Adjustment Facto	or		1.42							

Appendix F: Table F.98: Storm spreadsheet for Hayward, WI August 28, 1941



Appendix F: Table F.99: Depth-area-duration values for Hayward, WI August 28, 1941



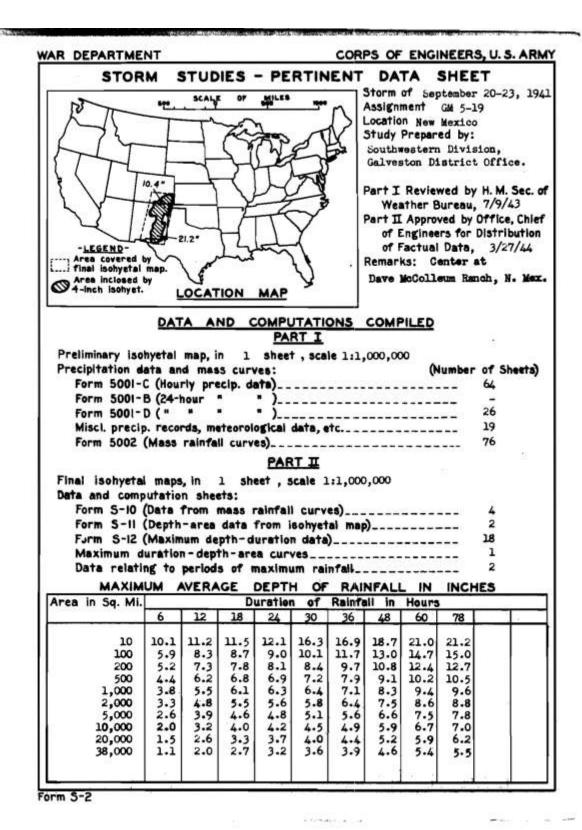
Appendix F: Figure F.127 and Figure F.128: Total storm isohyetal analysis and mass curve chart for Hayward, WI August 28, 1941

McColleum Ranch, NM, AWA 49

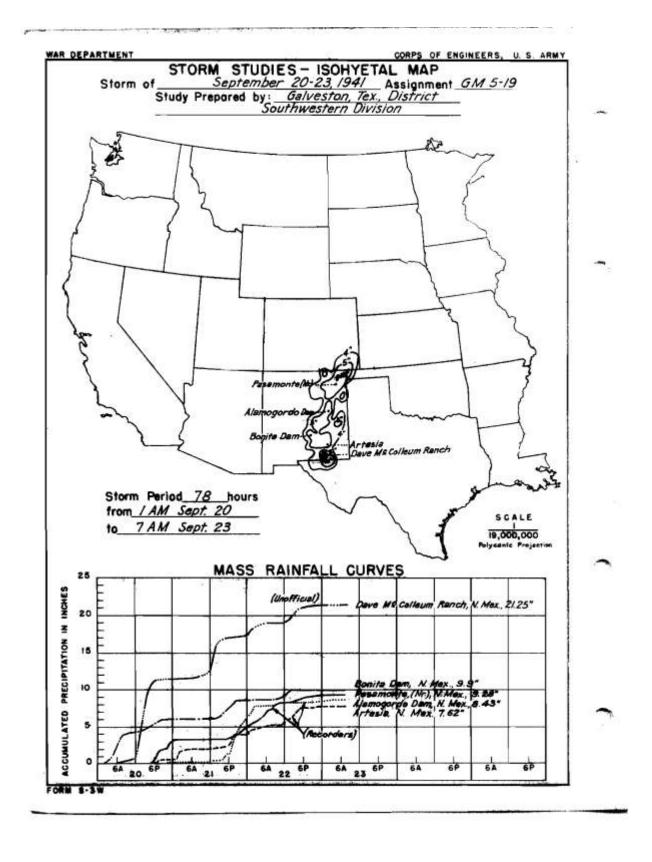
September 20, 1941 Storm Type: Frontal Grid Points Used: 6, 13

	n Ranch, NM	USACE GM		Storm	Adinat	ment fo	n ANO	Crid Da	int 6	
orm Date: 9/20-23/19 WA Analysis Date: 12/15/201				Storm	Aajust	ment 10	or ANO	Grid Po	omt o	
emporal Transposition Date	5-Sep									
	Lat	Long			Moisture Ir	flow Direct	ion:	ESE @ 415	miles	
torm center location	32.17 N	104.73 W			Grid Point	Elevation		4,400	feet	
torm Rep dew point location	29.53 N	98.41 W			Storm Cent	er Elevation	ı	5,783	feet	
ransposition dewpoint location	31.80 N	98.03 W			Storm Rep	Analysis Du	ıration	24	hours	
rid Point location	34.50 N	104.00 W								
The storm representative	dew point is	77.0 F	with tota	l precipitable	water above	sea level of	f		3.14	inches.
The in-place maximum	_	79.0 F		l precipitable l precipitable					3.44	inches.
The transpositioned maximum	•	78.0 F		l precipitable					3.29	inches.
The in-place stor	n elevation is	5,783	whi	ch subtracts	1.32	inches o	f precipitabl	e water at	77.0 F	
The in-place ston				ch subtracts			f precipitabl		79.0 F	
The transposition basis				ch subtracts			f precipitabl		78.0 F	
The Grid Point/Inflow ba	mer height is	4,400	whi	ch subtracts	1.09	inches o	f precipitabl	e water at	78.0 F	
The in-place st	orm maximizat	tion factor is	1.12	1	Notes: DAD	values taken	from GM 5-1	19. Storm repr	esentative	
The transposition/e			1.08		dew point va	ilue was base	d on maximun	n 24-hr Td vah	ies between	
	arrier adjustm		1.00					Values were		
					region where large area.	temperature	did not vary i	more than a 1-	iegree over a	
The	total adjustm	ent factor is	1.21		iaige alea.					
Observed Storm Depth	-Area-Durat	ion								
оззеттей заяти пери	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles		-	-	-	-	-	-	-	-	
10 sq miles	10.1	11.2	11.5	12.1	16.3	16.9	18.7	21.0	21.2	
100 sq miles	•	8.3	8.7	9.0	10.1	11.7	13.0	14.7	15.0	
200 sq miles 500 sq miles		7.3 6.2	7.8	8.1 6.9	8.4 7.2	9.7 7.9	10.8 9.1	12.4	12.7 10.5	
1000 sq miles		5.5	6.8 6.1	6.3	6.4	7.9 7.1	8.3	10.2 9.4	9.6	
2000 sq miles		4.8	5.5	5.6	5.8	6.4	7.5	8.6	8.8	
5000 sq miles		3.9	4.6	4.8	5.1	5.6	6.6	7.5	7.8	
10000 sq miles	•	3.2	4.0	4.2	4.5	4.9	5.9	6.7	7.0	
20000 sq miles	1.5	2.6	3.3	3.7	4.0	4.4	5.2	5.9	6.2	
Adinated Steams Death	Aura Dunati	_								
Adjusted Storm Depth	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	-	-	-	-	-	-	-	-	-	
10 sq miles	·	13.5	13.9	14.6	19.7	20.4	22.6	25.4	25.6	
100 sq miles		10.0	10.5	10.9	12.2	14.1	15.7	17.8	18.1	
200 sq miles	•	8.8	9.4	9.8	10.2	11.7	13.1	15.0	15.4	
500 sq miles 1000 sq miles		7.5 6.6	8.2 7.4	8.3 7.6	8.7 7.7	9.5 8.6	11.0 10.0	12.3 11.4	12.7 11.6	
2000 sq miles	·	5.8	6.6	6.8	7.0	7.7	9.1	10.4	10.6	
5000 sq miles		4.7	5.6	5.8	6.2	6.8	8.0	9.1	9.4	
10000 sq miles	2.4	3.9	4.8	5.1	5.4	5.9	7.1	8.1	8.5	
20000 sq miles	1.8	3.1	4.0	4.5	4.8	5.3	6.3	7.1	7.5	
Storm or Storm Center	Name		McColleum 1	Ranch, NM U	SACE GM 5	5-19				
Storm Date(s)			9/20-23/1941							
Storm Type			Synoptic							
Storm Location			32.17 N	104.73 W						
Storm Center Elevation Precipitation Total & D			5,783 21.2 Inches 7	8-hours						1
recipitation rotal & L	ruauvii		21.2 miches /	o-mours						1
	Dewpoint		77.0 F	24						
Storm Representative I		ation	29.53 N	98.41 W			Aug	Sept		
Storm Representative I	Dewpoint Loc		79.0 F				79.84	77.73		-
Storm Representative I Maximum Dewpoint										
Storm Representative I Maximum Dewpoint Moisture Inflow Vecto	r		ESE @ 415							1
Storm Representative I Maximum Dewpoint	r									
Storm Representative I Maximum Dewpoint Moisture Inflow Vecto	r Factor		ESE @ 415							
Stom Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dewpoi	r Factor n (Date) nt Location		ESE @ 415 1.12 5-Sep 31.80 N	98.03 W			Aug	Sept		
Stom Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dewpoi	r Factor n (Date) nt Location m Dewpoint		ESE @ 415 1.12 5-Sep 31.80 N 78.0 F	98.03 W			Aug 79.84	Sept 77.73		
Stom Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dewpoi Transposition Maximu Transposition Adjustn	r Factor n (Date) nt Location m Dewpoint		ESE @ 415 1.12 5-Sep 31.80 N 78.0 F 1.08	98.03 W				_		
Stom Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dewpoi Transposition Maximu Transposition Adjustn Grid Point Elevation	r Factor In (Date) Int Location In Dewpoint Inent Factor		ESE @ 415 1.12 5-Sep 31.80 N 78.0 F 1.08 4,400	98.03 W				_		
Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dewpoi Transposition Maximu Transposition Adjustn Grid Point Elevation Highest Elevation in B	r Factor In (Date) Int Location In Dewpoint Inent Factor		ESE @ 415 1.12 5-Sep 31.80 N 78.0 F 1.08 4,400 14,344	98.03 W				_		
Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dewpoi Transposition Maximu Transposition Adjustn Grid Point Elevation	r Factor In (Date) Int Location In Dewpoint In Dewpoint In Tactor		ESE @ 415 1.12 5-Sep 31.80 N 78.0 F 1.08 4,400	98.03 W				_		
Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoin Transposition Maximu Transposition Adjustus Grid Point Elevation Highest Elevation in B Inflow Barrier Height	r Factor n (Date) nt Location m Dewpoint nent Factor asin		ESE @ 415 1.12 5-Sep 31.80 N 78.0 F 1.08 4,400 14,344 xx	98.03 W				_		

Appendix F: Table F.100: Storm spreadsheet for McColleum Ranch, NM September 20, 1941



Appendix F: Table F.101: Depth-area-duration values for McColleum Ranch, NM September 20, 1941



Appendix F: Figure F.129 and Figure F.130: Total storm isohyetal analysis Mass curve chart for McColleum Ranch, NM September 20, 1941

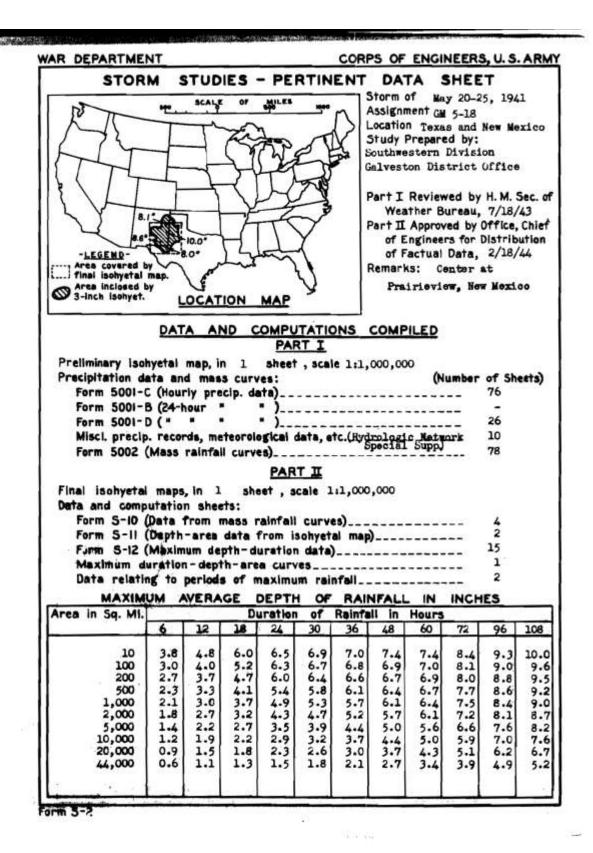
Prairieview, NM, AWA 50

May 20, 1941 Storm Type: Frontal

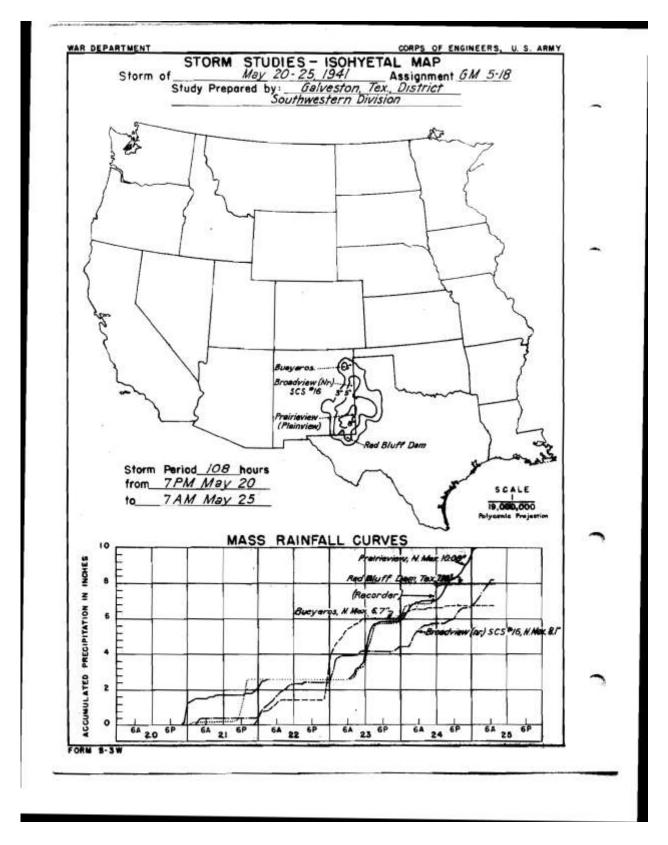
Grid Points Used: 5-6, 12

	ew, NM USAC	E GM 5-18		Storm	Adimat	ment f	n ANO	Crid D	int 6	
orm Date: 5/20-25/19 WA Analysis Date: 12/15/201				Storm	Adjust	ment ic	or ANO	Grid Po	omt 6	
mporal Transposition Date	5-Jun									
inporar Transposition Date	Lat	Long			Moisture Ir	ıflow Direct	ion:	SE @ 375	miles	
form center location	33.12 N	103.20 W			Grid Point			4,400	feet	
torm Rep dew point location	29.50 N	98.43 W				ter Elevation		3,855	feet	
ransposition dewpoint location	30.87 N	99.65 W				Analysis Du		24	hours	
rid Point location	34.50 N	104.00 W				,				
The storm representative	dew point is	73.0 F	with total	l precipitable	water above	e sea level of	f		2.60	inches.
The in-place maximum	-	78.0 F		precipitable					3.29	inches.
The transpositioned maximum	•	77.5 F		l precipitable					3.22 73.0 F	inches.
The in-place ston The in-place ston				ch subtracts ch subtracts	0.82		f precipitable f precipitable		78.0 F	
The transposition basis				ch subtracts	1.07		f precipitable		77.5 F	
The Grid Point/Inflow ba				ch subtracts	1.05		f precipitable		77.5 F	
The in-place st	orm maximizat	tion factor is	1.30					8. Storm rep		
The transposition/e			0.92					24-hr Td valı		
The b	oarrier adjustm	ent factor is	1.01					Values were nore than a 1-		
771	Andre Since	and Carteria	1.00		large area.	temperature	old not vary f	nore man a 1-0	orgice over a	
The	total adjustm	ient factor is	1.22		J - 3-					1
Observed Sterms D. 11	Auga Day	lam .								
Observed Storm Depth	h-Area-Durat 6 Hours	ion 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	÷	12 Hours	- 18 Hours	24 Hours	- JU Hours	30 Hours	48 Hours	ov nours	/2 Hours	
10 sq miles	•	4.8	6.0	6.5	6.9	7.0	7.4	7.4	8.4	1
100 sq miles	•	4.0	5.2	6.3	6.7	6.8	6.9	7.0	8.1	
200 sq miles	2.7	3.7	4.7	6.0	6.4	6.6	6.7	6.9	8.0	
500 sq miles	•	3.3	4.1	5.4	5.8	6.1	6.4	6.7	7.7	
1000 sq miles	•	3.0	3.7	4.9	5.3	5.7	6.1	6.4	7.5	
2000 sq miles	•	2.7	3.2	4.3	4.7	5.2	5.7	6.1	7.2	-
5000 sq miles 10000 sq miles	•	2.2 1.9	2.7	3.5 2.9	3.9 3.2	4.4 3.7	5.0 4.4	5.6 5.0	6.6 5.9	
20000 sq miles	•	1.5	1.8	2.3	2.6	3.0	3.7	4.3	5.1	
20000 bq maco	- 0.5	, 110	1.0							
Adjusted Storm Depth	-Area-Durati	on								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	÷	-	-	-	-	-	<u>-</u>	-	-	
10 sq miles	•	5.8	7.3	7.9	8.4	8.5	9.0	9.0	10.2	
100 sq miles 200 sq miles	· •	4.9 4.5	6.3 5.7	7.7 7.3	8.2 7.8	8.3 8.0	8.4 8.2	8.5 8.4	9.9 9.7	
500 sq miles	•	4.0	5.0	6.6	7.1	7.4	7.8	8.2	9.4	
1000 sq miles	· 🌣	3.7	4.5	6.0	6.5	6.9	7.4	7.8	9.1	
	•	3.3	3.9	5.2	5.7	6.3	6.9	7.4	8.8	1
2000 sq miles										
5000 sq miles	·	2.7	3.3	4.3	4.8	5.4	6.1	6.8	8.0	
5000 sq miles 10000 sq miles	1.7 1.5	2.3	2.7	3.5	3.9	4.5	5.4	6.1	7.2	
5000 sq miles	1.7 1.5	ţ		·		<u> </u>	· •	······		
5000 sq miles 10000 sq miles	1.7 1.5	2.3	2.7	3.5	3.9	4.5	5.4	6.1	7.2	
5000 sq miles 10000 sq miles 20000 sq miles	1.7 1.5 1.1	2.3 1.8	2.7	3.5 2.8	3.9 3.2	4.5	5.4	6.1	7.2	
5000 sq miles 10000 sq miles 20000 sq miles Storm or Storm Center	1.7 1.5 1.1	2.3 1.8	2.7 2.2 Prairieveiew	3.5 2.8 , NM USACE	3.9 3.2	4.5	5.4	6.1	7.2	
5000 sq miles 10000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s)	1.7 1.5 1.1	2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941	3.5 2.8 , NM USACE	3.9 3.2	4.5	5.4	6.1	7.2	
5000 sq miles 10000 sq miles 20000 sq miles Storm or Storm Center	1.7 1.5 1.1	2.3 1.8	2.7 2.2 Prairieveiew	3.5 2.8 , NM USACE	3.9 3.2	4.5	5.4	6.1	7.2	
Storm Or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation	1.7 1.5 1.1	2.3	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855	3.5 2.8 , NM USACE	3.9 3.2	4.5	5.4	6.1	7.2	
Storm Or Storm Center Storm Date(s) Storm Location	1.7 1.5 1.1	2.3	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N	3.5 2.8 , NM USACE	3.9 3.2	4.5	5.4	6.1	7.2	
Storm Center Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I	1.7 1.5 1.1 Name	2.3	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1	3.5 2.8 , NM USACE 103.20 W	3.9 3.2	4.5	5.4	6.1	7.2	
Storm Center Storm Cotton Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I	Name Duration Dewpoint	2.3	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1	3.5 2.8 , NM USACE 103.20 W 08-hours	3.9 3.2	4.5 3.7	5.4	6.1	7.2	
Storm Center Elevation Storm Center Elevation Storm Center Elevation Storm Center Elevation Precipitation Total & I Storm Representative Storm Representative Storm Representative	Name Duration Dewpoint	2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1 73.0 F 29.50 N	3.5 2.8 , NM USACE 103.20 W	3.9 3.2	4.5 3.7 May	5.4 4.5	6.1	7.2	
Storm Center Storm Content Storm Date(s) Storm Type Storm Content Storm Center Elevation Storm Center Elevation Precipitation Total & I	1.7 1.5 1.1 Name Duration Dewpoint Loc	2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1 73.0 F 29.50 N 78.0 F	3.5 2.8 , NM USACE 103.20 W 08-hours	3.9 3.2	4.5 3.7	5.4	6.1	7.2	
Stom or Stom Center Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & I Stom Representative Stom Representative Maximum Dewpoint	1.7 1.5 1.1 Name Duration Dewpoint Locura	2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1 73.0 F 29.50 N	3.5 2.8 , NM USACE 103.20 W 08-hours	3.9 3.2	4.5 3.7 May	5.4 4.5	6.1	7.2	
Storm Center Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative Maximum Dewpoint Moisture Inflow Vecto In-place Maximization	Name Duration Dewpoint Loc r Factor	2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1 73.0 F 29.50 N 78.0 F SE @ 375 1.30	3.5 2.8 , NM USACE 103.20 W 08-hours	3.9 3.2	4.5 3.7 May	5.4 4.5	6.1	7.2	
Stom or Stom Center Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & I Stom Representative Stom Representative Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio	1.7 1.5 1.1 Name Duration Dewpoint Dewpoint Locurer Factor on (Date)	2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1 73.0 F 29.50 N 78.0 F SE @ 375 1.30	3.5 2.8 NM USACE 103.20 W 08-hours 24 98.43 W	3.9 3.2	4.5 3.7 May 77.05	5.4 4.5	6.1	7.2	
Stom or Stom Center Stom Date(s) Stom Location Stom Center Elevation Precipitation Total & I Stom Representative Stom Representative Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoi	Name Name Duration Dewpoint Loc r Factor m (Date) nt Location	2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 33.855 10.0 Inches 1 73.0 F 29.50 N 78.0 F SE @ 375 1.30	3.5 2.8 , NM USACE 103.20 W 08-hours	3.9 3.2	4.5 3.7 May 77.05	5.4 4.5 June 79.01	6.1	7.2	
Stom or Stom Center Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & I Stom Representative Stom Representative Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoi	Name Name Description Description Description Description Description Description Description Description Description Table 2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1 73.0 F 29.50 N 78.0 F SE @ 375 1.30 5-Jun 30.87 N 77.5 F	3.5 2.8 NM USACE 103.20 W 08-hours 24 98.43 W	3.9 3.2	4.5 3.7 May 77.05	5.4 4.5	6.1	7.2		
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoi Transposition Maximum Transposition Adjustr	Name Name Description Description Description Description Description Description Description Description Description Table 2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1 73.0 F 29.50 N 78.0 F SE @ 375 1.30 5-Jun 30.87 N 77.5 F 0.92	3.5 2.8 NM USACE 103.20 W 08-hours 24 98.43 W	3.9 3.2	4.5 3.7 May 77.05	5.4 4.5 June 79.01	6.1	7.2		
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative! Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Transposition Dewpoin Transposition Maximu Transposition Adjustr Grid Point Elevation	Name Description 2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1 73.0 F 29.50 N 78.0 F SE @ 375 1.30 5-Jun 30.87 N 77.5 F 0.92 4,400	3.5 2.8 NM USACE 103.20 W 08-hours 24 98.43 W	3.9 3.2	4.5 3.7 May 77.05	5.4 4.5 June 79.01	6.1	7.2		
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoi Transposition Maximum Transposition Adjustr	Name Description 2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1 73.0 F 29.50 N 78.0 F SE @ 375 1.30 5-Jun 30.87 N 77.5 F 0.92	3.5 2.8 NM USACE 103.20 W 08-hours 24 98.43 W	3.9 3.2	4.5 3.7 May 77.05	5.4 4.5 June 79.01	6.1	7.2		
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Transposition Dewpoin Transposition Maximum Transposition Adjusts Grid Point Elevation Highest Elevation in B	Name Description	2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1 73.0 F 29.50 N 78.0 F SE @ 375 1.30 5-Jun 30.87 N 77.5 F 0.92 4,400 14,344	3.5 2.8 NM USACE 103.20 W 08-hours 24 98.43 W	3.9 3.2	4.5 3.7 May 77.05	5.4 4.5 June 79.01	6.1	7.2	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative Storm Representative Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoi Transposition Maximu Transposition Adjustr Grid Point Elevation Highest Elevation in B Inflow Barnier Height	Name Name Duration Dewpoint Loc r Factor m (Date) nt Location m Dewpoint Factor asin Factor	2.3 1.8	2.7 2.2 Prairieveiew 5/20-25/1941 Synoptic 33.12 N 3,855 10.0 Inches 1 73.0 F 29.50 N 78.0 F SE @ 375 1.30 5-Jun 30.87 N 77.5 F 0.92 4,400 14,344 xx	3.5 2.8 NM USACE 103.20 W 08-hours 24 98.43 W	3.9 3.2	4.5 3.7 May 77.05	5.4 4.5 June 79.01	6.1	7.2	

Appendix F: Table F.102: Storm spreadsheet for Prairieview, NM May 20, 1941



Appendix F: Table F.103: Depth-area-duration values for Prairieview, NM May 20, 1941



Appendix F: Figure F.131 and Figure F.132: Total storm isohyetal analysis and mass curve chart for Prairieview, NM May 20, 1941

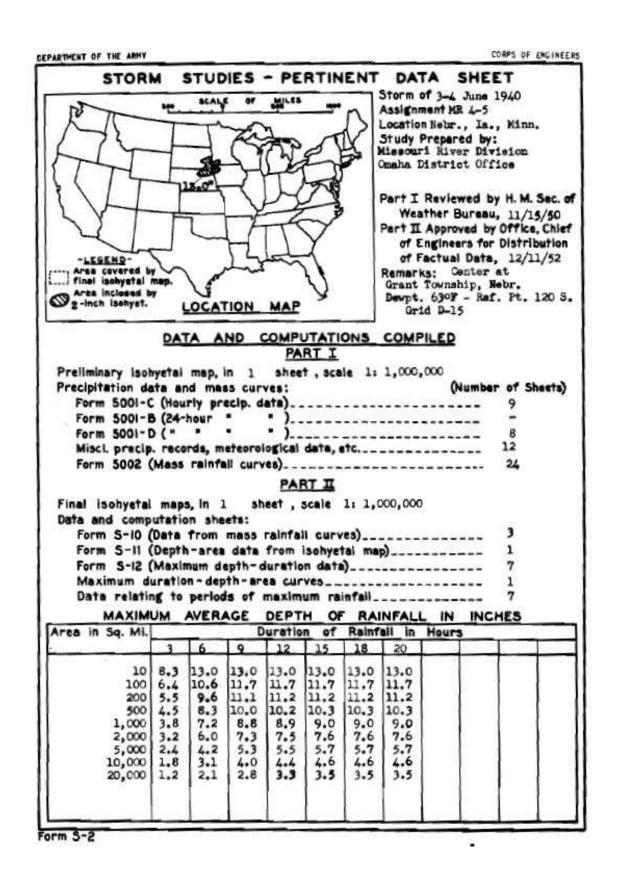
Grant Township, NE, AWA 51

June 3, 1940 Storm Type: MCC

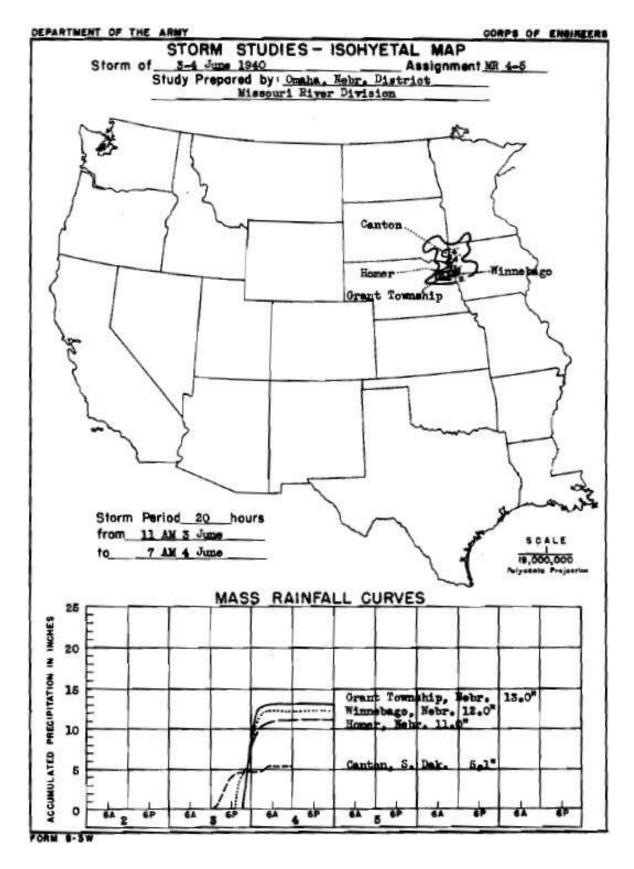
Grid Points Used: 2-4, 8-11, 16-18

Storm Name: USACE ME	R 4-5-Grant	Township,								
torm Date: June 3, 194 WA Analysis Date: 12/15/2013	40			Storm A	Adjustn	nent fo	r ANO	Grid P	oint 2	
emporal Transposition Date	18-Jun									
importar Fransposition Date	Lat	Long			Moisture I	nflow Direc	tion	S @ 120	miles	
torm Center Location	42.24 N	96.59 W			Grid Point	Elevation		550	feet	
torm Rep Dew Point Location	40.51 N	96.59 W			Storm Cen	ter Elevatio	n	1,400	feet	
ransposition Dew Point Location	41.00 N	92.58 W			Storm Rep	Analysis D	uration	6	hours	
rid Point Location	34.50 N	95.50 W			_					
The sterm representative d	lanun aint ia	74.0 F	with total	nennimitalala se	untar alansa	and larvel of			2.73	inahaa
The storm representative of The in-place maximum of	_	74.0 F 79.0 F		precipitable w precipitable w					3.44	inches.
The transpositioned maximum d	_	79.0 F		precipitable w					3.44	inches.
The in-place storm	-	1,400		ich subtracts			f precipitabl	e water at	74.0 F	
The in-place storm	elevation is	1,400	wh	ich subtracts	0.39	inches of	f precipitabl	e water at	79.0 F	
The transposition storm		550		ich subtracts			f precipitabl		79.0 F	
The Grid point/inflow barri	ier height is	1,000	wh	ich subtracts	0.28	inches of	f precipitabl	e water at	79.0 F	
The in-plac	e maximizati	on factor is	1.28	1	Notes: DA	D values ta	ken from US	SACE Storm	Studies	
	transpositi				MR 4-5. St	torm represe	ntative dew	point value	e was based	l
The elevation/ban	rier adjustme	nt factor is	1.00		_	7° to the US	-	is using EP	RI,	
TH 4-	tal a dive-to-	nt faat:-	1.32		Nebraska, a	and TRWD	guidance.			
I ne to	tal adjustme	ant ractor is	1.32							-
Observed Storm Depth	ý									
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	- 120	13.0	13.0	-	-	-	-	-	-	-
10 sq miles 100 sq miles	13.0 10.6	11.7	11.7	-	-	-	-	-	-	
200 sq miles	9.6	11.2	11.7	-	-	-	-	-	-	
500 sq miles	8.3	10.2	10.3	-	-	-	-	-	-	
1000 sq miles	7.2	8.9	9.0	-	-	-	-	-	_	
2000 sq miles	6.0	7.5	7.6	-	-	-	-	-	-	
5000 sq miles	4.2	5.5	5.7	-	-	-	-	-	-	
10000 sq miles	3.1	4.4	4.6	-	-	-	-	-	-	
20000 sq miles	2.1	3.3	3.5	-	-	-	-	-	-	
Adjusted Storm Depth			:		¥	·	¥	y		
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	150	-		-	-	-	-	-	-	
10 sq miles 100 sq miles	17.2 14.0	17.2 15.5	17.2 15.5	-	-	-	-	-	-	
200 sq miles	12.7	14.8	14.8	-	-	-	-	-	-	
500 sq miles	11.0	13.5	13.6	-	-	-	-	-	-	
1000 sq miles	9.5	11.8	11.9	-	-	-	-	-	-	
2000 sq miles	7.9	9.9	10.0	-	-	_	-	-	-	
5000 sq miles	5.6	7.3	7.5	-	-	-	-	-	-	
10000 sq miles 20000 sq miles	4.1 2.8	5.8 4.4	6.1 4.6	-	-	-	-	-	-	
20000 sq miles	2.8	4.4	4.0	-	-	-	-	-	-	
Storm or Storm Center	Name		USACE MR 4	-5-Grant Tow	nship, NE					
Storm Date(s)			3-Jun-1940 MCC							1
Storm Type Storm Location			42.24 N	96.59 W						
Storm Center Elevation			1.400	30.33 11						
Precipitation Total & D		sq mi)	13.00 Inches 6	-hours USAC	E Storm Str	udies MR 4-	.5			
Storm Representative I	Dans Daint		74.0 F	6						-
Storm Representative I Storm Representative I		ncation	40.51 N	6 96.59 W						1
Maximum Dew Point	2 I VAIL L	- Judvii	79.0 F	20.22 11						1
Moisture Inflow Vector	r		S @ 120							1
In-place Maximization l	Factor		1.28							
m			40.7							-
Temporal Transpositio			18-Jun	02 50 777						-
Transposition Dew Poi			41.00 N 79.0 F	92.58 W						-
Transposition Maximus Transposition Adjustm		ıı	1.04							1
Grid Point Elevation	20101		550							1
Highest Elevation in Ba	asin		14,344							
Inflow Barrier Height			1,000							
Elevation Adjustment l			1.00							-
Total Adjustment Fact	or		1.32							

Appendix F: Table F.104: Storm spreadsheet for Grant Township, NE June 3, 1940



Appendix F: Table F.105: Depth-area-duration values for Grant Township, NE June 3, 1940



Appendix F: Figure F.133 and Figure F.134: Total storm isohyetal analysis and mass curve chart for Grant Township, NE June 3, 1940

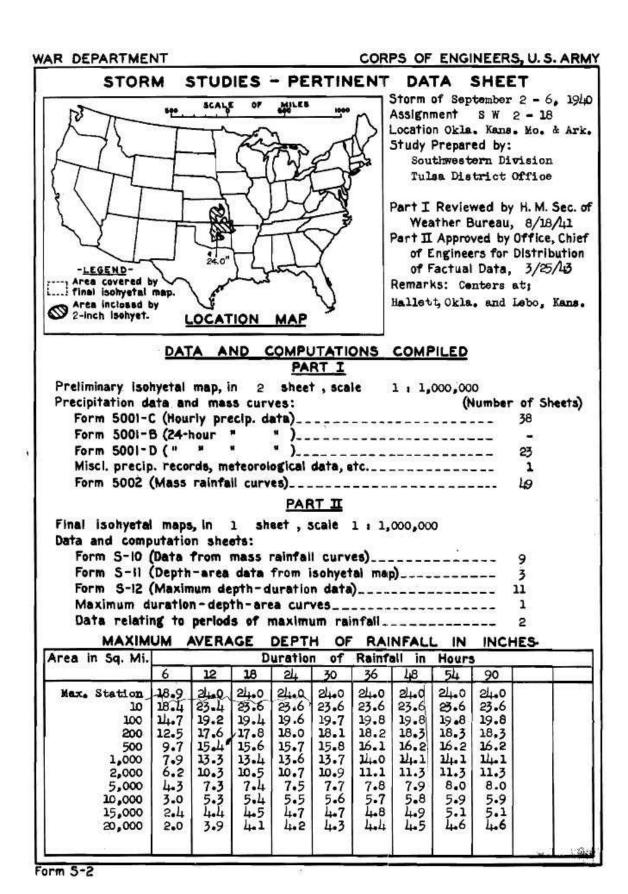
Hallett, OK AWA 52

September 2, 1940 Storm Type: MCC

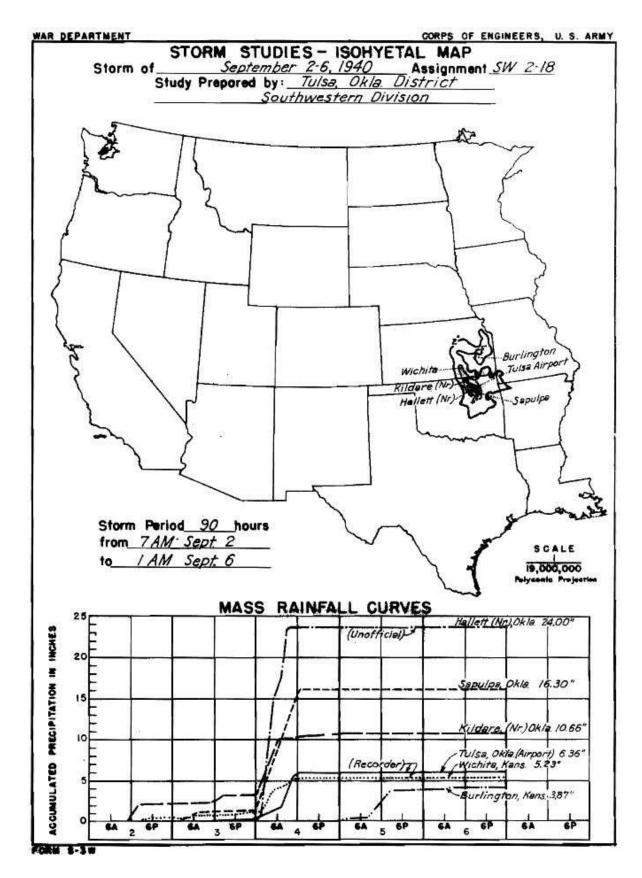
Grid Points Used: 1-4, 8-11, 16-18

orm Name:	USACE SW 2-	18-Hallett, OK			64			1310.0		_	
rm Date: VA Analysis Date:	9/2-4/1940 12/15/2013				Sto	rm Adju	stment fo	or ANO G	rid Point	1	
_	_	17-Aug									
iporal Transposi	ion Date	Lat	Long			Maisture Infl	low Direction		SE @ 300	miles	
m Center Locati	-n	36.23 N	96.57 W			Grid Point El			350	feet	
		30.23 N 32.90 N							900		
rm Rep Dew Poin nsposition Dew P		39.39 N	93.15 W 89.86 W			Storm Center		om	12	feet hours	
d Point Location	oint Location	35.31 N	93.23 W			Storm Kep A	nalysis Durati	on	12	nours	
	The storm representativ	e dew point is	77.5 F	with total	precipitable wate	r above sea le	vel of			3.22	inches
	The in-place maximus		80.0 F		precipitable wate					3.52	inche
The	transpositioned maximur	n dew point is	80.0 F		precipitable wate					3.52	inche
	The in-place stor		900		which subtracts			s of precipitable		77.5 F	
	The in-place stor		900		which subtracts			s of precipitable		80.0 F	
	The transposition stor		350 1,000		which subtracts			s of precipitable		80.0 F	
	The Grid point/inflow ba	amer neight is	1,000		which subtracts	0.29	inche	s of precipitable	water at	80.0 F	
	The	n-place maximiz	ation factor is	1.09	1	Notes: Reanaly	zed the storm ret	Td using hourly s	urface obs in the r	egion. Used	1
	THE	_	ition factor is	0.99				e the 6 hour avera			
	The elevatio	n/barrier adjust		1.00		·					
		The total adjust	ment factor is	1.09							
Obser	ved Storm Depth-Area-	Duration									
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	18.4	23.4	23.6	23.6	23.6	23.6	23.6	-	-	
	100 sq miles	14.7	19.2	19.4	19.6	19.7	19.8	19.8	-	-	
	200 sq miles	12.5 9.7	17.6	17.8	18.0	18.1	18.2	18.3	-	-	
	500 sq miles 1000 sq miles	7.9	15.4 13.3	15.6 13.4	15.7 13.6	15.8 13.7	16.1 14.0	16.2 14.1	-	-	
	2000 sq miles	6.2	10.3	10.5	10.7	10.9	11.1	11.3			
	5000 sq miles	4.3	7.3	7.4	7.5	7.7	7.8	7.9	-	-	
	10000 sq miles	3.0	5.3	5.4	5.5	5.6	5.7	5.8	-	-	
	20000 sq miles	2.0	3.9	4.1	4.2	4.3	4.4	4.5	-	-	_
A 31	ted Cterms Denth Asset I										
Adjus	ted Storm Depth-Area-I	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	20.0	25.4	25.6	25.6	25.6	25.6	25.6	-	/2 Hours	
•••••	100 sq miles	16.0	20.8	21.1	21.3	21.4	21.5	21.5	-	-	
	200 sq miles	13.6	19.1	19.3	19.5	19.7	19.8	19.9	-	-	
	500 sq miles	10.5	16.7	16.9	17.0	17.2	17.5	17.6	_	-	
	1000 sq miles	8.6	14.4	14.5	14.8	14.9	15.2	15.3	-	-	
	2000 sq miles	6.7	11.2	11.4	11.6	11.8	12.1	12.3	-	-	
	5000 sq miles	4.7	7.9	8.0 5.0	8.1	8.4	8.5	8.6	-	-	
	10000 sq miles	3.3 2.2	5.8 4.2	5.9 4.5	6.0 4.6	6.1 4.7	6.2 4.8	6.3 4.9	-	-	-
	20000 sq miles	4.4	4.2	4.5	4.0	4./	4.8	4.9	-	-	4
Storm	or Storm Center Name				-18-Hallett, OK						
	Date(s)			9/2-4/1940							1
	Туре			MCC							4
	Location			36.23 N	96.57 W						-
	Center Elevation	(10 sa mi)		900 24.00 inches in	12 haues						-
Frecip	itation Total & Duration	(10 sq mi)		24.00 inches in	112 nours						1
Storm	Representative Dew Po	int		77.5 F	12						1
	Representative Dew Por			32.90 N	93.15 W		A				1
	num Dew Point			80.0 F			79.5				
	ure Inflow Vector			SE @ 300							
In-pla	ce Maximization Factor			1.09							
				47.4							4
	oral Transposition (Date			17-Aug	00.06.777			0			1
	position Dew Point Loca			39.39 N	89.86 W		A 90.5	S 76			1
	position Maximum Dew position Adjustment Fac			80.0 F 0.99			80.5	76			1
	oint Elevation			350							1
	st Elevation in Basin			14,344							1
	Barrier Height			1,000							1
HIHOW				-							1
	ion Adjustment Factor			1.00							

Appendix F: Table F.106: Storm spreadsheet for Hallett, OK September 2, 1940



Appendix F: Table F.107: Depth-area-duration values for Hallett, OK September 2, 1940



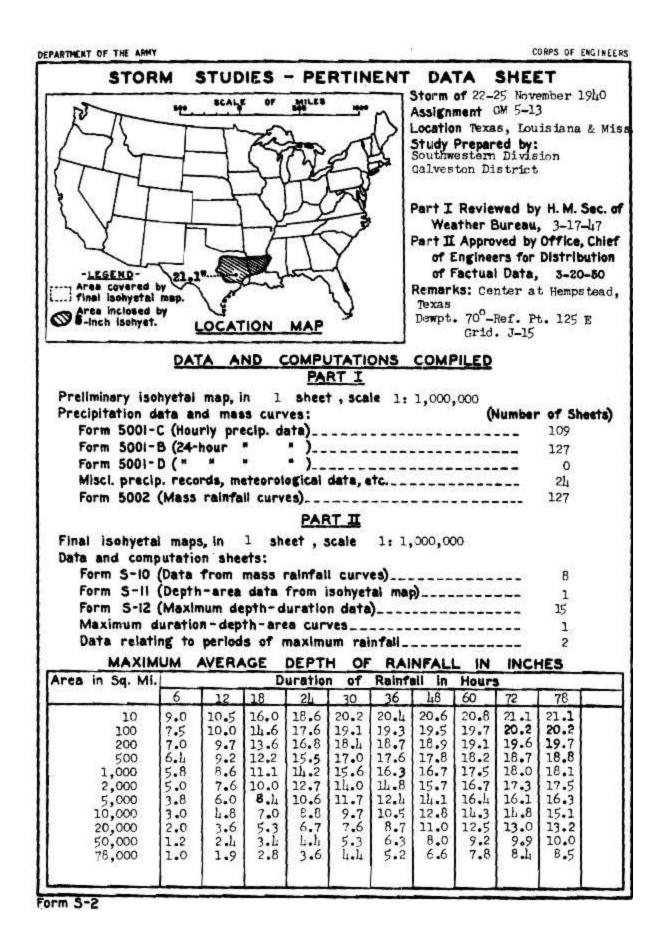
Appendix F: Figure F.135 and Figure F.136: Total storm isohyetal analysis and mass curve chart for Hallett, OK September 2, 1940

Hempstead, TX AWA 53

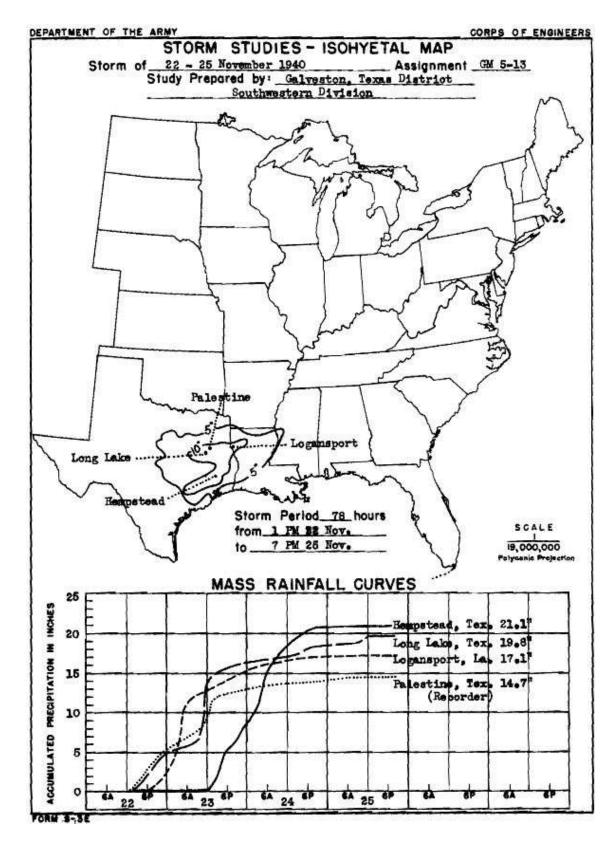
November 22, 1940 Storm Type: Frontal/MCC Grid Points Used: 1-3, 8-10

n Name: n Date: A Analysis Date:	USACE GM 5- 11/22-25/1940 12/15/2013	13-Hempstead,)	TX		Sto	rm Adju	stment fo	or ANO G	rid Point	1	
		5 N					1				_
oral Transposition Da	ite	5-Nov				10.0	. D: .:		F 0 105	9	
		Lat	Long				low Direction:		E @ 125	miles	
n center location		30.13 N	96.13 W			Grid Point El			350	feet	
n Rep SST location		30.15 N	94.05 W			Storm Cente	r Elevation		200	feet	
sposition SST location	1	33.30 N	96.05 W			Storm Rep A	nalysis Durati	on	24	hours	
Point location		35.31 N	93.23 W								
Т	he storm represe	ntative SST is	72.0 F	with total	precipitable wate	r above sea le	vel of			2.47	inches
	The in-place m		74.5 F		precipitable wate					2.79	inches
The tr	anspositioned ma	aximum SST is	71.5 F		precipitable wate					2.42	inches
	The in-place sto	rm elevation is	200		which subtracts	0.05	inche	s of precipitable	water at	72.0 F	
	The in-place sto	rm elevation is	200		which subtracts	0.05	inche	s of precipitable	water at	74.5 F	
The t	transposition sto	m elevation at	350		which subtracts	0.24	inche	s of precipitable	water at	71.5 F	
	rid point/inflow b		1,050		which subtracts	0.24		s of precipitable		71.5 F	
	Tho	in alaas marimis	ention footoris	1.13		Notes: Added 2	2° to the USACE	storm rep Td based	on EPRI and Ne	hraska midance	-
	ine	in-place maximiz	sition factor is	0.80				12hr persisting to		- Soldanice	
	The elevativ	on/barrier adjus		1.00			_	_			
	The elevant	varier aujus	amorit ractor 15	1.00							
		The total adjus	tment factor is	0.90							
Observed Sto	orm Depth-Area-	Duration									
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	9.0	10.5	16.0	18.6	20.2	20.4	20.6	20.8	21.1	
	100 sq miles	7.5	10.0	14.6	17.6	19.1	19.3	19.5	19.7	20.2	
	200 sq miles	7.0	9.7	13.6	16.8	18.4	18.7	18.9	19.1	19.6	
	500 sq miles	6.4	9.2	12.2	15.5	17.0	17.6	17.8	18.2	18.7	
	1000 sq miles	5.8	8.6	11.1	14.2	15.6	16.3	16.7	17.5	18.0	
	2000 sq miles	5.0	7.6	10.0	12.7	14.0	14.8	15.7	16.7	17.3	
	5000 sq miles	3.8	6.0	8.4	10.6	11.7	12.4	14.1	16.4	16.1	
	10000 sq miles	3.0	4.8	7.0	8.8	9.7	10.5	12.8	14.3	14.8	"
	20000 sq miles	2.0	3.6	5.3	6.7	7.6	8.7	11.0	12.5	13.0	
Adjusted Sto	rm Depth-Area-l	Duration									
. zajustcu isto		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	8.1	9.5	14.4	16.8	18.2	18.4	18.6	18.8	19.1	
	100 sq miles	6.8	9.0	13.2	15.9	17.2	17.4	17.6	17.8	18.2	1
			8.8	12.3	15.2	16.6	16.9	17.1	17.2	17.7	
	200 sq miles	6.3							,		
		6.3 5.8	8.3	11.0	14.0	15.3	15.9	16.1	16.4	16.9	
	200 sq miles			11.0 10.0	14.0 12.8	15.3 14.1	15.9 14.7	16.1 15.1	16.4 15.8	16.9 16.3	
	200 sq miles 500 sq miles	5.8	8.3						\$	•	
	200 sq miles 500 sq miles 1000 sq miles	5.8 5.2	8.3 7.8	10.0	12.8	14.1	14.7	15.1	15.8	16.3	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	5.8 5.2 4.5 3.4 2.7	8.3 7.8 6.9 5.4 4.3	10.0 9.0	12.8 11.5	14.1 12.6 10.6 8.8	14.7 13.4 11.2 9.5	15.1 14.2 12.7 11.6	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles	5.8 5.2 4.5 3.4	8.3 7.8 6.9 5.4	10.0 9.0 7.6	12.8 11.5 9.6	14.1 12.6 10.6	14.7 13.4 11.2	15.1 14.2 12.7	15.8 15.1 14.8	16.3 15.6 14.5	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	5.8 5.2 4.5 3.4 2.7	8.3 7.8 6.9 5.4 4.3	10.0 9.0 7.6 6.3	12.8 11.5 9.6 7.9	14.1 12.6 10.6 8.8	14.7 13.4 11.2 9.5	15.1 14.2 12.7 11.6	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	5.8 5.2 4.5 3.4 2.7	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8	12.8 11.5 9.6 7.9	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5	15.1 14.2 12.7 11.6	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	5.8 5.2 4.5 3.4 2.7	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940	12.8 11.5 9.6 7.9 6.0	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5	15.1 14.2 12.7 11.6	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 500 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	5.8 5.2 4.5 3.4 2.7	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC	12.8 11.5 9.6 7.9 6.0	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5	15.1 14.2 12.7 11.6	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s) Storm Type Storm Locatio	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	5.8 5.2 4.5 3.4 2.7	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N	12.8 11.5 9.6 7.9 6.0	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5	15.1 14.2 12.7 11.6	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Location Storm Center	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC MCC 30.13 N 200	12.8 11.5 9.6 7.9 6.0	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5	15.1 14.2 12.7 11.6	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatic Storm Center Precipitation	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 500 sq miles 10000 sq miles 20000 sq miles Total & Duration	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in	12.8 11.5 9.6 7.9 6.0	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5	15.1 14.2 12.7 11.6	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatic Storm Center Precipitation	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in	12.8 11.5 9.6 7.9 6.0 -13-Hempstead, 7 96.13 W	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 1000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Total & Duration Sentative SST Lose	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in 72.0 F 30.15 N	12.8 11.5 9.6 7.9 6.0	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatio Storm Center Precipitation Storm Repres Storm Repres In-place Max	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Total & Duration Total & Duration Sentative SST Lo	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in 72.0 F 30.15 N 74.5 F	12.8 11.5 9.6 7.9 6.0 -13-Hempstead, 7 96.13 W	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatio Storm Center Precipitation Storm Repres Storm Repres In-place Max Moisture Infl	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Total & Duration Total & Duration Sentative SST Lo	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in 72.0 F 30.15 N	12.8 11.5 9.6 7.9 6.0 -13-Hempstead, 7 96.13 W	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Max Moisture Infl	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 20000 sq mile	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in 72.0 F 30.15 N 74.5 F E @ 125	12.8 11.5 9.6 7.9 6.0 -13-Hempstead, 7 96.13 W	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Max Moisture Infl In-place Max Temporal Tra	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mile	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in 72.0 F 30.15 N 74.5 F E @ 125	12.8 11.5 9.6 7.9 6.0 -13-Hempstead, 7 96.13 W 72 hours, 18.6" ir	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Max Moisture Infl In-place Max Temporal Tra	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mile	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in 72.0 F 30.15 N 74.5 F E @ 125 5-Nov 33.30 N	12.8 11.5 9.6 7.9 6.0 -13-Hempstead, 7 96.13 W	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Max Moisture Infl In-place Max Temporal Tra	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq mile	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in 72.0 F 30.15 N 74.5 F E @ 125	12.8 11.5 9.6 7.9 6.0 -13-Hempstead, 7 96.13 W 72 hours, 18.6" ir	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s) Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Max Moisture Infl In-place Max Temporal Tra Transposition Transposition	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 20000 sq mile	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in 72.0 F 30.15 N 74.5 F E @ 125	12.8 11.5 9.6 7.9 6.0 -13-Hempstead, 7 96.13 W 72 hours, 18.6" ir	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Max Moisture Infl In-place Max Temporal Tra Transposition Transposition Transposition	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mile	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in 72.0 F 30.15 N 74.5 F E @ 125 5-Nov 33.30 N 71.5 F	12.8 11.5 9.6 7.9 6.0 -13-Hempstead, 7 96.13 W 72 hours, 18.6" ir	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Max Moisture Infl In-place Max Temporal Tra Transposition Transposition Grid Point Ele Highest Elevi	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mile	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in 72.0 F 30.15 N 74.5 F E @ 125	12.8 11.5 9.6 7.9 6.0 -13-Hempstead, 7 96.13 W 72 hours, 18.6" ir	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	
Storm Date(s Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Max Moisture Infl In-place Max Temporal Tra Transposition Transposition Transposition Grid Point Ele Highest Elev Inflow Barrier	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mile	5.8 5.2 4.5 3.4 2.7 1.8	8.3 7.8 6.9 5.4 4.3 3.3	10.0 9.0 7.6 6.3 4.8 USACE GM 5 11/22-25/1940 MCC 30.13 N 200 21.1 inches in 72.0 F 30.15 N 74.5 F E @ 125 5-Nov 33.30 N 71.5 F	12.8 11.5 9.6 7.9 6.0 -13-Hempstead, 7 96.13 W 72 hours, 18.6" ir	14.1 12.6 10.6 8.8 6.9	14.7 13.4 11.2 9.5 7.9	15.1 14.2 12.7 11.6 9.9	15.8 15.1 14.8 12.9	16.3 15.6 14.5 13.4	

Appendix F: Table F.108: Storm spreadsheet for Hempstead, TX November 22, 1940



Appendix F: Table F.109: Depth-area-duration values for Hempstead, TX November 22, 1940



Appendix F: Figure F.137 and Figure F.138: Total storm isohyetal analysis and mass curve chart for Hempstead, TX November 22, 1940

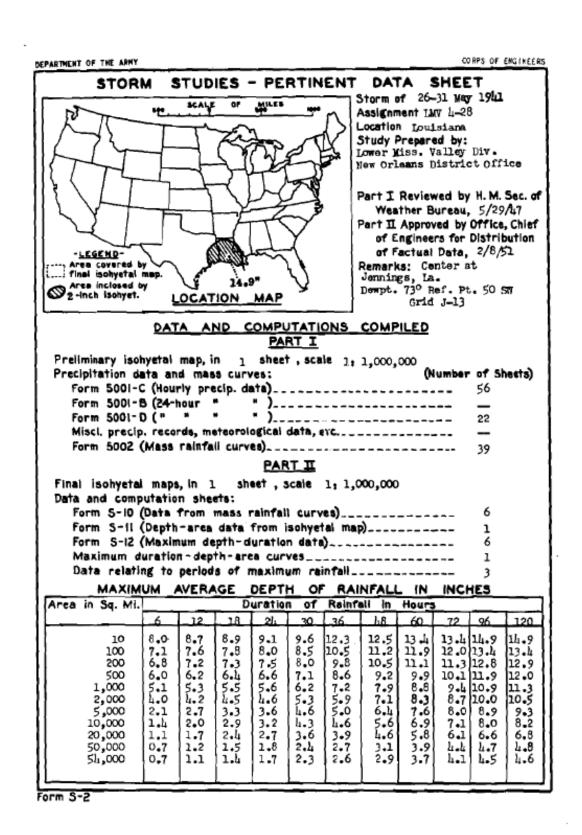
Index, AR, AWA 54

June 30, 1940 Storm Type: MCC

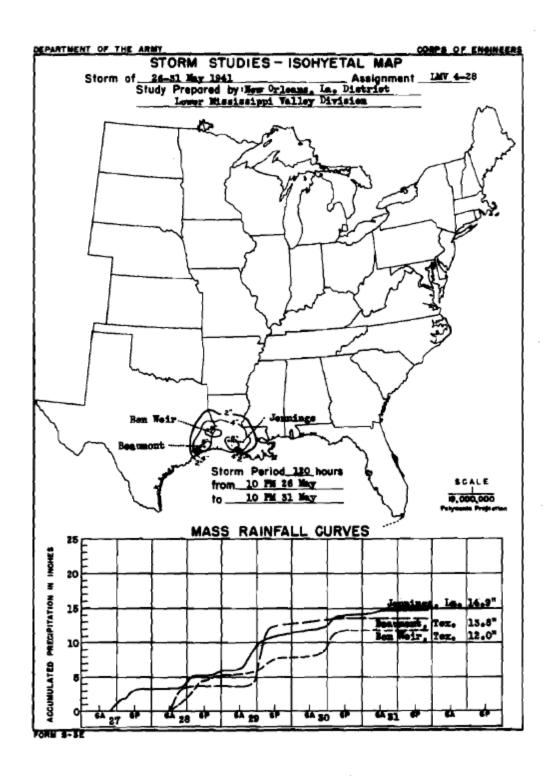
Grid Points Used: 13-, 8-10, 16-17

torm Name: USACE LM torm Date: 30-Jun-194	V 4-25-Index	, AK		Storm	Adinet	ment fo	r ANO	Grid Po	nint 1	
WA Analysis Date: 12/15/2013				Storm	Aujust	шент то	TANO	Griu P	mi i	
emporal Transposition Date	15-Jul									
emporar Transposition Date	Lat	Long			Maietura In	ıflow Directi	on	SSE @ 75	miles	
torm Center Location	33.55 N	94.04 W			Grid Point		ion	350	feet	
								300		
torm Rep Dew Point Location	32.50 N	93.67 W				ter Elevation			feet	
ransposition Dew Point Location rid Point Location	41.68 N	92.15 W			Storm Rep	Analysis Du	ration	12	hours	
rid Point Location	35.31 N	93.23 W								
The stamp consequention	4 i i .	77.0 F	mist sessi	l precipitable		1 1 4			3.14	inches
The storm representative The in-place maximum	•	81.0 F		l precipitable l precipitable					3.76	inches
The transpositioned maximum	-	81.0 F		l precipitable l precipitable					3.76	inches
The in-place storm	_	300		ch subtracts	0.08		f precipitabl	e water at	77.0 F	mones
The in-place storm		300		ch subtracts	0.09		f precipitabl		81.0 F	
The transposition basin		350	whi	ch subtracts	0.30		f precipitabl		81.0 F	
The Grid point/inflow bar		1,000	whi	ch subtracts	0.30		f precipitabl		81.0 F	
•										
The in-place sto	rm maximizat	ion factor is	1.20		Notes: DAI) values take	n from USA	CE LMV 4-2	5. Storm	
The transposition/el	evation to ba	sin factor is	0.94		representati	ive dew poin	it value was	based on ma	ximum 12hr	
The ba	rrier adjustm	ent factor is	1.00		Td values b	etween June	30-July 1, 1	940 at KBAI).	
The	total adjustm	ent factor is	1.13							
Observed Storm Depth				· · · · · · · · · · · · · · · · · · ·				·		
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	8.5	10.4	10.9	10.9	11.2	11.5	11.5	-	-	
100 sq miles	8.4	9.8	10.2	10.2	10.7	11.3	11.3	-	-	
200 sq miles	8.3	9.5	9.9	10.0	10.4	10.9	11.0	-	-	
500 sq miles	7.8	8.9	9.4	9.6	9.8	10.3	10.4	-	-	
1000 sq miles	7.3	8.2	8.8	9.1	9.3	9.6	9.8	-	-	
2000 sq miles	6.4 4.8	7.2 5.7	7.8 6.1	8.1	8.5 7.1	8.7 7.4	9.0 7.7	-	-	-
5000 sq miles 10000 sq miles	3.5	4.5	4.8	6.4 5.1	7.1 5.8	6.2	6.5	-	-	
20000 sq miles	2.3	3.3	3.4	3.8	4.4	5.0	6.2	-	-	l -
20000 Sq macs	2.0	0.0	014				. 0.2			
Adjusted Storm Depth-	Area-Duratio	n								1
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	9.6	11.8	12.3	12.3	12.7	13.0	13.0	-	-	
100 sq miles	9.5	11.1	11.5	11.5	12.1	12.8	12.8	-	-	
200 sq miles	9.4	10.7	11.2	11.3	11.8	12.3	12.4	-	-	1
500 sq miles	8.8	10.1	10.6	10.9	11.1	11.6	11.8	-	-	
1000 sq miles	8.3	9.3	10.0	10.3	10.5	10.9	11.1	-	-	
2000 sq miles	7.2	8.1	8.8	9.2	9.6	9.8	10.2	-	-	
5000 sq miles	5.4	6.4	6.9	7.2	8.0	8.4	8.7	-	-	
10000 sq miles	4.0	5.1	5.4	5.8	6.6	7.0	7.3	-	-	
20000 sq miles	2.6	3.7	3.8	4.3	5.0	5.7	7.0	-	-	
a										
Storm or Storm Center N	Name		USACE LMV	4-25-Index,	AR					
Storm Date(s)	Name		30-Jun-1940	7 4-25-Index,	AR					
Storm Date(s) Storm Type	Name		30-Jun-1940 MCC		AR					
Storm Date(s) Storm Type Storm Location			30-Jun-1940 MCC 33.55 N	7 4-25-Index, 94.04 W	AR					
Storm Date(s) Storm Type Storm Location Storm Center Elevation			30-Jun-1940 MCC 33.55 N 300	94.04 W		15				
Storm Date(s) Storm Type Storm Location			30-Jun-1940 MCC 33.55 N	94.04 W		15				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	uration		30-Jun-1940 MCC 33.55 N 300	94.04 W		15				
Storm Date(s) Storm Type Storm Location Storm Center Elevation	uration Dewpoint		30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3	94.04 W 6-hours USA		15				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	uration Dewpoint	ation	30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3	94.04 W 6-hours USA		25				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Di Storm Representative D Storm Representative D	uration Pewpoint Pewpoint Loc	ation	30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3 77.0 F 32.50 N	94.04 W 6-hours USA		.5				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Di Storm Representative D Storm Representative D Maximum Dewpoint	uration Newpoint Newpoint Loc	ation	30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3 77.0 F 32.50 N 81.0 F	94.04 W 6-hours USA		.5				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F	uration Dewpoint Dewpoint Loc- Cactor	ation	30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3 77.0 F 32.50 N 81.0 F SSE @ 75 1.20	94.04 W 6-hours USA		25				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Drecipitation Total & Drecipitation Storm Representative Drecipitation Dewpoint Moisture Inflow Vector In-place Maximization Fremporal Transposition	Dewpoint Locarda actor	ation	30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3 77.0 F 32.50 N 81.0 F SSE @ 75 1.20	94.04 W 6-hours USA 12 93.67 W		15				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Di Storm Representative D Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoin	Dewpoint Dewpoint Loc. Gactor In (Date)	ation	30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3 77.0 F 32.50 N 81.0 F SSE @ 75 1.20	94.04 W 6-hours USA		15				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoin Transposition Maximum	Dewpoint Location Gactor a (Date) It Location b Dewpoint	ation	30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3 77.0 F 32.50 N 81.0 F SSE @ 75 1.20 15-Jul 41.68 N 81.0 F	94.04 W 6-hours USA 12 93.67 W		25				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoin Transposition Maximum Transposition Adjustm	Dewpoint Location Gactor a (Date) It Location b Dewpoint	ation	30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3 77.0 F 32.50 N 81.0 F SSE @ 75 1.20 15-Jul 41.68 N 81.0 F	94.04 W 6-hours USA 12 93.67 W		25				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoin Transposition Maximum Transposition Adjustm Grid Point Elevation	ewpoint Loc. Gactor In (Date) In Dewpoint Location In Dewpoint In	ation	30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3 77.0 F 32.50 N 81.0 F SSE @ 75 1.20 15-Jul 41.68 N 81.0 F	94.04 W 6-hours USA 12 93.67 W		25				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoin Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	ewpoint Loc. Gactor In (Date) In Dewpoint Location In Dewpoint In	ation	30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3 77.0 F 32.50 N 81.0 F SSE @ 75 1.20 15-Jul 41.68 N 81.0 F 81.0 F 81.0 F	94.04 W 6-hours USA 12 93.67 W		25				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoin Transposition Maximum Transposition Adjustm Grid Point Elevation	ewpoint Loc Cactor In (Date) It Location In Dewpoint ent Factor	ation	30-Jun-1940 MCC 33.55 N 300 11.5 Inches 3 77.0 F 32.50 N 81.0 F SSE @ 75 1.20 15-Jul 41.68 N 81.0 F	94.04 W 6-hours USA 12 93.67 W		25				

Appendix F: Table F.110: Storm spreadsheet for Index, AR June 30, 1940



Appendix F: Table F.111: Depth-area-duration values for Index, AR June 30, 1940



Appendix F: Figure F.139 and Figure F.140: Total storm isohyetal analysis and mass curve chart for Index, AR June 30, 1940

Elbert, CO, AWA 55

May 30, 1935 Storm Type: MCC

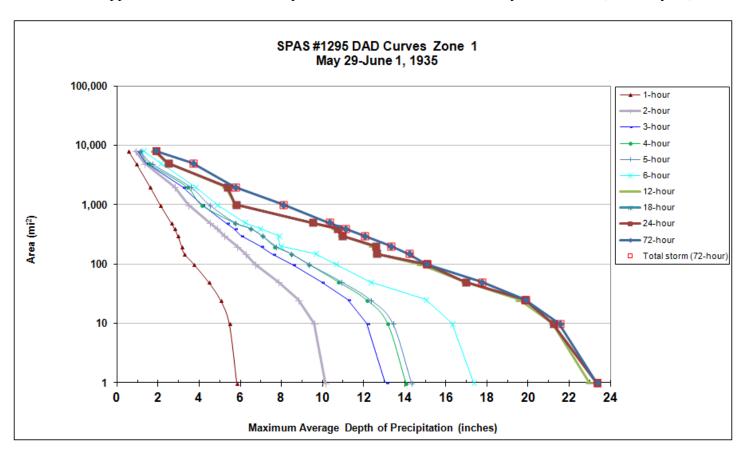
Grid Points Used: 6, 13, 15, 21

	5 Cherry Cre	ek-Elbert, C		Storm	Adinat	mont f	or ANO	Crid Da	int 6	
torm Date: 5/29-31/19 WA Analysis Date: 12/15/201				Storm	Aajust	ment fo	or ANO	Grid Po	ont o	
emporal Transposition Date	30-May									
	Lat	Long			Moisture Ir	ıflow Direct	ion:	SSE @ 500	miles	
torm center location	39.24 N	104.49 W			Basin Ave.	Elevation		4,400	feet	
torm Rep dew point location	33.05 N	99.80 W			Storm Cen	ter Elevation	1	6,800	feet	
ransposition dewpoint location	28.33 N	100.03 W			Storm Rep	Analysis D	uration	6	hours	
asin location	34.50 N	104.00 W								
The storm representativ	a day point is	76.5 F	with tot	al precipitable	water above	a can laval a	é		3.07	inches.
The in-place maximus	•			al precipitable al precipitable					3.29	inches.
The transpositioned maximus	•			al precipitable					3.44	inches.
The in-place stor	m elevation is	6,800		nich subtracts			of precipitabl	e water at	76.5 F	
The in-place stor				iich subtracts			of precipitabl		78.0 F	
The transposition bas				ich subtracts			of precipitabl		79.0 F	
The inflow barrier/basin elev-	ation height is	4,400	wh	iich subtracts	1.12	inches o	of precipitabl	e water at	79.0 F	
The in place s	torm maximizat	tion factor is	1.09	1	Notes: DAD) values taken	from SPAS 1	295 Zone 1. S	torm	1
The transposition/								ed on maximun		
_	barrier adjustm				hr Td values	between Ma	y 29-30, 1935	at KABI and	KSPS.	
	•									
Th	e total adjustm	nent factor is	1.46							1
Observed Storm Depth	-Area-Durati	on								
Observed Storm Depth	1 Hours	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	18 Hours	24 Hours	
1 sq mile:		10.1	13.0	14.1	14.3	17.4	23.0	23.3	23.3	
10 sq mile	s 5.5	9.6	12.1	13.2	13.4	16.3	21.2	21.2	21.2	
100 sq mile	•••	6.7	8.5	9.3	9.3	10.6	14.8	15.0	15.0	
200 sq mile:	••••	5.8	7.0	7.7	7.7	7.9	12.4	12.5	12.5	
500 sq miles	•••	4.5 3.5	5.3 4.1	5.7 4.1	5.7 4.5	6.2 4.8	9.5 5.7	9.5	9.5	
1000 sq miles 2000 sq miles	•••	2.8	3.2	3.4	3.6	3.8	5.7	5.7 5.4	5.7 5.4	
5000 sq miles	•••	1.3	1.4	1.6	1.7	2.1	2.5	2.5	2.5	•
10000 sq mile:	•••	-	-	-	-	-	-	-	-	
20000 sq mile:	s -	-	-	-	-	-	-	-	-	
Adinoted Street Double	A D									
Adjusted Storm Depth	1 Hours	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	18 Hours	24 Hours	
1 sq miles	•••	14.8	19.1	20.6	20.9	25.4	33.6	34.1	34.1	
10 sq mile:	••••	14.0	17.8	19.3	19.6	23.8	31.0	31.0	31.0	
100 sq mile:	••••	9.8	12.5	13.6	13.6	15.6	21.6	22.0	22.0	
200 sq mile:	···•	8.5	10.2	11.2	11.3	11.6	18.2	18.4	18.4	
500 sq miles	••••	6.6 5.1	7.8 6.0	8.3 6.0	8.4 6.6	9.1 7.1	13.9 8.4	13.9 8.4	13.9 8.4	
1000 sq mile: 2000 sq mile:	···•	4.1	4.6	5.0	5.2	5.6	7.8	7.8	7.8	
5000 sq miles		1.9	2.1	2.3	2.5	3.1	3.6	3.6	3.6	
10000 sq miles	s -	-	-	-	-	-	-	-	-	
20000 sq miles	<u>-</u>	-	-	-	-	-	-	-	-	
Storm or Storm Center	Name		SPAS 1295	Cherry Cree	ek-Elbert, CO	O Zone 1				
Storm Date(s)			5/29-31/1935							1
Storm Type			Convective							
Storm Location			39.24 N	104.49 W						
Storm Center Elevation			6,800	10 1						-
Precipitation Total & I	Juration		24.0 Inches	10-nours						1
Storm Representative I	 Dewpoint		76.5 F	6						1
Storm Representative I		ation	33.05 N	99.80 W			May	June		
Maximum Dewpoint			78.0 F				76.5	79		
Moisture Inflow Vecto			SSE @ 500	Miles						-
In-place Maximization	Factor		1.09							
Temporal Transpositio	n (Date)		30-May							1
Transposition Dewpoi			28.33 N	100.03 W			May	June		
	ım Dewpoint		79.0 F				78	79.5		
Transposition Maximu	nent Factor		1.46							
Transposition Adjustn										I
Transposition Adjustr Average Basin Elevati			4,400							
Transposition Adjustn Average Basin Elevati Highest Elevation in B			14,344							
Transposition Adjustr Average Basin Elevati	asin									

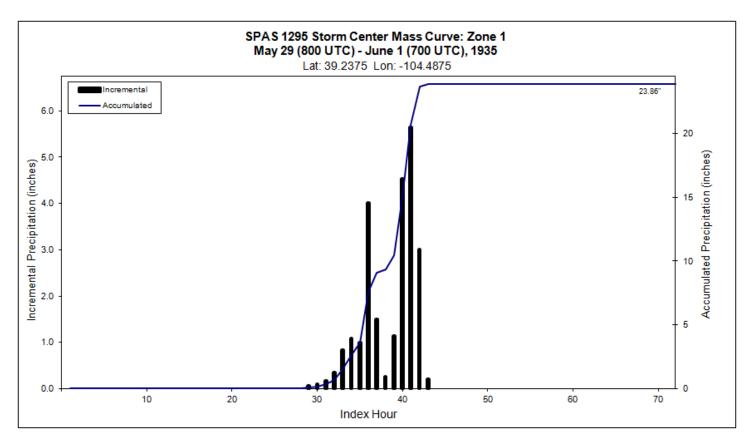
Appendix F: Table F.112: Storm spreadsheet for Cherry Creek-Elbert, CO May 30, 1935

					•		ne 1 (700				
			MAXIMUN	AVERAG			IPITATION	(INCHES)			
					D	uration (hou	rs)				
Area (mi ²)	1	2	3	4	5	6	12	18	24	72	Total
0.3	5.99	10.46	13.33	14.39	14.66	17.83	23.53	23.86	23.86	23.86	23.86
1	5.83	10.14	13.04	14.05	14.31	17.35	22.97	23.32	23.32	23.32	23.32
10	5.46	9.59	12.14	13.16	13.4	16.29	21.18	21.18	21.18	21.51	21.51
25	5.02	8.83	11.2	12.13	12.31	15	19.54	19.81	19.81	19.82	19.82
50	4.44	7.83	9.93	10.76	10.91	12.31	16.92	16.92	16.92	17.72	17.72
100	3.72	6.71	8.52	9.31	9.31	10.63	14.75	15.04	15.04	15.04	15.04
150	3.26	6.27	7.55	8.45	8.45	9.67	12.6	12.6	12.6	14.17	14.17
200	3.14	5.83	6.95	7.66	7.73	7.93	12.41	12.54	12.54	13.3	13.30
300	2.95	5.19	6	7.06	7.06	7.85	10.92	10.92	10.92	12	12.00
400	2.78	4.85	5.68	6.47	6.47	6.94	10.58	10.68	10.68	11.08	11.08
500	2.62	4.5	5.3	5.69	5.73	6.2	9.49	9.49	9.49	10.29	10.29
1,000	2.09	3.47	4.1	4.1	4.49	4.84	5.73	5.74	5.74	8.06	8.06
2,000	1.6	2.81	3.17	3.4	3.58	3.8	5.3	5.35	5.35	5.7	5.70
5,000	0.92	1.33	1.42	1.55	1.69	2.09	2.45	2.45	2.45	3.66	3.66
8,125	0.54	0.9	1.03	1.13	1.14	1.27	1.81	1.85	1.86	1.86	1.86

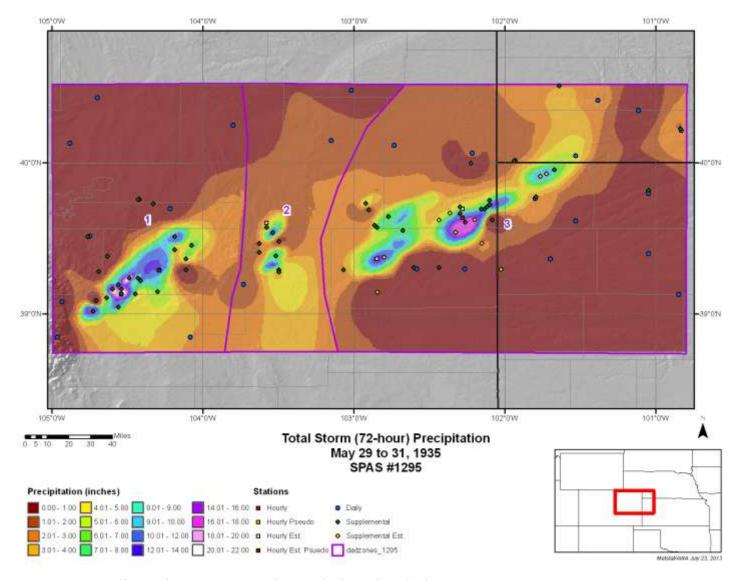
Appendix F: Table F.113: Depth-area-duration values for Cherry Creek-Elbert, CO May 30, 1935



Appendix F: Figure F.141: Depth-area-duration chart for Cherry Creek-Elbert, CO May 30, 1935



Appendix F: Figure F.142: Mass curve chart for Cherry Creek-Elbert, CO May 30, 1935



Appendix F: Figure F.143 Total storm isohyetal analysis Cherry Creek-Elbert, CO May 30, 1935

Hale, CO, AWA 56

May 30, 1935 Storm Type: MCC

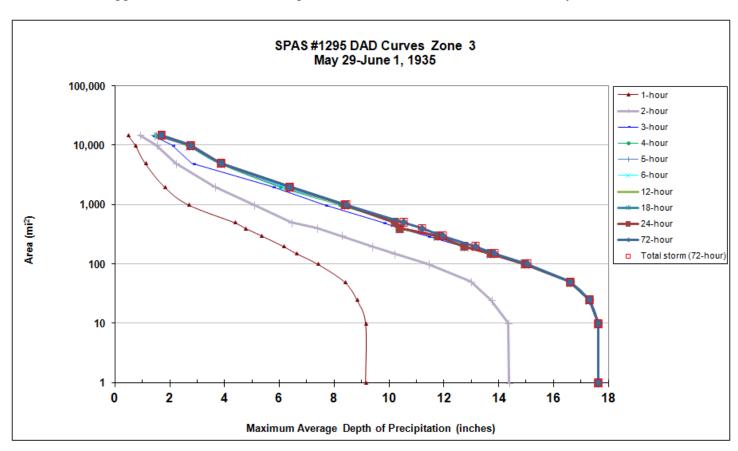
Grid Points Used: 5-6, 12, 15, 19-20

	95 DAD Zone 3	Hale, CO		Store	Adina	mont f	N ANO	Cuid D	int 6	
orm Date: 5/30/193 VA Analysis Date: 12/15/20				Storm	ı Aajust	ment 10	or ANO	Grid Po	oint 6	
mporal Transposition Date	30-May									
	Lat	Long			Moisture I	nflow Direct	ion:	SSE @ 475	miles	
orm center location	39.61 N	102.26 W			Grid Point	Elevation		4,400	feet	
orm Rep dew point location	33.05 N	99.80 W			Storm Cen	ter Elevation	1	3,700	feet	
ansposition dewpoint location	28.00 N	102.15 W			Storm Rep	Analysis D	ıration	6	hours	
id Point location	34.50 N	104.00 W								
The storm representativ	e dew point is	76.5 F	with tot	al precipitable	water abov	e sea level o	f		3.07	inches
The in-place maximu	•	78.0 F		al precipitable					3.29	inches
The transpositioned maximu	•	79.0 F		al precipitable					3.44	inches
The in-place sto		3,700		ich subtracts			f precipitabl		76.5 F	
The in-place sto		3,700 4,400		iich subtracts iich subtracts			of precipitabl		78.0 F 79.0 F	
The transposition base The Grid Point/Inflow b		4,400		iich subtracts			of precipitabl of precipitabl		79.0 F	
	storm maximizat		1.08					295 Zone 3. Sed on maximus		
The transposition	'elevation to ba barrier adjustm		0.99 1.00			•		1935 at KAB		-
The	carrer adjustill	CZIC LECCOI IS	1.00	1	Values were	selected in re	gion where ter	nperature did		
Ti	ie total adjustm	ent factor is	1.07		more than a	1-degree over	a large area.			
01 10 5	0 1 D									
Observed Storm Dep	th-Area-Durati 1 Hours	on 3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq mile		17.6	17.6	17.6	17.6	17.6	- 30 Hours	- 40 HOURS	- 12 Hours	
10 sq mile	••••	17.6	17.6	17.6	17.6	17.6	-	-	-	1
100 sq mile	s 7.4	14.9	14.9	14.9	14.9	14.9	-	-	-	
200 sq mile	••••	12.7	12.7	12.7	12.7	12.7	-	-	-	
500 sq mile	••••	9.8	10.2	10.2	10.2	10.2	-	-	-	
1000 sq mile 2000 sq mile	••••	7.6 5.7	8.4 6.1	8.4 6.4	8.4 6.4	8.4 6.4	-	-	-	-
5000 sq mile	•••	2.8	3.8	3.8	3.8	3.9	-	-	-	1
10000 sq mile		2.1	2.6	2.7	2.7	2.8	-	-	-	1
20000 sq mile	s -	-	-	-	-	-	-	-	-	
Adjusted Storm Dept	h Assa Dassati	_								
Adjusted Storm Dept	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq mile	•••	18.8	18.8	18.8	18.8	18.8	-	-	-	
10 sq mile	s 9.7	18.8	18.8	18.8	18.8	18.8	-	-	-	
100 sq mile		15.9	15.9	15.9	15.9	15.9	-	-	-	
200 sq mile	••••	13.5 10.4	13.5	13.6	13.6	13.6	-	-	-	
500 sq mile 1000 sq mile	••••	8.1	10.9 8.9	10.9 8.9	10.9 8.9	10.9 8.9	-	-	<u>-</u>	
2000 sq mile	••••	6.1	6.5	6.8	6.8	6.8	-	-	-	
5000 sq mile		3.0	4.1	4.1	4.1	4.1	-	-	-	
10000 sq mile	••••	2.2	2.8	2.8	2.8	2.9	-	-	-	
20000 sq mile	<u>s</u> -	-	-	-	-	-	-	-	-	
Storm or Storm Cente	r Name			DAD Zone 3	Hale, CO					
Storm Date(s) Storm Type			5/30/1935 Convective							1
Storm Location			39.61 N	102.26 W						1
Storm Center Elevation			3,700							
Precipitation Total &	Duration		18.00 Inches	3-hours						-
Storm Representative	Dewpoint		76.5 F	6		May	June			1
Storm Representative		ation	33.05 N	99.80 W		76.5	79			
Maximum Dewpoint			78.0 F							
Moisture Inflow Vect In-place Maximization			SSE @ 475 1.08							1
ni-piace Maximization	1 20:01		2.00							1
	on (Date)		30-May			May	June			
Temporal Transposit				100 15 337		78	79.5			
Transposition Dewpo	int Location		28.00 N	102.15 W						
Transposition Dewpo Transposition Maxim	oint Location um Dewpoint		79.0 F	102.13 W						-
Transposition Dewpo Transposition Maxim Transposition Adjus	oint Location um Dewpoint		79.0 F 0.99	102.13 W						
Transposition Dewpo Transposition Maxim	oint Location um Dewpoint tment Factor		79.0 F	102.13 W						
Transposition Dewpo Transposition Maxim Transposition Adjus Grid Point Elevation Highest Elevation in Inflow Barrier Height	oint Location um Dewpoint tment Factor Basin		79.0 F 0.99 4,400 14,344 xx	102.13 W						
Transposition Dewpo Transposition Maxim Transposition Adjus Grid Point Elevation Highest Elevation in	oint Location um Dewpoint tment Factor Basin t Factor		79.0 F 0.99 4,400 14,344	102.13 W						

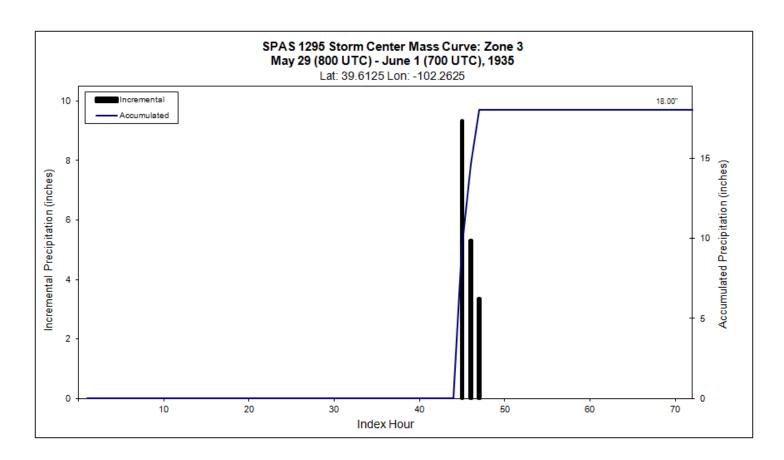
Appendix F: Table F.114: Storm spreadsheet for Hale, CO May 30, 1935

					•		ne 1 (700				
			MAXIMUN	IAVERAG	E DEPTH	OF PREC	IPITATION	(INCHES)			
					D	uration (hou	rs)				
Area (mi ²)	1	2	3	4	5	6	12	18	24	72	Total
0.3	9.33	14.64	18	18	18	18	18	18	18	18	18.00
1	9.13	14.37	17.62	17.62	17.62	17.62	17.62	17.62	17.62	17.62	17.62
10	9.13	14.35	17.62	17.62	17.62	17.62	17.62	17.62	17.62	17.62	17.62
25	8.81	13.72	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.30
50	8.36	12.98	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.60
100	7.38	11.42	14.92	14.92	14.92	14.92	14.92	14.92	14.92	15.01	15.01
150	6.61	10.18	13.62	13.66	13.69	13.69	13.69	13.69	13.69	13.82	13.82
200	6.12	9.36	12.65	12.66	12.69	12.7	12.71	12.71	12.71	13.12	13.12
300	5.33	8.25	11.39	11.63	11.75	11.75	11.75	11.75	11.75	11.93	11.93
400	4.75	7.37	10.33	10.37	10.37	10.37	10.37	10.37	10.37	11.18	11.18
500	4.35	6.44	9.76	10.19	10.19	10.19	10.19	10.19	10.19	10.52	10.52
1,000	2.66	5.06	7.62	8.17	8.35	8.35	8.37	8.37	8.37	8.4	8.40
2,000	1.79	3.62	5.71	6.01	6.11	6.11	6.35	6.35	6.35	6.36	6.36
5,000	1.09	2.21	2.79	3.79	3.84	3.84	3.84	3.84	3.85	3.85	3.85
10,000	0.73	1.5	2.06	2.6	2.64	2.64	2.67	2.67	2.75	2.75	2.75
14,854	0.46	0.9	1.35	1.45	1.48	1.48	1.56	1.56	1.68	1.68	1.68

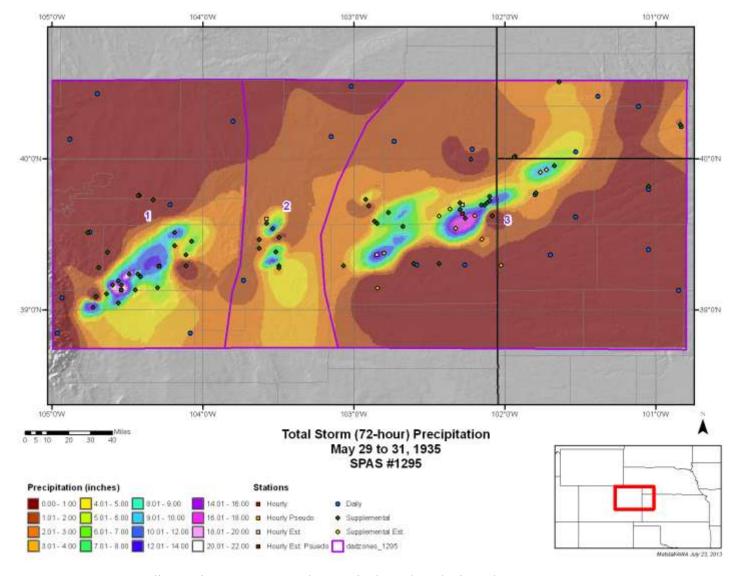
Appendix F: Table F.115: Depth-area-duration values for Hale, CO May 30, 1935



Appendix F: Figure F.144: Total storm isohyetal analysis for Hale, CO May 30, 1935



Appendix F: Figure F.145: Mass curve chart for Hale, CO May 30, 1935



Appendix F: Figure F.146 Total storm isohyetal analysis Hale, CO May 30, 1935

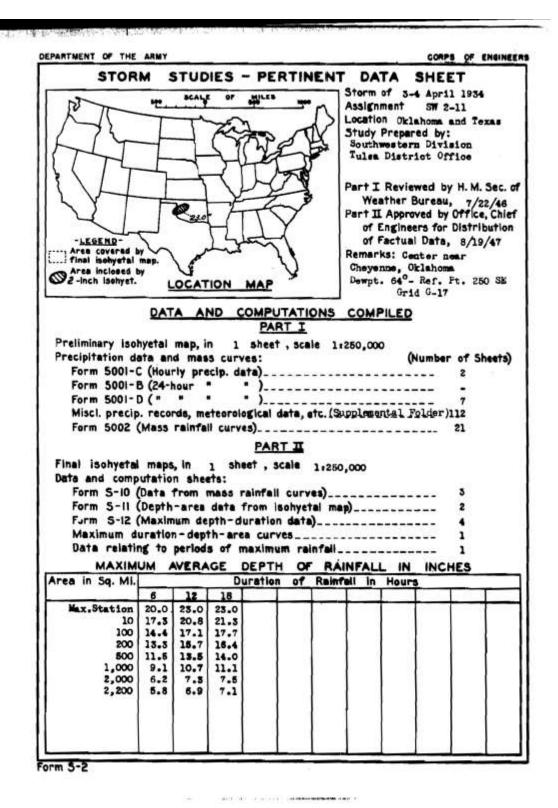
Cheyenne, OK, AWA 57

April 3, 1934 Storm Type: MCC

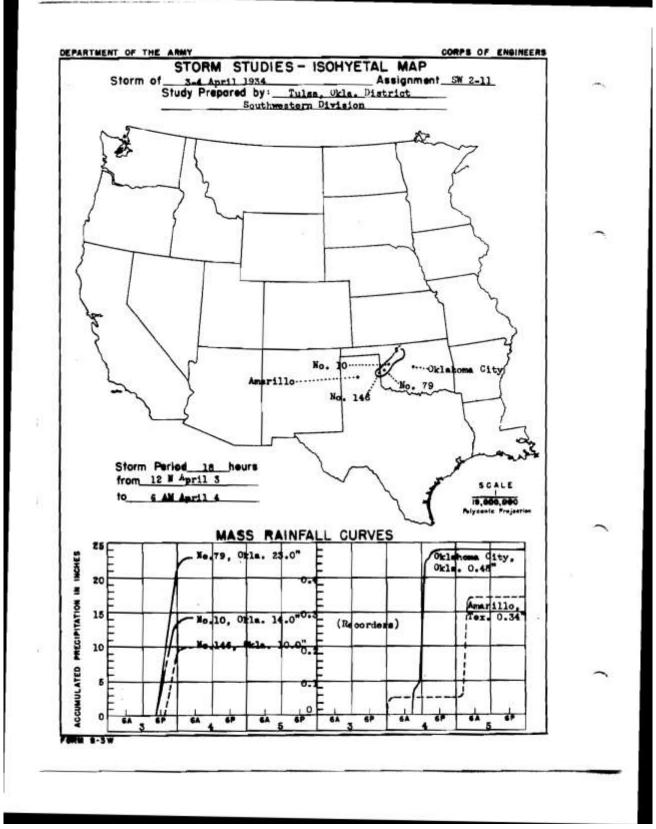
Grid Points Used: 8, 10-11, 16-18

AWA Analysis Date: 12/16/2013	34	nne, OK		Storn	ı Adjus	tment f	or ANC	Grid P	oint 8	
Cemporal Transposition Date	15-Apr									
temporar Transposition Date	Lat	Long			Moisture Ir	flow Directi	ion	SE @ 250	miles	
Storm Center Location	35.61 N	99.67 W			Grid Point		ion	1,200	feet	
								1,990		
Storm Rep Dew Point Location	33.04 N	96.62 W 89.25 W				ter Elevation			feet	
ransposition Dew Point Location Frid Point Location	40.13 N 37.50 N	93.00 W			Storm Kep	Analysis Du	iration	12	hours	
The storm representative	dew point is	71.0 F	with tot	al precipitabl	le water abo	ve sea level	of		2.36	inches
The in-place maximum	-			al precipitabl					2.60	inches
The transpositioned maximum	-	67.0 F		al precipitabl					1.95	inches
The in-place stom				ch subtracts			f precipitabl		71.0 F	
The in-place stom				ch subtracts			f precipitabl		73.0 F	
The transposition basir The Grid Point/Inflow bas				ch subtracts ch subtracts			f precipitabl f precipitabl		67.0 F 67.0 F	
71 : 1 .				1	Notoo: DA	D values tal	ron from III	SACE Storn	n Ctudion (DW 2.1
The in-place ste			1.11 0.82			o storm rep		SACE STOTE	ii Studies (300 2-1
The transposition/e	ievation to ba arrier adjustn		1.00		nuucu / l	o acominieb	ru.			
The	total adjustm	ent factor is	0.91							
Ol1 St P1	Arras Drawat	•								
Observed Storm Depth	-Area-Durat 6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	-
10 sq miles	17.3	20.8	21.3	24 Hours -	-	-	- 40 110 115	-	- 72 Hours	
100 sq miles	14.4	17.1	17.7		_					
200 sq miles	13.3	15.7	16.4		_	_				-
500 sq miles	11.5	13.5	14.0	-	-	-	-	-	-	
1000 sq miles	9.1	10.7	11.1	-	-	_	-	_	_	1
5000 sq miles	-	-	-	-	-	-	-	-	-	
10000 sq miles	-	-	-	-	-	-	-	-	-	"
20000 sq miles	-	-	-	-	-	-	-	-	-	
Adjusted Storm Depth-	Area-Durati	on								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	15.7	18.9	19.3	-	-	-	-	-	-	
To 3q miles	14.1					-	-	:		1
100 sq miles	13.1	15.5	16.1	-	-	<u> </u>	!	-	-	
100 sq miles 200 sq miles	12.1	14.2	14.9	-	-	-	-	-	-	
100 sq miles 200 sq miles 500 sq miles	12.1 10.4	14.2 12.2	14.9 12.7	-	- - -	 :	-		- - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles	12.1	14.2	14.9	-	-	-	-	-	-	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles	12.1 10.4	14.2 12.2	14.9 12.7	-	-	-	-	-	-	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 10000 sq miles	12.1 10.4 8.3	14.2 12.2 9.7	14.9 12.7 10.1	- - -	-	- - -	- - -	-	- - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles	12.1 10.4 8.3	14.2 12.2 9.7	14.9 12.7 10.1	- - -	- - -	- - -	- - - -	-	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	12.1 10.4 8.3 - -	14.2 12.2 9.7 - -	14.9 12.7 10.1	- - - - -	- - - - -	- - - -	- - - - -	- - - -	- - - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	12.1 10.4 8.3 - -	14.2 12.2 9.7 -	14.9 12.7 10.1 - - - - USACE SW	- - - -	- - - - -	- - - -	- - - - -	- - - -	- - - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s)	12.1 10.4 8.3 - -	14.2 12.2 9.7 -	14.9 12.7 10.1 - - - - - - - - - - - - - - - - - - -	- - - - -	- - - - -	- - - -	- - - - -	- - - -	- - - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type	12.1 10.4 8.3 - -	14.2 12.2 9.7 -	14.9 12.7 10.1 - - - - USACE SW 4/3/34 MCC	- - - - - - - - - - - - - - - - - - -	- - - - -	- - - -	- - - - -	- - - -	- - - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type Storm Location	12.1 10.4 8.3 - - - - Name	14.2 12.2 9.7 -	14.9 12.7 10.1 - - - - - - - - - - - - - - - - - - -	- - - - -	- - - - -	- - - -	- - - - -	- - - -	- - - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type	12.1 10.4 8.3 - -	14.2 12.2 9.7 -	14.9 12.7 10.1 - - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -	- - - - - - - enne, OK	- - - - -	- - - - - -	- - - -	- - - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm O Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I	12.1 10.4 8.3 Name Puration	14.2 12.2 9.7	14.9 12.7 10.1 - - - - - - - - - - - - - - - - - - -		enne, OK			- - - -		
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 20000 sq miles	12.1 10.4 8.3 Name Puration	14.2 12.2 9.7	14.9 12.7 10.1 - - - - - - - - - - - - - - - - - - -		enne, OK					
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles Storm OStorm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Storm Representative I Maximum Dew Point	12.1 10.4 8.3 Name Puration Dew Point Lo	14.2 12.2 9.7	14.9 12.7 10.1 - - - - - - - - - - - - - - - - - - -		enne, OK					
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector	12.1 10.4 8.3 Name Puration Dew Point Lore	14.2 12.2 9.7 - -	14.9 12.7 10.1 - - - USACE SW 4/3/34 MCC 35.61 N 1,990 23.00 Inche 71.0 F 33.04 N 73.0 F SE @ 250		enne, OK					
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles Storm Ostorm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Storm Representative I Maximum Dew Point	12.1 10.4 8.3 Name Puration Dew Point Lore	14.2 12.2 9.7 - -	14.9 12.7 10.1 - - - - - - - - - - - - - - - - - - -		enne, OK					
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition	12.1 10.4 8.3 Name Puration Dew Point Dow Point Lorer Factor In (Date)	14.2 12.2 9.7	14.9 12.7 10.1 - - - USACE SW 4/3/34 MCC 35.61 N 1,990 23.00 Inche 71.0 F 33.04 N 73.0 F SE @ 250 1.11	99.67 W 12hr average 96.62 W	enne, OK					
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200 sq miles 200 sq miles 500 sq miles 1000 sq miles 3000 sq miles 10000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm Grid Point Elevation	12.1 10.4 8.3 Name Puration Dew Point Location n (Date) n (Date) n Dew Point Location m Dew Point Location m Dew Point Location m Dew Point Location m Location	14.2 12.2 9.7 - -	14.9 12.7 10.1	99.67 W 12hr average 96.62 W	enne, OK					
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	12.1 10.4 8.3 Name Puration Dew Point Location n (Date) n (Date) n Dew Point Location m Dew Point Location m Dew Point Location m Dew Point Location m Location	14.2 12.2 9.7	14.9 12.7 10.1 USACE SW 4/3/34 MCC 35.61 N 1,990 23.00 Inche 71.0 F 33.04 N 73.0 F SE @ 250 1.11 15-Apr 40.13 N 67.0 F 0.82 1,200 14,344	99.67 W 12hr average 96.62 W	enne, OK					
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Appendix F: Table F.116: Storm spreadsheet for Cheyenne, OK April 3, 1934



Appendix F: Table F.117: Depth-area-duration values for Cheyenne, OK April 3, 1934



Appendix F: Figure F.147 and Figure F.148: Total storm isohyetal analysis and mass curve chart for Cheyenne, OK April 3, 1934

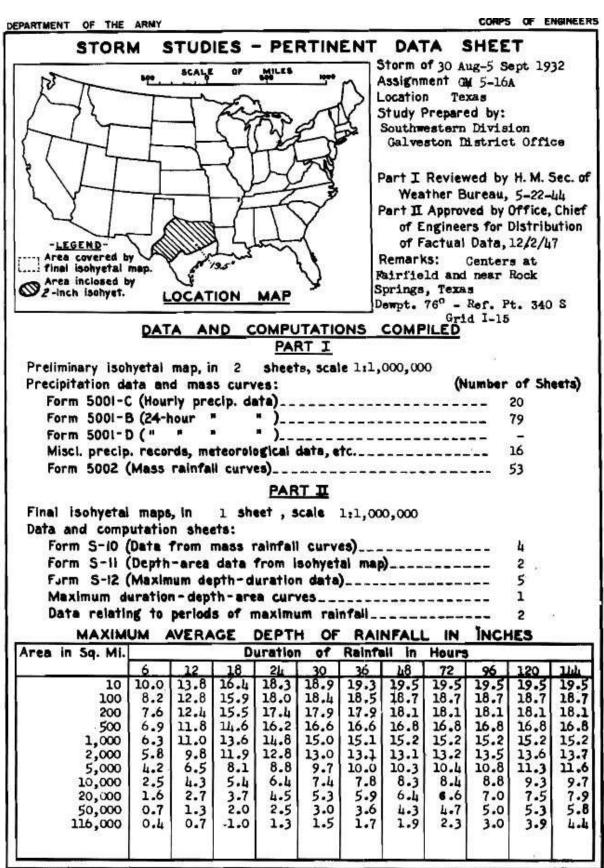
Fairfield, TX, AWA 58

August 30, 1932 Storm Type: MCC

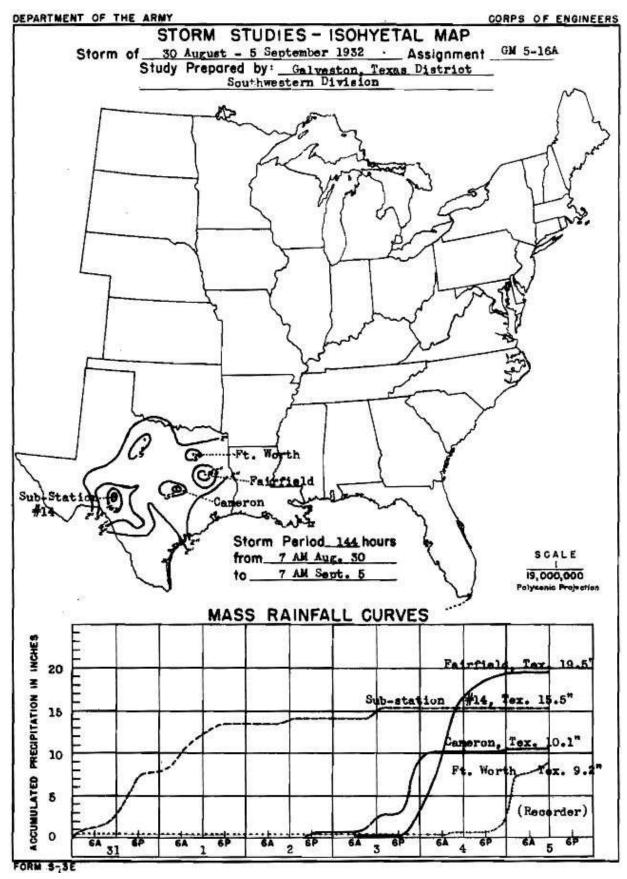
Grid Points Used: 1-3, 8-10

	USACE GM 5-	16A-Fairfield, 7	ſΧ								
m Date:	9/3-5/1932				Sto	rm Adju	stment fo	r ANO G	rid Point	1	
A Analysis Date:	12/16/2013	•••								1	_
poral Transposition Da	te	20-Aug Lat	T			M-: I-0	ow Direction:		5 @ 240		
			Long						S @ 340	miles	
m center location		31.73 N	96.17 W			Grid Point El			350 450	feet	
m Rep SST location		27.00 N	97.55 W			Storm Center				feet	
nsposition SST location l Point location	ı	28.60 N 35.31 N	99.60 W 93.23 W			Storm Rep A	nalysis Duratio	n	12	hours	
1 one ocation		33.3111	73.23 W								
Т	he storm represer	ntative SST is	76.0 F	with total p	recipitable wate	r above sea le	vel of			2.99	inches
	The in-place m		79.0 F		orecipitable wate					3.44	inches
	anspositioned ma		79.0 F	•	orecipitable wate					3.44	inches
	The in-place stor		450		which subtracts	0.12		of precipitable		76.0 F	
	The in-place stor		450		which subtracts	0.135		of precipitable		79.0 F	
	ransposition stor		350 1,050		which subtracts which subtracts	0.295 0.295		of precipitable		79.0 F 79.0 F	
The Gr	id point/inflow b	amer neight is	1,050	'	which subtracts	0.295	Hiches	of precipitable	water at	/9.0 F	
	Thei	n-place maximiz	ation factor is	1.15		Notes: USACE	states an inflow	of South @ 340 m	iles for the storm	rep dew point	1
			sition factor is	0.95		location, howev	ver, this would be	over the Gulf of N	lexico, more likel	ly this is an	
	The elevation	n/barrier adjust		1.00				vector and the loc	ation of the storr	m rep was from	
		•				the Corpus Chri	isti area.				
		The total adjust	ment factor is	1.10							_
Ohannal Cr	um Donth A	Dunetica									
Observed Sto	rm Depth-Area-	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	10.0	13.8	16.4	18.3	18.9	19.3	19.5	-	19.5	
	100 sq miles	8.2	12.8	15.9	18.0	18.4	18.5	18.7	-	18.7	
	200 sq miles	7.6	12.4	15.5	17.4	17.9	17.9	18.1	-	18.1	
	500 sq miles	6.9	11.8	14.6	16.2	16.6	16.6	16.8	_	16.8	
	1000 sq miles	6.3	11.0	13.6	14.8	15.0	15.1	15.2	-	15.2	
	2000 sq miles	5.8	9.8	11.9	12.8	13.0	13.1	13.1	-	13.2	
	5000 sq miles	4.2 2.5	6.5 4.3	8.1 5.4	8.8 6.4	9.7 7.4	10.0 7.8	10.3 8.3	-	10.4 8.4	
	10000 sq miles 20000 sq miles	1.6	2.7	3.7	4.5	7.4 5.3	7.0 5.9	5.9	-	6.6	
	20000 Eq. mines	210									
Adjusted Stor	rm Depth-Area-I	Ouration									
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	11.0	15.1	18.0	20.1	20.7	21.1	21.4	-	21.4	
	400	9.0	14.0	17.4	19.7	20.2	20.3	20.5	-	20.5	
	100 sq miles		10.4	170	101		10.4				
	200 sq miles	8.3	13.6	17.0	19.1	19.6	19.6	19.8	-	19.8	
	200 sq miles 500 sq miles	8.3 7.6	12.9	16.0	17.8	19.6 18.2	18.2	18.4	-	18.4	
	200 sq miles 500 sq miles 1000 sq miles	8.3 7.6 6.9	12.9 12.1	16.0 14.9	17.8 16.2	19.6 18.2 16.4	18.2 16.5	18.4 16.7	- - -	18.4 16.7	
	200 sq miles 500 sq miles	8.3 7.6	12.9	16.0	17.8	19.6 18.2	18.2	18.4	-	18.4	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	8.3 7.6 6.9 6.4	12.9 12.1 10.7	16.0 14.9 13.0	17.8 16.2 14.0	19.6 18.2 16.4 14.2	18.2 16.5 14.4	18.4 16.7 14.4	-	18.4 16.7 14.5	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles	8.3 7.6 6.9 6.4 4.6	12.9 12.1 10.7 7.1	16.0 14.9 13.0 8.9	17.8 16.2 14.0 9.6	19.6 18.2 16.4 14.2 10.6	18.2 16.5 14.4 11.0	18.4 16.7 14.4 11.3		18.4 16.7 14.5 11.4	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	8.3 7.6 6.9 6.4 4.6 2.7	12.9 12.1 10.7 7.1 4.7	16.0 14.9 13.0 8.9 5.9	17.8 16.2 14.0 9.6 7.0	19.6 18.2 16.4 14.2 10.6 8.1	18.2 16.5 14.4 11.0 8.5	18.4 16.7 14.4 11.3 9.1	- - - -	18.4 16.7 14.5 11.4 9.2	
Starm or Star	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	8.3 7.6 6.9 6.4 4.6 2.7	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1	17.8 16.2 14.0 9.6 7.0 4.9	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5	18.4 16.7 14.4 11.3 9.1	- - - -	18.4 16.7 14.5 11.4 9.2	
	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles m Center Name	8.3 7.6 6.9 6.4 4.6 2.7	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1	17.8 16.2 14.0 9.6 7.0	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5	18.4 16.7 14.4 11.3 9.1	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm or Stor Storm Date(s) Storm Type	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles m Center Name	8.3 7.6 6.9 6.4 4.6 2.7	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1	17.8 16.2 14.0 9.6 7.0 4.9	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5	18.4 16.7 14.4 11.3 9.1	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s)	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	8.3 7.6 6.9 6.4 4.6 2.7	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932	17.8 16.2 14.0 9.6 7.0 4.9	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5	18.4 16.7 14.4 11.3 9.1	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles m Center Name	8.3 7.6 6.9 6.4 4.6 2.7	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC	17.8 16.2 14.0 9.6 7.0 4.9	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5	18.4 16.7 14.4 11.3 9.1	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type Storm Locatio Storm Center	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles m Center Name	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N	17.8 16.2 14.0 9.6 7.0 4.9	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5	18.4 16.7 14.4 11.3 9.1	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type Storm Location Storm Center Precipitation	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Total & Duration	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5	18.4 16.7 14.4 11.3 9.1	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type Storm Locatic Storm Center Precipitation Storm Repres	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Don Elevation Total & Duration Lentative SST	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5 6.5	18.4 16.7 14.4 11.3 9.1 6.5	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Total & Duration Elevation Total & Duration entative SST Lo	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5 6.5	18.4 16.7 14.4 11.3 9.1 6.5	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type Storm Locatic Storm Center Precipitation Storm Repres	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Total & Duration Elevation Total & Duration Entative SST Loimum SST	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4 76.0 F 27.00 N 79.0 F	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5 6.5	18.4 16.7 14.4 11.3 9.1 6.5	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type Storm Location Storm Center Precipitation Storm Repres Storm Repres In-place Maximum Moisture Infil	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Total & Duration Elevation Total & Duration Entative SST Loimum SST	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5 6.5	18.4 16.7 14.4 11.3 9.1 6.5	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Maxi Moisture Infl In-place Maxi	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 2000 sq mi	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4 76.0 F 27.00 N 79.0 F 8 @ 340	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5 6.5	18.4 16.7 14.4 11.3 9.1 6.5	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Maxi Moisture Infil In-place Maxi Temporal Tra	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4 76.0 F 27.00 N 79.0 F S @ 340	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T 96.17 W 96.17 W 97.55 W	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5 6.5	18.4 16.7 14.4 11.3 9.1 6.5	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Maxi Moisture Infl In-place Maxi Temporal Tra	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4 76.0 F 27.00 N 79.0 F S @ 340	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5 6.5	18.4 16.7 14.4 11.3 9.1 6.5	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Maxi Moisture Infl In-place Maxi Temporal Tra Transposition Transposition	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles m Center Name Demonstration Total & Duration Total & Duration Total & ST centative SST Locimum SST ow Vector imization Factor Insposition (Date on Dewpoint Loca on Maximum SST	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4 76.0 F 27.00 N 79.0 F S @ 340	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T 96.17 W 96.17 W 97.55 W	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5 6.5	18.4 16.7 14.4 11.3 9.1 6.5	- - - -	18.4 16.7 14.5 11.4 9.2	
Storm Date(s) Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Maxi Moisture Infl In-place Maxi Temporal Tra Transposition Transposition	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4 76.0 F 27.00 N 79.0 F 8 @ 340 20-Aug 28.60 N 79.0 F	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T 96.17 W 96.17 W 97.55 W	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5 6.5	18.4 16.7 14.4 11.3 9.1 6.5	- - - -	18.4 16.7 14.5 11.4 9.2	
Stom Date(s) Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Maxis Moisture Infl In-place Maxis Temporal Tra Transposition Transposition Transposition Grid Point Ele	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4 76.0 F 27.00 N 79.0 F 8 @ 340 20-Aug 28.60 N 79.0 F	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T 96.17 W 96.17 W 97.55 W	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5 6.5	18.4 16.7 14.4 11.3 9.1 6.5	- - - -	18.4 16.7 14.5 11.4 9.2	
Stom Date(s) Storm Type Storm Locatic Storm Center Precipitation Storm Repres Storm Repres In-place Maxis Moisture Infl In-place Maxis Temporal Tra Transposition Transposition Transposition Grid Point Ele	200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq mil	8.3 7.6 6.9 6.4 4.6 2.7 1.8	12.9 12.1 10.7 7.1 4.7 3.0	16.0 14.9 13.0 8.9 5.9 4.1 USACE GM 5- 9/3-5/1932 MCC 31.73 N 450 19.5 inches in 4 76.0 F 27.00 N 79.0 F 8 @ 340 20-Aug 28.60 N 79.0 F	17.8 16.2 14.0 9.6 7.0 4.9 16A-Fairfield, T 96.17 W 96.17 W 97.55 W	19.6 18.2 16.4 14.2 10.6 8.1 5.8	18.2 16.5 14.4 11.0 8.5 6.5	18.4 16.7 14.4 11.3 9.1 6.5	- - - -	18.4 16.7 14.5 11.4 9.2	

Appendix F: Table F.118: Storm spreadsheet for Fairfield, TX August 30, 1932



Form 5-2



Appendix F: Figure F.149 and Figure F.150: Total storm isohyetal analysis and mass curve chart for Fairfield, TX August 30, 1932

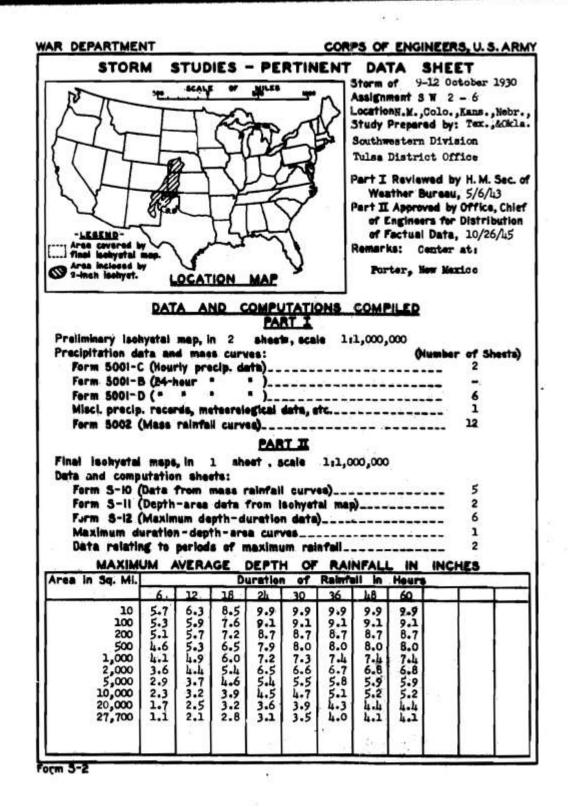
Porter, NM, AWA 59

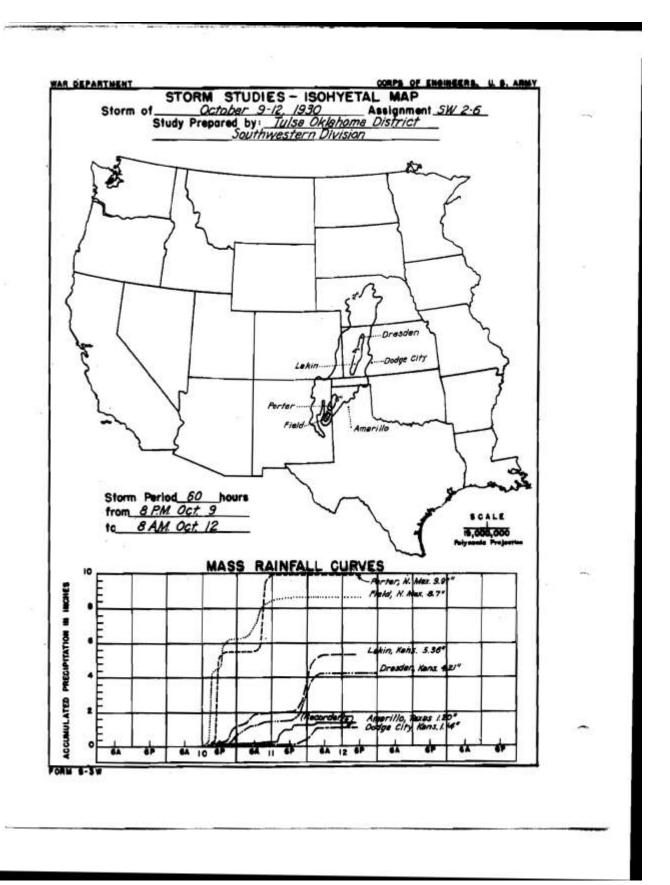
October 9, 1930

Storm Type: Frontal/Tropical Grid Points Used: 5-6, 12-13

torm Name: Porter, I	M USACE SW	2-6		Stamm	Adina	ment f	n ANO	Grid Po	int 6	
torm Date: 10/9-12/ WA Analysis Date: 12/21/20				Storm	Aajusi	ment 10	or ANO	Gria Po	omi o	
emporal Transposition Date	25-Sep									
emporar Transposition Date	Lat	Long			Moietura I	nflow Direct	ion:	SE @ 380	miles	
orm center location	35.20 N	103.28 W			Grid Point		ion.	4,400	feet	
								4,120		
torm Rep dew point location	31.25 N 31.95 N	98.75 W 97.95 W				ter Elevation		24	feet	
ransposition dewpoint location rid Point location	31.95 N 34.50 N	104.00 W			Storm Kep	Analysis Du	iration	24	hours	
id I offic location	34.3011	104.00 11								
The storm representati	ve dew point is	73.0 F	with tota	l precipitable	water abov	e sea level of			2.60	inches.
The in-place maxim		77.0 F		l precipitable					3.14	inches.
The transpositioned maxim	ım dew point is	77.0 F	with tota	l precipitable	water abov	e sea level of			3.14	inches
The in-place st	orm elevation is	4,120	wh	ich subtracts	0.86	inches o	f precipitabl	e water at	73.0 F	
The in-place st		4,120		ich subtracts	0.99		f precipitabl		77.0 F	
The transposition ba				ich subtracts	1.05		f precipitabl		77.0 F	
The Grid Point/Inflow	oarrier height is	4,400	wh	ich subtracts	1.05	inches o	f precipitabl	e water at	77.0 F	
				1	Notes DAD	\1 +-1	5 CW 2 6	A 44-4 20F a	- TICA CE	1
	storm maximizat		1.24					. Added 2°F t m Td climatol		
The transposition			0.97 1.00		storm rep to	convert of av	crage maximo	iii 16 ciiiiatoi	ogy.	
Inc	barrier adjustm	ent ractor is	1.00							
Т	he total adjustm	ent factor is	1.20	1						
Observed Storm De	th-Area-Durat	ion						V		
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq mil	••••	-	-	-	-	-	-		-	
10 sq mil	·····	6.3	8.5	9.9	9.9	9.9	9.9	9.9	-	-
100 sq mil	•••••	5.9 5.7	7.6 7.2	9.1 8.7	9.1 8.7	9.1 8.7	9.1 8.7	9.1 8.7	-	
200 sq mil 500 sq mil	····:	5.7	6.5	7.9	8.0	8.0	8.0	8.0	-	
1000 sq mil	·····	4.9	6.0	7.2	7.3	7.4	7.4	7.4	-	
2000 sq mil	•••••	4.4	5.4	6.5	6.6	6.7	6.8	6.8	-	1
5000 sq mil	••••	3.7	4.6	5.4	5.5	5.8	5.9	5.9	-	
10000 sq mil	es 2.3	3.2	3.9	4.5	4.7	5.1	5.2	5.2	-	
20000 sq mil	es 1.7	2.5	3.2	3.6	3.9	4.3	4.4	4.4	-	
Adjusted Storm Dep	••••;	ý		.,	,		y	,	,	
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq mil	·····;		-	-	-	-	-	-	-	
10 sq mil	·····	7.6 7.1	10.2 9.1	11.9 10.9	11.9 10.9	11.9 10.9	11.9 10.9	11.9 10.9	-	
100 sq mil 200 sq mil	·····	6.8	8.6	10.5	10.5	10.5	10.5	10.5	-	
500 sq mil	······	6.4	7.8	9.5	9.6	9.6	9.6	9.6	-	1
1000 sq mil	·····	5.9	7.2	8.6	8.8	8.9	8.9	8.9	-	1
2000 sq mil	•••••	5.3	6.5	7.8	7.9	8.0	8.2	8.2	-	
5000 sq mil	es 3.5	4.4	5.5	6.5	6.6	7.0	7.1	7.1	-	
10000 sq mil	es 2.8	3.8	4.7	5.4	5.6	6.1	6.2	6.2	-	
20000 sq mil	es 2.0	3.0	3.8	4.3	4.7	5.2	5.3	5.3	-	
a,			n	1010						
Storm or Storm Cent Storm Date(s)	er Name		Porter, NM 1 10/9-12/1930		Z-Ó					1
Storm Date(s) Storm Type			Synoptic							1
Storm Location			35.20 N	103.28 W						1
Storm Center Elevati	on		4,120	105.20 11						1
Precipitation Total &			9.90 Inches 6	0-hours						
Storm Representativ			73.0 F	24		DRT, AUS,	FTW, ABI			-
Storm Representativ		ation	31.25 N	98.75 W						1
Maximum Dewpoint			77.0 F			C4	0-4			1
Moisture Inflow Vec In-place Maximizatio			SE @ 380 1.24			77.5	Oct 76			1
m-piace Maximizatio	n ractor		1,24			11.3	70			1
Temporal Transposi	ion (Date)		25-Sep							1
Transposition Dewp			31.95 N	97.95 W						1
Transposition Maxim			77.0 F							
Transposition Adjus	tment Factor		0.97							
Grid Point Elevation			4,400							
Highest Elevation in	Basin		14,344							1
			4 400							
Inflow Barrier Heigh			4,400							
-	t Factor		4,400 1.00 1.20							

Appendix F: Table F.120: Storm spreadsheet for Porter, NM October 9, 1930
Page **274** of **346**





Appendix F: Figure F.151 and Figure F.152: Total storm isohyetal analysis and mass curve chart for Porter, NM October 9, 1930
Page **276** of **346**

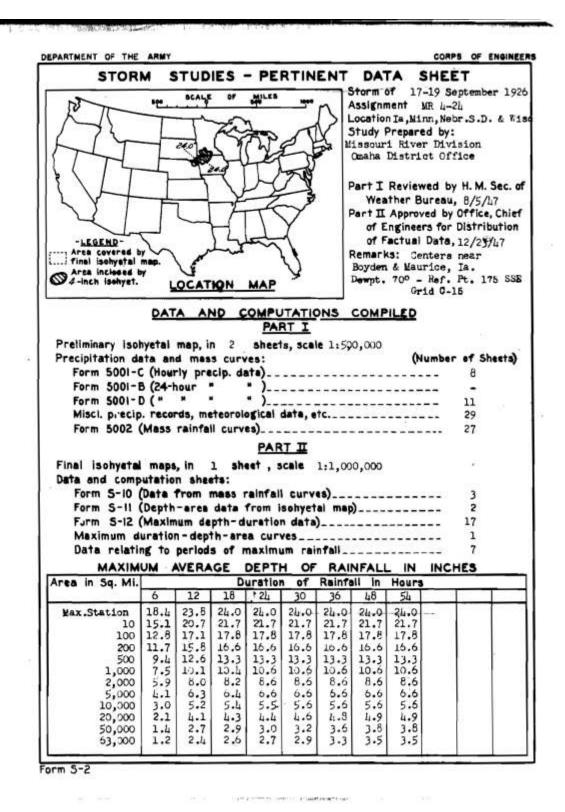
Boyden, IA, AWA 60, MR 4-24

September 17, 1926 Storm Type: MCC

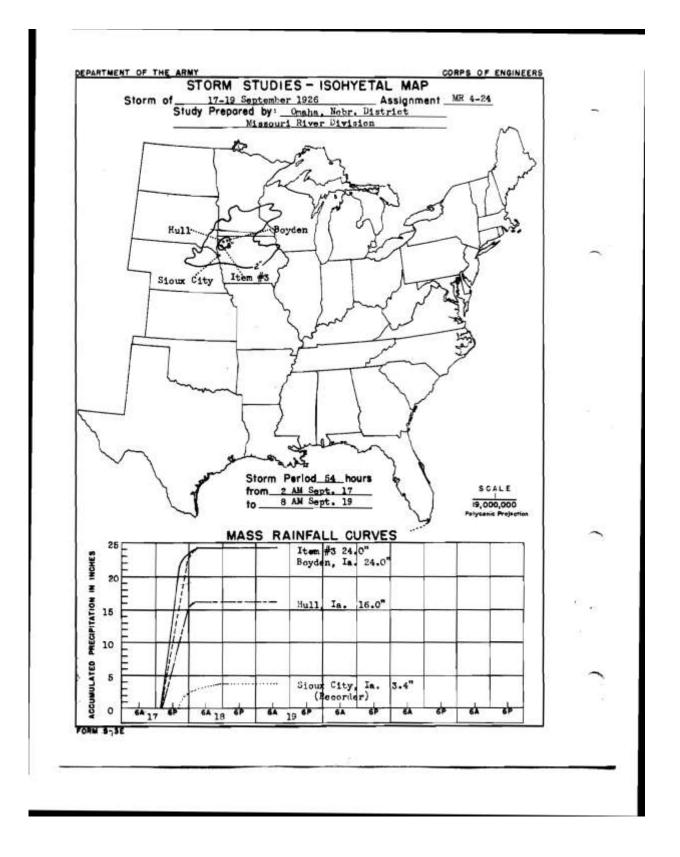
Grid Points Used: 1-4, 8-11, 16-18

torm Name: Boyden, IA torm Date: 17-Sep-19:				Storm	Adinst	ment fo	r ANO	Grid Po	int 1	
WA Analysis Date: 12/21/201				Storm	Aujust	ment re	ANO	Onur	лис 1	
emporal Transposition Date	3-Sep									
	Lat	Long				ıflow Direct	ion	SSE @ 175	miles	
torm Center Location	43.19 N	96.01 W			Grid Point	Elevation		350	feet	
torm Rep Dew Point Location	40.85 N	94.75 W			Storm Cent	ter Elevation	1	1,400	feet	
ransposition Dew Point Location		91.33 W			Storm Rep	Analysis Du	ıration	12	hours	
rid Point Location	35.31 N	93.23 W								
The storm representative	dew point is	77.0 F	with total	l precipitable	water above	e sea level of	f		3.14	inches
The in-place maximum	dew point is	78.5 F		l precipitable					3.37	inches
The transpositioned maximum	dew point is	77.5 F		l precipitable					3.22	inches
The in-place ston		1,400		ch subtracts			f precipitabl		77.0 F	
The in-place ston				ch subtracts			f precipitabl		78.5 F 77.5 F	
The transposition basis The Grid Point/inflow ba				ch subtracts ch subtracts			f precipitabl f precipitabl		77.5 F	
The did I dile into we	iner neight is	550	****	en subtracts	0.20	menes e	1 precipitator	o water at	77101	
The in-place st	orm maximizat	tion factor is	1.07					MR 4-24. St		
The transposition/e			0.99					ed on adding 7	° to the	
The b	arrier adjustm	ent factor is	1.00		OSACE anal	ysis following	g standard gui	Garice.		
The	total adjustm	ent factor is	1.06							
				4						
Observed Storm Deptl	·	::				·		·		
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles		23.8	24.0	24.0	24.0	24.0	24.0	-	-	_
10 sq miles 100 sq miles		20.7 17.1	21.7 17.8	21.7 17.8	21.7 17.8	21.7 17.8	21.7 17.8	-	-	
200 sq miles	<u> </u>	15.8	16.6	16.6	16.6	16.6	16.6	-	-	
500 sq miles		12.6	13.3	13.3	13.3	13.3	13.3	-	-	
1000 sq miles	·	10.1	10.4	10.6	10.6	10.6	10.6	-	-	
2000 sq miles	5.9	8.0	8.2	8.6	8.6	8.6	8.6	-	-	
5000 sq miles		6.3	6.4	6.6	6.6	6.6	6.6	-	-	
10000 sq miles	·	5.2	5.4	5.5	5.6	5.6	5.6	-	-	
20000 sq miles	2.1	4.1	4.3	4.4	4.6	4.8	4.9	-	-	
Adjusted Storm Depth	-Area-Durati	on								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles		25.2	25.4	25.4	25.4	25.4	25.4	-	-	
10 sq miles	•	21.9	23.0	23.0	23.0	23.0	23.0	-	-	
100 sq miles 200 sq miles		18.1 16.7	18.9 17.6	18.9 17.6	18.9 17.6	18.9 17.6	18.9 17.6	-	-	-
500 sq miles	.	13.4	14.1	14.1	14.1	14.1	14.1	-		
1000 sq miles		10.7	11.0	11.2	11.2	11.2	11.2	-	-	
2000 sq miles	6.3	8.5	8.7	9.1	9.1	9.1	9.1	-	-	
5000 sq miles	<u> </u>	6.7	6.8	7.0	7.0	7.0	7.0	-	-	
10000 sq miles		5.5	5.7	5.8	5.9	5.9	5.9	-	-	
20000 sq miles	2.2	4.3	4.6	4.7	4.9	5.1	5.2	-		
						_				
Storm or Storm Center	Name		Boyden, IA M							I
Storm Date(s)	Name		17-Sep-1926							-
Storm Date(s) Storm Type	Name		17-Sep-1926 MCC							
Storm Date(s) Storm Type Storm Location			17-Sep-1926 MCC 43.19 N							
Storm Date(s) Storm Type	1		17-Sep-1926 MCC	96.01 W	ACE Storm S	Studies MR 4	1-24			
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I	ı Duration		17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches	96.01 W 18-hours US.	ACE Storm S	Studies MR 4	1-24			
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative	o Duration Dewpoint		17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches	96.01 W 18-hours US	ACE Storm S	Studies MR 4		S		
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Storm Representative I	o Duration Dewpoint	ation	17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches 77.0 F 40.85 N	96.01 W 18-hours US.	ACE Storm S	Studies MR 4	Aug	Sep		
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative	Duration Dewpoint Dewpoint Loc	ation	17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches 77.0 F 40.85 N 78.5 F	96.01 W 18-hours US	ACE Storm S	Studies MR 4		Sep 76		
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Storm Representative I Maximum Dewpoint	Duration Dewpoint Dewpoint Loc	ation	17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches 77.0 F 40.85 N	96.01 W 18-hours US	ACE Storm S	Studies MR -	Aug	_		
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization	Duration Dewpoint Dewpoint Loc r Factor	ation	17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches 77.0 F 40.85 N 78.5 F SSE @ 175 1.07	96.01 W 18-hours US	ACE Storm S	Studies MR 4	Aug	_		
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio	Dewpoint Dewpoint Loc r Factor	ation	17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches 77.0 F 40.85 N 78.5 F SSE @ 175 1.07	96.01 W 18-hours US. 12 94.75 W	ACE Storm S	Studies MR 4	Aug 81	76		
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoi	Dempoint Dewpoint Loc r Factor in (Date)	ation	17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches 77.0 F 40.85 N 78.5 F SSE @ 175 1.07 3-Sep 40.39 N	96.01 W 18-hours US	ACE Storm S	Studies MR -	Aug 81	76 Sep		
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoi	Duration Dewpoint Dewpoint Loc r Factor In (Date) Int Location In Dewpoint	ation	17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches 77.0 F 40.85 N 78.5 F SSE @ 175 1.07 3-Sep 40.39 N 77.5 F	96.01 W 18-hours US. 12 94.75 W	ACE Storm S	Studies MR 4	Aug 81	76		
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoi	Duration Dewpoint Dewpoint Loc r Factor In (Date) Int Location In Dewpoint	ation	17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches 77.0 F 40.85 N 78.5 F SSE @ 175 1.07 3-Sep 40.39 N	96.01 W 18-hours US. 12 94.75 W	ACE Storm S	Studies MR 4	Aug 81	76 Sep		
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoi Transposition Maximu Transposition Adjustn	Duration Dewpoint Dewpoint Loc r Factor In (Date) Int Location In Dewpoint Interpretation	ation	17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches 77.0 F 40.85 N 78.5 F SSE @ 175 1.07 3-Sep 40.39 N 77.5 F 0.99	96.01 W 18-hours US. 12 94.75 W	ACE Storm S	Studies MR 4	Aug 81	76 Sep		
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoi Transposition Maximu Transposition Adjustur Grid Point Elevation Highest Elevation in B Inflow Barrier Height	Dewpoint Loc r Factor in (Date) int Location in Dewpoint ment Factor assin	ation	17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches 77.0 F 40.85 N 78.5 F SSE @ 175 1.07 3-Sep 40.39 N 77.5 F 0.99 350 14,344 N/A	96.01 W 18-hours US. 12 94.75 W	ACE Storm S	Studies MR 4	Aug 81	76 Sep		
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transposition Transposition Dewpoir Transposition Maximu Transposition Adjustr Grid Point Elevation Highest Elevation in B	Dewpoint Dewpoint Loc r Factor m (Date) mt Location m Dewpoint Factor asin	ation	17-Sep-1926 MCC 43.19 N 1,400 24.00 Inches 77.0 F 40.85 N 78.5 F SSE @ 175 1.07 3-Sep 40.39 N 77.5 F 0.99 350 14,344	96.01 W 18-hours US. 12 94.75 W	ACE Storm S	Studies MR 4	Aug 81	76 Sep		

Appendix F: Table F.122: Storm spreadsheet for Boyden, IA September 17, 1926



Appendix F: Table F.123: Depth-area-duration values for Boyden, IA September 17, 1926



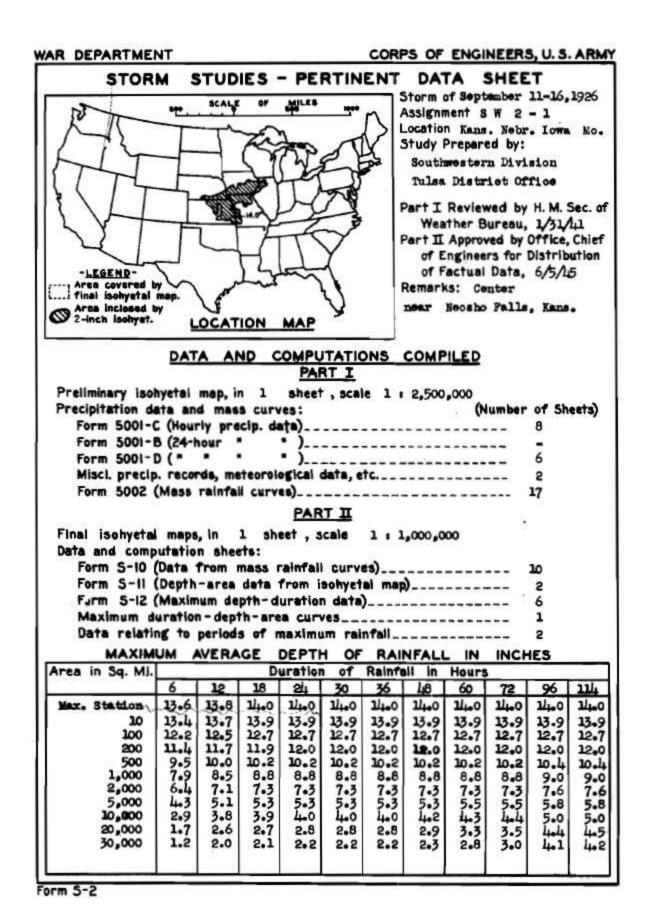
Appendix F: Figure F.153 and Figure F.154: Total storm isohyetal analysis and mass curve chart for Boyden, IA September 17, 1926

Neosho Falls, KS, AWA 61

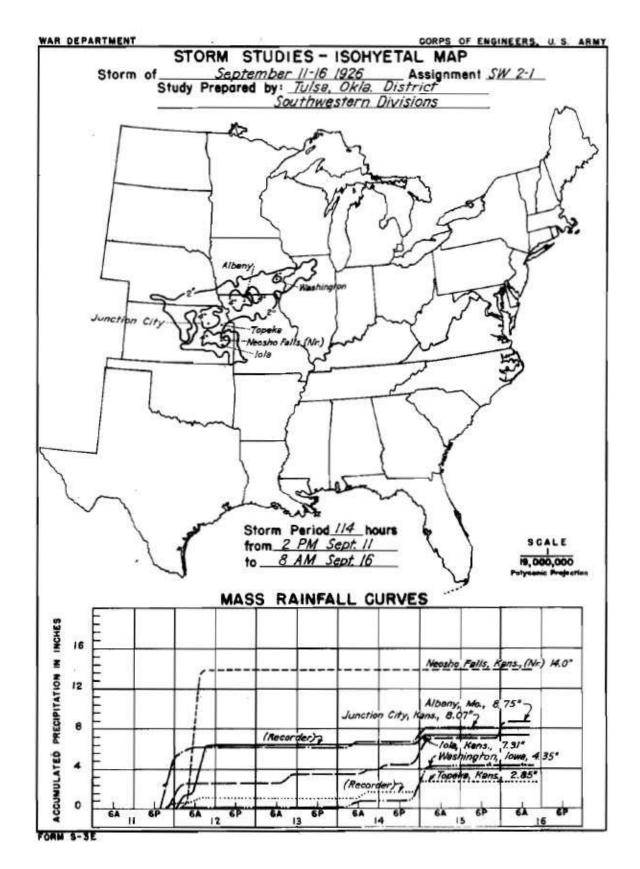
September 12, 1926 Storm Type: MCC

Grid Points Used: 1-4, 8-11, 16-18

		Z-1-Neosna	Falls, KS								
	11-Sep-192 sis Date: 12/16/2013				Storm	Adjust	tment f	or ANO	Grid Po	oint 1	
pvs us il	ransposition Date	25-Aug									
		Lat	Long			Moisture In	nflow Direct	ion	SSE @ 475	miles	
rm Cente	er Location	38.08 N	95.70 W			Grid Point	Elevation		350	feet	
rm Rep I	Dew Point Location	31.35 N	93.80 W			Storm Cen	ter Elevation	1	1,000	feet	
anspositio	on Dew Point Location	36.00 N	90.58 W			Storm Rep	Analysis D	ıration	6	hours	
id Point L	ocation	35.31 N	93.23 W								
Th	e storm representative	dew point is	75.0 F	with tota	al precipitable	e water abov	re sea level o	of		2.85	inches
	The in-place maximum	-	80.5 F		al precipitable					3.68	inches
The tran	nspositioned maximum	-	79.5 F		al precipitable					3.52	inches
	The in-place storm		1,000		ch subtracts			f precipitabl		75.0 F	
7	The in-place storm		1,000		ch subtracts			f precipitabl		80.5 F	
	The transposition basin ie Grid point/inflow ban		350 1,000		ch subtracts ch subtracts	0.29		of precipitable of precipitable		79.5 F 79.5 F	
	•										
	The in-place sto			1.31					CE SW 2-1.		
	The transposition/el			0.95 1.00		-	_		based on ma 26 at WBAN !		
	The ba	rrier adjustm	ent factor is	1.00		12945.	between sep	tember 1, 192	oat WBAIN	73930 and	
	The	total adjustm	ent factor is	1.24							
C	Observed Storm Depth-	Area-Durati	on								
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	1 sq miles	13.6	13.8	14.0	14.0	14.0	14.0	14.0	14.0	14.0	
	10 sq miles	13.4	13.7	13.9	13.9	13.9	13.9	13.9	13.9	13.9	
	100 sq miles	12.2	12.5	12.7	12.7	12.7	12.7	12.7	12.7	12.7	
	200 sq miles	11.4	11.7	11.9	12.0	12.0	12.0	12.0	12.0	12.0	
	500 sq miles	9.5	10.0	10.2	10.2	10.2	10.2	10.2	10.2	10.2 8.8	
	1000 sq miles 2000 sq miles	7.9 6.4	8.5 7.1	8.8 7.3	8.8 7.3	8.8 7.3	8.8 7.3	8.8 7.3	8.8 7.3	7.3	
	5000 sq miles	4.3	7.1 5.1	5.3	7.3 5.3	7.3 5.3	5.3	5.3	7.5 5.5	7.5 5.5	
	10000 sq miles	2.9	3.8	3.9	4.0	4.0	4.0	4.2	4.3	4.4	
	20000 sq miles	1.7	2.6	2.7	2.8	2.8	2.8	2.9	3.3	3.5	
	Adjusted Storm Depth	Anos Duneti									
-	Aujusteu Storm Deptii-	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	1 sq miles	16.9	17.1	17.4	17.4	17.4	17.4	17.4	17.4	17.4	
Ü	10 sq miles	16.6	17.0	17.3	17.3	17.3	17.3	17.3	17.3	17.3	
	100 sq miles	15.2	15.5	15.8	15.8	15.8	15.8	15.8	15.8	15.8	
	200 sq miles	14.2	14.5	14.8	14.9	14.9	14.9	14.9	14.9	14.9	
	500 sq miles	11.8	12.4	12.7	12.7	12.7	12.7	12.7	12.7	12.7	
	1000 sq miles	9.8	10.6	10.9	10.9	10.9	10.9	10.9	10.9	10.9	
	2000 sq miles	8.0 5.3	8.8	9.1	9.1 6.6	9.1	9.1	9.1	9.1	9.1	
	5000 sq miles 10000 sq miles	3.6	6.3 4.7	6.6 4.8	5.0	6.6 5.0	6.6 5.0	6.6 5.2	6.8 5.3	6.8 5.5	
	20000 sq miles	2.1	3.2	3.4	3.5	3.5	3.5	3.6	4.1	4.3	
9	Storm or Storm Center N	Vame		USACE SW	2-1-Neosha	Falls, KS					
	Storm Date(s)			9/11/26							
	Storm Type				lerstorm Con	nplex					1
	Storm Location			38.08 N	95.70 W						-
	Storm Center Elevation Precipitation Total & Di	ıration		1,000 14.00 Inches	18-house						1
ľ	recipitation rotal & Di	urauvii			10-110415						
	Storm Representative D		4:	75.0 F 31.35 N	6 93.80 W		Δ=	C			-
	Storm Representative D Maximum Dewpoint	ewpoint Loc	auon	31.35 N 80.5 F	93.80 W		Aug 79.5	Sep 78.5			1
	Moisture Inflow Vector			SSE @ 475			17.3	10.3			1
	n-place Maximization F			1.31							
1	Temporal Transposition	(Date)		25-Aug							
	ransporar Transposition Fransposition Dewpoin			36.00 N	90.58 W		Aug	Sep			1
	Fransposition Maximum			79.5 F			81	77			1
7				0.95							1
1	Fransposition Adjustme										
1	I ransposition Adjustm Brid Point Elevation			350							
1 1 1 C	Grid Point Elevation Highest Elevation in Ba			350 14,344							
1 1 0 1	Grid Point Elevation	sin									



Appendix F: Table F.125: Depth-area-duration values for Neosho Falls, KS September 12, 1926



Appendix F: Figure F.155 and Figure F.156: Total storm isohyetal analysis and mass curve chart for Neosho Falls, KS September 12, 1926

Penrose, CO, AWA 62

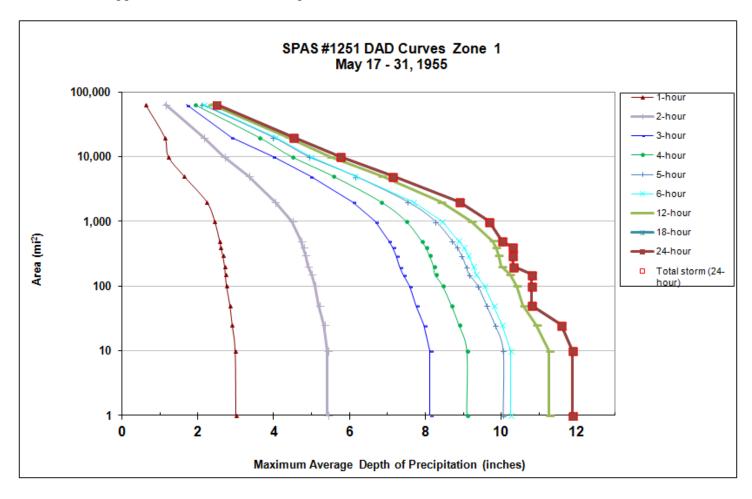
June 2, 1921 Storm Type: MCC

Grid Points Used: 6, 13, 15, 21

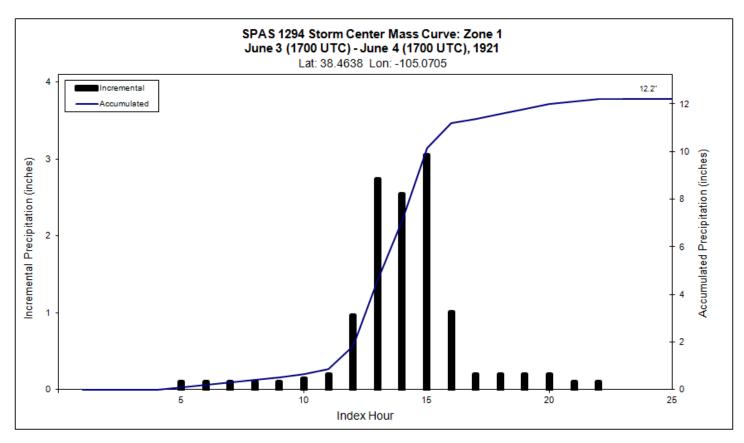
	294 Penrose, C	:O		04	A 31		A NICO	Cuid D	:4.6	
orm Date: 6/3-4/19 WA Analysis Date: 12/16/2				Storm	Adjust	ment fo	or ANO	Grid Po	oint 6	
mporal Transposition Date	20-Jur	1								
	Lat	Long			Moisture I	nflow Direct	ion:	SE @ 400	miles	
orm center location	38.46 N	105.07 W			Grid Point	Elevation		4,400	feet	
torm Rep dew point location	34.25 N	100.10 W			Storm Cen	ter Elevation	1	5,544	feet	
ransposition dewpoint location	n 36.35 N	100.05 W			Storm Rep	Analysis D	ıration	6	hours	
rid Point location	34.50 N	104.00 W				•				
Th	to a description to	740F		1		1 1 .	d		2.72	:t
The storm representate The in-place maxim	•			il precipitable il precipitable					2.73 3.52	inches.
The transpositioned maxim	•			ıl precipitable					3.52	inches
-	orm elevation is			ich subtracts			f precipitabl	e water at	74.0 F	
•	orm elevation is		wh	ich subtracts	1.38		f precipitabl		79.5 F	
The transposition be	asin elevation a	t 4,400	wh	ich subtracts	1.14	inches o	f precipitabl	e water at	79.5 F	
The Grid Point/Inflow	barrier height is	4,400	wh	ich subtracts	1.14	inches o	of precipitabl	e water at	79.5 F	
- TI - 1			105	1	Notes: DAE)	from CDAC 1	204 Starmen	n Td addad	1
The in-place The transpositio	storm maximiza n/elevation to b		1.35				d 12-hr persis	294. Storm re ting Td.	h in goded	
	e barrier adjustr		1.00							
111	anici aujusti	ractor is	2.00							
1	he total adjustr	nent factor is	1.50							
Observed Stewn D	nth Ance Dun-	tion								
Observed Storm De	pth-Area-Dura 1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq mi		8.1	10.3	11.3	11.9	11.9	-	-	-	1
10 sq mi	•••••	8.1	10.3	11.3	11.9	11.9	-	-	-	
100 sq mi	les 2.8	7.6	9.6	10.4	10.8	10.8	-	-	-	
200 sq mi	les 2.7	7.3	9.3	10.0	10.3	10.3	-	-	-	
500 sq mi	les 2.6	7.0	8.9	9.8	10.0	10.0	-	-	-	
1000 sq mi	•••••	6.7	8.4	9.2	9.7	9.7	-	-	-	
2000 sq mi	•••••	6.1	7.7	8.4	8.9	8.9	-	-	-	
5000 sq mi	•••••	5.0	6.2	6.8	7.1	7.1	-	-	-	
10000 sq mi 20000 sq mi	•••••	4.0 2.9	5.0 4.1	5.5 4.4	5.8 4.5	5.8 4.5	-	-	-	
20000 sq iiii	es; 1.1	2.9	4.1	- 4.4	4.5	; 4.0		-		
Adjusted Storm De	oth-Area-Durat	ion								
	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq mi	••••••	12.2	15.3	16.9	17.8	17.8	-	-	-	
10 sq mi	••••••	12.2	15.3	16.9	17.8	17.8	-	-	-	
100 sq mi	······	11.3	14.3 13.9	15.6	16.2 15.4	16.2	-	-	-	
200 sq mi 500 sq mi	••••••	11.0 10.5	13.3	15.0 14.6	15.4	15.4 15.0	-	-	-	
1000 sq mi	•••••	10.0	12.6	13.8	14.5	14.5	-	-	-	1
2000 sq mi	·····•	9.1	11.5	12.6	13.3	13.3	-	-	_	•
5000 sq mi	······	7.4	9.2	10.2	10.7	10.7	-	-	-	1
10000 sq mi	••••••	6.0	7.4	8.2	8.6	8.6	-	-	-	
	les 1.7	4.3	6.1	6.6	6.8	6.8	-	-	-	
20000 sq mi										
20000 sq mi	er Name		SPAS 1294	Penrose. CO						
	er Name		SPAS 1294 6/3-4/1921	Penrose, CO						
20000 sq mi Storm or Storm Cen	er Name			Penrose, CO						
20000 sq mi Storm or Storm Cent Storm Date(s)	er Name		6/3-4/1921	Penrose, CO						
Storm or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat	ion		6/3-4/1921 Convective 38.46 N 5,544	105.07 W						
Storm or Storm Center Storm Date(s) Storm Type Storm Location	ion		6/3-4/1921 Convective 38.46 N	105.07 W						
Storm or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat	ion & Duration		6/3-4/1921 Convective 38.46 N 5,544	105.07 W		June	July			
Storm or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total &	ion & Duration		6/3-4/1921 Convective 38.46 N 5,544 12.20 Inches	105.07 W 18-hours		June	July 81.5			
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total &	ion & Duration re Dewpoint	cation	6/3-4/1921 Convective 38.46 N 5,544 12.20 Inches	105.07 W 18-hours						
Storm or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Storm Representativ Maximum Dewpoint Moisture Inflow Ve	ion & Duration re Dewpoint Dewpoint Lo	cation	6/3-4/1921 Convective 38.46 N 5,544 12.20 Inches 74.0 F 34.25 N 79.5 F SE @ 400	105.07 W 18-hours						
Storm or Storm Centre Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Storm Representativ Maximum Dewpoint	ion & Duration re Dewpoint Dewpoint Lo	cation	6/3-4/1921 Convective 38.46 N 5,544 12.20 Inches 74.0 F 34.25 N 79.5 F	105.07 W 18-hours						
Storm Or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Storm Representativ Maximum Dewpoint Moisture Inflow Ve In-place Maximization	ion & Duration re Dewpoint Lo re Dewpoint Lo re Toron Factor	cation	6/3-4/1921 Convective 38.46 N 5,544 12.20 Inches 74.0 F 34.25 N 79.5 F SE @ 400 1.35	105.07 W 18-hours		79	81.5			
Storm or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Storm Representativ Maximum Dewpoint Moisture Inflow Ve In-place Maximization	ion & Duration re Dewpoint re Dewpoint Lo	cation	6/3-4/1921 Convective 38.46 N 5,544 12.20 Inches 74.0 F 34.25 N 79.5 F SE @ 400	105.07 W 18-hours						
Storm Or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Maximum Dewpoint Moisture Inflow Ve In-place Maximization	ion Duration Duration Depoint Location To Dewpoint Location Depoint Location	cation	6/3-4/1921 Convective 38.46 N 5,544 12.20 Inches 74.0 F 34.25 N 79.5 F SE @ 400 1.35	105.07 W 18-hours 6 100.10 W		79 June	81.5 July			
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total of Storm Representativ Storm Representativ Maximum Dewpoint Moisture Inflow Ve In-place Maximization Temporal Transpos	ion è Duration re Dewpoint Location on Factor ittion (Date) ooint Location mum Dewpoint	cation	6/3-4/1921 Convective 38.46 N 5,544 12.20 Inches 74.0 F 34.25 N 79.5 F SE @ 400 1.35 20-Jun 36.35 N	105.07 W 18-hours 6 100.10 W		79 June	81.5 July			
Storm Or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Maximum Dewpoint Moisture Inflow Ve In-place Maximizativ Temporal Transpos Transposition Dewy Transposition Maxi Transposition Maxi Transposition Adju Grid Point Elevation	ion & Duration re Dewpoint Locator on Factor ition (Date) point Location mum Dewpoint stment Factor	cation	6/3-4/1921 Convective 38.46 N 5,544 12.20 Inches 74.0 F 34.25 N 79.5 F SE @ 400 1.35 20-Jun 36.35 N 79.5 F 1.11	105.07 W 18-hours 6 100.10 W		79 June	81.5 July			
Storm Or Storm Center Storm Date(s) Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Maximum Dewpoint Moisture Inflow Ve In-place Maximizativ Temporal Transpos Transposition Dewy Transposition Dewy Transposition Adju Grid Point Elevation Highest Elevation in	ion & Duration The Dewpoint Logical Control on Factor The Dewpoint Logical Control on Factor The Dewpoint Location on Location	cation	6/3-4/1921 Convective 38.46 N 5,544 12.20 Inches 74.0 F 34.25 N 79.5 F SE @ 400 1.35 20-Jun 36.35 N 79.5 F 1.11 4,400	105.07 W 18-hours 6 100.10 W		79 June	81.5 July			
Storm or Storm Cent Storm Date(s) Storm Type Storm Location Storm Center Elevat Precipitation Total & Storm Representativ Maximum Dewpoint Moisture Inflow Ve In-place Maximizativ Temporal Transpost Transposition Dewy Transposition Maximization Adju Grid Point Elevation	ion & Duration The Dewpoint Location Factor The Development Location Th	cation	6/3-4/1921 Convective 38.46 N 5,544 12.20 Inches 74.0 F 34.25 N 79.5 F SE @ 400 1.35 20-Jun 36.35 N 79.5 F 1.11	105.07 W 18-hours 6 100.10 W		79 June	81.5 July			

		SPAS 12	294 - Jun	ie 3 (170	0 UTC) -	June 4 (1700 UT	C), 1921		
		MAX	MUM AVE	RAGE DE	PTH OF P	RECIPITA	TION (INC	HES)		
					Duration	n (hours)				
Area (mi ²)	1	2	3	4	5	6	12	18	24	Total
0.3	3.05	5.59	8.34	9.35	10.32	10.52	11.59	12.20	12.20	12.20
1	3.00	5.42	8.12	9.09	10.05	10.25	11.26	11.88	11.88	11.88
10	2.98	5.42	8.12	9.09	10.05	10.25	11.26	11.88	11.88	11.88
25	2.90	5.33	7.95	8.88	9.83	10.02	10.92	11.58	11.58	11.58
50	2.84	5.19	7.76	8.68	9.61	9.80	10.58	10.81	10.81	10.81
100	2.75	5.09	7.58	8.45	9.38	9.55	10.40	10.81	10.81	10.81
150	2.72	4.99	7.40	8.25	9.15	9.33	10.22	10.80	10.80	10.80
200	2.70	4.90	7.32	8.21	9.07	9.26	10.00	10.31	10.31	10.31
300	2.65	4.84	7.23	8.10	8.95	9.13	9.92	10.30	10.30	10.30
400	2.60	4.78	7.13	8.00	8.82	9.00	9.85	10.30	10.30	10.30
500	2.57	4.72	7.03	7.89	8.70	8.87	9.77	10.03	10.03	10.03
1,000	2.44	4.48	6.68	7.49	8.26	8.43	9.20	9.67	9.67	9.67
2,000	2.23	4.03	6.08	6.82	7.53	7.67	8.41	8.89	8.89	8.89
5,000	1.63	3.33	4.96	5.56	6.14	6.15	6.84	7.14	7.14	7.14
10,000	1.22	2.69	3.98	4.47	4.92	4.97	5.49	5.76	5.76	5.76
20,000	1.12	2.15	2.88	3.60	3.97	4.05	4.39	4.53	4.53	4.53
63,927	0.62	1.14	1.70	1.91	2.10	2.15	2.36	2.49	2.49	2.49

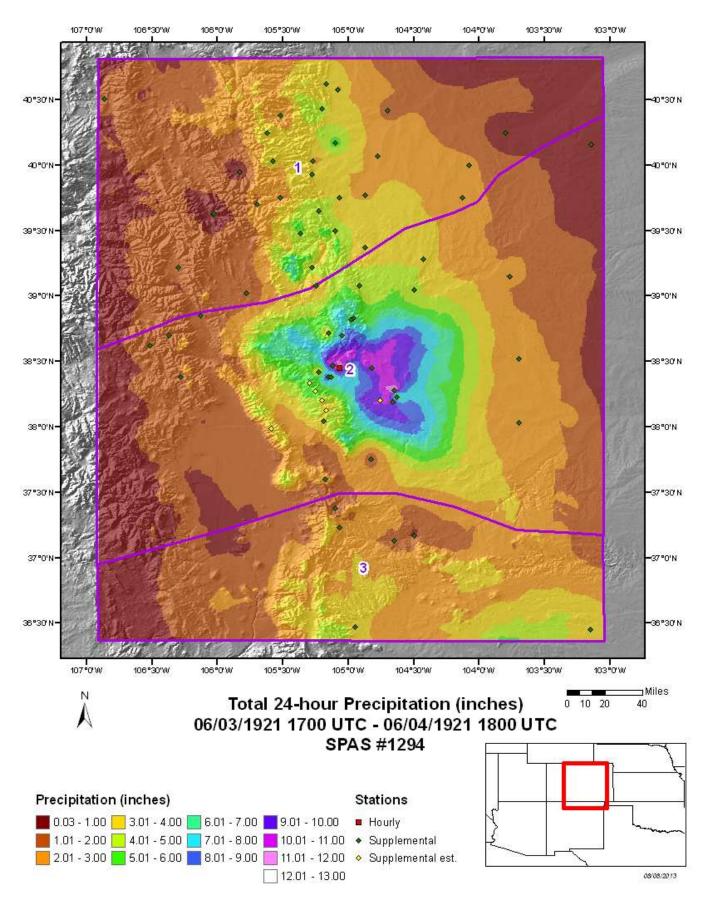
Appendix F: Table F.127: Depth-area-duration values for Penrose, CO June 2, 1921



Appendix F: Figure F.157: Depth-area-duration chart for Penrose, CO June 2, 1921



Appendix F: Figure F.158: Mass curve chart for Penrose, CO June 2, 1921



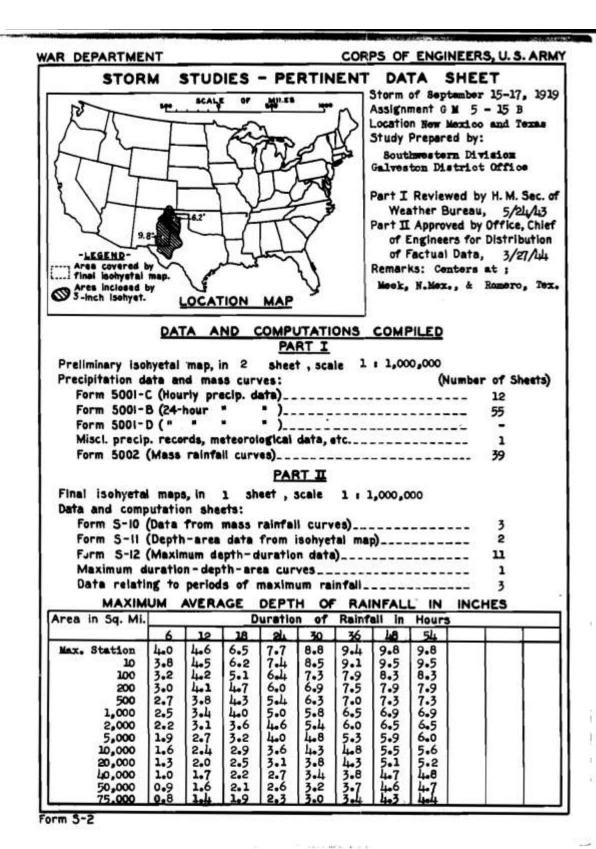
Appendix F: Figure F.159: Total storm isohyetal analysis for Penrose, CO June 2, 1921

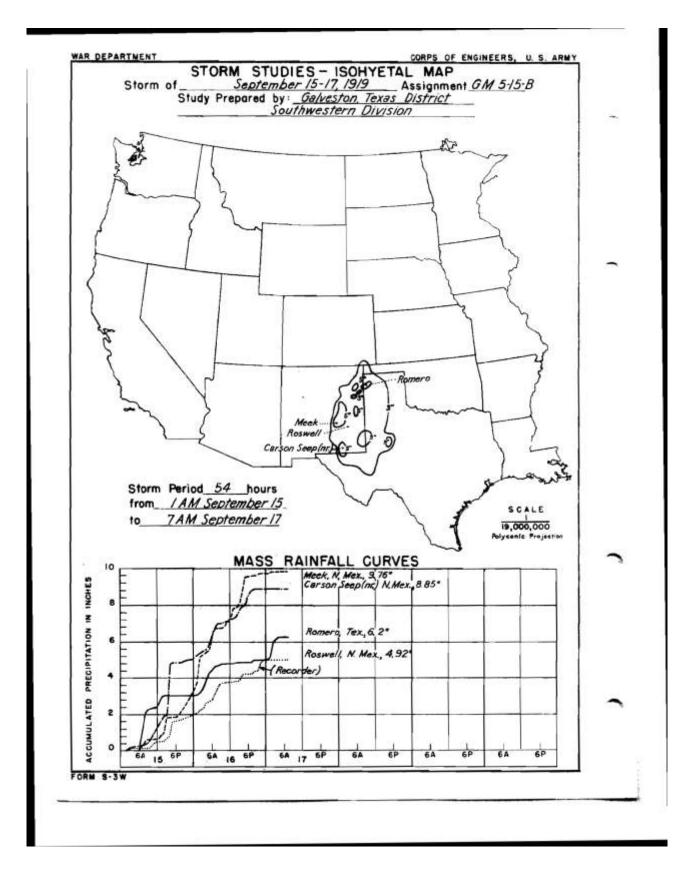
Meek, NM, AWA 63

September 15, 1919 Storm Type: Frontal Grid Points Used: 6, 13

	I USACE GM	5-15B		C) t	4 31		4.3.	a		
torm Date: 9/15-17/1 WA Analysis Date: 12/16/20				Storm	Adjust	ment fo	or ANO	Grid Po	int 6	
emporal Transposition Date	1-Sep									
imporar fransposition Date	Lat	Long			Moisture Ir	ıflow Direct	ion:	ESE @ 400	miles	
orm center location	33.68 N	105.18 W			Grid Point			4,400	feet	
torm Rep dew point location	31.30 N	98.90 W				ter Elevation		5,224	feet	
ransposition dewpoint location	38.16 N	87.45 W				Analysis Du		24	hours	
rid Point location	34.50 N	104.00 W			Storm Kep	Alialysis Di	II atton	24	nouis	
The storm representativ	e dew point is	74.0 F	with total	precipitable	water above	e sea level of			2.73	inches.
The in-place maximus	•	78.5 F	with total	precipitable	water above	e sea level of			3.37	inches.
The transpositioned maximum	n dew point is	78.0 F	with total	l precipitable	water above	e sea level of			3.29	inches
The in-place stor		5,224	whi	ch subtracts	1.09	inches o	f precipitabl	e water at	74.0 F	
The in-place stor				ch subtracts	1.28		f precipitabl		78.5 F	
The transposition bas				ch subtracts	1.09		f precipitabl		78.0 F	
The Grid Point/Inflow b	amer neight is	XX	wni	ch subtracts	1.09	inches o	f precipitabl	e water at	78.0 F	
The in otens		: -	1.27	1	Notes: DAD	tralinae takan	from GM 5.1	5B. Added 2°	E to	
The transposition	torm maximizat		1.06					maximum Td		
	barrier adjustm		1.00				8		0,	
2 He	augustii		2.00							
Th	e total adjustm	ent factor is	1.34							
Observed Storm Dept	···			,		*		·		
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq mile	•••	-	- 63	- 7.4	- 0 =	- 0.1	- 0.5	- 0.5	-	
10 sq mile 100 sq mile	•••	4.5 4.2	6.2 5.1	7.4 6.4	8.5 7.3	9.1 7.9	9.5 8.3	9.5 8.3	-	1
200 sq mile	··•	4.1	4.7	6.0	6.9	7.5 7.5	7.9	7.9		
500 sq mile	•••	3.8	4.3	5.4	6.3	7.0	7.3	7.3	-	
1000 sq mile	•••	3.4	4.0	5.0	5.8	6.5	6.9	6.9	-	
2000 sq mile	•••	3.1	3.6	4.6	5.4	6.0	6.5	6.5	-	
5000 sq mile	1.9	2.7	3.2	4.0	4.8	5.3	5.9	6.0	-	
10000 sq mile	•••	2.4	2.9	3.6	4.3	4.8	5.5	5.6	-	
20000 sq mile	1.3	2.0	2.5	3.1	3.8	4.3	5.1	5.2	-	
Adjusted Storm Dept			10.77	24.11	20.11	26 11	40.77	60 11	72.11	
1 sq mile	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq mile		6.0	8.3	9.9	11.4	12.2	12.7	12.7	_	
100 sq mile	•••	5.6	6.8	8.6	9.8	10.6	11.1	11.1	-	
200 sq mile	···	5.5	6.3	8.0	9.3	10.1	10.6	10.6	-	
500 sq mile	3.6	5.1	5.8	7.2	8.5	9.4	9.8	9.8	-	
1000 sq mile	3.4	4.6	5.4	6.7	7.8	8.7	9.3	9.3	-	
2000 sq mile		4.2	4.8	6.2	7.2	8.0	8.7	8.7	-	
	2.5	3.6	4.3	5.4	6.4	7.1	7.9	8.0	<u>-</u>	
5000 sq mile							7.4	7.5	-	
10000 sq mile	2.1	3.2	3.9	4.8	5.8	6.4	÷	÷		
***************************************	2.1	3.2 2.7	3.9 3.4	4.8	5.8 5.1	6.4 5.8	6.8	7.0	-	
10000 sq mile	2.1	¢			}		÷	÷	-	
10000 sq mile	2.1	2.7		4.2	5.1		÷	÷	-	
10000 sq mile: 20000 sq mile:	2.1	2.7	3.4	4.2 SACE GM 5-	5.1		÷	÷	-	
10000 sq mile 20000 sq mile Storm or Storm Center	2.1	2.7	3.4 Meek, NM U	4.2 SACE GM 5-	5.1		÷	÷	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location	2.1 1.7 Name	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N	4.2 SACE GM 5-	5.1		÷	÷	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevatio	2.1 1.7 Name	2.7	3.4 Meek, NM U: 9/15-17/1919 Synoptic 33.68 N 5,224	4.2 SACE GM 5- 105.18 W	5.1		÷	÷	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location	2.1 1.7 Name	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N	4.2 SACE GM 5- 105.18 W	5.1		÷	÷	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total &	Name	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9.50 Inches 5	4.2 SACE GM 5- 105.18 W	5.1	5.8	6.8	7.0	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevatio Precipitation Total & Storm Representative	2.1 1.7 Name Duration Dewpoint	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9,50 Inches 5	4.2 SACE GM 5- 105.18 W 4-hours	5.1	5.8	÷	7.0	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevatio Precipitation Total & Storm Representative Storm Representative	2.1 1.7 Name Duration Dewpoint	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9.50 Inches 5 74.0 F 31.30 N	4.2 SACE GM 5- 105.18 W	5.1	5.8	6.8	7.0	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevatio Precipitation Total & Storm Representative	Name Name Duration Dewpoint Loc	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9,50 Inches 5	4.2 SACE GM 5- 105.18 W 4-hours	5.1	5.8	OKC, SAT,	7.0		
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevatio Precipitation Total & Storm Representative Storm Representative Maximum Dewpoint	2.1 1.7 Name Duration Dewpoint Locor	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9.50 Inches 5 74.0 F 31.30 N 78.5 F	4.2 SACE GM 5- 105.18 W 4-hours	5.1	ABI, FTW,	6.8	7.0	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Storm Representative Maximum Dewpoint Moisture Inflow Vecta	Name Name Duration Dewpoint Loc Factor	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9.50 Inches 5 74.0 F 31.30 N 78.5 F ESE @ 400 1.27	4.2 SACE GM 5- 105.18 W 4-hours	5.1	ABI, FTW,	OKC, SAT,	7.0	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Storm Representative Storm Representative Maximum Dewpoint Moisture Inflow Vect In-place Maximization Temporal Transpositi	Name In Duration Dewpoint Loc or Factor on (Date)	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9.50 Inches 5 74.0 F 31.30 N 78.5 F ESE @ 400 1.27	4.2 SACE GM 5- 105.18 W 4-hours 24 98.90 W	5.1	ABI, FTW,	OKC, SAT,	7.0	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevatio Precipitation Total & Storm Representative Storm Representative Maximum Dewpoint Moisture Inflow Vect. In-place Maximization Temporal Transpositi	Name 1.7 Name Duration Dewpoint Loc or Factor on (Date) int Location	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9,50 Inches 5 74.0 F 31.30 N 78.5 F ESE @ 400 1.27 1-Sep 38.16 N	4.2 SACE GM 5- 105.18 W 4-hours	5.1	ABI, FTW,	OKC, SAT,	7.0	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevatio Precipitation Total & Storm Representative Storm Representative Maximum Dewpoint Moisture Inflow Vector In-place Maximization Temporal Transpositi Transposition Dewport Transposition Maximum Dewport Transposition Dewport Transposition Dewport Transposition Dewport Transposition Dewport Transposition Dewport Tra	Name Duration Dewpoint Loc Factor on (Date) int Location um Dewpoint	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9.50 Inches 5 74.0 F 31.30 N 78.5 F ESE @ 400 1.27 1-Sep 38.16 N 78.0 F	4.2 SACE GM 5- 105.18 W 4-hours 24 98.90 W	5.1	ABI, FTW,	OKC, SAT,	7.0	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevatio Precipitation Total & Storm Representative Maximum Dewpoint Moisture Inflow Vect In-place Maximization Temporal Transpositi Transposition Dewpo Transposition Maxim Transposition Adjust	Name Duration Dewpoint Loc Factor on (Date) int Location um Dewpoint	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9.50 Inches 5 74.0 F 31.30 N 78.5 F ESE @ 400 1.27 1-Sep 38.16 N 78.0 F 1.06	4.2 SACE GM 5- 105.18 W 4-hours 24 98.90 W	5.1	ABI, FTW,	OKC, SAT,	7.0	-	
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total &: Storm Representative Maximum Dewpoint Moisture Inflow Vect In-place Maximization Temporal Transpositi Transposition Dewpo Transposition Maxim Transposition Adjust Grid Point Elevation	Name 1.7 Name Duration Dewpoint Loc or Factor on (Date) int Location um Dewpoint ment Factor	ation	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9.50 Inches 5 74.0 F 31.30 N 78.5 F ESE @ 400 1.27 1-Sep 38.16 N 78.0 F 1.06 4,400	4.2 SACE GM 5- 105.18 W 4-hours 24 98.90 W	5.1	ABI, FTW,	OKC, SAT,	7.0		
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total &: Storm Representative Maximum Dewpoint Moisture Inflow Vect In-place Maximization Temporal Transpositi Transposition Dewpo Transposition Adjust Grid Point Elevation Highest Elevation in I	Name 1.7 Name Duration Dewpoint Loc or Factor on (Date) int Location um Dewpoint ment Factor	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9.50 Inches 5 74.0 F 31.30 N 78.5 F ESE @ 400 1.27 1-Sep 38.16 N 78.0 F 1.06 4,400 14,344	4.2 SACE GM 5- 105.18 W 4-hours 24 98.90 W	5.1	ABI, FTW,	OKC, SAT,	7.0		
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevatio Precipitation Total &: Storm Representative Maximum Dewpoint Moisture Inflow Vector In-place Maximization Temporal Transposition Dewpo Transposition Daxim Transposition Adjust Grid Point Elevation	Name In Duration Dewpoint Dewpoint Loc or Factor on (Date) int Location um Dewpoint Factor Basin	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9.50 Inches 5 74.0 F 31.30 N 78.5 F ESE @ 400 1.27 1-Sep 38.16 N 78.0 F 1.06 4,400	4.2 SACE GM 5- 105.18 W 4-hours 24 98.90 W	5.1	ABI, FTW,	OKC, SAT,	7.0		
Storm or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Storm Representative Maximum Dewpoint Moisture Inflow Vect In-place Maximization Temporal Transpositi Transposition Dewpo Transposition Maxim Transposition Adjust Grid Point Elevation Highest Elevation in I	Name 1.7 Name Duration Dewpoint Loc Factor on (Date) int Location um Dewpoint ment Factor Basin Factor	2.7	3.4 Meek, NM U 9/15-17/1919 Synoptic 33.68 N 5,224 9.50 Inches 5 74.0 F 31.30 N 78.5 F ESE @ 400 1.27 1-Sep 38.16 N 78.0 F 1.06 4,400 14,344 xx	4.2 SACE GM 5- 105.18 W 4-hours 24 98.90 W	5.1	ABI, FTW,	OKC, SAT,	7.0		

Appendix F: Table F.128: Storm spreadsheet for Meek, NM September 15, 1919





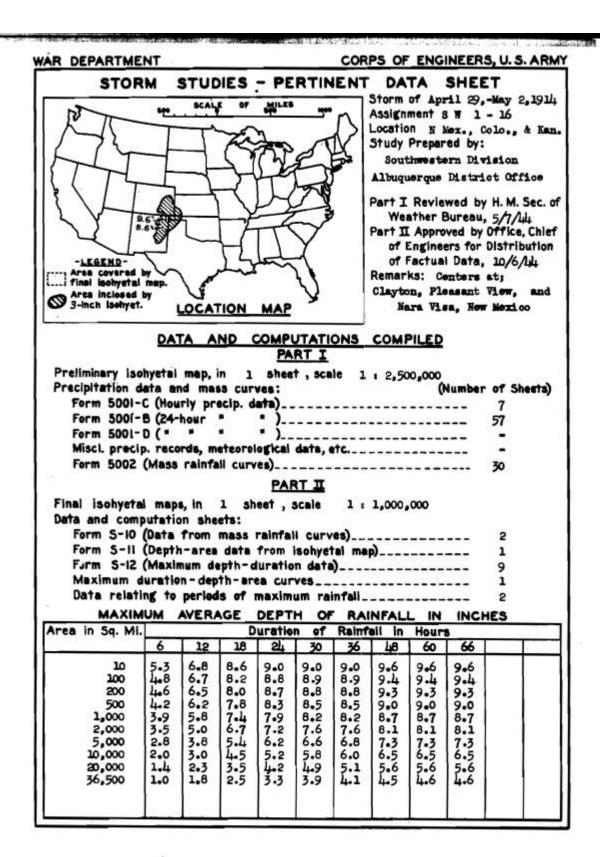
Appendix F: Figure F.160 and Figure F.161: Total storm isohyetal analysis and mass curve chart for Meek, NM September 15, 1919

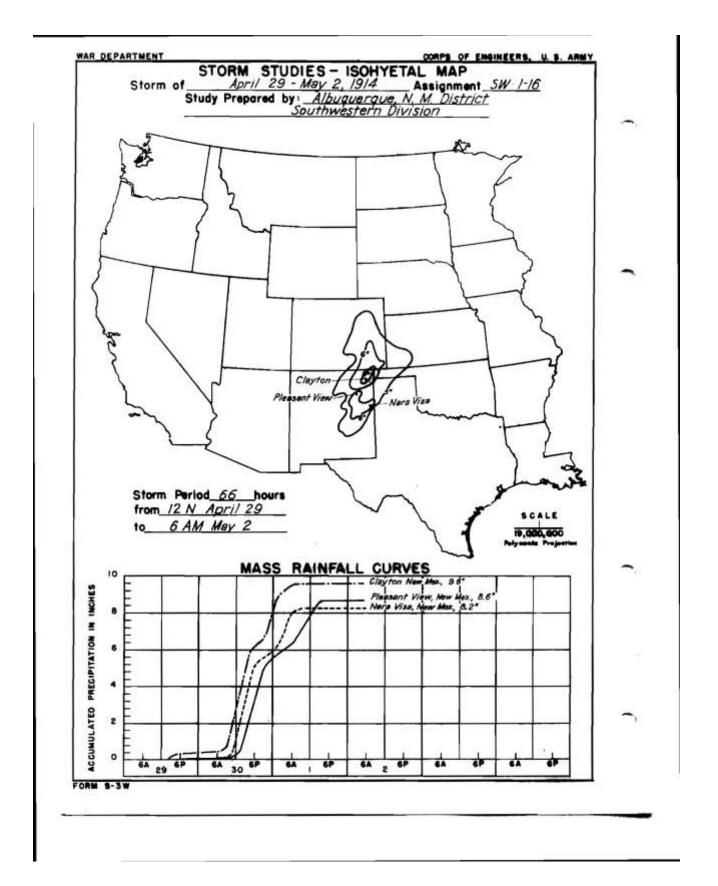
Clayton, NM, AWA 64 April 29, 1914

Storm Type: Frontal Grid Points Used: 5-6, 12-13

Storm Name: Clayton, N Storm Date: 4/29-5/2/1	M USACE SV	V 1-16		Stamm	Adina	ment f	n ANO	Crid Da	int 6	
WA Analysis Date: 12/21/201				Storm	Aujust	шент то	or ANO	Grid Po	ин о	
emporal Transposition Date	15-May									
	Lat	Long			Moisture I	ıflow Direct	ion:	SSE @ 560	miles	
torm center location	36.33 N	103.10 W			Grid Point	Elevation		4,400	feet	
torm Rep dew point location	28.80 N	99.55 W			Storm Cen	ter Elevation	ı	4,719	feet	
ransposition dewpoint location	26.40 N	100.26 W			Storm Rep	Analysis D	ıration	24	hours	
rid Point location	34.50 N	104.00 W								
T1	4	71.0F		1		1 1	d		2.26	:t
The storm representative The in-place maximum	•	71.0 F 76.5 F		l precipitable l precipitable					2.36 3.07	inches.
The transpositioned maximum	•			l precipitable l precipitable					3.07	inches.
The in-place ston	-			ich subtracts			f precipitabl	le water at	71.0 F	
The in-place ston			whi	ich subtracts	1.09		f precipitabl		76.5 F	
The transposition basi	n elevation at	4,400	whi	ich subtracts	1.04	inches o	f precipitabl	le water at	76.5 F	
The Grid Point/Inflow ba	rrier height is	4,400	whi	ich subtracts	1.04	inches o	f precipitabl	le water at	76.5 F	
The in other of		· 6	1.05	1	Notes: DAD	realman talcan	from SW 1 1	6. Added 2°F	to ITS ACE	1
The in-place st			1.35					m Td climatol		
•	arrier adjustm		1.03				-6-		<i></i>	
THE	uujustii		1.00							
The	total adjustm	ent factor is	1.39							
Observed Storm Depth	h-Area-Durati	ion								
Osserved Storm Dept	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	÷	-	-	-	-	_	-	-	-	
10 sq miles	•	6.8	8.6	9.0	9.0	9.0	9.6	9.6	-	
100 sq miles	÷	6.7	8.2	8.8	8.9	8.9	9.4	9.4	-	
200 sq miles	•	6.5	8.0	8.7	8.8	8.8	9.3	9.3	-	-
500 sq miles 1000 sq miles	÷	6.2 5.8	7.8 7.4	8.3 7.9	8.5 8.2	8.5 8.2	9.0 8.7	9.0 8.7	-	
2000 sq miles		5.0	6.7	7.2	7.6	7.6	8.1	8.1		
5000 sq miles	÷	3.8	5.4	6.2	6.6	6.8	7.3	7.3		
10000 sq miles	•	3.0	4.5	5.2	5.8	6.0	6.5	6.5		
20000 sq miles	•	2.3	3.5	4.2	4.9	5.1	5.6	5.6	-	
Adjusted Storm Depth	-Area-Durati 6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	· ····································	- 12 Hours	-	24 Hours	- JU HOURS	- 30 Hours	+0 HOURS	- OU FIGURS	- 12 Hours	
10 sq miles	•	9.4	11.9	12.5	12.5	12.5	13.3	13.3	-	
100 sq miles	· •	9.3	11.4	12.2	12.3	12.3	13.0	13.0	-	
200 sq miles	6.4	9.0	11.1	12.1	12.2	12.2	12.9	12.9	-	
500 sq miles	5.8	8.6	10.8	11.5	11.8	11.8	12.5	12.5	-	
1000 sq miles	5.4	8.0	10.3	11.0	11.4	11.4	12.1	12.1	-	
2000 sq miles	•	6.9	9.3	10.0	10.5	10.5	11.2	11.2	-	
5000 sq miles		5.3	7.5	8.6	9.2	9.4	10.1	10.1	-	
10000 sq miles	2.8	4.2	6.2	7.2	8.0	8.3	9.0	9.0	-	
20000 sq miles	1.9	3.2	4.9	5.8	6.8	7.1	7.8	7.8	-	
Storm or Storm Center	Name		Clayton, NM		1-16					
Storm Date(s)			4/29-5/2/1914	l .						-
Storm Type			Synoptic	102 10 ***						-
Storm Location			36.33 N 4.719	103.10 W						-
Storm Center Elevation Precipitation Total & I			4,/19 9.60 Inches 6	6-hours						1
Storm Representative	_	4:	71.0 F	24		SAT, DRT,	CRP			
Storm Representative I Maximum Dewpoint	Dewpoint Loc	ation	28.80 N 76.5 F	99.55 W				-		-
Moisture Inflow Vecto	r		SSE @ 560			Aug	Sept			1
In-place Maximization			1.35			79	76.5			
T	- (Deta)		15 1/							
Temporal Transposition			15-May 26 40 N	100 26 337						-
Termon a sidi a a Dan			26.40 N 76.5 F	100.26 W						
Transposition Dewpoi										1
Transposition Dewpoi Transposition Maximu Transposition Adjustr	•		1.03							
Transposition Maximu	•		1.03 4,400							
Transposition Maximu Transposition Adjustr Grid Point Elevation Highest Elevation in B	ment Factor		4,400 14,344							
Transposition Maximu Transposition Adjustr Grid Point Elevation Highest Elevation in B Inflow Barrier Height	nent Factor asin		4,400 14,344 4,400							
Transposition Maximu Transposition Adjustr Grid Point Elevation Highest Elevation in B	nent Factor asin Factor		4,400 14,344							

Appendix F: Table F.130: Storm spreadsheet for Clayton, NM April 29, 1914
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Appendix F: Figure F.162 and Figure F.163: Total storm isohyetal analysis and mass curve chart for Clayton, NM April 29, 1914

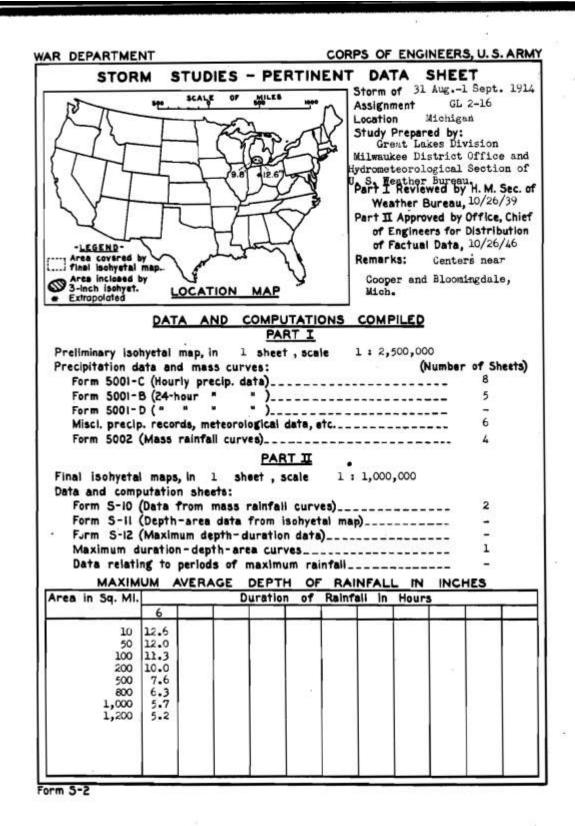
Cooper, MI, AWA 65

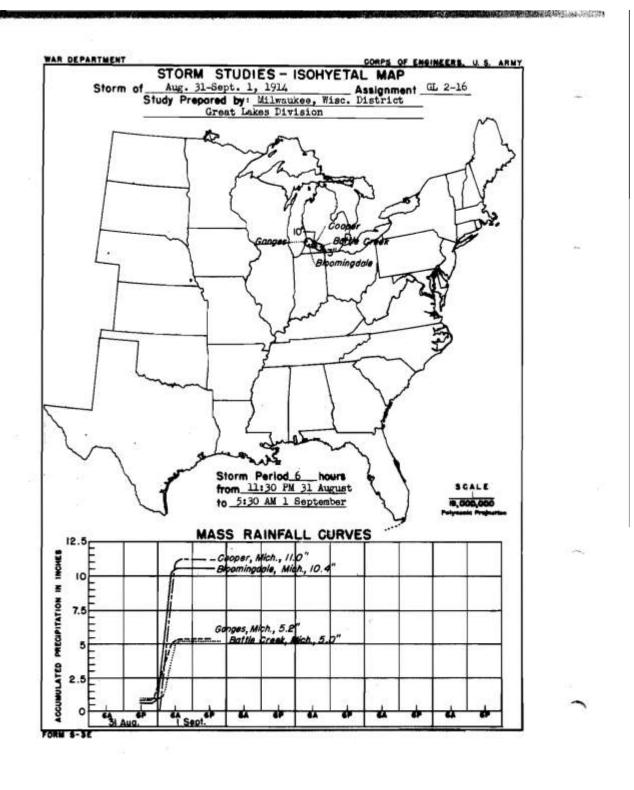
August 31, 1914 Storm Type: MCC

Grid Points Used: 8-10, 16-18

Storm Name: USACE GL Storm Date: August 31, AWA Analysis Date: 12/16/2013		er, MI		Storm	Adjust	ment fo	or ANO	Grid Po	int 8	
emporal Transposition Date	16-Aug									
	Lat	Long			Moisture I	nflow Direc	tion	SW @ 235	miles	
torm Center Location	42.38 N	85.61 W			Grid Point			1,200	feet	
								900		
Storm Rep Dew Point Location	40.10 N	89.00 W				ter Elevatio		6	feet	
ransposition Dew Point Location Frid Point Location	40.45 N 37.50 N	95.99 W 93.00 W			Storm Kep	Analysis D	uration	0	hours	
The storm representative d	lew point is	75.0 F	with total p	recipitable v	ater above	sea level of			2.85	inches
The in-place maximum d	•	80.5 F		recipitable w					3.68	inches
The transpositioned maximum d	•	81.0 F		recipitable v					3.76	inches
The in-place storm		900		h subtracts			precipitable		75.0 F	
The in-place storm		900		h subtracts			precipitable		80.5 F	
The transposition storm				ch subtracts			precipitable		81.0 F	
The Grid Point/inflow barri	er height is	1,000	whic	ch subtracts	0.30	inches of	precipitable	e water at	81.0 F	
The in-plac	e maximizati	on factor is	1.30		Notes: DA	D values ta	ken from US	ACE GL 2-16.	Storm	
-	transpositi				representat	tive dew poi	nt value wa	s based on ad	ding 7° to	
The elevation/barr					the USACE	analysis us	sing EPRI, N	ebraska, and	TRWD	
					guidance.					
The to	tal adjustme	ent factor is	1.32							
Observed Storm Depth	-Area-Dura	ıtion					,			
1 sq miles	6 Hours -	12 Hours -	18 Hours -	24 Hours	30 Hours -	36 Hours -	48 Hours -	60 Hours -	72 Hours	
10 sq miles	12.6	-	-	-	-	-	-	-	-	1
100 sq miles	11.3	-	-	-	-	-	-	-	-	1
200 sq miles	10.0	-	-	<u>-</u>	-	-	_	-	-	
500 sq miles	7.6	-	-	_	-	-	-	-	-	1
1000 sq miles	5.7	-	-	-	-	-	-	-	-	
5000 sq miles	-	-	-	-	-	-	-	-	-	1
10000 sq miles	-	-	-	-	-	-	-	-	-	
20000 sq miles	-	-	-	-	-	-	-	-	-]
Adjusted Storm Depth	-Area-Dura	tion								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	-	-	-	-	-	-	-	-	-	
10 sq miles	16.6	-	-	-	-	-	-	-	-	
100 sq miles	14.9	-	-	-	-	-	-	-	-	
200 sq miles	13.2	-	-	-	-	-	-	-	-	
500 sq miles	10.0	-	-	-	-	-	-	-	-	
1000 sq miles	7.5	-	-	-	-	-	-	-	-	
5000 sq miles	-	-	-	-	-	-	-	-	-	
10000 sq miles	-	-	-	-	-	-	-	-	-	1
20000 sq miles	-	-	-	-	-	-	-	-	-	-
				6 Caarre 3						
Storm or Storm Control	Vame		HIGACT OF A 1							1
Storm or Storm Center:	Name		31-Aug-1914	o-Cooper, N	Ш					1
Storm Date(s)	Name		31-Aug-1914	o-Cooper, N	Ц					1
Storm Date(s) Storm Type	Name		31-Aug-1914 MCS		1					
Storm Date(s) Storm Type Storm Location			31-Aug-1914 MCS 42.38 N	85.61 W	II					
Storm Date(s) Storm Type		sq mi)	31-Aug-1914 MCS	85.61 W						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	turation (10	sq mi)	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1	85.61 W hours USAC						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I	Puration (10	• ′	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F	85.61 W hours USAC						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I	Puration (10	• ′	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F 40.10 N	85.61 W hours USAC						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point	Puration (10 Dew Point Dew Point L	• ′	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F 40.10 N 80.5 F	85.61 W hours USAC						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector	Puration (10 Dew Point Dew Point L	• ′	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F 40.10 N 80.5 F SW @ 235	85.61 W hours USAC						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I	Puration (10 Dew Point Dew Point L r Factor	• ′	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F 40.10 N 80.5 F SW @ 235 1.30	85.61 W hours USAC						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I	Dew Point Dew Point L r Factor	ocation	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F 40.10 N 80.5 F SW @ 235 1.30	85.61 W hours USAC 6 89.00 W						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transpositio	Dew Point Dew Point L Factor In (Date) Int Location	ocation	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F 40.10 N 80.5 F SW @ 235 1.30 16-Aug 40.45 N	85.61 W hours USAC						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transpositio Transposition Dew Poir Transposition Maximum	Dew Point Dew Point L Factor In (Date) Int Location In Dew Point L	ocation	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F 40.10 N 80.5 F SW @ 235 1.30 16-Aug 40.45 N 81.0 F	85.61 W hours USAC 6 89.00 W						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transpositio Transposition Dew Poi Transposition Maximum Transposition Adjustm	Dew Point Dew Point L Factor In (Date) Int Location In Dew Point L	ocation	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F 40.10 N 80.5 F SW @ 235 1.30 16-Aug 40.45 N 81.0 F 1.02	85.61 W hours USAC 6 89.00 W						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transpositio Transposition Dew Poi Transposition Maximum Transposition Adjustin Grid Point Elevation	Puration (10 Dew Point L Factor In (Date) In Location In Dew Point L The control of the contr	ocation	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F 40.10 N 80.5 F SW @ 235 1.30 16-Aug 40.45 N 81.0 F 1.02 1,200	85.61 W hours USAC 6 89.00 W						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Adjustr Grid Point Elevation Highest Elevation in Ba	Puration (10 Dew Point L Factor In (Date) In Location In Dew Point L The control of the contr	ocation	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F 40.10 N 80.5 F SW @ 235 1.30 16-Aug 40.45 N 81.0 F 1.02 1,200 14,344	85.61 W hours USAC 6 89.00 W						
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transpositio Transposition Dew Poi Transposition Maximum Transposition Adjustin Grid Point Elevation	Puration (10 Dew Point L Factor In (Date) Int Location In Dew Point E Dew Point L Dew Poin	ocation	31-Aug-1914 MCS 42.38 N 900 12.60 Inches 6-1 75.0 F 40.10 N 80.5 F SW @ 235 1.30 16-Aug 40.45 N 81.0 F 1.02 1,200	85.61 W hours USAC 6 89.00 W						

Appendix F: Table F.132: Storm spreadsheet for Cooper, MI August 31, 1914
Page **299** of **346**





Appendix F: Figure F.164 and Figure F.165: Total storm isohyetal analysis and mass curve chart for Cooper, MI August 31, 1914

Wagon Wheel, CO, AWA 66

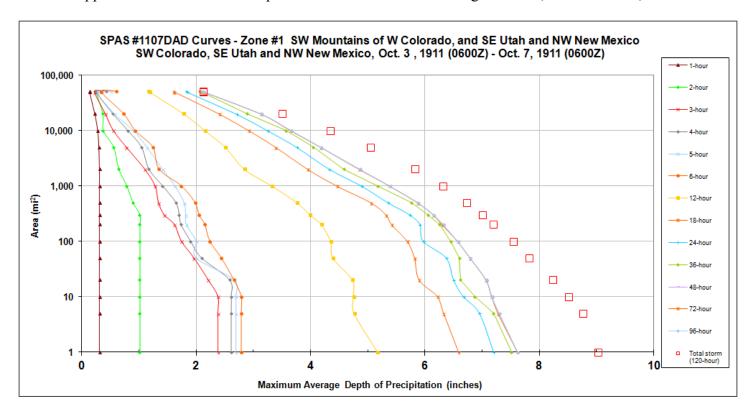
October 3, 1911 Storm Type: Remnant Tropical Grid Points Used: 22

Storm Name Storm Date: AWA Analy			Mtns		Storm A	Adjustn	nent foi	r ANO	Grid Po	oint 22		
Temporal T	ransposition Date	20-Sep										
		Lat	Long			Moisture l	nflow Direc	tion:	SW @ 350	miles		
Storm cente	er location	37.66 N	106.94 W			Grid Point	Elevation		9,871	feet		
Storm Rep d	lew point location	34.50 N	111.60 W			Storm Cer	iter Elevatio	n	12,500	feet		
_	on dewpoint location	35.85 N	111.25 W			Strom Ren	Analysis D	uration	9,871	feet		
Grid Point l			106.50 W				,		•			
The	storm representative d	lew point is	68.0 F	with total	l precipitable	water abov	e sea level o	of		2.05	inches.	
	he in-place maximum d	-			l precipitable					2.73	inches.	
The trans	spositioned maximum d	_			precipitable					2.73	inches.	
	The in-place storm				ch subtracts			f precipitabl		68.0 F		
Th.	The in-place storm				ch subtracts			f precipitabl		74.0 F 74.0 F		
	e transposition barrier (Grid point/inflow barri		-		ch subtracts			f precipitabl f precipitabl		74.0 F		
THE	она рошиншом ван	ier neight is	9,0/1	WIII	en subtracts	1.//	inches of	precipitabl	e water at	/4.0 F		
	The in plac	o mavimizati	ion factor is	1.50	1	Notes: Form	nally known a	s Gladstone (20			
	•		ion factor is				,	, (-			
			ition Factor			I						
	2105100111			2		1						
	The to	tal adjustm	ent factor is	2.06		L						
(Observed Storm Depth	:	:	2.77	4.77			10.77	24.77	26.17	40.77	70.77
	10 3	1 Hours	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	24 Hours	36 Hours	48 Hours	72 Hour
	10 sq miles	0.3	1.0	2.4	2.6	2.7	2.8	4.8	6.7	6.9	7.1	7.2 6.6
	100 sq miles	0.3 0.3	1.0 1.0	1.7 1.6	1.9 1.7	2.0 1.8	2.2	4.4 4.2	6.0 5.9	6.5 6.3	6.5 6.3	6.3
	200 sq miles 500 sq miles	0.3	0.9	1.3	1.6	1.8	2.0	3.8	5.4	5.8	5.8	5.9
	1000 sq miles	0.3	0.8	1.3	1.4	1.6	1.7	3.3	4.9	5.2	5.3	5.4
-	2000 sq miles	0.3	0.6	1.1	1.2	1.4	1.4	2.8	4.3	4.6	4.7	4.9
	5000 sq miles	0.3	0.6	0.8	1.0	1.1	1.2	2.5	3.8	4.1	4.1	4.2
	10000 sq miles	0.3	0.4	0.6	0.8	0.9	0.9	2.2	3.3	3.6	3.7	3.7
	20000 sq miles	0.2	0.4	0.4	0.5	0.6	0.7	1.8	2.7	2.9	2.9	3.1
	50000 sq miles	0.1	0.2	0.2	0.3	0.3	0.3	1.2	1.8	2.1	2.1	2.1
I	Adjusteded Storm Dep	:	:									
		1 Hours	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	24 Hours	36 Hours	48 Hours	72 Hours
	10 sq miles	0.6	2.1 2.1	4.9 3.6	5.4 3.9	5.6 4.1	5.7	9.8 8.9	13.7 12.3	14.1	14.5 13.3	14.7 13.5
	100 sq miles 200 sq miles	0.6 0.6	2.1	3.3	3.6	3.8	4.6 4.4	8.6	12.2	13.3 12.9	12.9	13.0
	500 sq miles	0.6	1.8	2.8	3.4	3.7	4.1	7.7	11.0	11.8	11.9	12.1
	1000 sq miles	0.6	1.6	2.6	2.9	3.4	3.6	6.8	10.1	10.6	10.8	11.1
	2000 sq miles	0.6	1.3	2.3	2.4	2.9	2.8	5.8	8.9	9.4	9.6	10.0
T T	5000 sq miles	0.6	1.1	1.6	2.1	2.3	2.6	5.2	7.7	8.3	8.5	8.6
l l	10000 sq miles	0.6	0.8	1.1	1.6	1.9	1.9	4.4	6.7	7.3	7.5	7.5
	20000 sq miles	0.5	0.7	0.8	1.1	1.2	1.5	3.7	5.6	5.9	6.0	6.4
	50000 sq miles	0.3	0.5	0.5	0.5	0.6	0.7	2.4	3.8	4.3	4.3	4.4
F.	a	.,		CD 4 C 3 C C	0 *							
	Storm or Storm Center	name		SPAS-1107-	oan Juan Mt	ns					1	
	Storm Date(s)			10/4-6/1911 Transical							1	
	Storm Type Storm Location			Tropical 37.66 N	106.94 W						1	
	Storm Center Elevation	l		12,500	orographic						1	
	Precipitation Total & D		sq mi)	7.88 inches 7			D)				1	
	_	,			,							
	Storm Representative I	_		68.0 F	24							
	Storm Representative I		ocation	34.50 N	111.60 W							
	In-place Maximum Dew			74.0 F							-	
	Moisture Inflow Vector			SW @ 350							1	
1	In-place Maximization l	ractor									1	
-	Temporal Transpositio	n (Date)		20-Sep							1	
	Transposition Dewpois			35.85 N	111.25 W						1	
	Transposition Maximu			74.0 F								
	Transposition Adjustn											
	Grid Point Elevation			9,871								
(Highest Elevation in Ba	asin		14,344								
[]]				9,871								

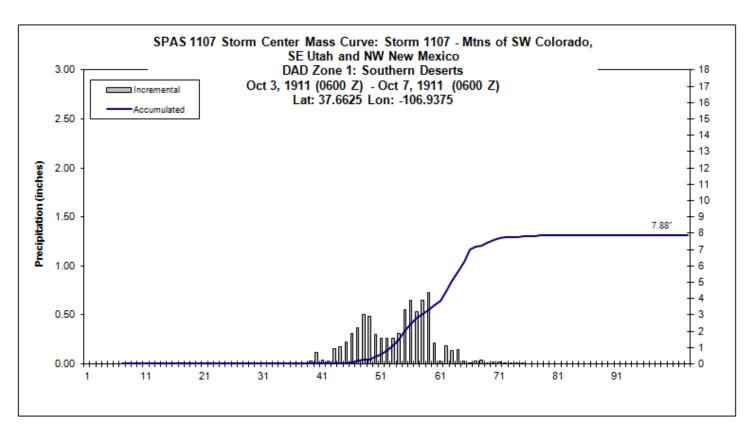
Appendix F: Table F.134: Storm spreadsheet for Wagon Wheel, CO October 3, 1911

	Sto	rm 110	7 - SW	Colora	do, SE l	Jtah an	d NW N	ew Mex	cico, Oc	t 3. 191	11 (0600)Z) - Oc	t 7. 191	1 (0600Z)	
					MAXIMUI	M AVERA	AGE DEP	TH OF P	RECIPITA	ATION (II	NCHES)				
								Duration	n (hours)						
Area (mi ²)	1	2	3	4	5	6	12	18	24	36	48	72	96		Total
0.27	0.72	1.37	2.66	2.93	3.03	3.10	5.49	6.92	7.50	7.84	7.88	7.88	7.88		9.31
1	0.30	1.01	2.38	2.61	2.70	2.79	5.17	6.59	7.20	7.51	7.62	7.62	7.62		9.03
5	0.30	1.01	2.38	2.61	2.70	2.79	4.76	6.33	6.95	7.20	7.27	7.28	7.30		8.76
10	0.30	1.01	2.38	2.61	2.70	2.79	4.75	6.22	6.67	6.87	7.05	7.17	7.17		8.51
20	0.30	1.01	2.21	2.58	2.67	2.66	4.73	5.90	6.50	6.62	6.98	7.07	7.07		8.23
50	0.30	1.01	1.96	2.09	2.00	2.44	4.39	5.82	6.37	6.60	6.76	6.79	6.79		7.82
100	0.30	1.01	1.74	1.90	2.00	2.24	4.35	5.69	5.97	6.45	6.45	6.57	6.57		7.55
200	0.30	1.01	1.62	1.73	1.83	2.15	4.19	5.42	5.91	6.26	6.28	6.30	6.32		7.19
300	0.30	1.01	1.44	1.70	1.82	2.05	3.99	5.32	5.73	6.05	6.07	6.15	6.15		7.00
500	0.30	0.89	1.34	1.64	1.79	1.98	3.76	5.05	5.35	5.76	5.78	5.87	5.87		6.73
1000	0.30	0.78	1.28	1.41	1.63	1.74	3.32	4.46	4.89	5.17	5.25	5.38	5.38		6.31
2000	0.30	0.64	1.10	1.17	1.41	1.35	2.84	3.95	4.33	4.58	4.65	4.85	4.86		5.82
5000	0.29	0.55	0.78	1.04	1.14	1.24	2.51	3.39	3.76	4.05	4.14	4.18	4.18		5.05
10000	0.27	0.37	0.55	0.80	0.90	0.93	2.15	2.92	3.25	3.57	3.65	3.65	3.66		4.34
20000	0.22	0.36	0.41	0.54	0.57	0.73	1.78	2.40	2.70	2.89	2.91	3.13	3.13		3.50
50000	0.13	0.24	0.22	0.25	0.27	0.34	1.18	1.62	1.84	2.08	2.11	2.13	2.13		2.12
51059	0.13	0.24	0.33	0.42	0.51	0.60	1.16	1.60	1.82	2.06	2.09	2.09	2.09		2.12

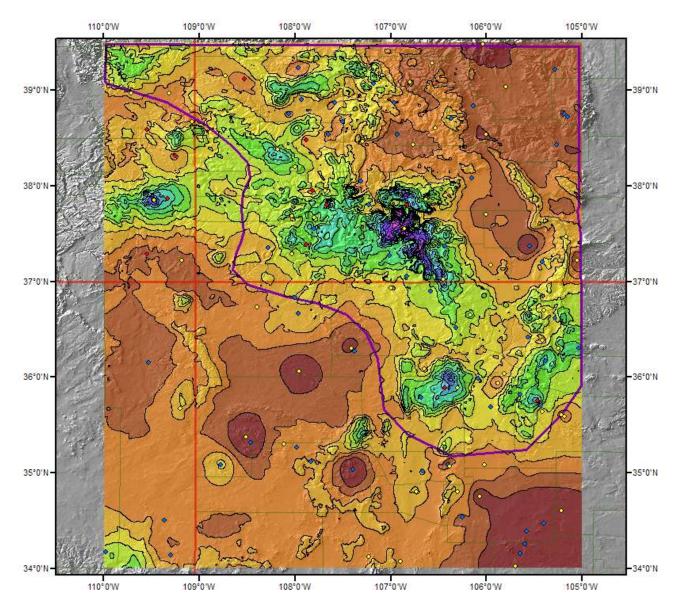
Appendix F: Table F.135: Depth-area-duration values for Wagon Wheel, CO October 3, 1911



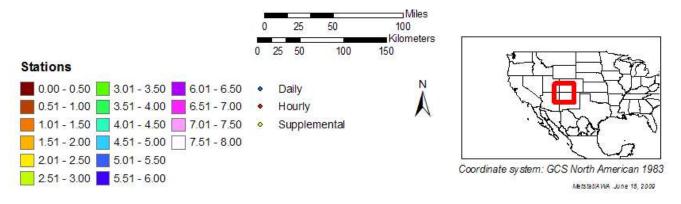
Appendix F: Figure F.166: Depth-area-duration for Wagon Wheel, CO October 3, 1911



Appendix F: Figure F.167: Mass curve chart for Wagon Wheel, CO October 3, 1911



Total Precipitation SPAS 1107 Oct 3, 1911 (0600 Z) - Oct 7, 1911 (0600 Z)



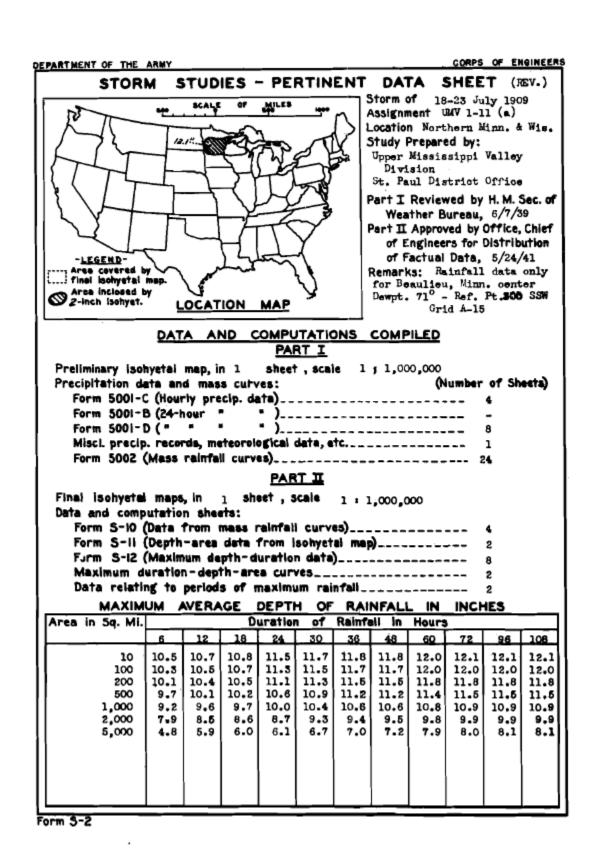
Appendix F: Figure F.168: Total storm isohyetal analysis for Wagon Wheel, CO October 3, 1911

Beaulieu, MN, AWA 67

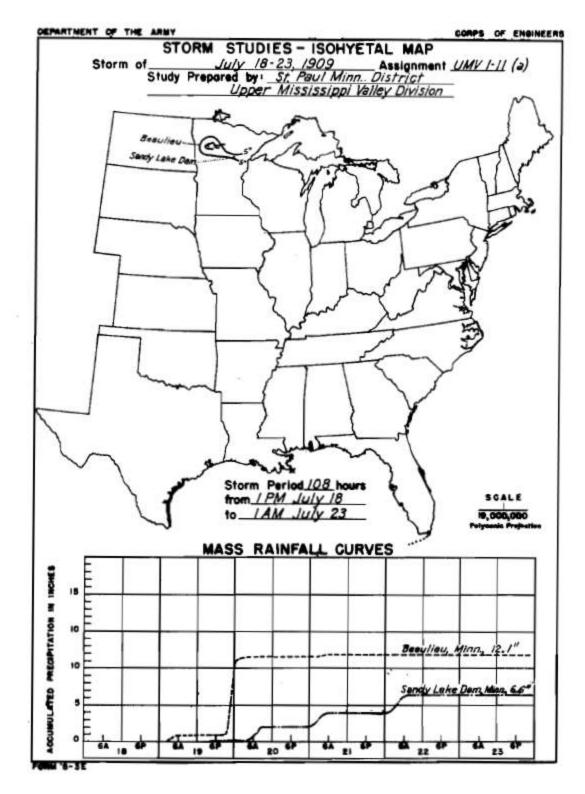
July 18, 1909 Storm Type: MCC

Grid Points Used: 8-11, 16-18

Storm Name: Storm Date:	18-Jul-190		aulieu, MN		Storm	Adjust	ment fo	or ANO	Grid Po	int 8	
AWA Analysis Date:											
emporal Transposit	tion Date	15-Jul					5 Di (CCTT C AO	-	
		Lat	Long				nflow Direct	ion	SSW @ 29	miles	
torm Center Locati		47.30 N	95.90 W			Grid Point			1,200	feet	
torm Rep Dew Poin	t Location	43.32 N	98.08 W			Storm Cen	ter Elevatior	ı	1,300	feet	
ransposition Dew P	oint Location		94.62 W			Storm Rep	Analysis Du	ıration	6	hours	
rid Point Location		37.50 N	93.00 W								
The storm r	epresentative	dew point is	78.0 F	with tota	l precipitable	water above	e sea level of	f		3.29	inches
	lace maximum	•	81.5 F		l precipitable					3.84	inches
The transpositio		-	82.5 F		l precipitable					3.98	inches
•	in-place storm	-	1,300		ch subtracts			f precipitabl	e water at	78.0 F	
	in-place storm		1,300	whi	ch subtracts	0.40		f precipitabl		81.5 F	
	position basin		1,200	whi	ch subtracts	0.32		f precipitabl		82.5 F	
	int/Inflow bar		1,000	whi	ch subtracts	0.32		f precipitabl		82.5 F	
	he in-place sto			1.17					CE UMV 1-1		
The tra	ansposition/el			1.06				-	based on gui	idance	L
	The ba	arrier adjustm	ent factor is	1.00		from EPRI,	Nebraska, ar	nd TRWD.			
	The	total adjustm	ent factor is	1.25							
	1110	total adjustin	circ ructor is	1.20							-
Observed	Storm Depth								,		
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	10.5	10.7	10.8	11.5	11.7	11.8	11.8	12.0	12.1	
	100 sq miles	10.3	10.5	10.7	11.3	11.5	11.7	11.7	12.0	12.0	
	200 sq miles	10.1	10.4	10.5	11.1	11.3	11.5	11.5	11.8	11.8	<u> </u>
	500 sq miles	9.7	10.1	10.2	10.6	11.0	11.2	11.2	11.5	11.5	
	1000 sq miles	9.2	9.6	9.7	10.0	10.4	10.5	10.6	10.8	10.9	
	2000 sq miles	7.9	8.5	8.6	8.7	9.3	9.4	9.5	9.8	9.9	
	5000 sq miles	4.8	5.9	6.0	6.1	7.1	7.3	7.5	7.9	8.0	
	0000 sq miles 0000 sq miles	-	-	-	-	-	-	-	-	-	
2.	occo sq nmes;	_			1			1	1 - 1		
Adjusted	Storm Depth-										
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	13.1	13.4	13.5	14.4	14.6	14.7	14.7	15.0	15.1	
	100 sq miles	12.9	13.1	13.4	14.1	14.4	14.6	14.6	15.0	15.0	
	200 sq miles	12.6	13.0 12.6	13.1 12.7	13.9 13.2	14.1 13.7	14.4	14.4	14.7	14.7 14.4	-
	500 sq miles	12.1 11.5	12.0	12.7	13.2	13.7	14.0 13.1	14.0 13.2	14.4 13.5	13.6	
	1000 sq miles 2000 sq miles	9.9	10.6	10.7	10.9	11.6	11.7	11.9	12.2	12.4	-
	5000 sq miles	6.0	7.4	7.5	7.6	8.9	9.1	9.4	9,9	10.0	
•••••	0000 sq miles 0000 sq miles							•	·		1
	0000 sq miles	-	-	-	-	-	-	<u>-</u> -	-	-	
Ctarra col	Storm Center N	Vama		USACE- UM	V 1 114 Pa-	ulian MN					1
Storm or S		vame		18-Jul-1909	v 1-11A-Bea	uneu, MIN					1
Storm Ty				MCC							1
Storm Loc				47.30 N	95.90 W						1
	nter Elevation			1.300							1
	ion Total & D			13.20 Inches	72-hours US.	ACE UMV 1	-11				
Storm Re	presentative D	lew Point		78.0 F	6						-
	presentative D			43.32 N	98.08 W						1
	Dew Point			81.5 F							1
	Inflow Vector			SSW @ 295							1
	Maximization F			1.17							1
	Trans	n (Date)		15 1-1							-
	Transposition			15-Jul 29.75 N	04.62.337						1
	iuon Dew Poii			38.75 N	94.62 W						1
Transpos				82.5 F							1
Transpos Transpos	ition Maximun			1.06							
Transpos Transpos Transpos	ition Maximun ition Adjustm			1.06							-
Transpos Transpos Transpos Grid Point	ition Maximun ition Adjustm t Elevation	ent Factor		1,200							
Transpos Transpos Transpos Grid Point Highest E	ition Maximun ition Adjustm t Elevation Ilevation in Ba	ent Factor		1,200 14,344							
Transpos Transpos Transpos Grid Point Highest E Inflow Ba	ition Maximun ition Adjustm t Elevation	ent Factor Isin		1,200							



Appendix F: Table F.137: Depth-area-duration values for Beaulieu, MN July 18, 1909



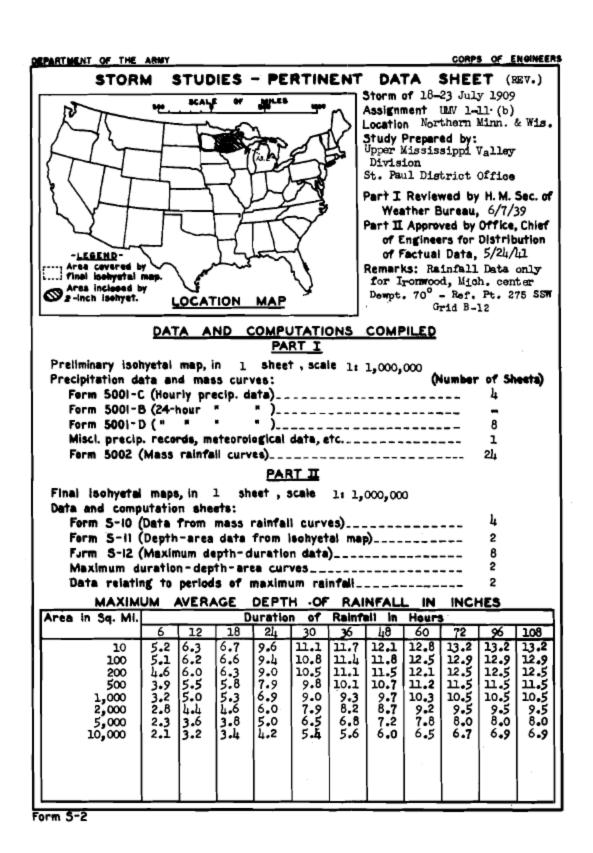
Appendix F: Figure F.169 and Figure F.170: Total storm isohyetal analysis and mass curve chart for Beaulieu, MN July 18, 1909

Ironwood, MI, AWA 68

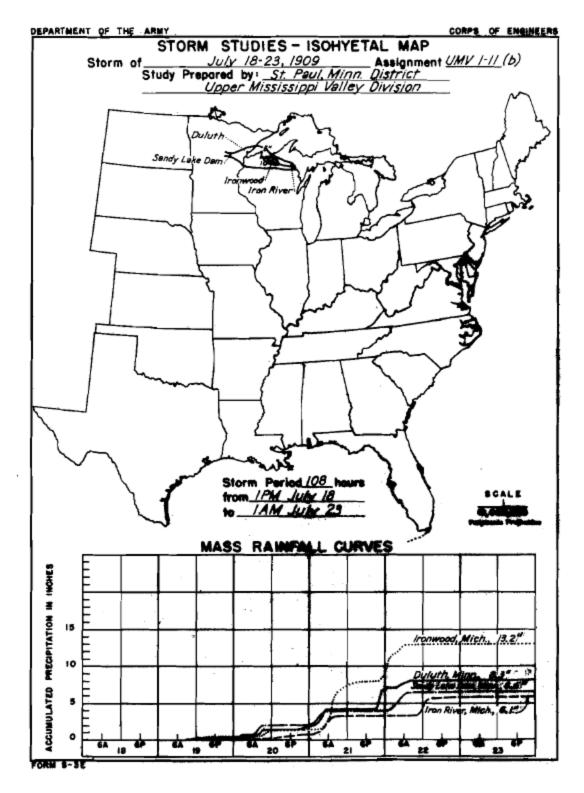
July 21, 1909 Storm Type: Frontal Grid Points Used:

torm Name: USACE- UM torm Date: 18-Jul-1909	IV 1-11b-Iro)	iwoou, Mi		Storm	Adinst	ment fo	r ANO	Grid Po	oint &	
WA Analysis Date: 12/16/2013				Storm	Aujust	шені 10	ANO	Gila I (ли о	
emporal Transposition Date	15-Jul									
•	Lat	Long			Moisture In	ıflow Directi	on	SSW @ 27	miles	
torm Center Location	46.45 N	90.18 W			Grid Point	Elevation		1,200	feet	
torm Rep Dew Point Location	42.75 N	92.25 W			Storm Cent	ter Elevation		1,500	feet	
ransposition Dew Point Location	39.02 N	94.50 W			Storm Rep	Analysis Du	ration	24	hours	
rid Point Location	37.50 N	93.00 W				·				
The storm representative	•	72.0 F		precipitable					2.47	inches
The in-place maximum	-	80.5 F		precipitable					3.68	inches
The transpositioned maximum	_	80.5 F 1,500		precipitable ch subtracts			f precipitable		3.68 72.0 F	inches
The in-place storm The in-place storm		1,500		ch subtracts ch subtracts			f precipitabl		80.5 F	
The transposition basin		1,200		ch subtracts			f precipitable		80.5 F	
The Grid point/inflow bar		1,000		ch subtracts			f precipitabl		80.5 F	
The in-place sto	rm maximizat	ion factor is	1.50		Notes: DAI) values take	n from USA	CE UMV 1-1	1b. Added	
The transposition/el	evation to ba	sin factor is	1.04				-	based on gu		
The ba	rrier adjustm	ent factor is	1.00					n Place max f		
			1.54		to 1.50 base	d on HMR g	guidance, cal	culated at 1.	52.	
The	total adjustm	ent factor is	1.56	J						1
Observed Strome Post	Auga Pour d									
Observed Storm Depth-	Area-Durati 6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	1
10 sq miles	5.2	6.3	6.7	9.6	11.1	11.7	12.1	12.8	13.2	
100 sq miles	5.1	6.2	6.6	9.4	10.8	11.7	11.8	12.5	12.9	1
200 sq miles	4.6	6.0	6.3	9.0	10.5	11.1	11.5	12.1	12.5	
500 sq miles	3.9	5.5	5.8	7.9	9.8	10.1	10.7	11.2	11.5	
1000 sq miles	3.2	5.0	5.3	6.9	9.0	9.3	9.7	10.3	10.5	
2000 sq miles	2.8	4.4	4.6	6.0	7.9	8.2	8.7	9.2	9.5	
5000 sq miles	2.3	3.6	3.8	5.0	6.5	6.8	7.2	7.8	8.0	
10000 sq miles	2.1	3.2	3.4	4.2	5.4	5.6	6.0	6.5	6.7	
20000 sq miles	-	-	-	-	-	-	-	-	-	
Adjusted Storm Depth-	Area Durati	.								1
Aujusteu Storiii Deptii-	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
		9.9	10.5	15.0	17.4	18.3	18.9	20.0	20.7	
10 sq miles	8.1						·····	107		1
10 sq miles 100 sq miles	8.1	9.7	10.3	14.7	16.9	17.8	18.5	19.6	20.2	
			10.3 9.9	14.7 14.1	ò	17.8 17.4	18.5 18.0	19.6 18.9	20.2 19.6	
100 sq miles	8.0	9.7			16.9					
100 sq miles 200 sq miles 500 sq miles 1000 sq miles	8.0 7.2 6.1 5.0	9.7 9.4 8.6 7.8	9.9 9.1 8.3	14.1 12.4 10.8	16.9 16.4 15.3 14.1	17.4 15.8 14.6	18.0 16.7 15.2	18.9 17.5 16.1	19.6 18.0 16.4	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles	8.0 7.2 6.1 5.0 4.4	9.7 9.4 8.6 7.8 6.9	9,9 9,1 8,3 7,2	14.1 12.4 10.8 9.4	16.9 16.4 15.3 14.1 12.4	17.4 15.8 14.6 12.8	18.0 16.7 15.2 13.6	18.9 17.5 16.1 14.4	19.6 18.0 16.4 14.9	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles	8.0 7.2 6.1 5.0 4.4 3.6	9.7 9.4 8.6 7.8 6.9 5.6	9,9 9,1 8,3 7,2 5,9	14.1 12.4 10.8 9.4 7.8	16.9 16.4 15.3 14.1 12.4 10.2	17.4 15.8 14.6 12.8 10.6	18.0 16.7 15.2 13.6 11.3	18.9 17.5 16.1 14.4 12.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	8.0 7.2 6.1 5.0 4.4 3.6 3.3	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3	14.1 12.4 10.8 9.4 7.8 6.6	16.9 16.4 15.3 14.1 12.4 10.2 8.5	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles	8.0 7.2 6.1 5.0 4.4 3.6	9.7 9.4 8.6 7.8 6.9 5.6	9,9 9,1 8,3 7,2 5,9	14.1 12.4 10.8 9.4 7.8	16.9 16.4 15.3 14.1 12.4 10.2	17.4 15.8 14.6 12.8 10.6	18.0 16.7 15.2 13.6 11.3	18.9 17.5 16.1 14.4 12.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	8.0 7.2 6.1 5.0 4.4 3.6 3.3	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3	14.1 12.4 10.8 9.4 7.8 6.6	16.9 16.4 15.3 14.1 12.4 10.2 8.5	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	8.0 7.2 6.1 5.0 4.4 3.6 3.3	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3	14.1 12.4 10.8 9.4 7.8 6.6	16.9 16.4 15.3 14.1 12.4 10.2 8.5	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles	8.0 7.2 6.1 5.0 4.4 3.6 3.3	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9,9 9,1 8,3 7,2 5,9 5,3 - USACE- UM 18-Jul-1909	14.1 12.4 10.8 9.4 7.8 6.6	16.9 16.4 15.3 14.1 12.4 10.2 8.5	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center N Storm Date(s) Storm Type	8.0 7.2 6.1 5.0 4.4 3.6 3.3	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9,9 9,1 8,3 7,2 5,9 5,3 - USACE- UM 18-Jul-1909 Synoptic	14.1 12.4 10.8 9.4 7.8 6.6	16.9 16.4 15.3 14.1 12.4 10.2 8.5	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center N Storm Date(s) Storm Type Storm Location	8.0 7.2 6.1 5.0 4.4 3.6 3.3	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9,9 9,1 8,3 7,2 5,9 5,3 - USACE- UM 18-Jul-1909 Synoptic 46.45 N	14.1 12.4 10.8 9.4 7.8 6.6	16.9 16.4 15.3 14.1 12.4 10.2 8.5	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation	8.0 7.2 6.1 5.0 4.4 3.6 3.3	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9,9 9,1 8,3 7,2 5,9 5,3 - USACE- UMV 18-Jul-1909 Synoptic 46.45 N 1,500	14.1 12.4 10.8 9.4 7.8 6.6 V 1-11b-Iron	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center N Storm Date(s) Storm Type Storm Location	8.0 7.2 6.1 5.0 4.4 3.6 3.3	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9,9 9,1 8,3 7,2 5,9 5,3 - USACE- UM 18-Jul-1909 Synoptic 46.45 N	14.1 12.4 10.8 9.4 7.8 6.6 V 1-11b-Iron	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Date	8.0 7.2 6.1 5.0 4.4 3.6 3.3	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3 - USACE- UMV 18-Jul-1909 Synoptic 46.45 N 1,500 13.20 Inches	14.1 12.4 10.8 9.4 7.8 6.6 - V 1-11b-Iron 90.18 W	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Date Storm Representative D	8.0 7.2 6.1 5.0 4.4 3.6 3.3 -	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9,9 9,1 8,3 7,2 5,9 5,3 - USACE- UMV 18-Jul-1909 Synoptic 46.45 N 1,500	14.1 12.4 10.8 9.4 7.8 6.6 	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Date	8.0 7.2 6.1 5.0 4.4 3.6 3.3 -	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3 - USACE- UMV 18-Jul-1909 Synoptic 46.45 N 1,500 13.20 Inches	14.1 12.4 10.8 9.4 7.8 6.6 - V 1-11b-Iron 90.18 W	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles	8.0 7.2 6.1 5.0 4.4 3.6 3.3	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9,9 9,1 8,3 7,2 5,9 5,3 - USACE- UMV 18-Jul-1909 Synoptic 46.45 N 1,500 13.20 Inches	14.1 12.4 10.8 9.4 7.8 6.6 	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 2	8.0 7.2 6.1 5.0 4.4 3.6 3.3	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3 - USACE- UMV 18-Jul-1909 Synoptic 46.45 N 1,500 13.20 Inches 72.0 F 42.75 N 80.5 F	14.1 12.4 10.8 9.4 7.8 6.6 	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Drecipitation Total & Drecipitation Storm Representative D Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F	8.0 7.2 6.1 5.0 4.4 3.6 3.3 - Name ewpoint ewpoint Loc	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9,9 9,1 8,3 7,2 5,9 5,3 - USACE- UM 18-Jul-1909 Synoptic 46.45 N 1,500 13.20 Inches 72.0 F 42.75 N 80.5 F SSW @ 270 1.50	14.1 12.4 10.8 9.4 7.8 6.6 	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 2000 sq miles 20000 sq miles 20	8.0 7.2 6.1 5.0 4.4 3.6 3.3 - Name Paration ewpoint ewpoint Loc actor a (Date)	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3 - USACE- UMV 18-Jul-1909 Synoptic 46.45 N 1,500 13.20 Inches 72.0 F 42.75 N 80.5 F SSW @ 270 1.50 15-Jul	14.1 12.4 10.8 9.4 7.8 6.6 V 1-11b-Iron 90.18 W 72-hours US 24 92.25 W	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 2	8.0 7.2 6.1 5.0 4.4 3.6 3.3 - Vame weepoint teepoint Location actor actor actor (Date) t Location	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3 - USACE- UMV 18-Jul-1909 Synoptic 46.45 N 1,500 13.20 Inches 72.0 F 42.75 N 80.5 F SSW @ 270 1.50 15-Jul 39.02 N	14.1 12.4 10.8 9.4 7.8 6.6 	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 2	8.0 7.2 6.1 5.0 4.4 3.6 3.3 - Vame Vame Uration ewpoint Loc actor actor (Date) t Location Dewpoint	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3 - USACE- UMV 18-Jul-1909 Synoptic 46.45 N 1,500 13.20 Inches 72.0 F 42.75 N 80.5 F SSW @ 270 1.50 15-Jul 39.02 N 80.5 F	14.1 12.4 10.8 9.4 7.8 6.6 V 1-11b-Iron 90.18 W 72-hours US 24 92.25 W	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 2000 sq miles 200	8.0 7.2 6.1 5.0 4.4 3.6 3.3 - Vame Vame Uration ewpoint Loc actor actor (Date) t Location Dewpoint	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3 - USACE- UMV 18-Jul-1909 Synoptic 46.45 N 1,500 13.20 Inches 72.0 F 42.75 N 80.5 F SSW @ 270 1.50 15-Jul 39.02 N 80.5 F 1.04	14.1 12.4 10.8 9.4 7.8 6.6 V 1-11b-Iron 90.18 W 72-hours US 24 92.25 W	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 2000 sq miles 20000 sq miles 20	8.0 7.2 6.1 5.0 4.4 3.6 3.3 - Name warration ewpoint loc actor a (Date) t Location Dewpoint ent Factor	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3 - USACE- UMV 18-Jul-1909 Synoptic 46.45 N 1,500 13.20 Inches 72.0 F 42.75 N 80.5 F SSW @ 270 1.50 15-Jul 39.02 N 80.5 F	14.1 12.4 10.8 9.4 7.8 6.6 V 1-11b-Iron 90.18 W 72-hours US 24 92.25 W	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 2	8.0 7.2 6.1 5.0 4.4 3.6 3.3 - Name warration ewpoint loc actor a (Date) t Location Dewpoint ent Factor	9.7 9.4 8.6 7.8 6.9 5.6 5.0	9.9 9.1 8.3 7.2 5.9 5.3	14.1 12.4 10.8 9.4 7.8 6.6 V 1-11b-Iron 90.18 W 72-hours US 24 92.25 W	16.9 16.4 15.3 14.1 12.4 10.2 8.5 - wood, MI	17.4 15.8 14.6 12.8 10.6 8.8	18.0 16.7 15.2 13.6 11.3 9.4	18.9 17.5 16.1 14.4 12.2 10.2	19.6 18.0 16.4 14.9 12.5	

Appendix F: Table F.138: Storm spreadsheet for Ironwood, MI July 21, 1909



Appendix F: Table F.139: Depth-area-duration values for Ironwood, MI July 21, 1909



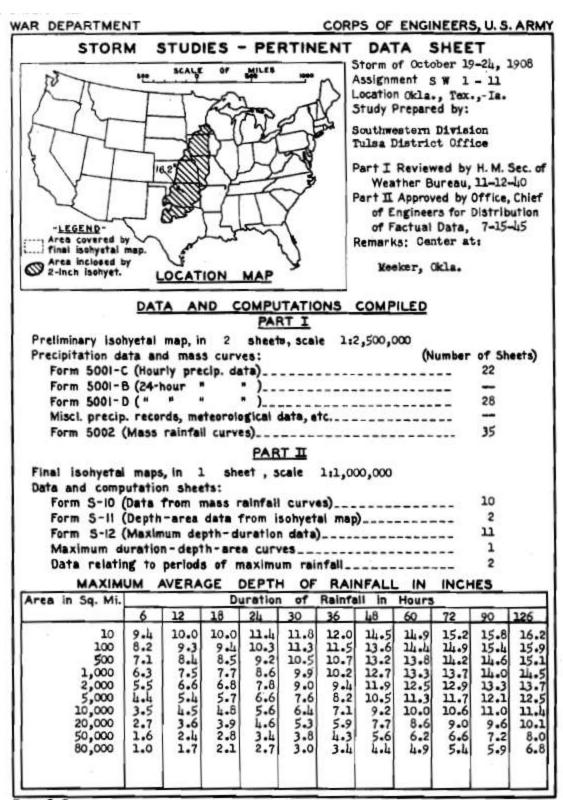
Appendix F: Figure F.171 and Figure F.172: Total storm isohyetal analysis and mass curve chart for Ironwood, MI July 21, 1909

Meeker, OK, AWA 69

October 19, 1908 Storm Type: Frontal

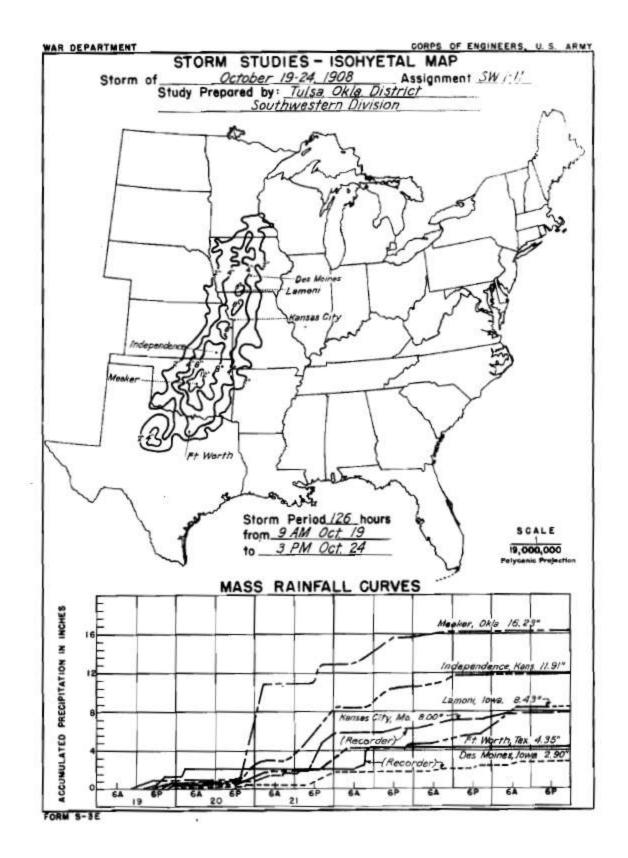
torm Name: SW 1-11-M torm Date: 10/19-23/1 .WA Analysis Date: 12/16/2013				Storm	Adjust	ment fo	or ANO	Grid Po	oint 1	
emporal Transposition Date	5-Oct									
	Lat	Long			Moisture II	ıflow Direct	ion	SE @ 200	miles	
torm Center Location	35.50 N	96.90 W			Grid Point	Elevation		350	feet	
torm Rep Dew Point Location	33.43 N	94.45 W				ter Elevation		900	feet	
ransposition Dew Point Location		89.88 W				Analysis Di		24	hours	
rid Point Location	35.31 N	93.23 W			этогш кер	Allalysis Di	il ation	24	nours	
The storm representative	dew point is	68.0 F		l precipitable					2.05	inches
The in-place maximum	•	75.5 F		l precipitable					2.92	inches
The transpositioned maximum	•	72.5 F		l precipitable					2.54	inches
The in-place stom		900 900		ich subtracts ich subtracts			f precipitabl		68.0 F 75.5 F	
The in-place stom The transposition basin		350		ich subtracts			f precipitabl f precipitabl		72.5 F	
The Grid point/inflow bar		1,000		ich subtracts			f precipitabl		72.5 F	
The in-place sto	orm maximizat	ion factor is	1.44	1	Notes: DAI	O values tak	en from USA	CE SW 1-11.	Added	1
The transposition/el			0.86		2°F to the U	JSACE stom	n rep Td to a	djust the per	sisting Td	
-	arrier adjustm		1.00			ige Td clima	_	-	-	
The	total adjustm	ent factor is	1.23							
Observed Storm Depth	-Area-Durati	on								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	9.4	10.0	10.0	11.4	11.8	12.0	14.5	14.9	15.2	
100 sq miles	8.2	9.3	9.4	10.3	11.3	11.5	13.6	14.4	14.9	1
500 sq miles	7.1	8.4	8.5	9.2	10.5	10.7	13.2	13.8	14.2	
1000 sq miles	6.3	7.5	7.7	8.6	9.9	10.2	12.7	13.3	13.7	
2000 sq miles	5.5	6.6	6.8	7.8	9.0	9.4	11.9	12.5	12.9	
5000 sq miles	4.4 3.5	5.4 4.5	5.7 4.8	6.6 5.6	7.6 6.4	8.2 7.1	10.5 9.2	11.3 10.0	11.7 10.6	
10000 sq miles 20000 sq miles	2.7	3.6	3.9	4.6	5.3	7.1 5.9	7.7	8.6	9.0	
Adjusted Storm Depth-	Area-Duratio	on								
•	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	11.6	12.3	12.3	14.1	14.5	14.8	17.9	18.4	18.7	
100 sq miles	10.1	11.5	11.6	12.7	13.9	14.2	16.8	17.7	18.4	
500 sq miles	8.8	10.4	10.5	11.3	12.9	13.2	16.3	17.0	17.5	
1000 sq miles	7.8	9.2	9.5	10.6	12.2	12.6	15.7	16.4	16.9	
2000 sq miles	6.8	8.1	8.4	9.6	11.1	11.6	14.7	15.4	15.9	
5000 sq miles	5.4	6.7	7.0	8.1	9.4	10.1	12.9	13.9	14.4	
10000 sq miles 20000 sq miles	4.3 3.3	5.5 4.4	5.9 4.8	6.9 5.7	7.9 6.5	8.8 7.3	11.3 9.5	12.3 10.6	13.1 11.1	
20000 Sq Ilmes		-1.1	110		0.0	7.00	, ,,,,	10.0	11.1	
Storm or Storm Center	Name		SW 1-11-Me							
Storm Date(s)			10/19-23/1908							
Storm Type			General Stom							1
Storm Location			35.50 N	96.90 W						1
Storm Center Elevation Precipitation Total & D			900 16.23 Inches	in 126 hours,	11.4 in 24 h	ours				
Storm Representative	Γd		68.0 F	24						
Storm Representative			33.43 N	94.45 W						
In-place Maximum Td			75.5 F							
Moisture Inflow Vector			SE @ 200							
In-place Maximization I	actor		1.44							1
Temporal Transposition			5-Oct 40.65 N	89.88 W		San	Oct			
Transposition Dewpoir Transposition Maximus			40.65 N 72.5 F	69.88 W		Sep 74	Oct 72			1
Transposition Maximum Transposition Adjustm			0.86			/=	12			1
Grid Point Elevation	can a actor		350							1
										1
Highest Elevation in Ba	isin		14,344							
Highest Elevation in Ba Inflow Barrier Height	ısin		14,344 1,000							
			-							
Inflow Barrier Height	actor		1,000							

Appendix F: Table F.140: Storm spreadsheet for Meeker, OK October 19, 1908



Form S-2

Appendix F: Table F.141: Depth-area-duration values for Meeker, OK October 19, 1908



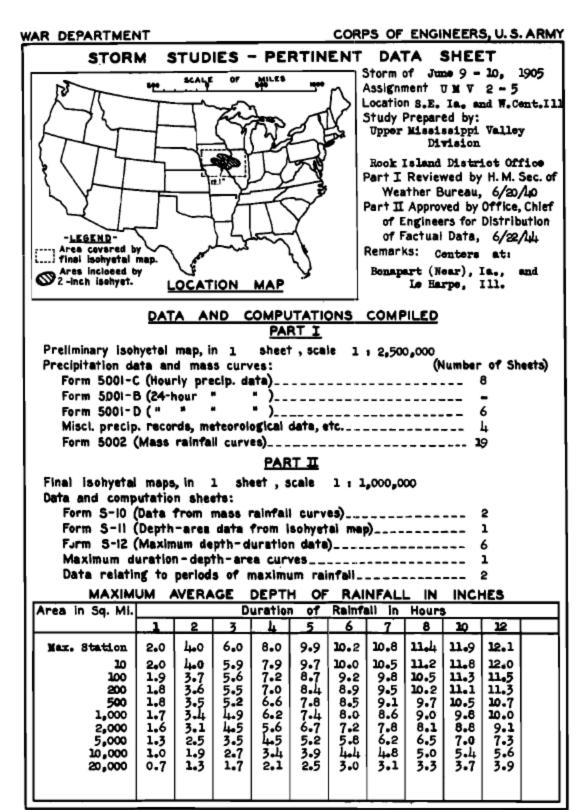
Appendix F: Figure F.173 and Figure F.174: Total storm isohyetal analysis and mass curve chart for Meeker, OK October 19, 1908

Bonaparte, IA, AWA 70

June 10, 1905 Storm Type: MCC

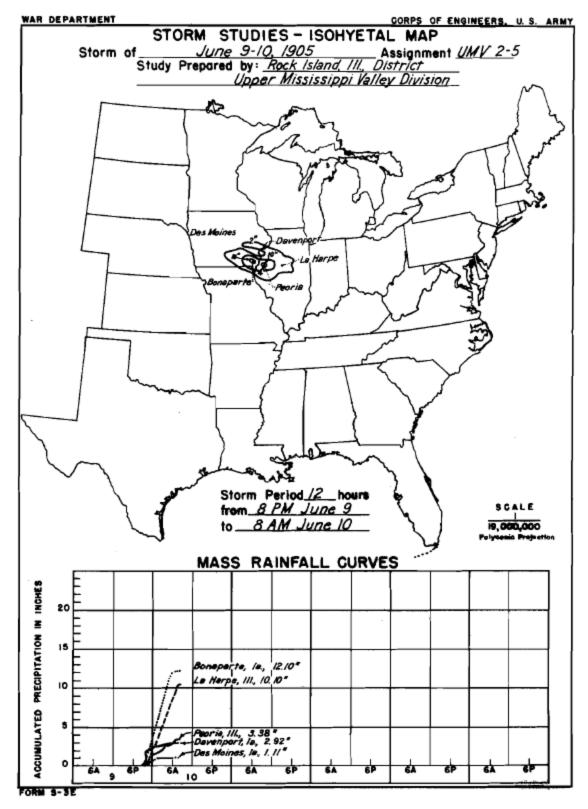
Storm Name: USACE UM Storm Date: June 9, 190		parte, IA		Storm A	Adinete	nent for	r ANO	Crid D	nint 2	
AWA Analysis Date: 12/16/2013				Storm A	Aajustn	пепт 10	r ANO	Gria Po	omt 2	
emporal Transposition Date	30-Jun									
	Lat	Long			Moisture I	nflow Direc	tion	S @ 155	miles	
Storm Center Location	40.77 N	91.75 W			Grid Point	Elevation		550	feet	
torm Rep Dew Point Location	38.52 N	91.81 W			Storm Cen	ter Elevatio	n	1,500	feet	
Transposition Dew Point Location	40.48 N	92.64 W			Storm Ren	Analysis D	uration	12	hours	
Grid Point Location	34.50 N	95.50 W			Storm reep	,515			110415	
The storm representative d		77.0 F		precipitable w					3.14	inches.
The in-place maximum d	-	80.0 F		precipitable w					3.60	inches.
The transpositioned maximum d	-	80.0 F		precipitable w					3.60	inches.
The in-place storm e		1,500		ich subtracts			f precipitabl		77.0 F	
The in-place storm e		1,500		ich subtracts			f precipitabl		80.0 F	
The transposition storm e		550		ich subtracts			f precipitabl		80.0 F	
The Grid Point/inflow barri	er neight is	1,000	wn	ich subtracts	0.30	inches of	f precipitabl	e water at	80.0 F	
The in-place	e mavimizatio	on factor is	1.15	1	Notes: DA	D values tal	cen from US	ACE UMV 2	2-5 Added	1
	transpositio							ep dew poin		
The elevation/barri	•						ebraska, TR			
2110 Olevadori Daris	ajasuit		2.00							
The to	tal adjustme	nt factor is	1.20							
Observed Storm Depth	-Area-Dura 1 Hours	tion 6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hour
1 sq miles	2.0	10.2	12.1	- 10110418	2+110UIS	- Jo 110th S	- JUITOUIS		-	,2110ul
10 sq miles	2.0	10.2	12.0		_	-	-	-	-	-
100 sq miles	1.9	9.2	11.5		-	-	-	-	-	-
200 sq miles	1.8	8.9	11.3	-	-	-	-	-	-	-
500 sq miles	1.8	8.5	10.7	-	-	-	-	-	-	-
1000 sq miles	1.7	8.0	10.0	-	-	-	-	-	-	-
2000 sq miles	1.6	7.2	9.1	_	_	-	-	_	-	-
5000 sq miles	1.3	5.8	7.3	-	-	-	-	-	-	-
10000 sq miles	1.0	4.4	5.6	_	-	_	-	-	-	† <u>-</u>
20000 sq miles	0.7	3.0	3.9	-	-	-	-	-	-	-
20000 bq miles										
Adjusted Storm Depth-			12.11	10 II	24 11	20.11	26 11	40 11	60 11	72.11
Adjusted Storm Depth-	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hour
Adjusted Storm Depth-	1 Hours 2.4	6 Hours 12.2	14.5	-	-	-	-	-	-	-
Adjusted Storm Depth- 1 sq miles 10 sq miles	1 Hours 2.4 2.4	6 Hours 12.2 12.0	14.5 14.4	-	-	-	-	-	-	-
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles	1 Hours 2.4 2.4 2.3	6 Hours 12.2 12.0 11.0	14.5 14.4 13.8	-	- - -	-	-	- - -	- - -	
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles	1 Hours 2.4 2.4 2.3 2.2	6 Hours 12.2 12.0 11.0 10.7	14.5 14.4 13.8 13.6	- - -	- - -	- - -	- - -	- - -	- - -	- - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles	1 Hours 2.4 2.4 2.3 2.2 2.2	6 Hours 12.2 12.0 11.0 10.7 10.2	14.5 14.4 13.8 13.6 12.8	-	- - - -	- - - -	- - - -	- - -	- - - -	- - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles	1 Hours 2.4 2.4 2.3 2.2 2.2 2.0	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6	14.5 14.4 13.8 13.6 12.8 12.0	- - - - - -	- - - - -	- - - - -	- - - - - -	- - -	- - - - -	- - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	1 Hours 2.4 2.4 2.3 2.2 2.2 2.0 1.9	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9	- - -	- - - -	- - - -	- - - -	- - -	- - - -	- - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles	1 Hours 2.4 2.4 2.3 2.2 2.2 2.0 1.9 1.6	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6 7.0	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8	- - - - - -	- - - - - -		- - - - - -	- - - - - -		- - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	1 Hours 2.4 2.4 2.3 2.2 2.2 2.0 1.9	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9	- - - - - -		- - - - - - -	- - - - - -		- - - - - -	- - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles	1 Hours 2.4 2.4 2.3 2.2 2.2 2.0 1.9 1.6 1.2	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7	- - - - - -	- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 2000 sq miles 5000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles	1 Hours 2.4 2.4 2.3 2.2 2.2 2.0 1.9 1.6 1.2 0.8	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7			- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 2000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles Storm or Storm Center I	1 Hours 2.4 2.4 2.3 2.2 2.2 2.0 1.9 1.6 1.2 0.8	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7			- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Storm Ostorm Center I	1 Hours 2.4 2.4 2.3 2.2 2.2 2.0 1.9 1.6 1.2 0.8	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905			- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 2000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 5000 sq miles	1 Hours 2.4 2.4 2.3 2.2 2.2 2.0 1.9 1.6 1.2 0.8	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC			- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 2000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Tope Storm Type Storm Location	1 Hours 2.4 2.4 2.3 2.2 2.0 1.9 1.6 1.2 0.8	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N			- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 2000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 10000 sq miles 20000 sq miles Storm Or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation	1 Hours 2.4 2.4 2.3 2.2 2.0 1.9 1.6 1.2 0.8	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500				- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Topte Storm Type Storm Location	1 Hours 2.4 2.4 2.3 2.2 2.0 1.9 1.6 1.2 0.8	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N				- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 2000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation	1 Hours 2.4 2.4 2.4 2.2 2.2 2.0 1.9 1.6 1.2 0.8	6 Hours 12.2 12.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500				- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 2000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Topte (Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	1 Hours 2.4 2.4 2.3 2.2 2.2 2.0 1.9 1.6 1.2 0.8	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1				- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20	1 Hours 2.4 2.4 2.3 2.2 2.2 2.0 1.9 1.6 1.2 0.8	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1				- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 10000 sq miles 20000 sq miles 20	1 Hours 2.4 2.4 2.3 2.2 2.0 1.9 1.6 1.2 0.8 Name	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1 77.0 F 38.52 N				- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative D Storm Representative D Maximum Dew Point	1 Hours 2.4 2.4 2.3 2.2 2.0 1.9 1.6 1.2 0.8 Name	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1 77.0 F 38.52 N 80.0 F				- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 200	1 Hours	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1 77.0 F 38.52 N 80.0 F S @ 155 1.15				- - - - - - - - - - - - - - - - - -	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 10000 sq miles 20000 sq miles 200	1 Hours	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1 77.0 F 38.52 N 80.0 F \$\@ 155 1.15	91.75 W 2-hours USA				- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 200 sq miles 500 sq miles 500 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 200	1 Hours	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1 77.0 F 38.52 N 80.0 F S @ 155 1.15 30-Jun 40.48 N					- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 20000 sq miles 20000 sq miles 10000 sq miles 20000 sq miles 2	1 Hours 2.4 2.4 2.3 2.2 2.0 1.9 1.6 1.2 0.8 Name Dew Point Dew Point Location in (Date) int Location in Dew Point	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1 77.0 F 38.52 N 80.0 F \$\tilde{\text{3}}\text{2}\text{155} 1.15 30-Jun 40.48 N 80.0 F	91.75 W 2-hours USA				- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20	1 Hours 2.4 2.4 2.3 2.2 2.0 1.9 1.6 1.2 0.8 Name Dew Point Dew Point Location in (Date) int Location in Dew Point	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1: 77.0 F 38.52 N 80.0 F S @ 155 1.15 30-Jun 40.48 N 80.0 F 1.04	91.75 W 2-hours USA				- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 5000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 2000	1 Hours 2.4 2.4 2.3 2.2 2.0 1.9 1.6 1.2 0.8 Name Dew Point Dew Point Location in (Date) in (Date) in Dew Point Leating the Control of the C	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1 77.0 F 38.52 N 80.0 F S @ 155 1.15 30-Jun 40.48 N 80.0 F 1.04 550	91.75 W 2-hours USA				- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 5000 sq miles 20000	1 Hours 2.4 2.4 2.3 2.2 2.0 1.9 1.6 1.2 0.8 Name Dew Point Dew Point Location in (Date) in (Date) in Dew Point Leating the Control of the C	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1 77.0 F 38.52 N 80.0 F S @ 155 1.15 30-Jun 40.48 N 80.0 F 1.04 550 14,344	91.75 W 2-hours USA				- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
Adjusted Storm Depth- 1 sq miles 10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 5000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 2000	1 Hours 2.4 2.4 2.3 2.2 2.0 1.9 1.6 1.2 0.8 Name Dew Point Location in Dew Point Location in Dew Point Location in Dew Point Factor lessin	6 Hours 12.2 12.0 11.0 11.0 10.7 10.2 9.6 8.6 7.0 5.3 3.6	14.5 14.4 13.8 13.6 12.8 12.0 10.9 8.8 6.7 4.7 USACE UMV 9-Jun-1905 MCC 40.77 N 1,500 12.10 Inches 1 77.0 F 38.52 N 80.0 F S @ 155 1.15 30-Jun 40.48 N 80.0 F 1.04 550	91.75 W 2-hours USA				- - - - - - - - -	- - - - - - - - -	

Appendix F: Table F.142: Storm spreadsheet for Bonaparte, IA June 10, 1905



Form 5-2

Appendix F: Table F.143: Depth-area-duration values for Bonaparte, IA June 10, 1905



Appendix F: Figure F.175 and Figure F.176: Total storm isohyetal analysis and mass curve chart for Bonaparte, IA June 10, 1905

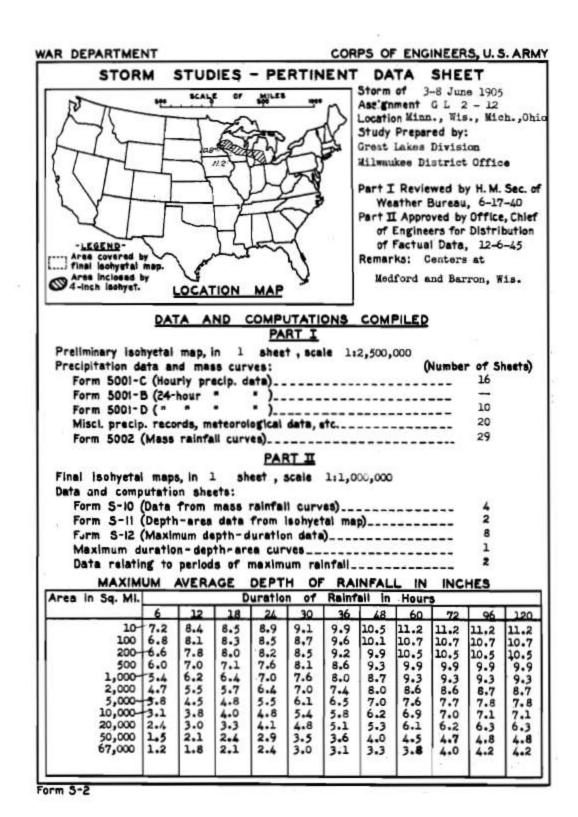
Medford, WI, AWA 71

June 4, 1905

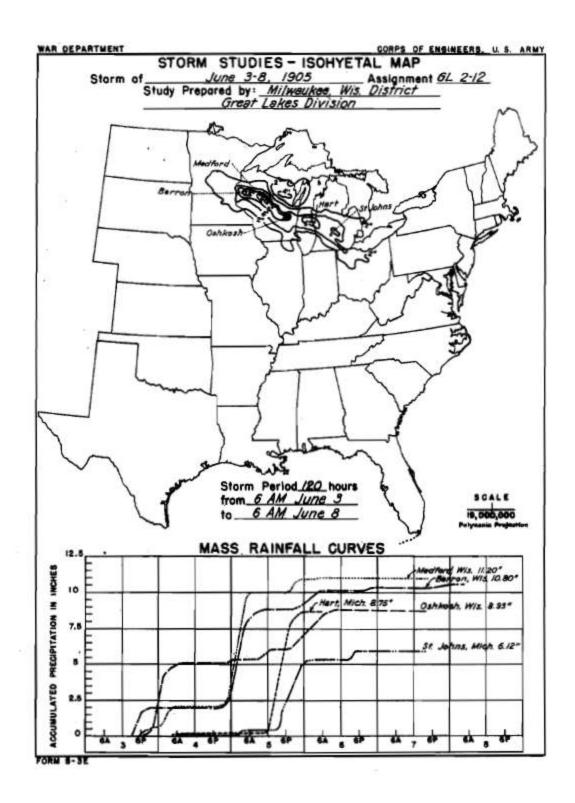
Storm Type: Frontal/MCC Grid Points Used: 8-11, 16-18

Storm Name: GL 2-12, M Storm Date: 6/3-8/1905				Storm	Adina	tmont f	or ANG	Grid P	oint 9	
torm Date: 0/3-8/1905 WA Analysis Date: 12/16/2013				Storii	ı Aujus	tment 1	or ANC	Gria P	omt 8	
emporal Transposition Date	15-Jun									
	Lat	Long			Moisture II	ıflow Directi	ion:	SW @ 200	miles	
torm Center Location	45.14 N	90.34 W			Grid Point	Elevation		1,200	feet	
torm Rep Dew Point Location	43.06 N	93.14 W			Storm Cen	ter Elevation		1,500	feet	
ransposition Dew Point Location	40.65 N	95.28 W			Storm Rep	Analysis Du	ration	24	hours	
rid point Location	37.50 N	93.00 W								
The storm representative	dew point is	70.0 F	with tot	tal precipitab	le water abo	ve sea level	of		2.25	inches
The in-place maximum	dew point is	76.5 F	with tot	tal precipitab	le water abo	ve sea level	of		3.07	inches
The transpositioned maximum	-	78.0 F		tal precipitab					3.14	inches
The in-place storm		1,500		ch subtracts			f precipitabl		70.0 F	
The in-place storm		1,500		ch subtracts ch subtracts			f precipitabl		76.5 F	
The transposition basin The Grid point/inflow bar		1,200 1,000		en subtracts ch subtracts			f precipitabl f precipitabl		78.0 F 78.0 F	
The in-place sto The transposition/el			1.38 1.07					ACE GL 2-12. 2hr persisting		
-	evanon to ba arrier adjustm		1.00		Td adjustm	-	Cased Off I.	a persistilig	, to average	
	•		1 45							
Ine	total adjustm	ent factor is	1.47							
Observed Storm Depth				¥		*				
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	7.2	8.4	8.5	8.9	9.1	9.9	10.5	11.2	11.2	
100 sq miles	6.8	8.1 7.8	8.3 8.0	8.5 8.2	8.7 8.5	9.6 9.2	10.1 9.9	10.7 10.5	10.7 10.5	-
200 sq miles 500 sq miles	6.6 6.0	7.8 7.0	7.1	7.6	8.5 8.1	9.2 8.6	9.9	9.9	9.9	
1000 sq miles	5.4	6.2	6.4	7.0	7.6	8.0	8.7	9.3	9.3	
5000 sq miles	3.8	4.5	4.8	5.5	6.1	6.5	7.0	7.6	7.7	
10000 sq miles	3.1	3.8	4.0	4.8	5.4	5.8	6.2	6.9	7.0	1
20000 sq miles	2.4	3.0	3.3	4.1	4.8	5.1	5.3	6.1	6.2	
Adjusted Storm Depth-	Area Durati	on								
Adjusted Storm Depth-	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	10.6	12.4	12.5	13.1	13.4	14.6	15.5	16.5	16.5	
100 sq miles	10.0	11.9	12.2	12.5	12.8	14.2	14.9	15.8	15.8	
200 sq miles	9.7	11.5	11.8	12.1	12.5	13.6	14.6	15.5	15.5	
500 sq miles	8.8	10.3	10.5	11.2	11.9	12.7	13.7	14.6	14.6	
1000 sq miles	8.0	9.1	9.4	10.3	11.2	11.8	12.8	13.7 11.2	13.7 11.4	-
5000 sq miles 10000 sq miles	5.6 4.6	6.6 5.6	7.1 5.9	8.1 7.1	9.0 8.0	9.6 8.6	10.3 9.1	10.2	10.3	
20000 sq miles	3.5	4.4	4.9	6.0	7.1	7.5	7.8	9.0	9.1	
Storm or Storm Center 1	Name		GL 2-12, M	ledford, WI						1
Storm Date(s)			6/3-8/1905							
Storm Type			Synoptic							
Storm Location			45.14 N	90.34 W						
Storm Center Elevation Precipitation Total & D			1,500 11.20 Inche	s 72-hours U	SACE GL 2-	12				
•										
Storm Representative D Storm Representative D		ation	70.0 F 43.06 N	24 93.14 W						
Maximum Dewpoint	Capolit Loc		76.5 F							1
Moisture Inflow Vector			SW @ 200	Miles						
In-place Maximization F	actor		1.38							
Temporal Transposition	n (Date)		15-Jun							
rempetar rianspessaes			40.65 N	95.28 W						
Transposition Dewpoin	it Location									
Transposition Dewpoin Transposition Maximum	n Dewpoint		78.0 F							
Transposition Dewpoin Transposition Maximum Transposition Adjustm	n Dewpoint		1.07							
Transposition Dewpoir Transposition Maximur Transposition Adjustm Grid Point Elevation	n Dewpoint ent Factor		1.07 1,200							
Transposition Dewpoir Transposition Maximur Transposition Adjustm Grid Point Elevation Highest Elevation in Ba	n Dewpoint ent Factor		1.07 1,200 14,344							
Transposition Dewpoir Transposition Maximur Transposition Adjustm Grid Point Elevation	n Dewpoint ent Factor sin		1.07 1,200							

Appendix F: Table F.144: Storm spreadsheet for Medford, WI June 4, 1905



Appendix F: Table F.145: Depth-area-duration values for Medford, WI June 4, 1905



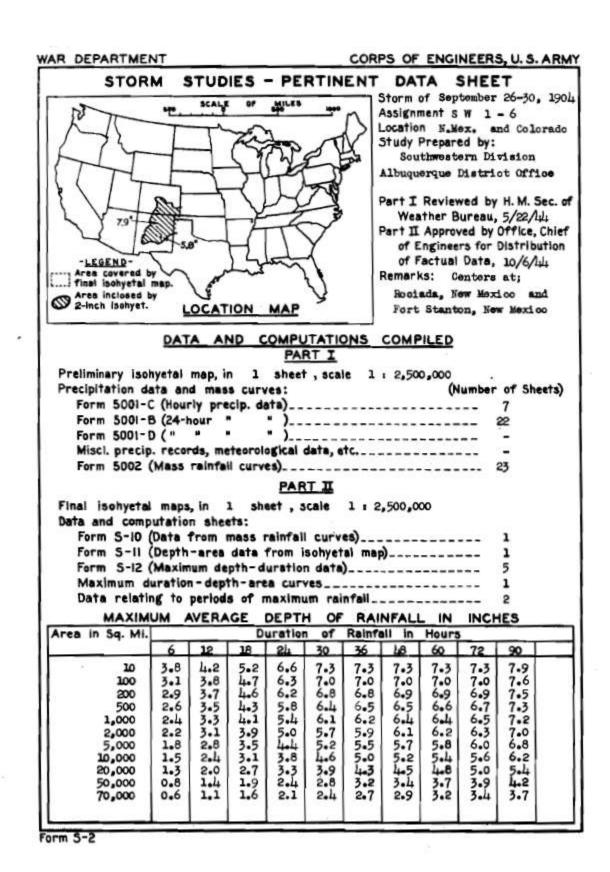
Appendix F: Figure F.177 and Figure F.178: Total storm isohyetal analysis and mass curve chart for Medford, WI June 4, 1905

Rociada, NM, AWA 72

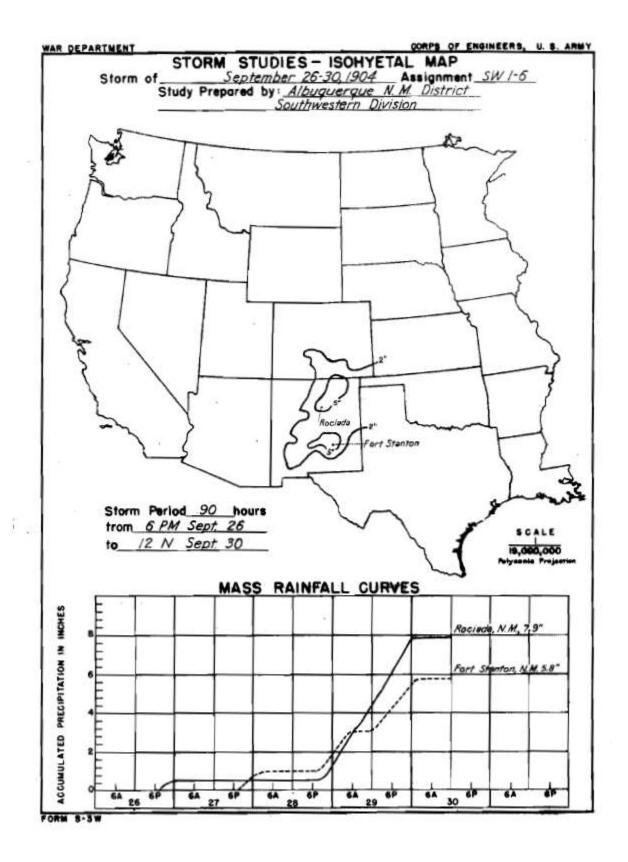
September 26, 1904 Storm Type: Frontal Grid Points Used: 7, 13-14

	M USACE SV	V 1-6		Storm	Adina	mont f	or ANO	Crid Da	int 6	
orm Date: 9/26-30/19 WA Analysis Date: 12/16/2013				Storm	Aajust	шепі і	or ANO	Grid Po	omt o	
emporal Transposition Date	10-Sep									
	Lat	Long			Moisture I	ıflow Direct	ion:	ESE @ 300	miles	
torm center location	35.87 N	105.33 W			Grid Point	Elevation		4,400	feet	
torm Rep dew point location	34.10 N	100.50 W			Storm Cen	ter Elevation	1	7,743	feet	
ransposition dewpoint location	38.16 N	87.45 W				Analysis D		24	hours	
rid Point location	34.50 N	104.00 W				, , , , , , , , , , , , , , , , , , , ,				
The storm representative		74.0 F		l precipitable					2.73	inches.
The in-place maximum	•	77.0 F 78.0 F		l precipitable l precipitable					3.14	inches.
The transpositioned maximum The in-place store	_	7,743		ich subtracts			f precipitabl	e water at	74.0 F	miches.
The in-place ston		7,743		ich subtracts	1.63		of precipitable		77.0 F	
The transposition basis		-		ich subtracts	1.09		f precipitabl		78.0 F	
The Grid Point/Inflow ba		xx		ich subtracts	1.09		of precipitabl		78.0 F	
				-					****	
The in-place st			1.19 1.46					. Added 2°F to m Td climatolo		
The transposition/e	arrier adjustr		1.46			convert of a	upo manimo	20 cimacon	-6.7	
The b	miici aujustii	ciit ractor is	1.00							
The	total adjustm	ent factor is	1.73							
Observed Storm Depth	·····		10 Ua	24 11-	20 U	26 U	40 Ha	60 Uar	72 11	
1 sq miles	6 Hours -	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	3.8	4.2	5.2	6.6	7.3	7.3	7.3	7.3	7.3	
100 sq miles	3.1	3.8	4.7	6.3	7.0	7.0	7.0	7.0	7.0	1
200 sq miles	2.9	3.7	4.6	6.2	6.8	6.8	6.9	6.9	6.9	
500 sq miles	2.6	3.5	4.3	5.8	6.4	6.5	6.5	6.6	6.7	
1000 sq miles	2.4	3.3	4.1	5.4	6.1	6.2	6.4	6.4	6.5	
2000 sq miles	2.2	3.1	3.9	5.0	5.7	5.9	6.1	6.2	6.3	
5000 sq miles		2.8	3.5	4.4	5.2	5.5	5.7	5.8	6.0	
10000 sq miles		2.4	3.1	3.8	4.6	5.0	5.2	5.4	5.6	
20000 sq miles	1.3	2.0	2.7	3.3	3.9	4.3	4.5	4.8	5.0	
Adjusted Storm Depth	-Area-Durati	on								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles				<u> </u>						
10 sq miles	6.6	7.3	9.0	11.4	12.6	12.6	12.6	12.6	12.6	
100 sq miles	5.4 5.0	6.6 6.4	8.1 8.0	10.9 10.7	12.1 11.8	12.1 11.8	12.1 12.0	12.1 12.0	12.1 12.0	
200 sq miles 500 sq miles	·	6.1	7.4	10.7	11.0	11.3	11.3	11.4	11.6	
1000 sq miles	4.2	5.7	7.1	9.4	10.6	10.7	11.1	11.1	11.3	
2000 sq miles	3.8	5.4	6.8	8.7	9.9	10.2	10.6	10.7	10.9	•
5000 sq miles	3.1	4.9	6.1	7.6	9.0	9.5	9.9	10.0	10.4	
10000 sq miles	2.6	4.2	5.4	6.6	8.0	8.7	9.0	9.4	9.7	
20000 sq miles	2.3	3.5	4.7	5.7	6.8	7.4	7.8	8.3	8.7	
Storm or Storm Center	Name		Rociada, NM	USACE SW	1-6					
Storm or Storm Center Storm Date(s)	Name		Rociada, NM 9/26-30/1904	USACE SW	1-6					
Storm Date(s) Storm Type	Name		9/26-30/1904 Synoptic		1-6					
Storm Date(s) Storm Type Storm Location			9/26-30/1904 Synoptic 35.87 N		1-6					
Storm Date(s) Storm Type	ı		9/26-30/1904 Synoptic	105.33 W	1-6					
Stom Date(s) Stom Type Stom Location Stom Center Elevation Precipitation Total & D	o Duration		9/26-30/1904 Synoptic 35.87 N 7,743 7.90 Inches 3	105.33 W	1-6					
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I	Puration Dewpoint		9/26-30/1904 Synoptic 35.87 N 7,743 7.90 Inches 3	105.33 W 60-hours	1-6	ABI, AMA				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I	Puration Dewpoint	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7.90 Inches 3 74.0 F 34.10 N	105.33 W 60-hours	1-6	ABI, AMA				
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dewpoint	Duration Dewpoint Dewpoint Loc	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7.90 Inches 3 74.0 F 34.10 N 77.0 F	105.33 W 60-hours	1-6					
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I	Duration Dewpoint Dewpoint Loc	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7.90 Inches 3 74.0 F 34.10 N	105.33 W 60-hours	1-6	ABI, AMA	Sept 76.5			
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization	Dewpoint Dewpoint Loc r Factor	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7,90 Inches 3 74.0 F 34.10 N 77.0 F ESE @ 300 1.19	105.33 W 60-hours	1-6	Aug	Sept			
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization I	Duration Dewpoint Dewpoint Loc r Factor n (Date)	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7.90 Inches 3 74.0 F 34.10 N 77.0 F ESE @ 300 1.19	105.33 W 0-hours 24 100.50 W	1-6	Aug	Sept			
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dewpoin	Duration Dewpoint Dewpoint Loc r Factor In (Date) Int Location	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7.90 Inches 3 74.0 F 34.10 N 77.0 F ESE @ 300 1.19	105.33 W 60-hours	1-6	Aug	Sept			
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dewpoir Transposition Maximum	Duration Dewpoint Dewpoint Loc r Factor n (Date) nt Location m Dewpoint	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7,90 Inches 3 74.0 F 34.10 N 77.0 F ESE @ 300 1.19 10-Sep 38.16 N 78.0 F	105.33 W 0-hours 24 100.50 W	1-6	Aug	Sept			
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dewpoin Transposition Maximu Transposition Adjustin	Duration Dewpoint Dewpoint Loc r Factor n (Date) nt Location m Dewpoint	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7.90 Inches 3 74.0 F 34.10 N 77.0 F ESE @ 300 1.19 10-Sep 38.16 N 78.0 F 1.46	105.33 W 0-hours 24 100.50 W	1-6	Aug	Sept			
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization I Temporal Transposition Transposition Dewpoir Transposition Maximu Transposition Adjustn Grid Point Elevation	Duration Dewpoint Loc r Factor n (Date) nt Location m Dewpoint tent Factor	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7.90 Inches 3 74.0 F 34.10 N 77.0 F ESE @ 300 1.19 10-Sep 38.16 N 78.0 F 1.46 4,400	105.33 W 0-hours 24 100.50 W	1-6	Aug	Sept			
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dewpoin Transposition Maximu Transposition Adjustin	Duration Dewpoint Loc r Factor n (Date) nt Location m Dewpoint tent Factor	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7.90 Inches 3 74.0 F 34.10 N 77.0 F ESE @ 300 1.19 10-Sep 38.16 N 78.0 F 1.46	105.33 W 0-hours 24 100.50 W	1-6	Aug	Sept			
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Transposition Dewpoin Transposition Maximum Transposition Maximum Transposition Adjusts Grid Point Elevation Highest Elevation in B	Duration Dewpoint Dewpoint Loc r Factor In (Date) Int Location In Dewpoint Internet Factor Assin	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7.90 Inches 3 74.0 F 34.10 N 77.0 F ESE @ 300 1.19 10-Sep 38.16 N 78.0 F 1.46 4,400 14,344	105.33 W 0-hours 24 100.50 W	1-6	Aug	Sept			
Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dewpoint Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dewpoir Transposition Maximu Transposition Maximu Transposition Maximu Transposition Highest Elevation in B Inflow Barrier Height	Description Descri	ation	9/26-30/1904 Synoptic 35.87 N 7,743 7,90 Inches 3 74.0 F 34.10 N 77.0 F ESE @ 300 1.19 10-Sep 38.16 N 78.0 F 1.46 4,400 14,344 xx	105.33 W 0-hours 24 100.50 W	1-6	Aug	Sept			

Appendix F: Table F.146: Storm spreadsheet for Rociada, NM September 26, 1904



Appendix F: Table F.147: Depth-area-duration values for Rociada, NM September 26, 1904
Page **329** of **346**



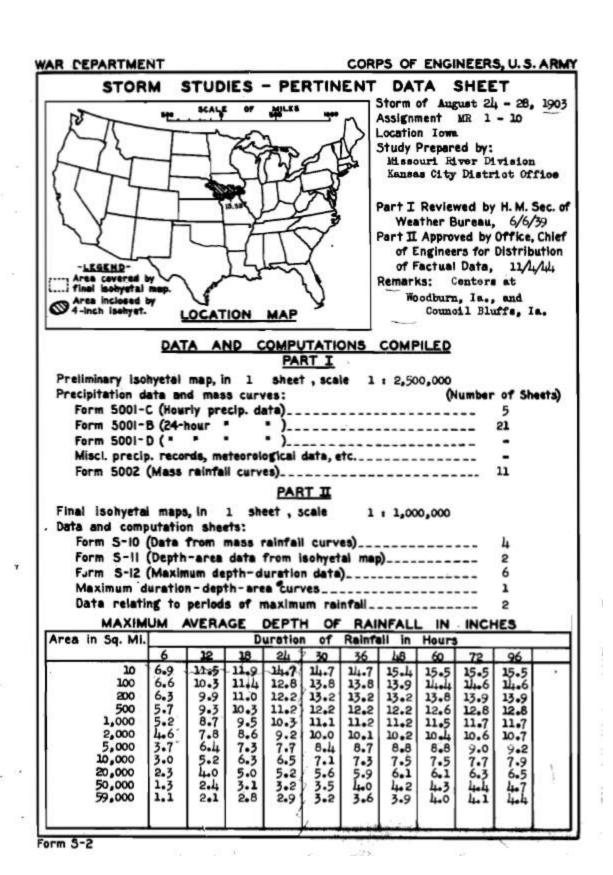
Appendix F: Figure F.179 and Figure F.180: Total storm isohyetal analysis and mass curve chart for Rociada, NM September 26, 1904

Woodburn, IA, AWA 73

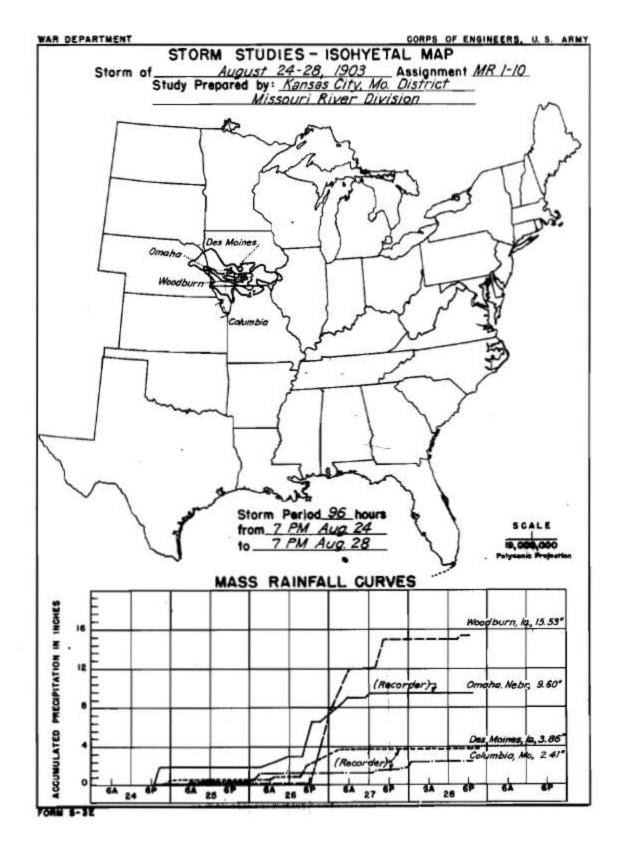
August 24, 1903 Storm Type: Frontal/MCC Grid Points Used: 1-4, 8-11, 16-18

Storm Name: MR 1-10- Storm Date: 24-Aug-1	Woodburn, IA			Storm	Adinst	mont fo	r ANO	Grid Po	int 1	
WA Analysis Date: 12/16/20				Storm	Aajust	шент 10	or ANO	Gria Po	int 1	
emporal Transposition Date	5-Aug									
	Lat	Long			Moisture In	nflow Direct	ion	SSE @ 195	miles	
torm Center Location	41.01 N	93.60 W			Grid Point	Elevation		350	feet	
torm Rep Dew Point Location	38.52 N	91.81 W			Storm Cen	ter Elevation	ı	1,150	feet	
ransposition Dew Point Location	n 40.25 N	90.75 W			Storm Rep	Analysis Du	ıration	24	hours	
rid Point Location	35.31 N	93.23 W			•	•				
ha starm ranga sentativa dare na	int is	75.0 F	with tota	ıl precipitable	mater about	11 of	e e e e e e e e e e e e e e e e e e e		2.85	inches
he storm representative dew po he in-place maximum dew point		80.5 F		il precipitable il precipitable					3.68	inches
he transpositioned maximum de		80.5 F		ıl precipitable					3.68	inches
he in-place storm elevation is		1,150		ich subtracts			f precipitabl	e water at	75.0 F	
he in-place storm elevation is		1,150	whi	ich subtracts	0.34	inches o	f precipitabl	e water at	80.5 F	
he transposition basin elevation	n at	350	wh	ich subtracts	0.30	inches o	f precipitabl	e water at	80.5 F	
he Grid Point/inflow barrier heig	ht is	1,000	wh	ich subtracts	0.30	inches o	f precipitabl	e water at	80.5 F	
The in-place storm ma	vimization fac	toris	1.31		Notes: DAI	D values take	en from IIS A	CE MR 1-10.	2° added	1
The in-place storm in			1.01					Nebraska ana		
The transposition ele		140101 15	1.01			r persisting ?			2,000 10	
2 Suno dajustino					,					
The total adjustment	factor is		1.32							
01 10 P										
Observed Storm Dep	th-Area-Durat 6 Hours	tion 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq mile	···•	11.5	11.9	14.7	14.7	14.7	15.4	15.5	15.5	1
100 sq mile	···	10.3	11.4	12.8	13.8	13.8	13.9	14.4	14.6	1
200 sq mile	····è·····	9.9	11.0	12.2	13.2	13.2	13.2	13.8	13.9	
500 sq mile	••••	9.3	10.3	11.2	12.2	12.2	12.6	12.8	12.8	
1000 sq mile	••••	8.7	9.5	10.3	11.1	11.2	11.2	11.5	11.7	
2000 sq mile	••••	7.8	8.6	9.2	10.0	10.1	10.2	10.4	10.6	
5000 sq mile	····	6.4	7.3	7.7	8.4	8.7	8.8	8.8	9.0	-
10000 sq mile 20000 sq mile	···•	5.2 4.0	6.3 5.0	6.5 5.2	7.1 5.6	7.3 5.9	7.5 6.1	7.5 6.1	7.7 6.3	
20000 sq fillie	5 2.3	4.0	5.0	3.2	3.0	5.9	0.1	0.1	0.3	-
Adjusted Storm Dept	h-Area-Durat	ion								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq mile	••••	15.2	15.7	19.4	19.4	19.4	20.4	20.5	20.5	
100 sq mile	···•	13.6	15.1	16.9	18.2	18.2	18.4	19.0	19.3	
200 sq mile	••••	13.1	14.5	16.1	17.4	17.4	17.4	18.2	18.4	
500 sq mile 1000 sq mile	••••	12.3 11.5	13.6 12.6	14.8 13.6	16.1 14.7	16.1 14.8	16.7 14.8	16.9 15.2	16.9 15.5	
2000 sq mile	• • • • • • • • • • • • • • • • • • • •	10.3	11.4	12.2	13.2	13.3	13.5	13.7	14.0	
5000 sq mile	····•	8.5	9.6	10.2	11.1	11.5	11.6	11.6	11.9	
10000 sq mile	••••	6.9	8.3	8.6	9.4	9.6	9.9	9.9	10.2	1
20000 sq mile	····	5.3	6.6	6.9	7.4	7.8	8.1	8.1	8.3	
Storm or Storm Cente	r Name		MR 1-10-W	oodburn, IA						1
Storm Date(s)			24-Aug-1903							
Storm Type			MCC							
Storm Location			41.01 N	93.60 W						1
Storm Center Elevation Precipitation Total &			1,150	24-hours US	ACE MP 1 1	0				1
rrecipitation rotal &	Duranon		14.70 menes	24-110df \$ U.S.	TOE WIN I-I					
Storm Representative			75.0 F	24						
Storm Representative	Dewpoint Lo	cation	38.52 N	91.81 W						1
Maximum Dewpoint Moisture Inflow Vect			80.5 F							1
In-place Maximization			SSE @ 195 1.31							1
- Face Manualion										1
Temporal Transpositi			5-Aug							
Transposition Dewpo			40.25 N	90.75 W		J	A			1
Transposition Maxim			80.5 F			80.5	80.5			1
Transposition Adjust	ment Factor		1.01 350							1
Grid Point Elevation	Racin		14,344							1
Highest Flavories in 1			47,277							
Highest Elevation in I Inflow Barrier Height			1,000							
<u> </u>			1,000 1.00							

Appendix F: Table F.148: Storm spreadsheet for Woodburn, IA August 24, 1903



Appendix F: Table F.149: Depth-area-duration values for Woodburn, IA August 24, 1903

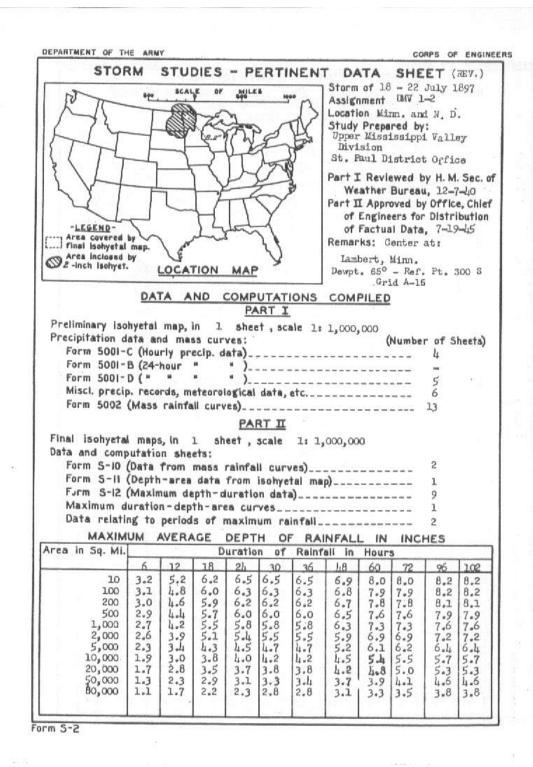


Appendix F: Figure F.181 and Figure F.182: Total storm isohyetal analysis and mass curve chart for Woodburn, IA August 24, 1903

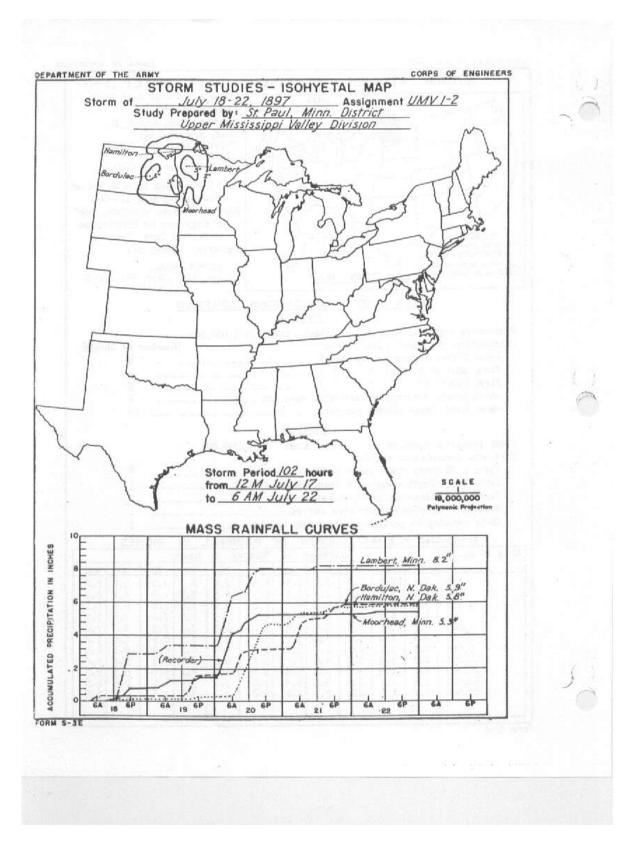
Lambert, MN, AWA 75, UMV 1-2 July 18, 1897 Storm Type: Frontal/MCC

Temporal Transposition Date Lat Long Moisture Inflow Direction SSE @ 300 miles	Storm Name: UMV 1-2, L Storm Date: 7/18-22/18 AWA Analysis Date: 12/16/2013				Storn	ı Adjus	tment f	or ANC	Grid P	oint 8	
Moisture Inflow Direction SSE @ 300 males											
	emporar Transposition Date					Moisture Ir	flow Direct	ion	SSE @ 300	miles	
Storm Rep Dew Point Location 43.70 N 33.60 W Storm Rep Analysis Duration 24 hours	Storm Center Location							ion			
Transposition New Point Location 38.94 N 90.47 W Storm Rep Analysis Duration 24 hours 27.50 N 93.00 W Storm Rep Analysis Duration 24 hours 24 hours 27.50 N 93.00 W Storm Rep Analysis Duration 24 hours 27.50 N 25.00 W 25.00 N 25.									-		
The storm representative dever point is 71.0 F The in-place maximum dew point is 81.0 F The in-place maximum dew point is 81.0 F The in-place maximum dew point is 81.0 F The in-place monitored maximum develorities 81.0 F The in-place storm deviation is 11.50 which subtracts 0.3 mchase of precipitable water at 71.0 F The in-place toom deviation is 11.50 which subtracts 0.3 mchase of precipitable water at 80.5 F The forth point inflore bank in elegation is 12.00 which subtracts 0.3 mchase of precipitable water at 80.5 F The forth point inflore bank in elegation is 12.00 which subtracts 0.3 mchase of precipitable water at 80.5 F The forth point inflore bank in elegation 12.00 which subtracts 0.3 mchase of precipitable water at 80.5 F The forth point inflore bank in elegation 10.0 which subtracts 0.3 mchase of precipitable water at 80.5 F The forth point inflore bank in elegation 10.0 which subtracts 0.3 mchase of precipitable water at 80.5 F The forth point inflore bank in elegation 10.0 which subtracts 0.3 mchase of precipitable water at 80.5 F The forth point inflore bank in elegation 10.0 mchase 10.0 mc	•										
The in-place maximum dev point is 80.5 The transpositioned maximum dev point is 13.0 The in-place store deviation is 1.150 The in-place store deviation is 1.150 The in-place store deviation is 1.150 The transposition basin elevation is 1.150 The transposition basin elevation is 1.150 The transposition basin elevation is 1.000 The transposition basin elevation is 1.000 The transposition basin elevation is 1.000 The transposition deviation to basin factors is 1.000 The barrier adjustment factor is 1.000 The barrier adju						Storm Kep	Analysis Du	ration	24	nours	
The transpositioned maximum dev point is SLOF The in-place store deviation is 1,150 Which subtracts 0.35 inches of precipitable water at 71.0 F inches of precipitable water at 1,200 which subtracts 0.35 inches of precipitable water at 1,200 which subtracts 0.35 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 which subtracts 0.30 inches of precipitable water at 1,200 inches 1,200 in	The storm representative	dew point is	71.0 F	with tot	tal precipitab	le water abo	ve sea level	of		2.36	inches
The in-place store deviation is 1,150 which subtracts 0.25 inches of precipitable water at 71.0F 1,150 which subtracts 0.30 inches of precipitable water at 80.0F inches of precipitable water at 1,150 which subtracts 0.30 inches of precipitable water at 1,150 which subtracts 0.30 inches of precipitable water at 1,150 which subtracts 0.30 inches of precipitable water at 1,150 which subtracts 0.30 inches of precipitable water at 1,150 which subtracts 0.30 inches of precipitable water at 1,150 which subtracts 0.30 inches of precipitable water at 1,150 which subtracts 0.30 inches of precipitable water at 1,150 which subtracts 0.30	The in-place maximum	dew point is	80.5 F	with tot	tal precipitab	le water abo	ve sea level	of		3.68	inche
The in-place storm deviation is 1.150	•	•									inche
The transposition basin elevation at 1,200 which subtracts to 0.30 inches of precipitable water at 1,000 which subtracts which subtracts to 0.30 inches of precipitable water at 1,000 which subtracts to 0.30 inches of precipitable water at 1,000 miches of 1,0	•		-								
The Grid point inflow barrier height is 1,000 which subtracts 0.30 inches of precipitable water at 81.0 F The in-place storm maximization factor is 1.58 The transposition (elevation to basin factor is 1.04 The barrier adjustment factor is 1.04 The barrier adjustment factor is 1.04 The total adjustment factor is 1.64 Observed Storm Depth-Area-Duration 61 Flours 12 Hours 18 Hours 24 Hours 30 Hours 48 Hours 60 Hours 72 Hours 10 sq miles 3.2 5.2 6.2 6.5 6.5 6.5 6.9 8.0 8.0 8.0 100 sq miles 3.1 4.8 6.0 6.3 6.3 6.3 6.3 6.3 7.9 7.9 200 sq miles 3.0 4.6 5.9 6.2 6.2 6.2 6.2 6.7 7.8 7.8 5000 sq miles 2.3 3.4 4.3 4.5 4.7 4.7 5.2 6.1 6.2 6.1 6.2 10000 sq miles 1.7 2.8 3.5 3.0 3.8 4.0 4.2 4.2 4.5 5.4 5.5 20000 sq miles 1.7 2.8 3.5 3.7 3.8 3.8 4.2 4.5 5.4 5.5 5.5 5.0 5.5 5.0 5.5 5.0 5.5 5.0 5.5	•		-					-			
The transposition/elevation to basin factor is 1.04 The barrier adjustment factor is 1.00 The barrier adjustment factor is 1.04 The total adjustment factor is 1.64 Observed Storm Depth-Area-Duration 6 Hours 12 Hours 18 Hours 24 Hours 30 Hours 36 Hours 48 Hours 60 Hours 72 Hours 10 sq miles 3.1 4.8 6.0 6.3 6.5 6.5 6.5 6.9 8.0 8.0 10 0 sq miles 3.1 4.8 6.0 6.3 6.3 6.3 6.3 6.8 7.9 7.9 20 0 sq miles 3.0 4.6 5.9 6.2 6.2 6.2 6.2 6.7 7.8 7.8 7.8 5.00 sq miles 2.7 4.2 5.5 8.8 5.8 5.8 5.8 6.3 7.3 7.3 5.000 sq miles 2.7 4.2 5.5 8.8 5.8 5.8 5.8 6.3 7.3 7.3 5.000 sq miles 2.7 4.2 5.5 8.8 5.8 5.8 5.8 6.3 7.3 7.3 5.000 sq miles 1.9 3.0 3.8 4.0 4.2 4.2 4.5 5.4 5.5 20000 sq miles 1.7 2.8 3.5 3.7 3.8 3.8 4.0 4.2 4.2 4.5 5.4 5.5 5.000 sq miles 1.7 2.8 3.5 3.7 3.8 3.8 4.0 4.2 4.2 4.5 5.4 5.5 5.000 sq miles 1.7 2.8 3.5 3.7 3.8 3.8 3.8 4.2 4.8 5.0 Adjusted Storm Depth-Area-Duration 6 Hours 12 Hours 18 Hours 24 Hours 30 Hours 36 Hours 44 Hours 60 Hours 72 Hours 10 sq miles 5.1 7.9 9.8 10.3 10.3 10.3 11.2 13.0 13.0 13.0 10.0 sq miles 5.1 7.9 9.8 10.3 10.3 10.3 11.2 13.0 13.0 13.0 10.0 sq miles 4.9 7.5 9.7 10.2 10.2 11.0 12.1 11.0 12.8 12.8 12.8 10.0 sq miles 4.4 6.9 9.0 9.5 9.5 9.5 10.3 10.3 11.2 13.0 13.0 13.0 10.0 sq miles 4.4 6.9 9.0 9.5 9.5 9.5 10.3 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0	-										
The transposition/elevation to basin factor is 1.04 The barrier adjustment factor is 1.00 The barrier adjustment factor is 1.04 The total adjustment factor is 1.64 Observed Storm Depth-Area-Duration 6 Hours 12 Hours 18 Hours 24 Hours 30 Hours 36 Hours 48 Hours 60 Hours 72 Hours 10 sq miles 3.1 4.8 6.0 6.3 6.5 6.5 6.5 6.9 8.0 8.0 10 0 sq miles 3.1 4.8 6.0 6.3 6.3 6.3 6.3 6.8 7.9 7.9 20 0 sq miles 3.0 4.6 5.9 6.2 6.2 6.2 6.2 6.7 7.8 7.8 7.8 5.00 sq miles 2.7 4.2 5.5 8.8 5.8 5.8 5.8 6.3 7.3 7.3 5.000 sq miles 2.7 4.2 5.5 8.8 5.8 5.8 5.8 6.3 7.3 7.3 5.000 sq miles 2.7 4.2 5.5 8.8 5.8 5.8 5.8 6.3 7.3 7.3 5.000 sq miles 1.9 3.0 3.8 4.0 4.2 4.2 4.5 5.4 5.5 20000 sq miles 1.7 2.8 3.5 3.7 3.8 3.8 4.0 4.2 4.2 4.5 5.4 5.5 5.000 sq miles 1.7 2.8 3.5 3.7 3.8 3.8 4.0 4.2 4.2 4.5 5.4 5.5 5.000 sq miles 1.7 2.8 3.5 3.7 3.8 3.8 3.8 4.2 4.8 5.0 Adjusted Storm Depth-Area-Duration 6 Hours 12 Hours 18 Hours 24 Hours 30 Hours 36 Hours 44 Hours 60 Hours 72 Hours 10 sq miles 5.1 7.9 9.8 10.3 10.3 10.3 11.2 13.0 13.0 13.0 10.0 sq miles 5.1 7.9 9.8 10.3 10.3 10.3 11.2 13.0 13.0 13.0 10.0 sq miles 4.9 7.5 9.7 10.2 10.2 11.0 12.1 11.0 12.8 12.8 12.8 10.0 sq miles 4.4 6.9 9.0 9.5 9.5 9.5 10.3 10.3 11.2 13.0 13.0 13.0 10.0 sq miles 4.4 6.9 9.0 9.5 9.5 9.5 10.3 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0	The involve of		·	1.50	1	Notes: DAI) vialuos tale	on from IIC A	CEIMWIA	In place	
The barrier adjustment factor is 1.64 September 1.65 Septemb										-	
The total adjustment factor is 1.64	-										
Observed Storm Depth-Ares-Duration		•				-			u, anvagn		
	The	total adjustm	ent factor is	1.64							
10 sq miles 3.2 5.2 6.2 6.5 6.5 6.5 6.9 8.0 8.0	Observed Storm Depth			10 Uaues	24 Hauss	20 Haues	26 Uaure	40 Uaue	60 Uaues	72 Haues	
100 sq miles 3.1 4.8 6.0 6.3 6.3 6.3 6.3 6.8 7.9 7.9	10 sa miles				÷		·····		• • • • • • • • • • • • • • • • • • • •		
200 sq miles 3.0 4.6 5.9 6.2 6.2 6.2 6.7 7.8 7.8							 	\$	·		1
Sol sq miles 2.9					÷		¢	!	·•		
Solid Sq miles 2.3 3.4 4.3 4.5 4.7 4.7 5.2 6.1 6.2			4.4	5.7		6.0	!	6.5	7.6	7.6	"
10000 sq miles 1.9 3.0 3.8 4.0 4.2 4.2 4.5 5.4 5.5	1000 sq miles	2.7	4.2	5.5	5.8	5.8	5.8	6.3	7.3	7.3	
Adjusted Storm Depth-Area-Duration	5000 sq miles	2.3	3.4	4.3	4.5	4.7	4.7	5.2	6.1	6.2	
Adjusted Storm Depth-Area-Duration					÷		!		••••••••••••••••••••••••••		
10 sq miles 5.2 8.5 10.2 10.7 10.7 10.7 11.3 13.1 13.1 13.1 13.0 13.0 10.3 10	20000 sq miles	1.7	2.8	3.5	3.7	3.8	3.8	4.2	4.8	5.0	
10 sq miles 5.2 8.5 10.2 10.7 10.7 10.7 11.3 13.1 13.1 100 sq miles 5.1 7.9 9.8 10.3 10.3 10.3 11.2 13.0 13.0 13.0 200 sq miles 4.9 7.5 9.7 10.2 10.2 10.2 10.2 11.0 12.8 12.8 500 sq miles 4.8 7.2 9.3 9.8 9.8 9.8 10.7 12.5 12.5 12.5 1000 sq miles 4.4 6.9 9.0 9.5 9.5 9.5 10.3 12.0 12.0 12.0 10000 sq miles 3.8 5.6 7.1 7.4 7.7 7.7 8.5 10.0 10.2 10000 sq miles 3.1 4.9 6.2 6.6 6.9 6.9 7.4 8.9 9.0 20000 sq miles 2.8 4.6 5.7 6.1 6.2 6.2 6.9 7.9 8.2 4.6 5.7 5.1 5.2 5.2 5.2 5.2 5.2 5.3	Adjusted Storm Depth-	,		10.11	24.77	20.11	2611	40.77	60.11	72.11	
100 sq miles 5.1 7.9 9.8 10.3 10.3 10.3 11.2 13.0 13.0 200 sq miles 4.9 7.5 9.7 10.2 10.2 10.2 11.0 12.8 12.8 500 sq miles 4.8 7.2 9.3 9.8 9.8 9.8 10.7 12.5 12.5 1000 sq miles 4.4 6.9 9.0 9.5 9.5 9.5 10.3 12.0 12.0 5000 sq miles 3.8 5.6 7.1 7.4 7.7 7.7 8.5 10.0 10.2 10000 sq miles 3.1 4.9 6.2 6.6 6.9 6.9 7.4 8.9 9.0 20000 sq miles 2.8 4.6 5.7 6.1 6.2 6.2 6.9 7.9 8.2 Storm or Storm Center Name UMV 1-2, Lambert, MN Storm Date(s) 7/18-22/1897 Storm Type Synoptic/Thunderstorms Storm Location 47.80 N 96.0 W Storm Center Elevation 1,150 Precipitation Total & Duration 8.00 Inches 72-hours USACE UMV 1-2 Storm Representative Dewpoint 71.0 F 24 Storm Representative Dewpoint 80.5 F Moisture Inflow Vector S @ 285 In-place Maximization Factor 1.58 Temporal Transposition (Date) 15-Jul Transposition Dewpoint Location 38.94 N 90.47 W Transposition Maximum Dewpoint 71.04 Transposition Maximum Dewpoint 1,200 Highest Elevation in Basin 14,344 Inflow Barrier Height 1,000	10 sa milos	•••••						·····	•••••••••••••••••	•••••	-
200 sq miles 4.9 7.5 9.7 10.2 10.2 10.2 11.0 12.8 12.8					*		\$.			
Storm Center Name UMV 1-2, Lambert, MN Storm Date(s) 7/18-22/1897 Storm Location 1,150 1			·				!	¢	············		1
Storm or Storm Center Name UMV 1-2, Lambert, MN		4.8	7.2	9.3	9.8	9.8	9.8	10.7	12.5	12.5	
10000 sq miles 3.1 4.9 6.2 6.6 6.9 6.9 7.4 8.9 9.0	1000 sq miles	4.4	6.9	9.0	9.5	9.5	9.5	10.3	12.0	12.0	
Storm or Storm Center Name UMV 1-2, Lambert, MN			·				!	ò	···········		
Storm Ostom Center Name							å	<u> </u>	٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠٠		
Storm Date(s) 7/18-22/1897 Storm Type Synoptic/Thunderstorms Storm Location 47.80 N 96.00 W Storm Center Elevation 1,150 Precipitation Total & Duration 8.00 Inches 72-hours USACE UMV 1-2 Storm Representative Dewpoint 71.0 F 24 Storm Representative Dewpoint 80.5 F Moisture Inflow Vector S @ 285 In-place Maximization Factor 1.58 Temporal Transposition (Date) 15-Jul Transposition Dewpoint S1.0 F Transposition Maximum Dewpoint S1.0 F Transposition Maximum Dewpoint S1.0 F Transposition Adjustment Factor 1.04 Grid Point Elevation 1,200 Highest Elevation in Basin 14,344 Inflow Barrier Height 1,000 Storm Representative Demonstration 1,000 Storm Representative Dewpoint 1,000 Storm Representative Dewpoint 1,000 Storm Representative Dewpoint 1,000 Storm Representative Dewpoint 1,200 Storm Representative Dewpoint 1,200 Storm Representative Dewpoint 1,000 Storm Rep	20000 sq miles	2.8	4.6	5.7	6.1	6.2	6.2	6.9	7.9	8.2	
Storm Date(s) 7/18-22/1897 Storm Type Synoptic/Thunderstorms Storm Location 47.80 N 96.00 W Storm Center Elevation 1,150 Precipitation Total & Duration 8.00 Inches 72-hours USACE UMV 1-2 Storm Representative Dewpoint 71.0 F 24 Storm Representative Dewpoint 80.5 F Moisture Inflow Vector S @ 285 In-place Maximization Factor 1.58 In-place Maximization Factor 15-Jul Transposition Deate 15-Jul Transposition Maximum Dewpoint 81.0 F Transposition Maximum Dewpoint 81.0 F Transposition Adjustment Factor 1.04 Grid Point Elevation 1,200 Highest Elevation in Basin 14,344 Inflow Barrier Height 1,000	Starm or Starm Contar	Nama		IMOVI 2 I	ambant MN						
Storm Type		vanie									1
Storm Location						S					1
Precipitation Total & Duration 8.00 Inches 72-hours USACE UMV 1-2 Storm Representative Dewpoint 71.0 F 24 Storm Representative Dewpoint Location 43.70 N 93.60 W Maximum Dewpoint 80.5 F Moisture Inflow Vector S @ 285 In-place Maximization Factor 1.58 Temporal Transposition (Date) 15-Jul Transposition Dewpoint Location 38.94 N 90.47 W Transposition Maximum Dewpoint 81.0 F Transposition Adjustment Factor 1.04 Grid Point Elevation 1,200 Highest Elevation in Basin 14,344 Inflow Barrier Height 1,000											1
Stom Representative Dewpoint 71.0 F 24 Stom Representative Dewpoint Location 43.70 N 93.60 W Maximum Dewpoint 80.5 F Moisture Inflow Vector S @ 285 In-place Maximization Factor 1.58 Temporal Transposition (Date) 15-Jul Transposition Dewpoint Location 38.94 N 90.47 W Transposition Maximum Dewpoint 81.0 F Transposition Adjustment Factor 1.04 Grid Point Elevation 1,200 Highest Elevation in Basin 14,344 Inflow Barrier Height 1,000				-	72-hours 119	ACE LIMV	1-2				
Storm Representative Dewpoint Location 43.70 N 93.60 W	•					TOL OWIY					
Maximum Dewpoint 80.5 F Moisture Inflow Vector S @ 285 In-place Maximization Factor 1.58 Temporal Transposition (Date) 15-Jul Transposition Dewpoint Location 38.94 N Transposition Maximum Dewpoint 81.0 F Transposition Adjustment Factor 1.04 Grid Point Elevation 1,200 Highest Elevation in Basin 14,344 Inflow Barrier Height 1,000			ation								1
In-place Maximization Factor 1.58	Maximum Dewpoint	•		80.5 F							
Temporal Transposition (Date) 15-Jul											
Transposition Dewpoint Location 38.94 N 90.47 W Transposition Maximum Dewpoint 81.0 F Transposition Adjustment Factor 1.04 Grid Point Elevation 1,200 Highest Elevation in Basin 14,344 Inflow Barrier Height 1,000	•										
Transposition Maximum Dewpoint \$1.0 F Transposition Adjustment Factor 1.04 Grid Point Elevation 1,200 Highest Elevation in Basin 14,344 Inflow Barrier Height 1,000					00.47.337						1
Transposition Adjustment Factor 1.04 Grid Point Elevation 1,200 Highest Elevation in Basin 14,344 Inflow Barrier Height 1,000					90.47 W						1
Grid Point Elevation 1,200 Highest Elevation in Basin 14,344 Inflow Barrier Height 1,000											1
Highest Elevation in Basin 14,344 Inflow Barrier Height 1,000											1
	Olid Folili Elevation										1
Elevation Adjustment Factor 1,00		asin		14,344							
Total Adjustment Factor 1.58	Highest Elevation in Ba	ısin									

Appendix F: Table F.150: Storm spreadsheet for Lambert, MN July 18, 1897



Appendix F: Table F.151: Depth-area-duration values for Lambert, MN July 18, 1897



Appendix F: Figure F.183 and Figure F.184: Total storm isohyetal analysis and mass curve chart for Lambert, MN July 18, 1897

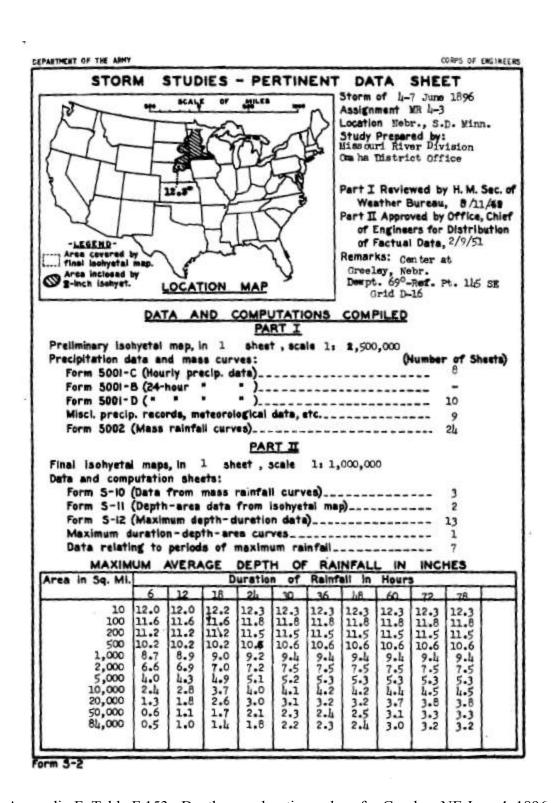
Greeley, NE, AWA 76 June 4, 1896

Storm Type: MCC

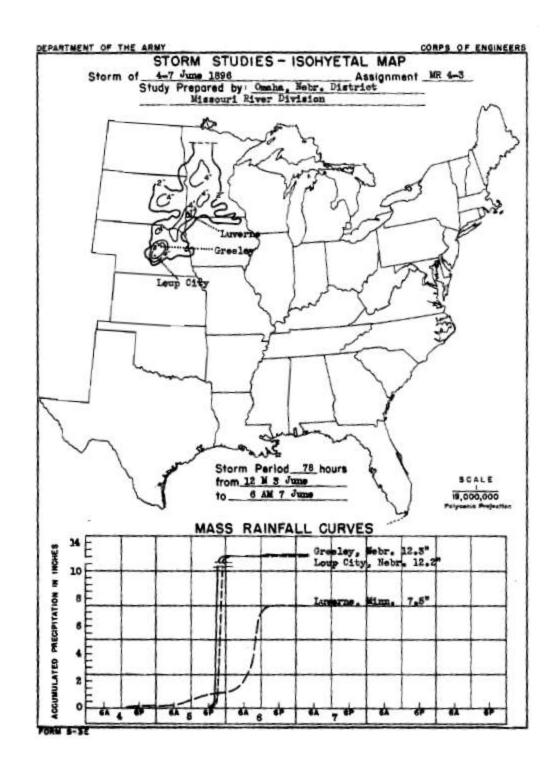
Grid Points Used: 3-4, 8-11, 16-18

torm Date: WA Analysis Temporal Tran Storm Center	6/4/1896 s Date: 12/16/2013				310111	AUTHS					
emporal Tran					Storm	riajust		1 11110	Grid Po	лисэ	
		19-Jun									
orm Center	isposition Date	Lat	Long			Moieture In	ıflow Directi	ion	SE @ 145	miles	
	Location	41.55 N	98.53 W			Grid Point		ion	1,150	feet	
	w Point Location	40.05 N	96.55 W				ter Elevation		2,000	feet	
•	Dew Point Location	41.23 N	90.55 W 90.57 W				Analysis Du		6	hours	
rid Point Loc		34.50 N	98.00 W			Storm Kep	Allalysis Du	Iration		nours	
110 1 01111 200		C IIICO II	70.00								
The s	storm representative	dew point is	76.0 F	with total	l precipitable	water above	e sea level of			2.99	inches
	ne in-place maximum	•	79.5 F		l precipitable					3.52	inches
The transp	positioned maximum	dew point is	79.0 F	with total	l precipitable	water above	e sea level of			3.44	inches
	The in-place storm	elevation is	2,000	whi	ch subtracts	0.50	inches o	f precipitabl	e water at	76.0 F	
	The in-place storm		2,000		ch subtracts			f precipitabl		79.5 F	
	transposition basin		1,150		ch subtracts			f precipitabl		79.0 F	
The (Grid point/inflow ban	ner height is	1,000	whi	ch subtracts	0.28	inches o	f precipitabl	e water at	79.0 F	
					1						-
	The in-place sto			1.19					ACE MR 4-3.		
	The transposition/el			1.06					rep Td based	on EPKI,	
	I ne ba	rrier adjustm	erit iactor is	1.00	1	iveoraska, a	ınd TRWD g	uiuarice.			
	The	total adjustm	ent factor is	1.27							
	1110	aujusuli		A14 /	-						1
Oh	served Storm Depth-	Area-Durati	on								
50.		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	12.0	12.0	12.2	12.3	12.3	12.3	12.3	12.3	12.3	1
	100 sq miles	11.6	11.6	11.6	11.8	11.8	11.8	11.8	11.8	11.8	1
	200 sq miles	11.2	11.2	11.2	11.5	11.5	11.5	11.5	11.5	11.5	
	500 sq miles	10.2	10.2	10.2	10.6	10.6	10.6	10.6	10.6	10.6	
	1000 sq miles	8.7	8.9	9.0	9.2	9.4	9.4	9.4	9.4	9.4	
	2000 sq miles	6.6	6.9	7.0	7.2	7.5	7.5	7.5	7.5	7.5	
	5000 sq miles	4.0	4.3	4.9	5.1	5.2	5.3	5.3	5.3	5.3	
	10000 sq miles	2.4	2.8	3.7	4.0	4.1	4.2	4.2	4.4	4.5	
	20000 sq miles	1.3	1.8	2.6	3.0	3.1	3.2	3.2	3.7	3.8	-
4.1		A D									
Adj	justed Storm Depth-	6 Hours	n 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	15.2	15.2	15.5	15.6	15.6	15.6	15.6	15.6	15.6	1
	100 sq miles	14.7	14.7	14.7	15.0	15.0	15.0	15.0	15.0	15.0	
	200 sq miles	14.2	14.2	14.2	14.6	14.6	14.6	14.6	14.6	14.6	
	500 sq miles	12.9	12.9	12.9	13.5	13.5	13.5	13.5	13.5	13.5	
	1000 sq miles	11.0	11.3	11.4	11.7	11.9	11.9	11.9	11.9	11.9	
	2000 sq miles	8.4	8.8	8.9	9.1	9.5	9.5	9.5	9.5	9.5	
	5000 sq miles	5.1	5.5	6.2	6.5	6.6	6.7	6.7	6.7	6.7	
	10000 sq miles	3.0	3.6	4.7	5.1	5.2	5.3	5.3	5.6	5.7	
	20000 sq miles	1.6	2.3	3.3	3.8	3.9	4.1	4.1	4.7	4.8	_
C+-	orm or Storm Center N	Iomo		HEACTAR	1.2 Cyceles	NE					1
	orm or Storm Center N	valle		USACE MR 4 6/4/1896	4-3-Greeley,	TAE					1
	orm Date(s)			MCC							1
	orm Location			41.55 N	98.53 W						1
	orm Center Elevation			2,000							1
	cipitation Total & Du	ıration		12.30 Inches	24-hours US	ACE MR 4-3					
	rm Representative D			76.0 F	6						1
	m Representative D	ew Point Loc		40.05 N	96.55 W						1
	ximum Dew Point			79.5 F							1
	pisture Inflow Vector			SE @ 145							1
In-j	place Maximization F	actor		1.19							1
Ter	mporal Transposition	(Date)		19-Jun							1
	inporar Transposition insposition Dew Poir			41.23 N	90.57 W		June	July			1
	ensposition Maximum			79.0 F			78.5	81			1
	nsposition Adjustm			1.06							1
	d Point Elevation			1,150							
	thest Elevation in Ba	sin		14,344							
Infl	low Barrier Height			1,000							1
	vation Adjustment F	actor		1.00							1

Appendix F: Table F.152: Storm spreadsheet for Greeley, NE June 4, 1896



Appendix F: Table F.153: Depth-area-duration values for Greeley, NE June 4, 1896



Appendix F: Figure F.185 and Figure F.186: Total storm isohyetal analysis and mass curve chart for Greeley, NE June 4, 1896

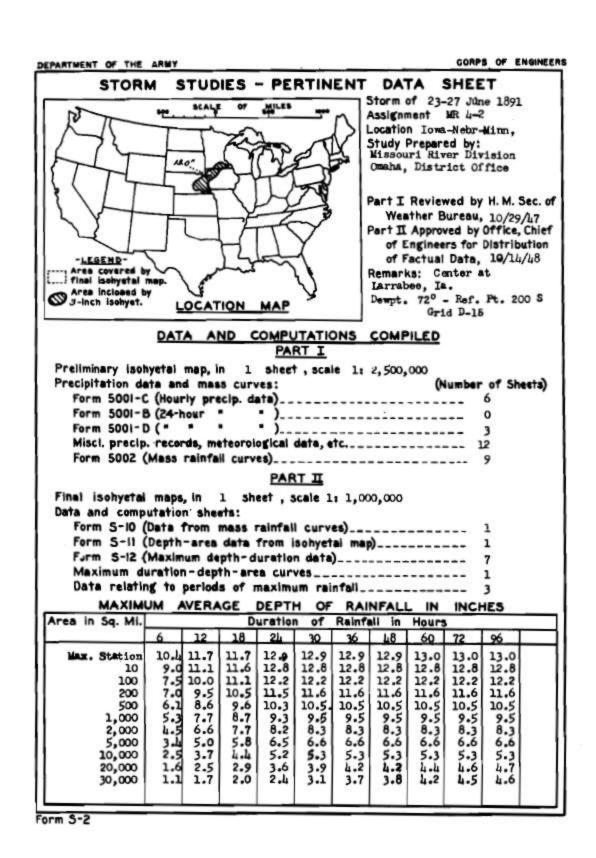
Larrabee, IA, AWA 77

September 10, 1891 Storm Type: MCC

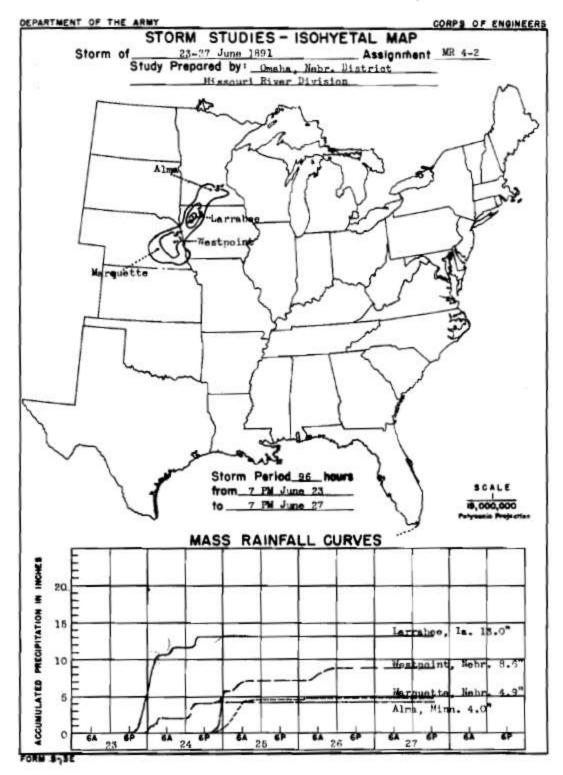
Grid Points Used: 1-4, 8-11, 16-18

Storm Nam		4-2-Larrabe	e, IA		Stower	direct	ont f	Eon A N	0 0 44	Doint 1	
orm Date VA Anal	e: 6/23/1891 vsis Date: 12/16/2013	S			Storm A	ajustm	ent Ior	r or AN	O Grid	Point 1	
	ransposition Date	10-Jul									
inporar i	Tanaposition Date	Lat	Long			Moisture II	ıflow Direct	ion	S @ 200	miles	
orm Cen	ter Location	42.86 N	95.55 W			Grid Point			350	feet	
	Dew Point Location	39.96 N	95.55 W				ter Elevation		1,400	feet	
	ion Dew Point Location	39.83 N	92.58 W				Analysis D		12	hours	
rid Point		35.31 N	93.23 W			этогш кер	Allalysis D	ii ation	12	nouis	
T	he storm representative	-	79.0 F		l precipitable					3.44	inches.
	The in-place maximum	•	81.0 F		l precipitable					3.75	inches.
The tra	anspositioned maximum	•	81.0 F		l precipitable					3.75	inches.
	The in-place storm		1,400		ich subtracts	0.39		of precipitabl		79.0 F	
	The in-place stom The transposition basin		1,400 350		ich subtracts ich subtracts			of precipitable of precipitable		81.0 F 81.0 F	
	he Grid point/inflow bar		1,000		ich subtracts	0.30		of precipitable		81.0 F	
			-,								
	The in-place sto	orm maximizat	ion factor is	1.09		Notes: DAI	O values tak	en from USA	CE MR 4-2.	Storm	
	The transposition/el			1.04		-	_		based on ad	_	
	The ba	arrier adjustm	ent factor is	1.00				_	ased on guid	lance from	
						EPRI, Nebra	aska, and TI	RWD.			
	The	total adjustm	ent factor is	1.13							1
	Observed Storm Depth	Area Dunati	on								
	Observed Storm Depth	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	1 sq miles	10.4	11.7	11.7	12.9	12.9	12.9	12.9	12.9	12.9	1
	10 sq miles	9.0	11.1	11.6	12.8	12.8	12.8	12.8	12.8	12.8	1
	100 sq miles	7.5	10.0	11.1	12.2	12.2	12.2	12.2	12.2	12.2	
	200 sq miles	7.0	9.5	10.5	11.5	11.6	11.6	11.6	11.6	11.6	
	500 sq miles	6.1	8.6	9.6	10.3	10.5	10.5	10.5	10.5	10.5	
	1000 sq miles	5.3	7.7	8.7	9.3	9.5	9.5	9.5	9.5	9.5	
	2000 sq miles	4.5	6.6	7.7	8.2	8.3	8.3	8.3	8.3	8.3	
	5000 sq miles	3.4	5.0	5.8	6.5	6.6	6.6	6.6	6.6	6.6	
	10000 sq miles 20000 sq miles	2.5 1.6	3.7 2.5	4.4 2.9	5.2 3.6	5.3 3.9	5.3 4.2	5.3 4.2	5.3 4.4	5.3 4.6	
	20000 sq nmcs	1.0	2.0	2.0	5.0		7.2	7.2	7.7	4.0	-
	Adjusted Storm Depth-	Area-Duratio	n								
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	1 sq miles	11.8	13.2	13.2	14.6	14.6	14.6	14.6	14.6	14.6	
	10 sq miles	10.2	12.6	13.1	14.5	14.5	14.5	14.5	14.5	14.5	
	100 sq miles	8.5	11.3	12.6	13.8	13.8	13.8	13.8	13.8	13.8	
	200 sq miles 500 sq miles	7.9 6.9	10.8 9.7	11.9 10.9	13.0 11.7	13.1 11.9	13.1 11.9	13.1 11.9	13.1 11.9	13.1 11.9	
	1000 sq miles	6.0	8.7	9.8	10.5	10.8	10.8	10.8	10.8	10.8	
	2000 sq miles	5.1	7.5	8.7	9.3	9.4	9.4	9.4	9.4	9.4	1
	5000 sq miles	3.8	5.7	6.6	7.4	7.5	7.5	7.5	7.5	7.5	1
	10000 sq miles	2.8	4.2	5.0	5.9	6.0	6.0	6.0	6.0	6.0	
	20000 sq miles	1.8	2.8	3.3	4.1	4.4	4.8	4.8	5.0	5.2	
		T		HO A OF A CO	107- 1	TA					1
	Storm or Storm Center I Storm Date(s)	vame		6/23/1891	4-2-Larrabe	, LA					1
	Storm Type				lerstorm Com	plex					1
	Storm Location			42.86 N	95.55 W						1
	Storm Center Elevation			1,400							
	Precipitation Total & D	uration		12.90 Inches	24-hours						
	a. B			7005	10						1
	Storm Representative D Storm Representative D			79.0 F 39.96 N	12 95.55 W		June	July			1
	Maximum Dewpoint	rewponic Loc		81.0 F	V CC.CE		S0	81.5			1
	Moisture Inflow Vector			S @ 200							1
	In-place Maximization F			1.09							
	Temporal Transposition			10-Jul							1
	Transposition Dewpoir			39.83 N	92.58 W		June	July			1
	Transposition Maximum			81.0 F			79	81			1
	Transposition Adjustm Grid Point Elevation	ent Factor		1.04 350							1
				14,344							1
	Highest Flevation in Ra										
	Highest Elevation in Ba Inflow Barrier Height	SITI		1,000							1
	_										

Appendix F: Table F.154: Storm spreadsheet for Larrabee, IA September 10, 1891



Appendix F: Table F.155: Depth-area-duration values for Larrabee, IA September 10, 1891



Appendix F: Figure F.187 and Figure F.188: Total storm isohyetal analysis and mass curve chart for Larrabee, IA September 10, 1891

Appendix G LIP Short Storm List Storm Data

Appendix G: Local Intense Precipitation Short Storm Analyses

Storm Name	State	AWA Storm Number	Lat	Lon	Year	Month	Day	Max Rainfall	Precipitation Source	ANO Total Adjustment Factor	ANO 1-hour
WARNER PARK	TN	2	36.0611	-86.9056	2010	4	30	19.71	SPAS 1208	1.18	5.40
LARTO LAKE	LA	4	31.220	-92.130	2008	9	1	23.31	SPAS 1182	1.15	7.07
FALL RIVER	KS	5	37.6300	-96.0500	2007	6	30	25.50	SPAS 1228	1.23	5.76
ALBANY	TX	18	32.7260	-99.3500	1978	8	3	32.50	SPAS 1179	1.26	15.36
ENID	OK	21	36.3805	-97.8683	1973	10	10	19.45	SPAS 1034	1.20	8.88
WOOSTER	OH	24	40.9146	-81.9729	1969	7	4	14.95	SPAS 1209	1.30	6.01
GLADEWATER	TX	25	32.5365	-94.9427	1966	4	27	25.33	SPAS 1181	1.24	3.62
EDGERTON	MO	26	40.4125	-95.5125	1965	7	18	20.76	SPAS 1183	1.27	4.67
COLLEGE HILL	OH	30	40.0854	-81.6479	1963	6	3	19.39	SPAS 1226	1.84	4.67
CAMP POLK	LA	81	31.067	-93.200	1953	4	23	21.10	LMV 5-3	0.97	4.97
HARRISONBURG DAN	LA	79	31.767	-91.817	1953	5	11	25.40	LMV 5-4	1.02	6.01
KELSO	MO	37	37.1906	-89.5495	1952	8	11	13.00	UMV 3-30	1.27	10.57
HOLT	MO	40	39.4528	-94.3422	1947	6	18	17.60	MR 8-20	1.18	14.16
COLLINSVILLE	IL	42	38.6717	-89.9800	1946	8	12	18.70	MR 7-2B	1.19	4.57
MOUNDS	OK	44	35.8770	-96.0610	1943	5	16	17.00	SW 2-21	1.39	14.14
SILVER LAKE	TX	45	32.6700	-95.5960	1943	6	5	16.50	SW 3-3	1.15	10.45
HALLETT	OK	52	36.2000	-96.6000	1940	9	2	24.00	SW 2-18	1.17	13.78
ENGLE	TX	83	29.681	-97.009	1940	6	29	22.70	GM 5-11	1.22	8.59
BEBE	TX	84	29.332	-97.682	1936	6	30	21.00	GM 5-6	1.11	9.95
NEOSHO FALLS	KS	61	38.0820	-95.7010	1926	9	12	14.00	SW 2-1	1.34	11.49
THRALL	TX	77	30.591	-97.297	1921	9	9	39.70	GM 4-12	1.14	16.34
BONAPARTE	IA	70	40.7667	-91.7500	1905	6	10	12.10	UMV 2-5	1.29	8.26

Appendix G: Table G.1: List of storms used in the Local Intense Precipitation PMP development

Warner Park, TN, AWA 2 April 30, 2010

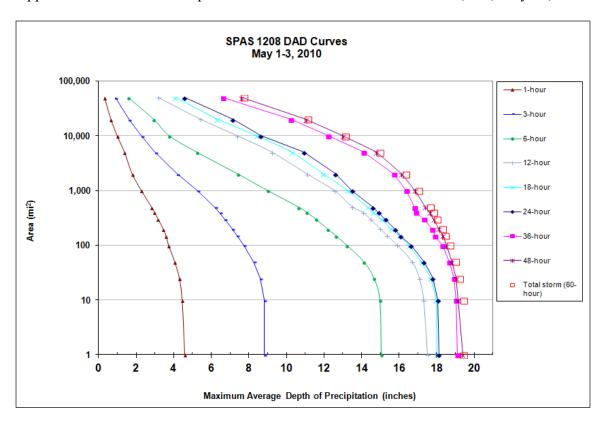
Storm Type: Frontal/MCC

torm Name: SPAS 1208		ee		64	A d!4		on A NIC	Call	int 1	
orm Date: 5/1-3/2010 WA Analysis Date: 12/13/2013				Storm	Aajust	ment f	or ANC	Grid Po	oint 1	
emporal Transposition Date	15-May Lat	Long			Maieture I	nflow Direc	tion	SSW @ 360	miles	
orm Center Location	36.06 N	86.91 W			Grid Point		tion	350	feet	
	31.50 N	90.00 W				ter Elevatio	_	600	feet	
orm Rep Dew Point Location		95.94 W						12		
ransposition Dew Point Location rid Point Location	35.31 N	93.23 W			Storm Kep	Analysis D	uration	12	hours	
To a control	COICEIN	70.20 11								
The storm representative de	ew point is	75.0 F	with total	precipitable	water abov	e sea level (of		2.85	inches.
The in-place maximum de	ew point is	76.5 F	with total	precipitable	water abov	e sea level (of		3.07	inches.
The transpositioned maximum de	ew point is	75.0 F	with total	precipitable	water abov	e sea level (of		2.85	inches.
The in-place storm e		600		h subtracts			precipitable		75.0 F	
The in-place storm e		600		h subtracts	0.16		precipitable		76.5 F	
The transposition storm e		350		h subtracts	0.25		precipitable		75.0 F	
The Grid point/inflow barrie	er height is	1,000	whic	h subtracts	0.25	inches of	precipitable	e water at	75.0 F	
The in place	marimizati	on factor is	1.08	1	Notes: Storm	representati	ve Td value w	as based on 12-h	r surface	1
The in-place The transposit			0.90					ig with Hysplit b		
	ier adjustme		1.00		trajectory. V	Values were se	lected in regio	on where temper	ature did not	
The balli	aajasuit	240101 15	2.00					ea. Used an aver	rage of	
The tot	tal adjustme	ent factor is	0.96		MJAN, KMC	B, KHBG, and	KASD.			
Observed Storm Depth-	-Area-Dura								,	
	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
10 sq miles	4.4	15.0	17.3	18.0	18.1	19.0	19.2	19.4	-	
100 sq miles	3.7	13.2	15.9	16.5	16.6	18.3	18.5	18.7	-	-
200 sq miles	3.4	12.2	15.0	15.6	15.8	17.8	18.1	18.3	-	
500 sq miles	2.8	10.6	13.5	14.3	14.6	16.8	17.4	17.7	-	
1000 sq miles	2.3 1.8	9.0 7.4	12.6 11.1	13.3 12.0	13.5 12.6	16.4 15.7	16.9 16.1	17.1 16.4	-	
2000 sq miles 5000 sq miles	1.4	7.4 5.2	9.2	10.3	10.9	14.1	14.8	15.0	-	1
10000 sq miles	1.0	3.8	7.4	8.4	8.6	12.2	13.0	13.1	-	
20000 sq miles	0.7	2.9	5.4	6.3	7.2	10.2	11.0	11.2	_	
20000 sq nmcs	0.7	2.7	2.4	. 0.5	7.2	10.2	11.0			
Adjusted Storm Depth-			5.4	. 0.0	7.2	10.2	11.0			
		tion 6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
Adjusted Storm Depth- 10 sq miles	Area-Dura 1 Hours 4.3	tion 6 Hours 14.4	12 Hours 16.7	18 Hours 17.3	24 Hours 17.4	36 Hours 18.3	48 Hours 18.4	60 Hours 18.7		
Adjusted Storm Depth- 10 sq miles 100 sq miles	Area-Dura 1 Hours 4.3 3.6	tion 6 Hours 14.4 12.7	12 Hours 16.7 15.3	18 Hours 17.3 15.9	24 Hours 17.4 16.0	36 Hours 18.3 17.6	48 Hours 18.4 17.8	60 Hours 18.7 18.0		
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles	Area-Dura 1 Hours 4.3 3.6 3.3	tion 6 Hours 14.4 12.7 11.7	12 Hours 16.7 15.3 14.4	18 Hours 17.3 15.9 15.0	24 Hours 17.4 16.0 15.2	36 Hours 18.3 17.6 17.1	48 Hours 18.4 17.8 17.4	60 Hours 18.7 18.0 17.6	72 Hours - - -	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles	Area-Dura 1 Hours 4.3 3.6 3.3 2.7	tion 6 Hours 14.4 12.7 11.7 10.2	12 Hours 16.7 15.3 14.4 13.0	18 Hours 17.3 15.9 15.0 13.8	24 Hours 17.4 16.0 15.2 14.1	36 Hours 18.3 17.6 17.1 16.2	48 Hours 18.4 17.8 17.4 16.8	60 Hours 18.7 18.0 17.6 17.0	72 Hours	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2	6 Hours 14.4 12.7 11.7 10.2 8.7	12 Hours 16.7 15.3 14.4 13.0	18 Hours 17.3 15.9 15.0 13.8 12.8	24 Hours 17.4 16.0 15.2 14.1 13.0	36 Hours 18.3 17.6 17.1 16.2 15.8	48 Hours 18.4 17.8 17.4 16.8 16.2	60 Hours 18.7 18.0 17.6 17.0	72 Hours - - -	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7	6 Hours 14.4 12.7 11.7 10.2 8.7 7.1	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8	72 Hours	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3	6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7	6 Hours 14.4 12.7 11.7 10.2 8.7 7.1	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8	72 Hours	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 1000 sq miles	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3 1.0	6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0 3.6	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9 7.1	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5 8.3	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2 12.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3 1.0 0.6	6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0 3.6	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9 7.1 5.2	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9 8.1 6.1	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5 8.3	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2 12.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 5000 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 10000 sq miles 20000 sq miles	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3 1.0 0.6	6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0 3.6	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9 7.1 5.2 SPAS 1208	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9 8.1 6.1	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5 8.3	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2 12.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 10000 sq miles 20000 sq miles 5000 sq miles 20000 sq miles Storm or Storm Center N	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3 1.0 0.6	6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0 3.6	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9 7.1 5.2 SPAS 1208- 5/1-3/2010	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9 8.1 6.1	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5 8.3	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2 12.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	
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Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 2000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3 1.0 0.6	6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0 3.6	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9 7.1 5.2 SPAS 1208- 5/1-3/2010	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9 8.1 6.1	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5 8.3	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2 12.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center N Storm Date(s) Storm Type	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3 1.0 0.6	tion 6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0 3.6 2.8	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9 7.1 5.2 SPAS 1208 - 5/1-3/2010 Synoptic 36.06 N	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9 8.1 6.1 Tennessee	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5 8.3	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2 12.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	
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Adjusted Storm Depth- 10 sq miles 100 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 20000 sq	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3 1.0 0.6 Name variation (10: d d Location factor an (Date)	tion 6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0 3.6 2.8	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9 7.1 5.2 SPAS 1208- 5/1-3/2010 Synoptic 36.06 N 600 19.71 inches i 75.0 F 31.50 N 76.5 F SSW @ 360 1.08	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9 8.1 6.1 Tennessee	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5 8.3	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2 12.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	
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Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 300 sq miles 1000 sq miles 2000 sq mile	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3 1.0 0.6 Name dd dLocation factor n (Date) tion n Td	tion 6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0 3.6 2.8	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9 7.1 5.2 SPAS 1208 5/1-3/2010 Synoptic 36.06 N 600 19.71 inches i 75.0 F 31.50 N 76.5 F SSW @ 360 1.08 15-May 38.16 N	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9 8.1 6.1 Tennessee	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5 8.3	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2 12.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 200 sq miles 1000 sq miles 2000 sq mile	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3 1.0 0.6 Name dd dLocation factor n (Date) tion n Td	tion 6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0 3.6 2.8	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9 7.1 5.2 SPAS 1208 5/1-3/2010 Synoptic 36.06 N 600 19.71 inches i 75.0 F 31.50 N 76.5 F SSW @ 360 1.08 15-May 38.16 N 75.0 F	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9 8.1 6.1 Tennessee	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5 8.3	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2 12.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq mile	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3 1.0 0.6 Name d d Location factor	tion 6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0 3.6 2.8	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9 7.1 5.2 SPAS 1208-5/1-3/2010 Synoptic 36.06 N 600 19.71 inches i 75.0 F SSW @ 360 1.08 15-May 38.16 N 75.0 F	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9 8.1 6.1 Tennessee	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5 8.3	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2 12.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	
Adjusted Storm Depth- 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 20000 sq mil	Area-Dura 1 Hours 4.3 3.6 3.3 2.7 2.2 1.7 1.3 1.0 0.6 Name variation (10 : d d d Location factor a (Date) tion a Td ent Factor sin	tion 6 Hours 14.4 12.7 11.7 10.2 8.7 7.1 5.0 3.6 2.8	12 Hours 16.7 15.3 14.4 13.0 12.1 10.7 8.9 7.1 5.2 SPAS 1208- 5/1-3/2010 Synoptic 36.06 N 600 19.71 inches i 75.0 F 31.50 N 76.5 F SSW @ 360 1.08 15-May 38.16 N 75.0 F 0.90 350	18 Hours 17.3 15.9 15.0 13.8 12.8 11.5 9.9 8.1 6.1 Tennessee	24 Hours 17.4 16.0 15.2 14.1 13.0 12.2 10.5 8.3	36 Hours 18.3 17.6 17.1 16.2 15.8 15.1 13.6	48 Hours 18.4 17.8 17.4 16.8 16.2 15.5 14.2 12.5	60 Hours 18.7 18.0 17.6 17.0 16.4 15.8 14.4	72 Hours	

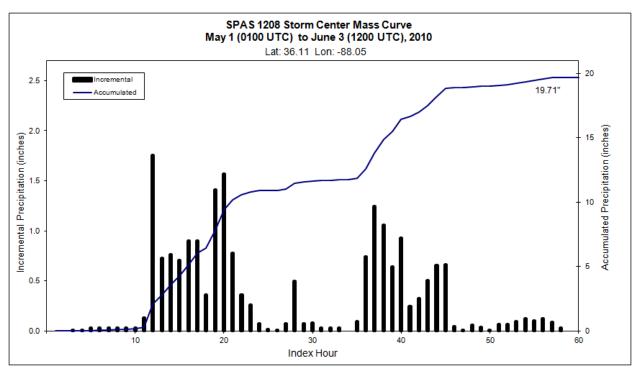
Appendix G: Table G.2: Storm spreadsheet for Warner Park, TN May 30, 2010

	Storm	1208 -	May 1	(0100 L	JTC) - I	May 3 (1200 U	TC), 20	10	
	MA	XIMUM A	VERAG	E DEPTI	H OF PR	ECIPITA	TION (IN	CHES)		
					Duration	n (hours)				
Area (mi²)	1	3	6	12	18	24	36	48	60	Total
0.4	4.63	8.92	15.31	17.77	18.33	18.39	19.36	19.66	19.71	19.71
1	4.58	8.82	15.06	17.52	18.03	18.12	19.11	19.38	19.45	19.45
10	4.44	8.81	14.98	17.31	17.97	18.06	19.04	19.15	19.43	19.43
25	4.29	8.61	14.66	17.08	17.69	17.8	18.91	19.05	19.24	19.24
50	4.04	8.25	14.12	16.7	17.2	17.33	18.67	18.82	19.01	19.01
100	3.72	7.72	13.21	15.9	16.52	16.63	18.31	18.51	18.71	18.71
150	3.58	7.37	12.62	15.37	16.04	16.07	17.91	18.35	18.48	18.48
200	3.43	7.12	12.18	14.99	15.57	15.78	17.75	18.11	18.32	18.32
300	3.16	6.72	11.56	14.47	15.07	15.28	17.33	17.85	18.05	18.05
400	2.97	6.44	11.07	14.08	14.65	14.91	16.9	17.65	17.85	17.85
500	2.81	6.19	10.63	13.52	14.34	14.61	16.84	17.4	17.67	17.67
1,000	2.27	5.26	8.99	12.55	13.27	13.5	16.39	16.86	17.05	17.05
2,000	1.79	4.19	7.41	11.11	11.96	12.62	15.72	16.14	16.37	16.37
5,000	1.38	3	5.23	9.24	10.3	10.93	14.12	14.79	15	15.00
10,000	0.99	2.28	3.76	7.39	8.42	8.64	12.21	13	13.13	13.13
20,000	0.66	1.6	2.93	5.44	6.33	7.16	10.24	11.04	11.15	11.15
50,000	0.32	0.88	1.58	3.19	4.08	4.59	6.63	7.63	7.75	7.75

Appendix G: Table G.3: Depth-area-duration values for Warner Park, TN, May 30, 2010



Appendix G: Figure G.1: Depth-area-duration chart for Warner Park, TN, May 30, 2010



Appendix G: Figure G.2: Mass curve chart for Warner Park, TN, May 30, 2010

| KPAH | SPAN | S

Appendix G: Figure G.3: Total storm isohyetal analysis for Warner Park, TN, May 30, 2010 Page 5 of 96

Larto Lake, LA, AWA 4

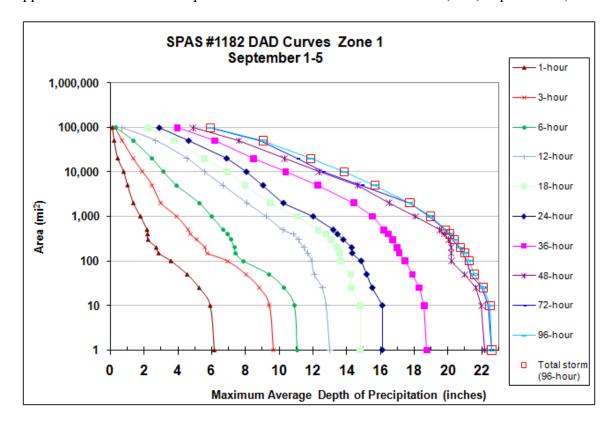
September 1, 2008 Storm Type: Tropical

	SPAS 1182	-Larto Lake	, LA		CI		4.0	4370	C	. , .	
orm Date:	9/1-5/2008				Storm .	Adjustr	nent fo	r ANO	Grid Po	int 1	
•	12/13/2013										
nporal Transpositio	n Date	15-Aug				16 1 4 T	g D'		CTV 150	- 9 -	
		Lat	Long				nflow Direct	ion:	SW @ 150	miles	
rm center location		31.22 N	92.13 W			Grid Point	Elevation		400	feet	
orm Rep Td location		30.00 N	94.00 W			Storm Cen	ter Elevatior	ı	50	feet	
ansposition Td locati	ion	34.10 N	95.19 W			Storm Rep	Analysis Du	ıration	24	hours	
id Point location		35.31 N	93.23 W								_
										• • • •	
	rm represent		76.0 F		recipitable w					2.99	inches
	in-place max sitioned maxi		80.0 F 79.5 F		recipitable w recipitable w					3.60 3.52	inches
•	-place storm (50		ch subtracts			f precipitabl	e water et	76.0 F	Hiches
	-place storm (50		ch subtracts	0.03		f precipitabl		80.0 F	
	sition storm (400		ch subtracts	0.12		f precipitabl		79.5 F	
The Grid poin			400		ch subtracts	0.12		f precipitabl		79.5 F	
	The in-place	e maximizati	on factor is	1.21		Notes:					1
	-	e transpositi									
The e	elevation/ban	•									
		•									
	The to	otal adjustme	nt factor is	1.15							
Observed S	torm Depth-			10 17	24 17	20 17	26 17	40 17	60 II	73 17	
	10 sa mila-	6 Hours 10.9	12 Hours 12.8	18 Hours 14.8	24 Hours 16.1	30 Hours	36 Hours 18.6	48 Hours 22.0	60 Hours	72 Hours 22.4	
	10 sq miles 100 sq miles	10.9 7.9	11.9	14.8	16.1	-	18.6	20.2	-	21.1	1
	······	7.9 7.4	11.5	13.7	14.9	-	17.5	20.2	-	20.7	1
	200 sq miles 500 sq miles	6.7	10.2	13.5	13.2	-	16.2	20.2 19.5	-	19.8	1
	000 sq miles	6.0	9.2	11.1	12.0	-	15.5	19.5	-	18.9	1
	000 sq miles 000 sq miles	5.3	8.1	9.5	10.3	-	14.4	16.5	-	17.7	1
	000 sq miles 000 sq miles	3.9	6.7	8.0	9.1	-	12.3	14.7	-	14.9	1
	000 sq miles	3.2	5.6	6.9	8.1	-	10.4	12.4		12.6	
	000 sq miles	2.5	4.5	5.6	6.9	-	8.5	10.3	-	11.1	1
							•				
Adjusted S	torm Depth-A	Area-Durati	on								
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	12.5	14.7	17.0	18.5	-	21.4	25.2	-	25.7	
	100 sq miles	9.1	13.7	15.7	17.1	-	20.1	23.2	-	24.2	
	200 sq miles	8.4	13.2	15.4	16.4	-	19.5	23.2	-	23.7	
	500 sq miles	7.7	11.7	14.2	15.2	-	18.6	22.4	-	22.8	
					13.8	_	17.9	20.8	-	21.7	
	000 sq miles	6.9	10.6	12.7			Y				
2	000 sq miles	6.1	9.3	10.9	11.8	-	16.6	19.0	-	20.4	
2) 5)	000 sq miles 000 sq miles	6.1 4.5	9.3 7.7	10.9 9.2	11.8 10.4	-	14.1	16.9	-	20.4 17.1	
20 50 10	000 sq miles 000 sq miles 000 sq miles	6.1 4.5 3.6	9.3 7.7 6.4	10.9 9.2 8.0	11.8 10.4 9.3	-	14.1 11.9	16.9 14.2	- - -	20.4 17.1 14.4	
20 50 10	000 sq miles 000 sq miles	6.1 4.5	9.3 7.7	10.9 9.2	11.8 10.4	-	14.1	16.9	-	20.4 17.1	
2 5 10	000 sq miles 000 sq miles 000 sq miles	6.1 4.5 3.6	9.3 7.7 6.4	10.9 9.2 8.0	11.8 10.4 9.3	-	14.1 11.9	16.9 14.2	-	20.4 17.1 14.4	
2 5 10 20	000 sq miles 000 sq miles 000 sq miles	6.1 4.5 3.6 2.8	9.3 7.7 6.4	10.9 9.2 8.0	11.8 10.4 9.3 7.9	-	14.1 11.9	16.9 14.2	-	20.4 17.1 14.4	
2 5 10 20	000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles	6.1 4.5 3.6 2.8	9.3 7.7 6.4	10.9 9.2 8.0 6.4	11.8 10.4 9.3 7.9	-	14.1 11.9	16.9 14.2	-	20.4 17.1 14.4	
20 50 10 20 Storm or St	000 sq miles 000 sq miles 000 sq miles 000 sq miles oom Center N (s)	6.1 4.5 3.6 2.8	9.3 7.7 6.4	10.9 9.2 8.0 6.4 SPAS 1182-La	11.8 10.4 9.3 7.9	-	14.1 11.9	16.9 14.2	-	20.4 17.1 14.4	
20 50 10 20 Storm or St Storm Date	000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles oom Center N (s)	6.1 4.5 3.6 2.8	9.3 7.7 6.4	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008	11.8 10.4 9.3 7.9	-	14.1 11.9	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent	000 sq miles com Center N (s) etion er Elevation	6.1 4.5 3.6 2.8	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm	11.8 10.4 9.3 7.9	-	14.1 11.9	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent	000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles oom Center N (s)	6.1 4.5 3.6 2.8	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N	11.8 10.4 9.3 7.9 rto Lake, LA Gustav 92.13 W	-	14.1 11.9	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio	000 sq miles 000 m Center N (s) s tion er Elevation n Total & Du	6.1 4.5 3.6 2.8	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in	11.8 10.4 9.3 7.9 rto Lake, LA Gustav 92.13 W	-	14.1 11.9	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio	000 sq miles in tion er Elevation n Total & Du esentative T	6.1 4.5 3.6 2.8	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in	11.8 10.4 9.3 7.9 rto Lake, L.s Gustav 92.13 W	-	14.1 11.9 9.7	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr	000 sq miles in Center N (s) in tion er Elevation n Total & Du esentative T esentative T	6.1 4.5 3.6 2.8	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in 76.0 F 30.00 N	11.8 10.4 9.3 7.9 rto Lake, LA Gustav 92.13 W	-	14.1 11.9 9.7	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr Storm Repr In-place Ma	000 sq miles comm Center N (s) etion er Elevation n Total & Du esentative T esentative T aximum Td	6.1 4.5 3.6 2.8 Jame	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in 76.0 F 30.00 N 80.0 F	11.8 10.4 9.3 7.9 rto Lake, L.s Gustav 92.13 W	-	14.1 11.9 9.7	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr Storm Repr In-place Ma	000 sq miles in Center N (s) ition er Elevation n Total & Du esentative T esentative T aximum Td nflow Vector	6.1 4.5 3.6 2.8	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in 76.0 F 30.00 N	11.8 10.4 9.3 7.9 rto Lake, L.s Gustav 92.13 W	-	14.1 11.9 9.7	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr Storm Repr In-place Ma	000 sq miles comm Center N (s) etion er Elevation n Total & Du esentative T esentative T aximum Td	6.1 4.5 3.6 2.8	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in 76.0 F 30.00 N 80.0 F	11.8 10.4 9.3 7.9 rto Lake, L.s Gustav 92.13 W	-	14.1 11.9 9.7	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr In-place Ma	000 sq miles in Center N (s) ition er Elevation n Total & Du esentative T esentative T aximum Td nflow Vector	6.1 4.5 3.6 2.8 Tame aration (10 so	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in 76.0 F 30.00 N 80.0 F	11.8 10.4 9.3 7.9 rto Lake, L.s Gustav 92.13 W	-	14.1 11.9 9.7	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr In-place Ma Moisture II In-place Ma	000 sq miles com Center N (s) e etion er Elevation n Total & Du esentative T esentative T aximum T d nflow Vector aximization F	6.1 4.5 3.6 2.8 Tame aration (10 so	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in 76.0 F 30.00 N 80.0 F SW @ 150	11.8 10.4 9.3 7.9 rto Lake, L.s Gustav 92.13 W	-	14.1 11.9 9.7	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr In-place M Moisture Ir In-place M Temporal T	000 sq miles comm Center N (s) e tion er Elevation n Total & Du esentative T esentative T aximum Td nflow Vector aximization F cransposition	6.1 4.5 3.6 2.8 Tame ration (10 solid del del Location actor (Date)	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in 76.0 F 30.00 N 80.0 F SW @ 150	11.8 10.4 9.3 7.9 rto Lake, LA Gustav 92.13 W 72hrs	-	14.1 11.9 9.7	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Repr In-place Ma Moisture Ir In-place Ma Temporal T Transpositi Transpositi	oom Sq miles oom sq miles oom Sq miles oom Center N (s) tion or Elevation on Total & Du esentative T esentative T aximum Td offlow Vector aximization F fransposition ion Dewpoint	6.1 4.5 3.6 2.8 lame lame d d Location actor (Date) t Location	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in 76.0 F 30.00 N 80.0 F SW @ 150	11.8 10.4 9.3 7.9 rto Lake, LA Gustav 92.13 W 72hrs	-	14.1 11.9 9.7 A	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr In-place Ma Moisture Ir In-place Ma Temporal T Transpositi Transpositi	ooo sq miles oom Center N (s) e tion er Elevation n Total & Du esentative T eximum Td nflow Vector aximization F eransposition ion Dewpoint ion Maximum ion Adjustme	6.1 4.5 3.6 2.8 lame lame d d Location actor (Date) t Location	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in 76.0 F 30.00 N 80.0 F SW @ 150	11.8 10.4 9.3 7.9 rto Lake, LA Gustav 92.13 W 72hrs	-	14.1 11.9 9.7 A	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Type Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr In-place Mi Moisture Ir In-place Mi Temporal T Transpositi Transpositi Grid Point I	ooo sq miles oom Center N (s) e tion er Elevation n Total & Du esentative T eximum Td nflow Vector aximization F eransposition ion Dewpoint ion Maximum ion Adjustme	6.1 4.5 3.6 2.8 Tame Tation (10 set of delication actor (Date) t Location T T dent Factor	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in 76.0 F 30.00 N 80.0 F SW @ 150 15-Aug 34.10 N 79.5 F	11.8 10.4 9.3 7.9 rto Lake, LA Gustav 92.13 W 72hrs	-	14.1 11.9 9.7 A	16.9 14.2	-	20.4 17.1 14.4	
Storm or St Storm Date Storm Type Storm Loca Storm Cent Precipitatio Storm Repr Storm Repr In-place Mi Moisture Ir In-place Mi Temporal T Transpositi Transpositi Transpositi Transpositi Grid Point I Highest Ele	ooo sq miles oom Center N (s) e tion er Elevation n Total & Du esentative T esentative T aximum Td inflow Vector aximization Fa fransposition ion Dewpoint ion Adjustme Elevation ovation in Base	6.1 4.5 3.6 2.8 Tame Tation (10 so d d Location actor (Date) t Location a Td ent Factor	9,3 7.7 6.4 5.2	10.9 9.2 8.0 6.4 SPAS 1182-La 9/1-5/2008 Tropical Storm 31.22 N 50 23.31 inches in 76.0 F 30.00 N 80.0 F SW @ 150 15-Aug 34.10 N 79.5 F	11.8 10.4 9.3 7.9 rto Lake, LA Gustav 92.13 W 72hrs	-	14.1 11.9 9.7 A	16.9 14.2	-	20.4 17.1 14.4	

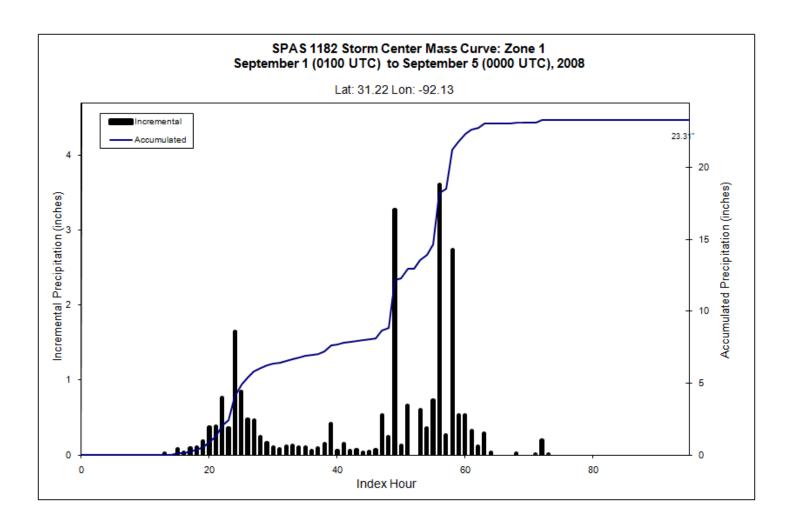
Appendix G: Table G.4: Storm spreadsheet for Larto Lake, LA, September 1, 2008

Stor	rm 118:	2 - Sept	tember JM AVER	1 (010 RAGE DE	0 UTC)	to Sep	tembe	r 5 (000	00 UTC), 2008	
						ration (ho					
Area (mi ²)	1	3	6	12	18	24	36	48	72	96	Total
0.40	6.35	9.89	11.34	13.44	15.26	16.55	19.37	22.93	23.31	23.31	23.31
1	6.15	9.65	11.08	13.02	14.80	16.10	18.75	22.17	22.60	22.60	22.60
10	5.90	9.42	10.91	12.80	14.80	16.10	18.59	21.98	22.37	22.48	22.48
25	5.25	8.82	10.29	12.56	14.26	15.51	18.29	21.66	22.03	22.10	22.10
50	4.54	8.03	9.42	12.09	14.24	15.17	17.89	21.00	21.34	21.56	21.56
100	3.58	6.92	7.88	11.94	13.66	14.85	17.47	20.21	21.11	21.28	21.28
150	2.85	5.72	7.44	11.70	13.60	14.32	17.11	20.20	20.89	21.01	21.01
200	2.71	5.61	7.35	11.46	13.45	14.29	16.99	20.19	20.67	20.73	20.73
300	2.23	5.10	7.15	11.15	13.09	13.79	16.72	20.03	20.25	20.39	20.39
400	2.20	4.74	6.96	10.84	12.75	13.45	16.45	19.77	20.04	20.13	20.13
500	2.17	4.61	6.70	10.22	12.32	13.20	16.21	19.51	19.83	19.87	19.87
1,000	1.78	3.93	6.00	9.23	11.08	12.01	15.54	18.07	18.90	18.98	18.98
2,000	1.36	3.00	5.27	8.09	9.47	10.25	14.42	16.52	17.74	17.75	17.75
5,000	1.02	2.48	3.92	6.66	7.99	9.05	12.30	14.67	14.86	15.67	15.67
10,000	0.79	1.91	3.16	5.57	6.93	8.06	10.39	12.35	12.57	13.85	13.85
20,000	0.44	1.35	2.47	4.52	5.55	6.89	8.47	10.31	11.06	11.87	11.87
50,000	0.23	0.71	1.36	2.68	3.78	4.64	6.20	7.63	8.86	9.05	9.05
97,260	0.12	0.28	0.34	0.67	2.22	2.90	3.98	4.89	5.86	5.94	5.94

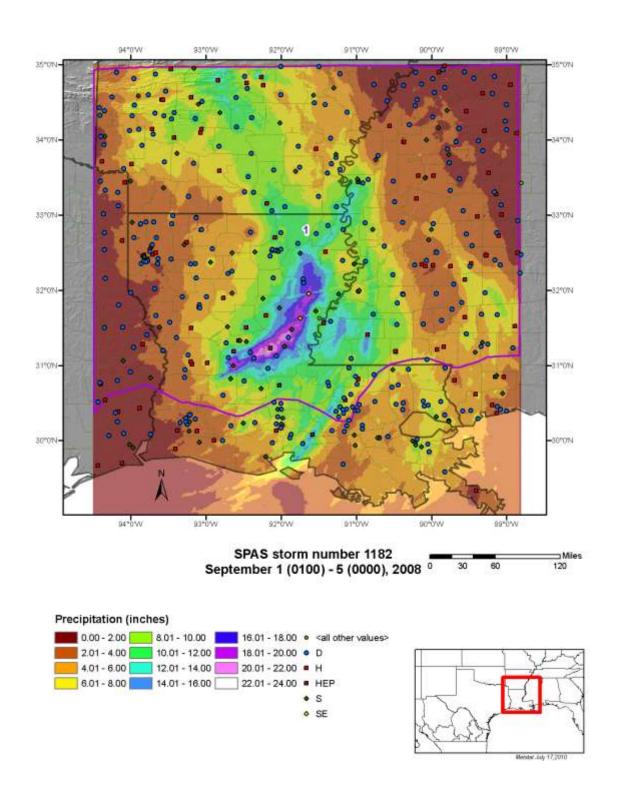
Appendix G: Table G.5: Depth-area-duration values for Larto Lake, LA, September 1, 2008



Appendix G: Figure G.4: Depth-area-duration chart for Larto Lake, LA, September 1, 2008



Appendix G: Figure G.5: Mass curve chart for Larto Lake, LA, September 1, 2008



Appendix G: Figure G.6: Total storm isohyetal analysis for Larto Lake, LA, September 1, 2008

Fall River, KS, AWA 5

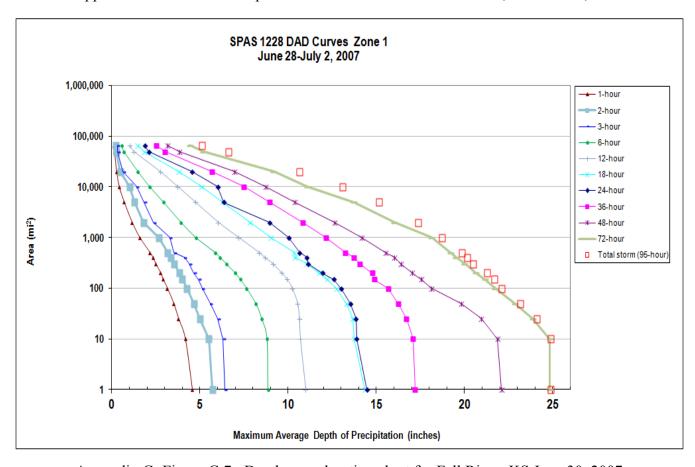
June 30, 2007 Storm Type: Frontal/MCC

torm Name: SPAS 1228	Fall River, F	(S								
torm Date: 6/28/2007 - WA Analysis Date: 12/13/2013				Storm	Adjust	ment fo	r ANO	Grid Po	oint 1	
mporal Transposition Date	15-Jul									
	Lat	Long			Moisture In	ıflow Directi	ion	S @ 460	miles	
torm Center Location	37.63 N	96.05 W			Grid Point	Elevation		350	feet	
torm Rep Dew Point Location	31.00 N	95.50 W			Storm Cent	ter Elevation		900	feet	
ransposition Dew Point Location	36.10 N	92.00 W			Storm Rep.	Analysis Du	ration	24	hours	
rid Point Location	35.31 N	93.23 W								
The storm representative	dew point is	76.5 F	with total	l precipitable	water above	sea level of			3.07	inche
The in-place maximum	-	80.0 F		l precipitable					3.60	inches
The transpositioned maximum	-	80.5 F 900		l precipitable ich subtracts					3.68 76.5 F	inche
The in-place storm The in-place storm		900		ich subtracts	0.21		f precipitabl f precipitabl		80.0 F	
The transposition basin		350		ich subtracts	0.30		f precipitabl		80.5 F	
The grid point/inflow barr		1,000	whi	ich subtracts	0.30		f precipitabl		80.5 F	
Th. i		· 6	117	1	Notes: DAD	reduce taken	from SDAS 1	228. Storm re	pracantativa	1
The in-place sto The transposition/ele			1.17					24-hr Td val	•	
· · · · · · · · · · · · · · · · · · ·	evation to ba errier adjustm		1.02			2007 at KDK				
	•									
The t	total adjustm	ent factor is	1.18	J]
Observed Storm Depth-	Area-Durati	on								
	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles	4.6	6.4	8.9	11.0	14.4	14.5	17.2	22.1	24.8	
10 sq miles	4.2	6.3	8.8	10.7	13.8	13.9	17.1	21.9	24.8	-
100 sq miles 200 sq miles	3.1 2.8	5.1 4.7	7.6 7.0	10.2 9.6	12.7 11.8	13.0 11.9	15.7 14.8	18.1 17.1	21.7 20.7	
500 sq miles	2.2	3.5	5.9	8.4	10.4	10.7	13.2	15.5	19.2	1
1000 sq miles	1.6	3.3	4.8	7.2	9.0	10.0	12.1	14.2	18.1	
2000 sq miles	1.1	2.4	3.9	6.0	7.8	9.0	10.8	12.6	16.0	
5000 sq miles	0.7	1.8	2.9	4.7	6.3	6.4	9.0	10.4	13.7	
10000 sq miles	0.4	1.4	2.2	3.7	5.1	6.0	7.5	8.7	11.1	
20000 sq miles	0.3	0.6	1.5	2.7	3.8	4.6	5.7	7.0	9.2	
Adjusted Storm Depth-							y		,	
	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles 10 sq miles	5.4 4.9	7.6 7.5	10.5 10.4	13.0 12.7	17.0 16.3	17.1 16.4	20.4 20.2	26.2 25.9	29.4 29.4	1
100 sq miles	3.7	6.1	9.0	12.1	15.1	15.4	18.6	21.5	25.7	
200 sq miles	3.3	5.5	8.3	11.4	13.9	14.1	17.5	20.2	24.4	
500 sq miles	2.6	4.2	6.9	9.9	12.3	12.6	15.7	18.4	22.7	
1000 sq miles	1.9	3.9	5.6	8.5	10.7	11.9	14.4	16.8	21.5	
2000 sq miles	1.3 0.8	2.8 2.2	4.6 3.5	7.1 5.6	9.3 7.4	10.6 7.5	12.8 10.6	14.9 12.3	19.0 16.3	-
5000 sq miles 10000 sq miles	0.5	1.7	2.5	4.4	6.0	7.1	8.9	10.3	13.1	
	0.3	0.7	1.8	3.2	4.5	5.4	6.7	8.2	10.9	
20000 sq miles										
20000 sq miles										
Storm or Storm Center N	Vame		SPAS 1228 I		S					
Storm or Storm Center N Storm Date(s)	Vame		6/28/2007 - 7/		s					
Storm or Storm Center N Storm Date(s) Storm Type	Vame		6/28/2007 - 7/ Synoptic	/2/2007	S					
Storm or Storm Center N Storm Date(s) Storm Type Storm Location			6/28/2007 - 7/		S					
Storm or Storm Center N Storm Date(s) Storm Type			6/28/2007 - 7/ Synoptic 37.63 N	/2/2007 96.05 W	S					
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation	uration		6/28/2007 - 7/ Synoptic 37.63 N 900	/2/2007 96.05 W	S					
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Da	uration Dew Point		6/28/2007 - 7/ Synoptic 37.63 N 900 25.50 Inches	96.05 W 95-hours	S					
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point	uration Dew Point Dew Point Loc	ation	6/28/2007 - 7/ Synoptic 37.63 N 900 25.50 Inches 76.5 F 31.00 N 80.0 F	96.05 W 95-hours 24 95.50 W	S					
Storm Or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & De Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector	uration New Point New Point Loc	ation	6/28/2007 - 7/ Synoptic 37.63 N 900 25.50 Inches 76.5 F 31.00 N 80.0 F \$ @ 460	96.05 W 95-hours	S					
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dr Storm Representative D Storm Representative D Maximum Dew Point	uration New Point New Point Loc	ation	6/28/2007 - 7/ Synoptic 37.63 N 900 25.50 Inches 76.5 F 31.00 N 80.0 F	96.05 W 95-hours 24 95.50 W	S					
Storm Or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & De Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector	uration New Point Loc Sactor	ation	6/28/2007 - 7/ Synoptic 37.63 N 900 25.50 Inches 76.5 F 31.00 N 80.0 F \$ @ 460	96.05 W 95-hours 24 95.50 W	S					
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dt Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Point	Dew Point Doew Point Locator In (Date) Int Location	ation	6/28/2007 - 7/ Synoptic 37.63 N 900 25.50 Inches 76.5 F 31.00 N 80.0 F 8 @ 460 1.17 15-Jul 36.10 N	96.05 W 95-hours 24 95.50 W	S					
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Dt Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Point Transposition Maximum	Dew Point Loc Gactor In (Date) In Dew Point Location In Dew Point	ation	6/28/2007 - 7/ Synoptic 37.63 N 900 25.50 Inches 76.5 F 31.00 N 80.0 F 8 @ 460 1.17 15-Jul 36.10 N 80.5 F	96.05 W 95-hours 24 95.50 W Miles	S					
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Du Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum Transposition Adjustment	Dew Point Loc Gactor In (Date) In Dew Point Location In Dew Point	ation	6/28/2007 - 7/ Synoptic 37.63 N 900 25.50 Inches 76.5 F 31.00 N 80.0 F S @ 460 1.17 15-Jul 36.10 N 80.5 F 1.02	96.05 W 95-hours 24 95.50 W Miles	S					
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Du Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Poin Transposition Maximum Transposition Adjustme Grid Point Elevation	ew Point Dew Point Loc Cactor In (Date) Int Location In Dew Point Dew Point Dew Point Dew Foint	ation	6/28/2007 - 7/ Synoptic 37.63 N 900 25.50 Inches 76.5 F 31.00 N 80.0 F \$ @ 460 1.17 15-Jul 36.10 N 80.5 F 1.02	96.05 W 95-hours 24 95.50 W Miles	S					
Storm or Storm Center N Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Du Storm Representative D Storm Representative D Maximum Dew Point Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dew Poir Transposition Maximum Transposition Adjustment	ew Point Dew Point Loc Cactor In (Date) Int Location In Dew Point Dew Point Dew Point Dew Foint	ation	6/28/2007 - 7/ Synoptic 37.63 N 900 25.50 Inches 76.5 F 31.00 N 80.0 F S @ 460 1.17 15-Jul 36.10 N 80.5 F 1.02	96.05 W 95-hours 24 95.50 W Miles	S					

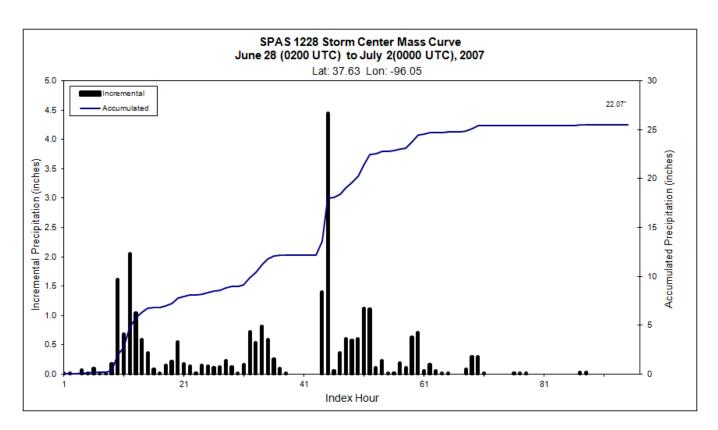
Appendix G: Table G.6: Storm spreadsheet for Fall River, KS, June 30, 2007

	Sto	m 1228	8 - June	e 28 (02	200 UT	C) - Jul	y 2 (00	00 UTC), 2007	•	
		MAXIMU	JM AVEF	RAGE DE	EPTH OF	PRECI	OITATIO	N (INCHE	ES)		
					Du	ration (ho	urs)				
Area (mi ²)	1	2	3	6	12	18	24	36	48	72	Total
0.4	4.68	5.84	6.6	9.12	11.37	14.72	14.91	17.72	22.66	25.43	25.50
1	4.56	5.7	6.41	8.86	10.99	14.35	14.46	17.2	22.09	24.84	24.90
10	4.16	5.5	6.31	8.81	10.69	13.76	13.89	17.08	21.88	24.84	24.90
25	3.78	4.99	6.02	8.51	10.63	13.66	13.85	16.71	20.96	23.86	24.10
50	3.5	4.66	5.58	8.17	10.53	13.31	13.53	16.24	19.81	22.86	23.18
100	3.14	4.26	5.12	7.64	10.22	12.73	13.01	15.68	18.13	21.74	22.11
150	2.9	4	4.91	7.28	9.93	12.22	12.58	14.89	17.55	21.16	21.69
200	2.76	3.83	4.65	6.99	9.61	11.77	11.94	14.76	17.05	20.65	21.28
300	2.49	3.54	4.4	6.5	9.14	11.07	11.13	14.05	16.39	20.02	20.49
400	2.33	3.35	4.11	6.15	8.67	10.39	11.07	13.73	16.03	19.53	20.17
500	2.16	3.18	3.52	5.87	8.36	10.36	10.65	13.24	15.53	19.21	19.84
1,000	1.57	2.66	3.29	4.76	7.18	9.02	10.04	12.13	14.17	18.13	18.71
2,000	1.14	1.79	2.37	3.92	6.03	7.83	8.95	10.82	12.62	16.03	17.37
5,000	0.69	1.29	1.83	2.92	4.73	6.29	6.35	8.96	10.39	13.73	15.17
10,000	0.41	1	1.4	2.15	3.74	5.09	6.01	7.5	8.72	11.08	13.09
20,000	0.26	0.48	0.63	1.48	2.73	3.79	4.55	5.68	6.95	9.18	10.66
50,000	0.14	0.25	0.34	0.68	1.24	1.84	2.11	3.02	3.82	5.21	6.63
65,761	0.12	0.23	0.31	0.55	1.03	1.48	1.87	2.51	3.15	4.44	5.10

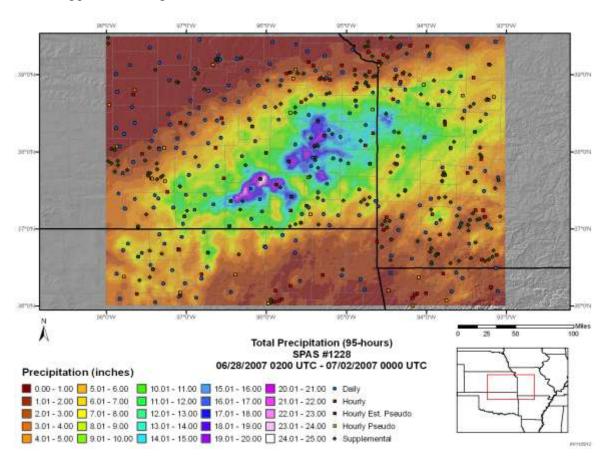
Appendix G: Table G.7: Depth-area-duration values for Fall River, KS June 30, 2007



Appendix G: Figure G.7: Depth-area-duration chart for Fall River, KS June 30, 2007



Appendix G: Figure G.8: Mass curve chart for Fall River, KS June 30, 2007



Appendix G: Figure G.9: Total storm isohyetal analysis for Fall River, KS June 30, 2007

Albany, TX AWA 18 August 3, 1978

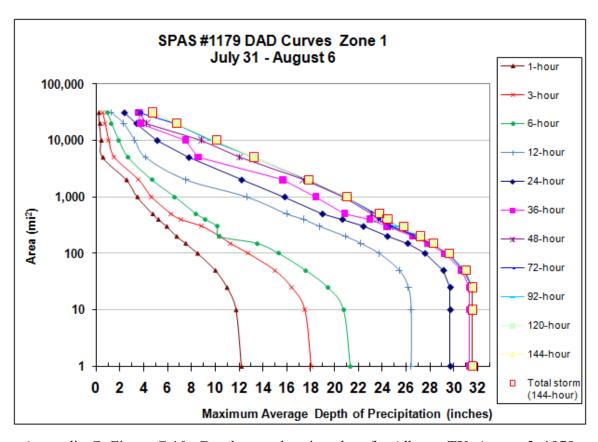
Storm Type: Tropical

rm Name:	SPAS 1179	Amelia- Al	bany, TX		64-	A 31: (ANTO	C-11 D	:4.2	
rm Date: VA Analysis Date:	8/1-5/1978 12/13/2013				Storm .	Adjustr	nent for	r ANO	Grid Po	int 2	
aporal Transposition		15-Jul									
por ar Transposition	II Dute	Lat	Long	1		Moisture I	nflow Direct	ion:	SSE @ 260	miles	
rm center location		32.74 N	99.33 W			Grid Point			550	feet	
rm Rep SST location	n	29.30 N	97.50 W				ter Elevation		1,500	feet	
nsposition Dew Po		31.08 N	93.65 W				Analysis D		12	hours	
d Point location	III Location	34.50 N	95.50 W			Storm Kep	Allalysis Di	ii ativii	12	nours	
The stor	m representa	tive SST is	78.0 F	with total p	recipitable w	ater above s	ea level of			3.29	inches.
	n-place maxis		80.0 F		recipitable w					3.60	inches.
The transpos	itioned maxin	num SST is	81.0 F	with total p	recipitable w	ater above s	sea level of			3.76	inches
	-place storm		1,500		ch subtracts			f precipitabl		78.0 F	
	-place storm		1,500		ch subtracts			f precipitabl		80.0 F	
•	sition storm		550		ch subtracts			f precipitabl		81.0 F	
The grid poin	t/inflow barn	er height is	550	whi	ch subtracts	0.175	inches of	f precipitabl	e water at	81.0 F	
					1	N-4 04	. D T.J t1	- 6	KSJT, KJCT,	VATT	•
	-	e maximizati				KSAT	n Kep 16 take	n irom ave oi	K3J1, KJC1,	KAII,	
Tt		e transpositi				l					
1 ne	elevation/ban	ner adjustme	ant ractor is	1.00		I					
	The to	otal adjustme	ent factor is	1,24		I					
	1110 ((- a a a gus alli			_						
Observed S	storm Depth-	Area-Durat	ion								
Justi ieu i	Deptil-	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	20.8	26.4	-	29.7	-	31.4	31.5	-	31.6	
	100 sq miles	15.3	23.8	_	27.6	-	29.2	29.4	-	29.5	
	200 sq miles	10.3	20.9	-	24.4	-	26.6	26.8	-	27.0	
	500 sq miles	8.4	16.0	-	19.0	-	20.9	23.1	-	23.4	
	000 sq miles	6.6	12.6	-	15.8	-	18.4	20.8	- 1	21.0	
•••••	000 sq miles	4.7	7.5	-	12.2	-	15.7	17.4	-	17.7	
	000 sq miles	2.7	4.2	-	7.8	-	8.5	12.0	-	13.2	-
•••••	000 sq miles	1.9	3.2	-	5.1	-	7.5	8.8	-	9.6	
20	000 sq miles	1.3	2.3	-	3.4	-	3.7	4.3	- 1	6.7	-
Adimeted	torm Danil	Amon December	on								
Adjusted S	torm Depth-A	Area-Durati 6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	25.8	32.9	10 Hours	37.0	JU FIGURS	39.0	48 Hours 39.2	ov nours	39.3	
	10 sq miles	19.1	29.6	<u>-</u>	34.3	-	36.4	36.6	-	36.7	1
	200 sq miles	12.9	26.1	-	30.4	-	33.1	33.3	† - †	33.6	
	500 sq miles	10.5	19.9	-	23.6	-	26.0	28.8	-	29.1	1
••••••	000 sq miles	8.2	15.7	-	19.7	-	22.9	25.9	-	26.2	
	000 sq miles	5.8	9.4	-	15.2	-	19.5	21.6	-	22.0	
	000 sq miles	3.3	5.2	_	9.7	-	10.6	15.0	-	16.4	
***************************************	000 sq miles	2.4	4.0	-	6.3	-	9.3	11.0	-	12.0	
20	000 sq miles	1.6	2.9	-	4.2	-	4.6	5.3	-	8.3	
				~ n							
	orm Center N	ame		SPAS 1179 Ar	nelia- Albany	y, TX					-
Storm Date	`			8/1-5/1978 Pampant Trans	ant Francist						1
Storm Type Storm Loca				Remnant Tropi 32.74 N	99.33 W						1
	er Elevation			1500	27.33 W						1
	n Total & Du	ration (10 se	g mi)	32.5 inches in 4	8 hours. 29 5	" 24 hours	12.47" in 1h	r. 21.94" in 6	ihrs		t
- I Sapatatio			/	and and and		_ ,,		,			1
Storm Repr	esentative S	ST		78.0 F	12						1
_	esentative S		1	29.30 N	97.50 W		J				
	aximum SST			80.0 F			80				
	nflow Vector			SSE @ 260							
In-place M	aximization F	actor									-
											-
	ransposition			15-Jul	02 65 337		-				-
	ion Dewpoint			31.08 N	93.65 W		J 81				-
	ion Maximum			81.0 F			01				1
		nit Factor		550							1
Transposit	destration			220							-
Transposit Grid Point l		sin		14 344							
Transposit Grid Point I Highest Ele	vation in Ba	sin		14,344							
Transposit Grid Point I Highest Ele Inflow Barr	vation in Ba			14,344							

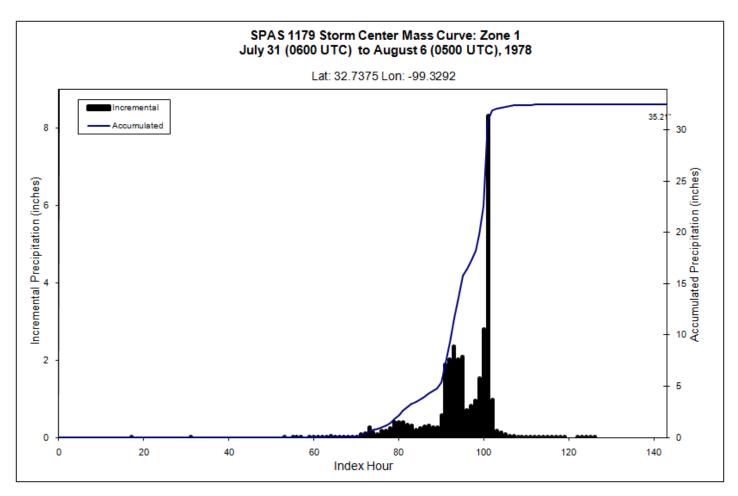
Appendix G: Table G.8: Storm spreadsheet for Albany, TX, August 3, 1978

Stor	n 1179 MA					- Augu ECIPITA		•	00 UTC	:)		
						Duration	n (hours)					
Area (mi²)	1	3	6	12	24	36	48	72	96	120	144	Total
0.30	12.47	18.53	21.94	27.16	30.54	32.22	32.41	32.50	32.51	32.51	32.51	32.51
1	12.19	18.01	21.33	26.43	29.71	31.35	31.52	31.60	31.60	31.60	31.60	31.60
10	11.74	17.48	20.76	26.43	29.71	31.35	31.52	31.60	31.60	31.60	31.60	31.60
25	10.98	16.38	19.45	26.20	29.71	31.35	31.52	31.60	31.60	31.60	31.60	31.60
50	10.00	14.97	17.59	25.44	29.14	30.67	30.83	30.91	30.91	31.06	31.06	31.06
100	8.51	12.74	15.32	23.75	27.58	29.22	29.44	29.51	29.51	29.62	29.62	29.62
150	7.51	11.25	13.52	22.20	26.13	27.86	28.13	28.26	28.27	28.27	28.29	28.29
200	6.75	10.34	10.34	20.94	24.43	26.58	26.77	27.03	27.03	27.21	27.22	27.22
300	5.92	8.87	10.15	18.76	22.41	24.40	24.66	24.69	25.23	25.77	25.83	25.83
400	5.22	7.08	9.16	17.42	20.65	22.97	23.63	23.67	24.45	24.45	24.45	24.45
500	4.74	6.28	8.40	15.98	18.97	20.85	23.11	23.41	23.78	23.78	23.79	23.79
1,000	3.45	4.62	6.61	12.63	15.81	18.43	20.77	21.03	21.04	21.05	21.06	21.06
2,000	2.54	3.55	4.67	7.54	12.19	15.66	17.39	17.66	17.78	17.82	17.84	17.84
5,000	0.55	1.52	2.68	4.15	7.76	8.54	12.04	13.19	13.21	13.22	13.23	13.23
10,000	0.42	1.04	1.91	3.24	5.10	7.50	8.83	9.63	9.65	9.94	10.11	10.11
20,000	0.30	0.74	1.29	2.31	3.38	3.71	4.25	6.67	6.74	6.75	6.75	6.75
31,010	0.22	0.54	0.95	1.27	2.35	3.57	3.63	3.63	4.74	4.75	4.75	4.75

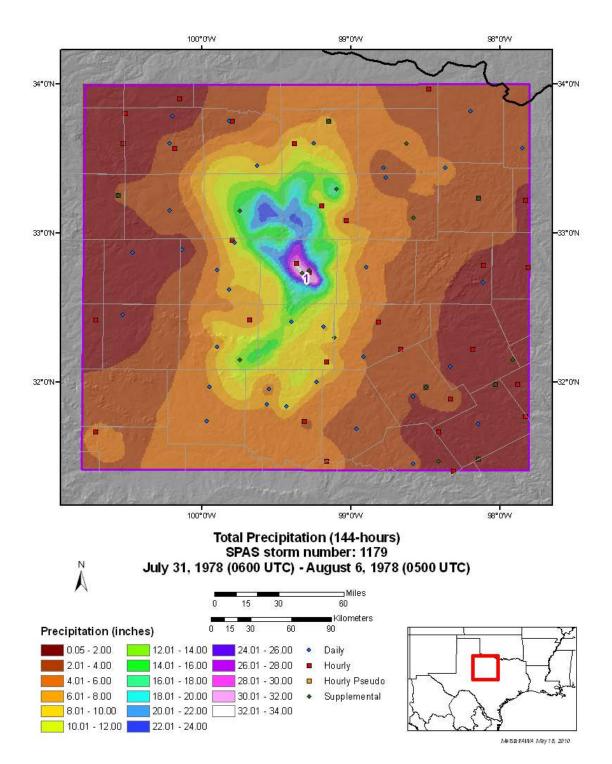
Appendix G: Table G.9: Depth-area-duration values for Albany, TX, August 3, 1978



Appendix G: Figure G.10: Depth-area-duration chart for Albany, TX, August 3, 1978



Appendix G: Figure G.11: Mass curve chart for Albany, TX, August 3, 1978



Appendix G: Figure G.12: Total storm isohyetal analysis for Albany, TX, August 3, 1978

Enid, OK, AWA 21 October 10, 1973

Storm Type: MCC

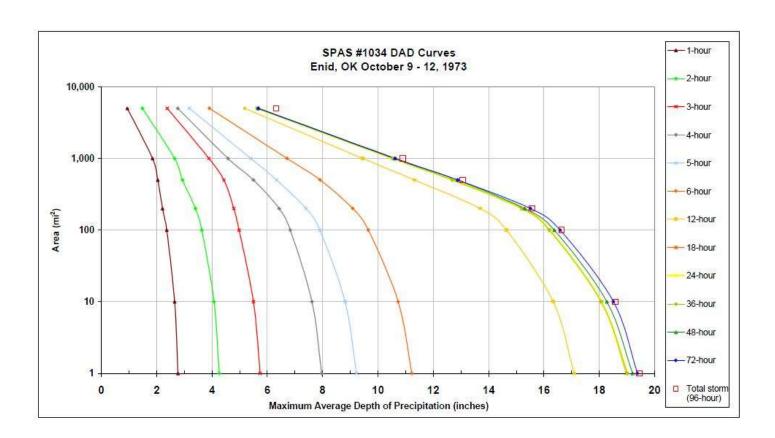
torm Name:		4-Enid, OK			04-	, A 3!		an A NICO	Call		
orm Date: VA Analysis I	10-Oct-197 Date: 12/14/2013				Storm	ı Adjusi	ment i	or ANO	Grid Po	oint 1	
mporal Trans		25-Sep									
mporar rrans	osition Date	Lat	Long			Moisture Ir	ıflow Direct	ion:	SSE @ 225	miles	
orm center loc	ation	36.38 N	97.87 W			Grid Point			350	feet	
			96.55 W						1,250		
orm Rep dew p		33.35 N 30.30 N	96.92 W				ter Elevation		1,250	feet hrs	
ansposition de rid Point locati	wpoint location	35.31 N	90.92 W 93.23 W			Storm Kep	Analysis Du	iration	12	nrs	
Id I offic focati	on	00.0111	70.20 11								
The sto	om representative	dew point is	75.0 F	with tota	al precipitable	e water ahov	re sea levrel c	vf.		2.85	inches
	in-place maximum	_	76.5 F		al precipitable					3.07	inches
	sitioned maximum	-	77.5 F		al precipitable					3.22	inches
	The in-place stom	-	1,250		ch subtracts			f precipitabl	e water at	75.0 F	
	The in-place stom	n elevation is	1,250	whi	ch subtracts	0.325	inches o	f precipitabl	e water at	76.5 F	
The tr	ransposition basir	i elevation at	0	whi	ch subtracts	0.285	inches o	f precipitabl	e water at	77.5 F	
The Gri	id point/inflow bar	nier height is	1,050	whi	ch subtracts	0.285	inches o	f precipitabl	e water at	77.5 F	
	The in-place sto	orm maximizat	ion factor is	1.08					S 1034. 12hr		
Th	ne transposition/el			1.07		KDFW and	WACO from	n 2100CDT 1	.0-9-73 to 0900	0CDT10-10	-73
	The ba	arrier adjustm	ent factor is	1.00							
	TH	tatal a dissar		114							
	The	total adjustm	ent factor is	1.16	I						
O)	and Ctar Day	Aura Donnal									
Obse	rved Storm Depth	-Area-Durati 6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
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•••••	10 sq miles	10.7	16.3	18.1	18.1	-	18.1	18.3	-	18.5	
	100 sq miles	9.7	14.6	16.2	16.2		16.2	16.4		16.6	-
	200 sq miles	9.1	13.7	15.2	15.2	-	15.2	15.3	-	15.5	
	500 sq miles	7.9	11.3	12.7	12.7	-	12.7	12.9	-	12.9	
	1000 sq miles	6.7	9.5	10.5	10.5	-	10.5	10.6	-	10.6	
	5000 sq miles	3.9	5.2	5.6	5.6	-	5.6	5.7	-	5.7	1
	10000 sq miles	0.0	0.0	0.0	0.0	-	0.0	0.0	- 1	0.0	
	20000 sq miles	0.0	0.0	0.0	0.0	-	0.0	0.0	-	0.0	
Adju	sted Storm Depth-	Area-Duratio	on								
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
		13.0	19.7	21.9	22.0	-	22.0	22.2	-	22.4	
	1 sq miles	13.0									
	10 sq miles	12.4	18.9	20.9	20.9	-	20.9	21.1		21.4	
	10 sq miles 100 sq miles	12.4 11.2	18.9 16.9	18.7	18.7	-	18.7	18.9	-	19.2	
	10 sq miles 100 sq miles 200 sq miles	12.4 11.2 10.5	18.9 16.9 15.8	18.7 17.6	18.7 17.6	-	18.7 17.6	18.9 17.7	-	19.2 17.9	
	10 sq miles 100 sq miles 200 sq miles 500 sq miles	12.4 11.2 10.5 9.1	18.9 16.9 15.8 13.1	18.7 17.6 14.7	18.7 17.6 14.7		18.7 17.6 14.7	18.9 17.7 14.9	- - -	19.2 17.9 14.9	
	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles	12.4 11.2 10.5 9.1 7.8	18.9 16.9 15.8 13.1 10.9	18.7 17.6 14.7 12.2	18.7 17.6 14.7 12.2	- - -	18.7 17.6 14.7 12.2	18.9 17.7 14.9 12.2	- - - -	19.2 17.9 14.9 12.3	
	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles	12.4 11.2 10.5 9.1 7.8 4.5	18.9 16.9 15.8 13.1 10.9 6.0	18.7 17.6 14.7 12.2 6.5	18.7 17.6 14.7 12.2 6.5	- - - -	18.7 17.6 14.7 12.2 6.5	18.9 17.7 14.9 12.2 6.6	- - - -	19.2 17.9 14.9 12.3 6.6	
	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles	12.4 11.2 10.5 9.1 7.8 4.5 0.0	18.9 16.9 15.8 13.1 10.9 6.0	18.7 17.6 14.7 12.2 6.5 0.0	18.7 17.6 14.7 12.2 6.5 0.0	- - - - -	18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles	12.4 11.2 10.5 9.1 7.8 4.5	18.9 16.9 15.8 13.1 10.9 6.0	18.7 17.6 14.7 12.2 6.5	18.7 17.6 14.7 12.2 6.5	- - - -	18.7 17.6 14.7 12.2 6.5	18.9 17.7 14.9 12.2 6.6	- - - -	19.2 17.9 14.9 12.3 6.6	
	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles	12.4 11.2 10.5 9.1 7.8 4.5 0.0	18.9 16.9 15.8 13.1 10.9 6.0	18.7 17.6 14.7 12.2 6.5 0.0	18.7 17.6 14.7 12.2 6.5 0.0	- - - - -	18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles	12.4 11.2 10.5 9.1 7.8 4.5 0.0	18.9 16.9 15.8 13.1 10.9 6.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0	18.7 17.6 14.7 12.2 6.5 0.0	- - - - -	18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
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Stom	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 2000 sq miles 20000 sq miles 0 or sq miles	12.4 11.2 10.5 9.1 7.8 4.5 0.0	18.9 16.9 15.8 13.1 10.9 6.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0	- - - - -	18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 20000 sq miles 10000 sq miles 20000 sq miles	12.4 11.2 10.5 9.1 7.8 4.5 0.0	18.9 16.9 15.8 13.1 10.9 6.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73	18.7 17.6 14.7 12.2 6.5 0.0	- - - - -	18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Stom	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 10000 sq miles	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0	18.9 16.9 15.8 13.1 10.9 6.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250	18.7 17.6 14.7 12.2 6.5 0.0 0.0	- - - - - -	18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Stom	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 10000 sq miles 10000 sq miles	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0	18.9 16.9 15.8 13.1 10.9 6.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250	18.7 17.6 14.7 12.2 6.5 0.0 0.0	- - - - - -	18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Stom Precij	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 1 Date(s) 1 Date(s) 1 Type 1 Location 1 Center Elevation pitation Total & D	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0	18.9 16.9 15.8 13.1 10.9 6.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches	18.7 17.6 14.7 12.2 6.5 0.0 0.0		18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Precij	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 20000 sq miles	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0	18.9 16.9 15.8 13.1 10.9 6.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 1-Enid, OK		18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Precij Stom Stom	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 20000 sq miles	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0	18.9 16.9 15.8 13.1 10.9 6.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches	18.7 17.6 14.7 12.2 6.5 0.0 0.0		18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Precip Stom Stom Maxin	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 10000 sq miles 10	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0 Name Dewpoint Dewpoint Loc	18.9 16.9 15.8 13.1 10.9 6.0 0.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches 75.0 F 33.35 N 76.5 F	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 1-Enid, OK		18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Stom Precip Stom Stom Maxin Mois	10 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 10000 sq miles	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0 Name uration Dewpoint Loc.	18.9 16.9 15.8 13.1 10.9 6.0 0.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches 75.0 F 33.35 N 76.5 F SSE @ 225	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 1-Enid, OK		18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Stom Precip Stom Stom Maxin Mois	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 10000 sq miles 10	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0 Name uration Dewpoint Loc.	18.9 16.9 15.8 13.1 10.9 6.0 0.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches 75.0 F 33.35 N 76.5 F	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 1-Enid, OK		18.7 17.6 14.7 12.2 6.5 0.0	18.9 17.7 14.9 12.2 6.6 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Precip Stom Stom Maxin Mois In-pla	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 10000 sq miles 20000 sq miles 10 or Storm Center I In Date(s) In Type In Location In Center Elevation In Representative I I I I I I I I I I I I I I I I I I I	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0 Name Description Description Description Description Description Description Factor	18.9 16.9 15.8 13.1 10.9 6.0 0.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches 75.0 F 33.35 N 76.5 F SSE @ 225 1.08	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 1-Enid, OK		18.7 17.6 14.7 12.2 6.5 0.0 0.0	18.9 17.7 14.9 12.2 6.6 0.0 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Stom Precip Stom Stom Axin Maxin In-pla	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 10000 sq miles 20000 sq miles 10 Date(s) 10 Date(s) 11 Date(s) 12 Date(s) 13 Date(s) 14 Date(s) 15 Date(s) 16 Date(s) 16 Date(s) 17 Date(s) 18 Date(s) 19 Date(s) 19 Date(s) 10 Date(s)	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0 Name Pewpoint Dewpoint Loc	18.9 16.9 15.8 13.1 10.9 6.0 0.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches 75.0 F 33.35 N 76.5 F SSE @ 225 1.08	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 1-Enid, OK 97.87 W		18.7 17.6 14.7 12.2 6.5 0.0 0.0	18.9 17.7 14.9 12.2 6.6 0.0 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Precip Stom Stom Maxin Mois In-pla	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 20000 sq miles 200	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0 Name Pewpoint Dewpoint Loc Factor In (Date) Int Location	18.9 16.9 15.8 13.1 10.9 6.0 0.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches 75.0 F 33.35 N 76.5 F SSE @ 225 1.08	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 1-Enid, OK		18.7 17.6 14.7 12.2 6.5 0.0 0.0	18.9 17.7 14.9 12.2 6.6 0.0 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Precip Stom Stom Asin Maxin Mois In-pla Temp Trans	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 20000 sq miles 200	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0 Name Pewpoint Dewpoint Location in (Date) in Location in Dewpoint	18.9 16.9 15.8 13.1 10.9 6.0 0.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches 75.0 F 33.35 N 76.5 F SSE @ 225 1.08	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 1-Enid, OK 97.87 W		18.7 17.6 14.7 12.2 6.5 0.0 0.0	18.9 17.7 14.9 12.2 6.6 0.0 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Precip Stom Stom Stom Stom Maxin Mois In-pla Temp Trans Trans	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 20000 sq miles 200	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0 Name Pewpoint Dewpoint Location in (Date) in Location in Dewpoint	18.9 16.9 15.8 13.1 10.9 6.0 0.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches 75.0 F 33.35 N 76.5 F SSE @ 225 1.08	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 1-Enid, OK 97.87 W		18.7 17.6 14.7 12.2 6.5 0.0 0.0	18.9 17.7 14.9 12.2 6.6 0.0 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Precip Stom Stom Maxin Mois In-pla Trans Trans Grid I	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 20000 sq miles 200	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0 Name Dewpoint Dewpoint Loc. Factor In (Date) Int Location In Dewpoint Location In Dewpoint Location In Dewpoint Interpretation Interpre	18.9 16.9 15.8 13.1 10.9 6.0 0.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches 75.0 F 33.35 N 76.5 F SSE @ 225 1.08 25-Sep 30.30 N 77.5 F	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 1-Enid, OK 97.87 W		18.7 17.6 14.7 12.2 6.5 0.0 0.0	18.9 17.7 14.9 12.2 6.6 0.0 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	
Stom Stom Stom Precip Stom Stom Maxin Mois In-pla Trans Trans Trans Grid I High	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 10 cation 10 Center I in Date(s) 11 Type 11 Cocation 11 Center Elevation 12 center Elevation 13 Representative I in Represe	12.4 11.2 10.5 9.1 7.8 4.5 0.0 0.0 Name Dewpoint Dewpoint Loc. Factor In (Date) Int Location In Dewpoint Location In Dewpoint Location In Dewpoint Interpretation Interpre	18.9 16.9 15.8 13.1 10.9 6.0 0.0 0.0	18.7 17.6 14.7 12.2 6.5 0.0 0.0 SPAS -1034 10/10/73 MCC 36.38 N 1,250 20.00 Inches 75.0 F 33.35 N 76.5 F SSE @ 225 1.08 25-Sep 30.30 N 77.5 F	18.7 17.6 14.7 12.2 6.5 0.0 0.0 0.0 1-Enid, OK 97.87 W		18.7 17.6 14.7 12.2 6.5 0.0 0.0	18.9 17.7 14.9 12.2 6.6 0.0 0.0	- - - -	19.2 17.9 14.9 12.3 6.6 0.0	

Appendix G: Table G.10: Storm spreadsheet for Enid, OK, October 10, 1973

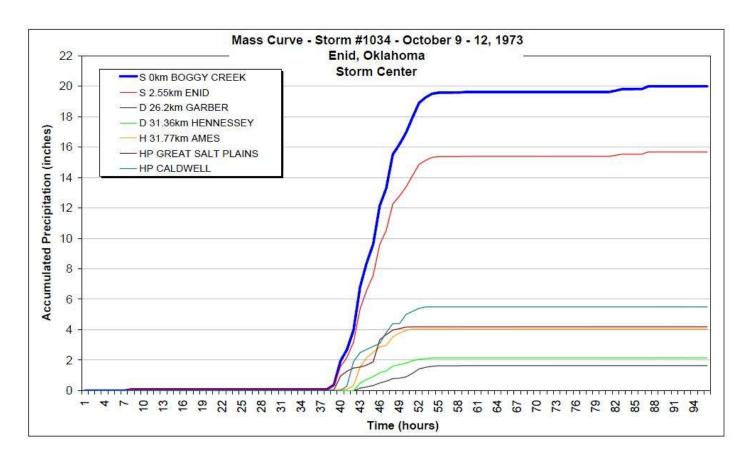
Storm 1034 - Enid OK, October 9 - 12, 1973

MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)

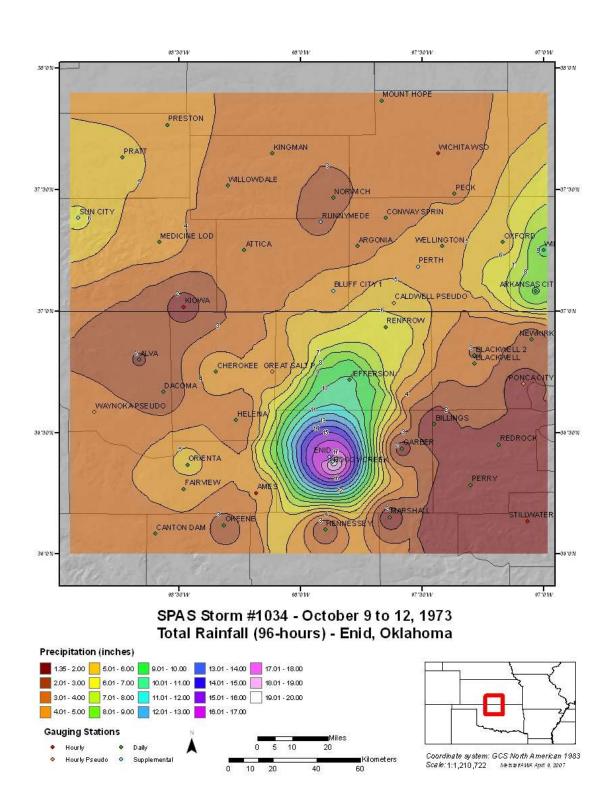
Area (mi²)	Duration (hours)													
	1	2	3	4	5	6	12	18	24	36	48	72	96	total
1	2.77	4.26	5.74	7.96	9.22	11.22	17.09	18.98	19.02	19.02	19.20	19.38	19.45	19.45
10	2.65	4.07	5.50	7.61	8.81	10.73	16.33	18.07	18.07	18.07	18.27	18.51	18.58	18.58
100	2.36	3.63	4.98	6.83	7.90	9.65	14.64	16.19	16.20	16.20	16.37	16.58	16.64	16.64
200	2.21	3.40	4.79	6.43	7.40	9.09	13.69	15.19	15.21	15.21	15.30	15.51	15.57	15.57
500	2.04	2.93	4.43	5.50	6.33	7.91	11.32	12.69	12.69	12.69	12.86	12.89	13.06	13.06
1,000	1.85	2.65	3.89	4.58	5.40	6.71	9.45	10.53	10.53	10.53	10.60	10.63	10.89	10.89
5,000	0.94	1.48	2.38	2.76	3.18	3.91	5.18	5.63	5.63	5.63	5.67	5.68	6.32	6.32



Appendix G: Table G.11: and Appendix G: Figure G.13: Depth-area-duration values Depth-area-duration chart for Enid, OK, October 10, 1973



Appendix G: Figure G.14: Mass curve chart for Enid, OK, October 10, 1973



Appendix G: Figure G.15: Total storm isohyetal analysis for Enid, OK, October 10, 1973

Wooster, OH, AWA 24

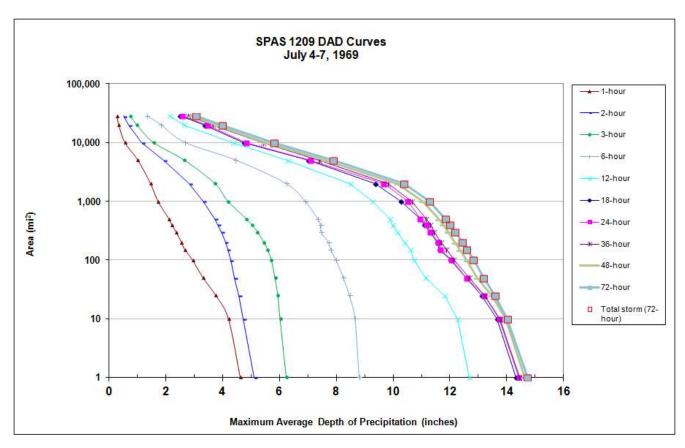
July 4, 1969 Storm Type: Frontal/MCC

orm Name: Wooster, O	Storm Adjustment for ANO Grid Point 8									
orm Date: 7/4-7/1969 WA Analysis Date: 12/14/2013				Storm	ı Aajusi	tment 10	or ANO	Gria Po	ınt 8	
mporal Transposition Date	15-Jul									
Lat Long					Moisture Inflow Direction SW			SW @ 140	miles	
orm Center Location	81.97 W			Grid Point Elevation			1,200	feet		
orm Rep Dew Point Location	83.80 W			Storm Center Elevation			1,150	feet		
ransposition Dew Point Location 41.25 N 94.					Storm Rep Analysis Duration 24			24	hours	
id Point Location	37.50 N	93.00 W								
The storm representative	dew point is	76.0 F	with tot	al precipitable	water abov	e sea level o	f		2.99	inches
The in-place maximum		with total precipitable water above sea level of 3.29								
The transpositioned maximum	•			al precipitable	water abov	e sea level o	f		3.68	inches
The in-place storm			ich subtracts	0.30		f precipitabl		76.0 F		
The in-place storm The transposition basin			ich subtracts ich subtracts	0.32		f precipitabl f precipitabl		78.0 F 80.5 F		
The Grid point/inflow bar			ich subtracts	0.30		f precipitabl		80.5 F		
		2,000								
The in-place sto	orm maximizat	tion factor is	1.10		Notes: DAI) values taken	from SPAS 1	209. Storm rep	oresentative	1
The transposition/el	The transposition/elevation to basin fac			1.14 dew point value was based on maximum 24-hr Td values betw						
The ba	arrier adjustm	ent factor is	1.00		July 4-5, 196	59 at KILN, K	FFO, and KO	CVG.		
TNL -	The total adjustment fac									<u> </u>
The										1
Observed Storm Depth		· · · · · · · · · · · · · · · · · · ·	·			·		,		
	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
1 sq miles	4.6	6.2	8.8	12.7	14.3	14.4	14.5	14.6	14.7	1
10 sq miles 100 sq miles	4.2 2.9	6.0 5.7	8.7 8.0	12.3 10.7	13.7 12.0	13.7 12.1	13.8 12.1	14.0 12.6	14.0 12.8	1
200 sq miles	2.5	5.5	7.7	10.7	11.6	11.6	11.7	12.0	12.4	1
500 sq miles	2.1	4.8	7.3	9.9	11.0	11.0	11.2	11.6	11.8	
1000 sq miles	1.7	4.2	6.9	9.3	10.3	10.5	10.7	11.0	11.3	
2000 sq miles	1.5	3.7	6.2	8.5	9.4	9.7	9.8	10.2	10.4	
5000 sq miles	1.0	2.6	4.5	6.3	7.0	7.1	7.4	7.6	7.9	
10000 sq miles 20000 sq miles	0.5	1.6 1.0	2.7 1.8	4.4 2.6	4.7 3.4	4.8 3.5	5.4 3.7	5.5 3.8	5.8 4.0	-
20000 Sq mmcS	0.0	1.0	1.0	2.0	5.4	0.0		5.0	4.0	
Adjusted Storm Depth-			611	12.11	10.11	24.11	26.11	40.11	72.11	
1 sq miles	1 Hours 5.8	3 Hours 7.8	6 Hours 11.0	12 Hours 15.9	18 Hours 18.0	24 Hours 18.1	36 Hours 18.1	48 Hours 18.3	72 Hours 18.5	
10 sq miles	5.3	7.6	10.9	15.4	17.1	17.2	17.3	17.5	17.6	
100 sq miles	3.7	7.2	10.0	13.4	15.1	15.1	15.2	15.8	16.1	1
200 sq miles	3.2	6.8	9.7	13.0	14.5	14.5	14.7	15.3	15.6	
	2.6	6.1	9.2	12.4	13.7	13.7	14.0	14.6	14.8	
500 sq miles			8.7	11.6	12.9	13.2	13.4	13.8	14.1	
500 sq miles 1000 sq miles	2.1	5.2	79	106		121	172	127		
500 sq miles 1000 sq miles 2000 sq miles	1.8	4.7	7.8 5.6	10.6 7.9	11.8	12.1 8.9	12.3 9.3	12.7 9.6	13.0	
500 sq miles 1000 sq miles		\$	7.8 5.6 3.3	10.6 7.9 5.5		12.1 8.9 6.1	9.3 6.8	12.7 9.6 6.9		
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles	1.8 1.3	4.7 3.3	5.6	7.9	11.8 8.8	8.9	9.3	9.6	13.0 9.9	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	1.8 1.3 0.7	4.7 3.3 1.9	5.6 3.3	7.9 5.5	11.8 8.8 5.9	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	1.8 1.3 0.7 0.4	4.7 3.3 1.9	5.6 3.3 2.3 Wooster, O	7.9 5.5	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center 1 Storm Date(s)	1.8 1.3 0.7 0.4	4.7 3.3 1.9	5.6 3.3 2.3 Wooster, O 7/4-7/1969	7.9 5.5 3.3	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center of Storm Date(s) Storm Type	1.8 1.3 0.7 0.4	4.7 3.3 1.9	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic	7.9 5.5 3.3 H SPAS 120	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center of Storm Date(s) Storm Type Storm Location	1.8 1.3 0.7 0.4	4.7 3.3 1.9	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N	7.9 5.5 3.3	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center? Storm Date(s) Storm Type	1.8 1.3 0.7 0.4	4.7 3.3 1.9	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic	7.9 5.5 3.3 H SPAS 120 81.97 W	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	1.8 1.3 0.7 0.4	4.7 3.3 1.9	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches	7.9 5.5 3.3 H SPAS 120 81.97 W	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation	1.8 1.3 0.7 0.4 Name Dewpoint	4.7 3.3 1.9 1.2	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N 1,150	7.9 5.5 3.3 H SPAS 120 81.97 W	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative D	1.8 1.3 0.7 0.4 Name Dewpoint	4.7 3.3 1.9 1.2	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches	7.9 5.5 3.3 H SPAS 120 81.97 W 5 72-hours	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
Storm Center Elevation Storm Center Elevation Storm Precipitation Total & D Storm Representative D Maximum Dewpoint Moisture Inflow Vector	1.8 1.3 0.7 0.4 Name Description	4.7 3.3 1.9 1.2	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140	7.9 5.5 3.3 H SPAS 120 81.97 W 5 72-hours	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center? Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Storm Representative E Storm Representative D Maximum Dewpoint	1.8 1.3 0.7 0.4 Name Description	4.7 3.3 1.9 1.2	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F	7.9 5.5 3.3 H SPAS 120 81.97 W s 72-hours 24 83.80 W	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
Storm Center Elevation Precipitation Total & D Storm Representative E Storm Proposition Storm Storm Center I Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Maximum Dewpoint Moisture Inflow Vector In-place Maximization F	1.8 1.3 0.7 0.4 Name Pewpoint Dewpoint Loc Factor In (Date)	4.7 3.3 1.9 1.2	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10	7.9 5.5 3.3 H SPAS 120 81.97 W 5 72-hours 24 83.80 W	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
Storm Orstorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition	1.8 1.3 0.7 0.4 Name Description Descrip	4.7 3.3 1.9 1.2	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10 15-Jul 41.25 N	7.9 5.5 3.3 H SPAS 120 81.97 W s 72-hours 24 83.80 W	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoir Transposition Maximum	1.8 1.3 0.7 0.4 Name Dewpoint Dewpoint Loc Factor In (Date) It Location Dewpoint Dewpoint	4.7 3.3 1.9 1.2	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10 15-Jul 41.25 N 80.5 F	7.9 5.5 3.3 H SPAS 120 81.97 W 5 72-hours 24 83.80 W	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoin Transposition Maximum Transposition Adjustm	1.8 1.3 0.7 0.4 Name Dewpoint Dewpoint Loc Factor In (Date) It Location Dewpoint Dewpoint	4.7 3.3 1.9 1.2	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10 15-Jul 41.25 N 80.5 F 1.14	7.9 5.5 3.3 H SPAS 120 81.97 W 5 72-hours 24 83.80 W	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative E Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoir Transposition Maximum	1.8 1.3 0.7 0.4 Name Dewpoint Dewpoint Loc Factor In (Date) In Location In Dewpoint Locati	4.7 3.3 1.9 1.2	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10 15-Jul 41.25 N 80.5 F	7.9 5.5 3.3 H SPAS 120 81.97 W 5 72-hours 24 83.80 W	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Tenter I Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative D Maximum Dewpoint Moisture Inflow Vector In-place Maximization F Temporal Transposition Transposition Dewpoir Transposition Maximum Transposition Adjustm Grid Point Elevation	1.8 1.3 0.7 0.4 Name Dewpoint Dewpoint Loc Factor In (Date) In Location In Dewpoint Locati	4.7 3.3 1.9 1.2	5.6 3.3 2.3 Wooster, O 7/4-7/1969 Synoptic 40.91 N 1,150 14.73 Inches 76.0 F 39.43 N 78.0 F SW @ 140 1.10 15-Jul 41.25 N 80.5 F 1.14 1,200	7.9 5.5 3.3 H SPAS 120 81.97 W 5 72-hours 24 83.80 W	11.8 8.8 5.9 4.2	8.9 6.1	9.3 6.8	9.6 6.9	13.0 9.9 7.3	

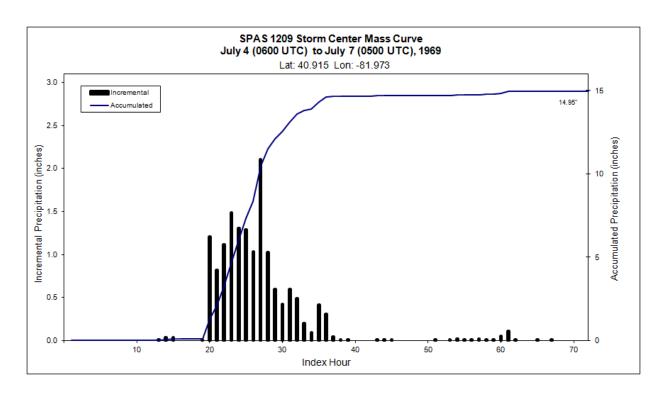
Appendix G: Table G.12: Storm spreadsheet for Wooster, OH July 4, 1969

Storm 1209 - July 4 (0600 UTC) - July 7 (0500 UTC),1969												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
	Duration (hours)											
Area (mi ²)	1	2	3	6	12	18	24	36	48	72	Total	
0.3	4.82	5.33	6.41	8.95	13.02	14.58	14.67	14.69	14.94	14.95	14.95	
1	4.62	5.11	6.24	8.81	12.67	14.32	14.44	14.45	14.63	14.73	14.73	
10	4.2	4.72	6.02	8.66	12.26	13.66	13.74	13.77	13.97	14.02	14.02	
25	3.75	4.56	5.94	8.46	11.81	13.13	13.21	13.23	13.47	13.58	13.58	
50	3.3	4.42	5.84	8.25	11.14	12.57	12.59	12.69	12.97	13.19	13.19	
100	2.93	4.27	5.71	7.99	10.72	12.02	12.06	12.14	12.59	12.83	12.83	
150	2.66	4.17	5.58	7.81	10.59	11.63	11.66	11.88	12.35	12.6	12.60	
200	2.54	4.09	5.45	7.72	10.4	11.56	11.6	11.69	12.18	12.44	12.44	
300	2.35	3.96	5.22	7.46	10.14	11.3	11.3	11.44	11.94	12.19	12.19	
400	2.2	3.83	5.02	7.44	9.97	11.1	11.18	11.31	11.75	12	12.00	
500	2.1	3.72	4.83	7.34	9.88	10.95	10.96	11.16	11.61	11.84	11.84	
1,000	1.71	3.31	4.18	6.9	9.27	10.28	10.52	10.66	11.04	11.27	11.27	
2,000	1.45	2.82	3.72	6.23	8.48	9.38	9.67	9.83	10.15	10.39	10.39	
5,000	1	1.93	2.64	4.45	6.27	7.02	7.09	7.4	7.62	7.9	7.90	
10,000	0.54	1.14	1.55	2.66	4.35	4.74	4.83	5.42	5.52	5.81	5.81	
20,000	0.33	0.69	0.97	1.82	2.64	3.37	3.47	3.65	3.78	3.98	3.98	
28,279	0.27	0.51	0.74	1.33	2.13	2.5	2.59	2.79	2.89	3.06	3.06	

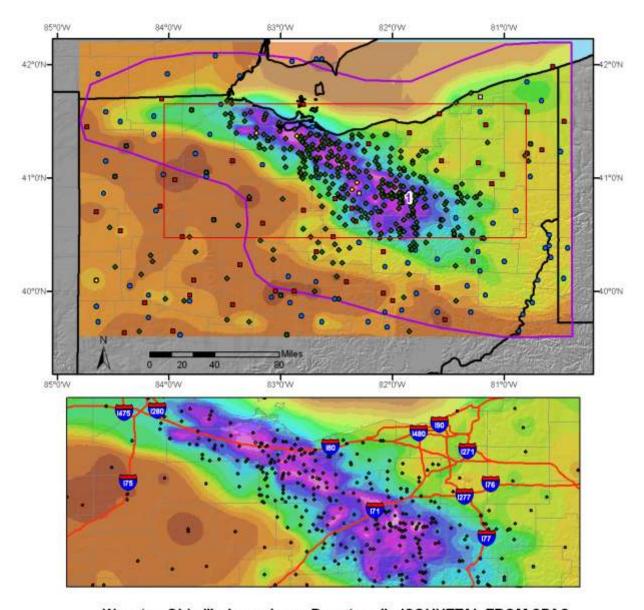
Appendix G: Table G.13: Depth-area-duration values for Wooster, OH July 4, 1969



Appendix G: Figure G.16: Depth-area-duration chart for Wooster, OH July 4, 1969



Appendix G: Figure G.17: Mass curve chart for Wooster, OH July 4, 1969



Wooster, Ohio "Independence Day storm" - ISOHYETAL FROM SPAS



Appendix G: Figure G.18: Total storm isohyetal analysis for Wooster, OH July 4, 1969

Gladewater, TX, AWA 25

April 27, 1966 Storm Type: Frontal

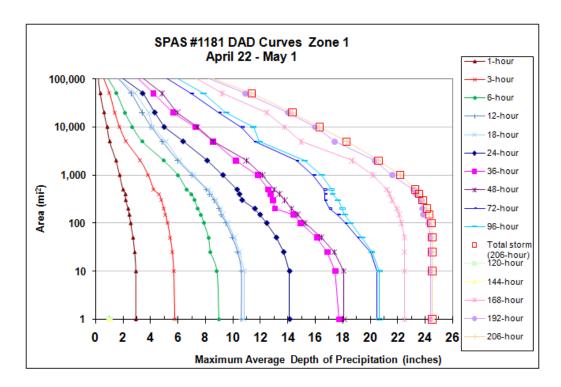
rm Name:	SPAS 1181-GI	adewater, TX								-	
rm Date:	4/22-5-1/1966				Sto	rm Adju	stment for	r ANO G	rid Point 1		
A Analysis Date:	12/14/2013				UN HEREAU.		13.000.000.000.000		SAN		
poral Transposition	Date	15-May									
		Lat	Long		U	Moisture Infl	ow Direction:		SSE @ 130	miles	
rm center location		32.80 N	94.71 W			Grid Point El	evation		350	feet	
rm Rep SST location	ē	31.00 N	94.00 W			Storm Center	r Elevation		250	feet	
nsposition SST loca		31.52 N	97.49 W		Ü.		nalysis Duratio		24	hours	
d Point location		35.31 N	93.23 W			Course step : 2		-		110423	
	The storm represer	ntative SST is	71.5 F	with total	precipitable water	rahove sea les	vel of			2.42	inche
	The in-place ma		77.0 F		precipitable water					3.14	inche
Th	e transpositioned ma		77.0 F		precipitable water					3.14	inche
	The in-place stor		250		which subtracts			of precipitable	water at	71.5 F	
	The in-place stor		250		which subtracts	0.07		of precipitable		77.0 F	
T	he transposition ston	m elevation at	350		which subtracts	0.28	inches	of precipitable	water at	77.0 F	
Th	e Grid point inflow be	amier height is	1,050		which subtracts	0.28	inches	of precipitable	water at	77.0 F	
449					- 50						
	Thei	n-place maximiz	ation factor is	1.30	1	Notes:					7
			sition factor is	0.93							
	The elevation	n/barrier adjust		1.00	1 1	1					

	3	The total adjust	ment factor is	1.21							
•											
Observed	Storm Depth-Area-I	Duration									
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	8.8	10.6	10.8	14.1		17.5	18.1		20.5	
	100 sq miles	7.9	9.5	9.6	12.5		14.9	15,2		18.2	
consider.	200 sq miles	7.4	9.0	9.1	11.6	i.	13.1	14.3	I	17.0	
	500 sq miles	6.6	8.1	8.2	10.3	i := 1	12.6	13.0	-	16.7	
	1000 sq miles	6.0	7.0	7.1	9.3	-	11.8	12.2	-	15.9	
1-333-50	2000 sq miles	4.9	6.0	6.1	8.1		10.2	11.0		14.6	
	5000 sq miles	3.4	4.8	5.1	6.4	(4)	8.6	8.6		11.6	
	10000 sq miles	2.7	4.0	4.1	5.0	-	7.3	7.4	- 1	10.6	
	20000 sq miles	2.1	3.4	3.9	4.3	- E	5.6	6.0	- 1	9.0	
Adjusted	Storm Depth-Area-D	uration									
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	10.7	12.8	13.1	17.1		21.1	21.9	-	24.8	-
	100 sq miles	9.5	11.5	11.6	15.1		18.1	18.5		22.1	-
-	200 sq miles	9.0	10.9	11.0	14.1		15.8	17.3		20.6	-
	500 sq miles	8.0	9.8	9.9	12.5		15.3	15.8		20.2	-
	1000 sq miles	7.2	8.5	8.7	11.2	-	14.3	14.7		19.2	-
	2000 sq miles	6.0	7.2	7.4	9.9		12.4	13.3		17.7	-
							10.				-
	5000 sq miles	4.1	5.9	6.2	7.7		10.4	10.4		14.0	
	5000 sq miles 10000 sq miles	3.2	4.9	5.0	6.1		8.8	9.0	- 1	14.0 12.9	+
	5000 sq miles						-			14.0	1
	5000 sq miles 10000 sq miles	3.2	4.9	5.0	6.1		8.8	9.0		14.0 12.9	1
	5000 sq miles 10000 sq miles 20000 sq miles	3.2	4.9 4.1	5.0 4.7	6.1 5.2		8.8	9.0		14.0 12.9	1
	5000 sq miles 10000 sq miles 20000 sq miles Storm Center Name	3.2	4.9	5.0 4.7 SPAS 1181-0	6.1		8.8	9.0		14.0 12.9	
Storm Da	5000 sq miles 10000 sq miles 20000 sq miles Storm Center Name te(s)	3.2	4.9	5.0 4.7 SPAS 1181-0 4/22-5-1/1966	6.1 5.2 Hadewater, TX		8.8	9.0		14.0 12.9	
Storm Da Storm Ty	5000 sq miles 10000 sq miles 20000 sq miles Storm Center Name te(s)	3.2	4.9	5.0 4.7 SPAS 1181-6 4/22-5-1/1966 General Storm	6.1 5.2 Hadewater, TX		8.8	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo	5000 sq miles 10000 sq miles 20000 sq miles Storm Center Name te(s) pe cation	3.2	4.9	5.0 4.7 SPAS 1181-6 4/22-5-1/1966 General Storm 32.80 N	6.1 5.2 Hadewater, TX		8.8	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Cer	5000 sq miles 10000 sq miles 20000 sq miles Storm Center Name te(s) pe cation nter Elevation	3.2	4.9	5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250	6.1 5.2 Hadewater, TX		8.8	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Cer	5000 sq miles 10000 sq miles 20000 sq miles Storm Center Name te(s) pe cation	3.2	4.9	5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250	6.1 5.2 Hadewater, TX		8.8	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Cer Precipitat	5000 sq miles 10000 sq miles 20000 sq miles Storm Center Name te(s) pe cation inter Elevation ion Total & Duration	3.2	4.9	5.0 4.7 SPAS 1181-6 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in	6.1 5.2 Hadewater, TX		8.8	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Cer Precipitat	5000 sq miles 10000 sq miles 20000 sq miles Storm Center Name te(s) pe cation nter Elevation ion Total & Duration presentative SST	3.2 2.6	4.9	5.0 4.7 SPAS 1181-0 4/22-5-1/1966 General Storm 32.80 N 250 250 2535 inches in	6.1 5.2 Sladewater, TX 94.71 W n 206 hours, 18.57		8.8	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Cer Precipitat Storm Re Storm Re	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Center Name te(s) pe cation nter Elevation son Total & Duration presentative SST presentative SST Loo	3.2 2.6	4.9	5.0 4.7 SPAS 1181-C 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N	6.1 5.2 Hadewater, TX		8.8 6.8	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Ce Precipitat Storm Re Storm Re	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Center Name te(s) pe cation nter Elevation sion Total & Duration presentative SST presentative SST Loc Maximum SST	3.2 2.6	4.9	5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N 77.0 F	6.1 5.2 Sladewater, TX 94.71 W n 206 hours, 18.57		8.8	9.0		14.0 12.9	
Storm Da Storm Ty Storm Co Storm Ce Precipitat Storm Re In-place ! Moisture	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles storm Center Name te(s) pe cation onter Elevation ion Total & Duration presentative SST presentative SST Loc Maximum SST Inflow Vector	3.2 2.6	4.9	5.0 4.7 SPAS 1181-C 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N	6.1 5.2 Sladewater, TX 94.71 W n 206 hours, 18.57		8.8 6.8	9.0		14.0 12.9	
Storm Da Storm Ty Storm Co Storm Ce Precipitat Storm Re In-place ! Moisture	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Center Name te(s) pe cation nter Elevation sion Total & Duration presentative SST presentative SST Loc Maximum SST	3.2 2.6	4.9	5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N 77.0 F	6.1 5.2 Sladewater, TX 94.71 W n 206 hours, 18.57		8.8 6.8	9.0		14.0 12.9	
Storm Da Storm Ty, Storm Lo. Storm Cer Precipitat Storm Rej Storm Rej In-place I Moisture In-place I	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Center Name te(s) pe cation miter Elevation ion Total & Duration presentative SST presentative SST Loo Maximum SST Inflow Vector Maximum SST	3.2 2.6 (10 sq mi)	4.9	5.0 4.7 SPAS 1181-C 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches ir 71.5 F 31.00 N 77.0 F SSE @ 130	6.1 5.2 Sladewater, TX 94.71 W 9206 hours, 18.57		8.8 6.8	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Ce Precipitat Storm Re Storm Re In-place I Moisture In-place I Temporal	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Center Name te(s) pe cation nter Elevation sion Total & Duration presentative SST presentative SST Loc Maximum SST Inflow Vector Maximization Factor Transposition (Date)	3.2 2.6 (10 sq mi)	4.9	5.0 4.7 SPAS 1181-G 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N 77.0 F	6.1 5.2 Sladewater, TX 94.71 W 9206 hours, 18.57		8.8 6.8	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Ce Precipitat Storm Re Storm Re In-place ! Moisture Ir-place ! Temporal Transpos	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles storm Center Name te(s) pe cation onter Elevation fon Total & Duration presentative SST presentative SST Loc Maximum SST Inflow Vector Maximization Factor Transposition (Date) ition Dewpoint Locat	3.2 2.6 (10 sq mi)	4.9	5.0 4.7 SPAS 1181-C 4/22-5-1/1966 General Storm 32.80 N 25.35 inches ii 71.5 F 31.00 N 77.0 F SSE @ 130	6.1 5.2 Sladewater, TX 94.71 W n 206 hours, 18.57		8.8 6.8 M	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Cer Precipitat Storm Re Storm Re In-place ! Moisture In-place ! Temporal Transpos Transpos	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm Center Name te(s) pe cation nter Elevation sion Total & Duration presentative SST presentative SST Loc Maximum SST Inflow Vector Maximization Factor Transposition (Date)	3.2 2.6 1 (10 sq mi) cation	4.9	5.0 4.7 SPAS 1181-C 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N 77.0 F SSE @ 130	6.1 5.2 Sladewater, TX 94.71 W n 206 hours, 18.57		8.8 6.8 M	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Cel Precipitat Storm Re Storm Re In-place I Temporal Transpos Transpos Transpos	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles storm Center Name te(s) pe cation onter Elevation ion Total & Duration presentative SST presentative SST Loc Maximum SST Inflow Vector Maximization Factor I Transposition (Date) ition Dewpoint Local ition Maximum SST	3.2 2.6 1 (10 sq mi) cation	4.9	5.0 4.7 SPAS 1181-C 4/22-5-1/1966 General Storm 32.80 N 250 25.35 inches in 71.5 F 31.00 N 77.0 F SSE @ 130	6.1 5.2 Sladewater, TX 94.71 W n 206 hours, 18.57		8.8 6.8 M	9.0		14.0 12.9	
Storm Da Storm Ty, Storm Lo. Storm Cer Precipitat Storm Re, In-place I Moisture In-place I Temporal Transpos Transpos Grid Poin	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Center Name te(s) pe cation niner Elevation tion Total & Duration presentative SST presentative SST Loc Maximum SST Inflow Vector Maximuzation Factor Transposition (Date sition Depoint Local sition Maximum SST inflom Adjustment Factor	3.2 2.6 1 (10 sq mi) cation	4.9	5.0 4.7 SPAS 1181-C 4/22.5-1/1966 General Storm 32.80 N 250 25 35 inches ir 71.5 F 31.00 N 77.0 F SSE @ 130	6.1 5.2 Sladewater, TX 94.71 W n 206 hours, 18.57		8.8 6.8 M	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Cer Precipitat Storm Re Storm Re In-place I Moisture In-place I Temporal Transpos Transpos Gnd Poim Highest I	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Center Name te(s) pe cation miter Elevation ion Total & Duration presentative SST presentative SST Loc Maximum SST Inflow Vector Maximuzation Factor Transposition (Date) sition Dewpoint Locat sition Adjustment Fact t Elevation	3.2 2.6 1 (10 sq mi) cation	4.9	5.0 4.7 SPAS 1181-C 4/22-5-1/1966 General Storm 32.80 N 25.35 inches ir 71.5 F 31.00 N 77.0 F SSE @ 130 15-May 31.52 N 77.0 F	6.1 5.2 Sladewater, TX 94.71 W n 206 hours, 18.57		8.8 6.8 M	9.0		14.0 12.9	
Storm Da Storm Ty Storm Lo Storm Cer Precipitat Storm Rej Storm Rej In-place ! Moisture In-place ! Temporal Transpos Transpos Grid Poim Highest E Inflow Ba	5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Center Name te(s) pe cation noter Elevation ion Total & Duration presentative SST presentative SST presentative SST Loc Maximum SST Inflow Vector Maximum SST Inflow Vector Maximum SST Inflom Vector I Transposition (Date) ition Dewpoint Locat ition Maximum SST ition Adjustment Fac t Elevation Devation in Basin	3.2 2.6 1 (10 sq mi) cation	4.9	5.0 4.7 SPAS 1181-C 4/22-5-1/1966 General Storm 32.80 N 25.35 inches ir 71.5 F 31.00 N 77.0 F SSE @ 130 15-May 31.52 N 77.0 F	6.1 5.2 Sladewater, TX 94.71 W n 206 hours, 18.57		8.8 6.8 M	9.0		14.0 12.9	

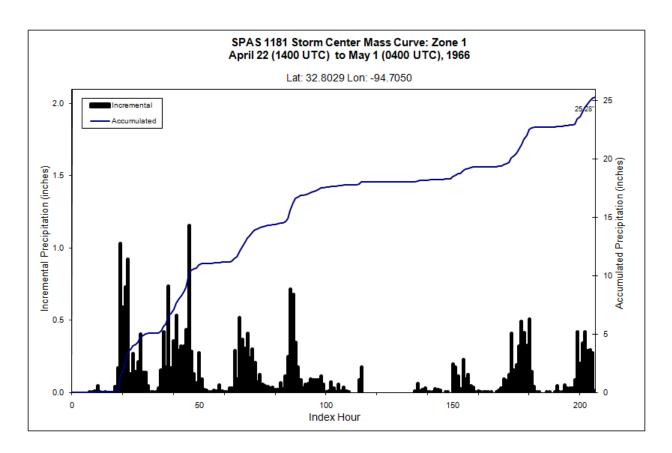
Appendix G: Table G.14: Storm spreadsheet for Gladewater, TX, April 27, 1966

			Sto	rm 118 MA	1 - Apı XIMUM A	ril 22, 1	966 (14 E DEPTI	00 UTO	C) - May	/ 1, 196 TION (IN	6 (040) CHES)	0 UTC)				
									n (hours)	,						
Area (mi²)	1	3	6	12	18	24	36	48	72	96	120	144	168	192	206	Total
0.30	2.98	5.88	9.17	10.89	11.12	14.53	18.21	18.57	21.04	21.17	21.17	21.59	23.27	25.21	25.28	25.28
1	2.92	5.75	8.97	10.59	10.80	14.13	17.74	18.09	20.49	20.68	20.69	21.10	22.51	24.41	24.52	24.52
10	2.92	5.68	8.82	10.59	10.80	14.12	17.45	18.07	20.49	20.68	20.69	21.10	22.51	24.41	24.52	24.52
25	2.83	5.57	8.35	10.32	10.47	13.69	16.88	17.38	20.01	20.13	20.13	20.61	22.51	24.41	24.52	24.52
50	2.71	5.43	8.21	9.96	10.13	13.16	16.14	16.47	19.11	19.42	19.46	19.53	22.51	24.41	24.52	24.52
100	2.54	5.23	7.87	9.48	9.61	12.46	14.93	15.23	18.20	18.57	18.57	19.35	22.28	24.22	24.46	24.46
150	2.44	5.08	7.67	9.15	9.24	11.98	14.43	14.74	17.64	18.15	18.15	19.02	22.12	23.84	24.30	24.30
200	2.36	4.96	7.42	8.98	9.09	11.60	13.07	14.28	17.02	17.98	18.02	18.89	21.95	23.80	24.14	24.14
300	2.18	4.77	7.19	8.63	8.74	10.67	12.91	13.78	16.67	17.65	17.88	18.63	21.61	23.72	23.82	23.82
400	2.16	4.61	6.99	8.31	8.38	10.48	12.75	13.39	16.67	17.27	17.30	18.31	21.41	23.32	23.55	23.55
500	1.99	4.23	6.62	8.08	8.19	10.31	12.59	13.01	16.66	17.19	17.26	17.90	21.21	23.15	23.29	23.29
1,000	1.74	3.82	5.97	7.01	7.14	9.28	11.83	12.17	15.85	16.49	16.70	17.35	20.22	21.60	22.20	22.20
2,000	1.48	3.24	4.94	5.97	6.10	8.13	10.22	10.97	14.62	15.22	15.34	16.02	18.68	20.32	20.60	20.60
5,000	1.02	2.21	3.38	4.84	5.13	6.38	8.56	8.56	11.57	11.93	13.28	13.60	14.97	17.43	18.28	18.28
10,000	0.84	1.73	2.68	4.04	4.14	5.01	7.27	7.41	10.61	11.50	11.87	12.20	13.75	15.98	16.30	16.30
20,000	0.61	1.38	2.11	3.38	3.88	4.32	5.64	5.95	8.98	9.52	9.53	9.92	12.48	14.03	14.34	14.34
50,000	0.34	1.00	1.52	2.57	2.88	3.44	4.20	4.84	6.94	7.86	7.97	8.44	9.21	10.90	11.37	11.37
110,790	0.20	0.52	0.81	1.50	1.50	1.77	2.92	3.28	4.96	5.68	5.80	6.18	7.06	7.87	8.14	8.14

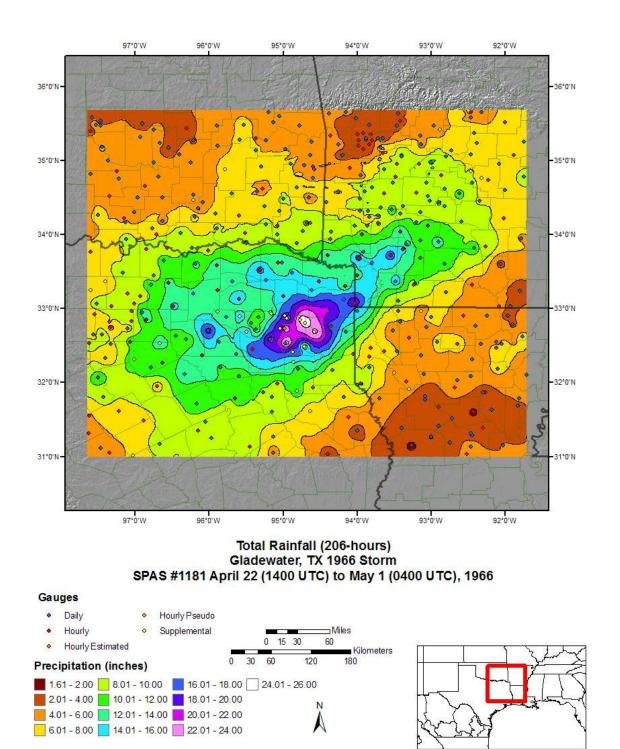
Appendix G: Table G.15: Depth-area-duration values for Gladewater, TX, April 27, 1966



Appendix G: Figure G.19: Depth-area-duration chart for Gladewater, TX, April 27, 1966



Appendix G: Figure G.20: Mass curve chart for Gladewater, TX, April 27, 1966



Appendix G: Figure G.21: Total storm isohyetal analysis for Gladewater, TX, April 27, 1966

Edgerton, MO, AWA 26 July 18, 1965

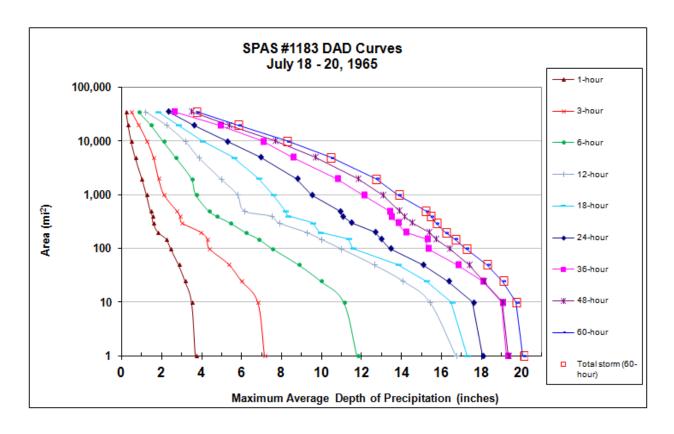
Storm Type: Frontal/MCC

Storm Name:	SPAS 1183		МО		G4		4.0	4370	C		
Storm Date:	7/18-20/19				Storm A	Adjustn	nent fo	r ANO	Grid Po	oint 1	
	Date: 12/14/2013										
emporal Trans	sposition Date	15-Jul Lat	Long			Moisture I	nflow Direc	tion	SW @ 100	miles	
Storm Center L	contion	40.41 N	95.51 W			Grid Point		tion	350	feet	
									950		
•	Point Location	39.22 N	96.58 W				ter Elevatio		24	feet	
l ransposition D Grid Point Loca	Dew Point Location	41.54 N 35.31 N	93.69 W 93.23 W			Storm Rep	Analysis D	uration	24	hours	
JIId I OIII LOCA	tion	55.5111	70.20 11								
The stor	m representative d	ew point is	76.0 F	with total p	precipitable w	ater above	sea level of			2.99	inches.
The i	n-place maximum d	ew point is	80.5 F	with total p	precipitable w	ater above	sea level of			3.68	inches.
The transpos	sitioned maximum d	ew point is	80.5 F	with total p	precipitable w	ater above	sea level of			3.68	inches.
	The in-place storm e				ich subtracts			precipitabl		76.0 F	
	The in-place storm e				ich subtracts			precipitabl		80.5 F	
	ansposition storm e				ich subtracts ich subtracts	0.30		precipitabl		80.5 F	
i ne Gno	d Point/inflow barri	er neight is	1,000	wn	ich subtracts	0.30	inches of	f precipitabl	e water at	80.5 F	
	The in-place	e mavimizati	on factor is	1.24		Notes:					
			on factor is	1.00		110103.					
	The elevation/barri	•		1.00							
	The tot	tal adjustme	ent factor is	1.23		L					
lo:	184 B	A 70	41								
Obs	erved Storm Depth	-Area-Dura 1 Hours	tion 6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hour
	1 sq miles	3.7	0 Hours	12 Hours 16.7	18 Hours	24 Hours 18.0	30 Hours	30 Hours 19.3	48 Hours 19.4	20.1	/2 Hour
	10 sq miles	3.5	11.1	15.4	16.5	17.6	-	19.0	19.4	19.7	-
	100 sq miles	2.4	7.5	11.0	11.5	13.4	-	15.3	16.4	17.2	-
	200 sq miles	1.8	6.2	9.2	9.9	12.7	-	14.2	15.4	16.2	-
	500 sq miles	1.4	4.4	6.1	8.2	10.9	-	13.4	13.9	15.2	-
	1000 sq miles	1.2	3.7	5.8	7.6	9.5	-	12.1	13.0	13.8	-
	2000 sq miles	1.0	3.5	4.9	6.8	8.7	-	10.8	11.8	12.7	-
	5000 sq miles	0.6	2.7	3.8	5.6	6.9	-	8.5	9.7	10.4	_
	10000 sq miles	0.4	2.1	3.2	4.0	5.2	-	7.0	7.7	8.2	-
	20000 sq miles	0.3	1.4	2.2	2.8	3.6	-	4.9	5.4	5.8	-
Adia	ısted Storm Depth-	Anna Duna	tion								
Auje	isteu Storm Deptii-	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hour
	1 sq miles	4.5	14.5	20.6	21.3	22.2	-	23.7	23.8	24.7	-
	10 sq miles	4.3	13.7	19.0	20.3	21.6	-	23.4	23.4	24.2	-
	100 sq miles	3.0	9.2	13.5	14.2	16.5	-	18.8	20.2	21.2	-
	200 sq miles	2.2	7.6	11.4	12.2	15.6	-	17.4	18.9	19.9	-
	500 sq miles	1.7	5.4	7.5	10.0	13.4	-	16.4	17.1	18.7	-
	1000 sq miles	1.5	4.6	7.1	9.3	11.7	-	14.9	16.0	17.0	-
	2000 sq miles	1.2	4.3	6.1	8.4	10.8	-	13.2	14.5	15.6	-
	5000 sq miles 10000 sq miles	0.8 0.5	3.3 2.5	4.7 3.9	6.9 4.9	8.5 6.4	-	10.5 8.6	11.9 9.4	12.8 10.1	-
	20000 sq miles	0.4	1.8	2.7	3.5	4.4	-	6.0	6.6	7.1	-
	m or Storm Center I	Vame		SPAS 1183-E	dgerton, MO						
	m Date(s)			7/18-20/1965							
	т Туре			General Storm							
	m Location m Center Elevation			40.41 N 950	95.51 W						
	ipitation Total & D		sa mi)	20.76 inches in	60hrs 18 50	' in 24hrs					
1160	-paulon rotat & D	(IV	-4)	20.70 HIGHES III	. 301113, 10.39	ar 271113					1
Ston	m Representative D	ew Point		76.0 F	24						
Ston	m Representative D		ocation	39.22 N	96.58 W						
	imum Dew Point			80.5 F							
	sture Inflow Vector			SW @ 100							
In-pi	lace Maximization F	actor		1.24							
Tom	poral Transposition	(Date)		15-Jul							1
	poral Transposition Isposition Dew Poir			41.54 N	93.69 W						1
	isposition Maximur			80.5 F	73.07 W						1
	sposition Adjustm			1.00							1
	Point Elevation			350							
	nest Elevation in Ba	sin		14,344							
	w Barrier Height			1,000							
	ation Adjustment F			1.00							
	al Adjustment Facto	· ·		1.23							1

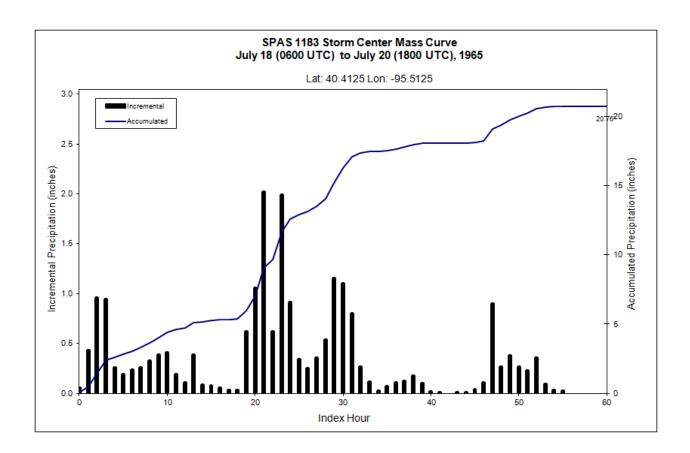
Appendix G: Table G.16: Storm spreadsheet for Edgerton, MO July 18, 1965

Stor	m 1183	- July	18, 196	5 (060	UTC)	to July ECIPITA	/ 20 (18	OUE EX	C), 196	5
	IVIA	AIMOIM F	VERAG	E DEF II		n (hours)	IION (IIV	CHES		
Area (mi²)	1	3	6	12	18	24	36	48	60	Total
0.30	3.77	7.34	12.06	17.13	17.80	18.59	19.82	19.86	20.76	20.76
1	3.68	7.13	11.77	16.72	17.29	18.04	19.27	19.35	20.08	20.08
10	3.49	6.79	11.11	15.41	16.49	17.56	19.00	19.06	19.71	19.71
25	3.15	5.96	9.93	14.05	15.23	16.32	18.04	18.12	19.06	19.06
50	2.83	5.35	8.83	12.60	13.81	15.05	16.79	17.37	18.27	18.27
100	2.43	4.36	7.52	10.95	11.54	13.41	15.27	16.39	17.22	17.22
150	2.21	4.26	6.84	9.96	11.34	12.96	15.23	15.69	16.66	16.66
200	1.79	3.94	6.18	9.23	9.90	12.66	14.18	15.38	16.18	16.18
300	1.55	2.99	5.41	7.86	9.53	11.45	13.80	14.49	15.71	15.71
400	1.52	2.90	4.74	7.48	8.30	11.04	13.43	14.13	15.44	15.44
500	1.41	2.73	4.35	6.13	8.17	10.88	13.37	13.88	15.17	15.17
1,000	1.21	2.09	3.71	5.79	7.57	9.48	12.08	13.04	13.83	13.83
2,000	0.98	1.82	3.49	4.94	6.83	8.74	10.76	11.80	12.70	12.70
5,000	0.64	1.56	2.69	3.84	5.57	6.92	8.50	9.66	10.42	10.42
10,000	0.44	1.24	2.06	3.16	4.00	5.23	7.03	7.67	8.24	8.24
20,000	0.29	0.82	1.44	2.21	2.81	3.59	4.86	5.36	5.81	5.81
35,221	0.19	0.45	0.83	1.17	1.78	2.29	2.57	3.46	3.72	3.72

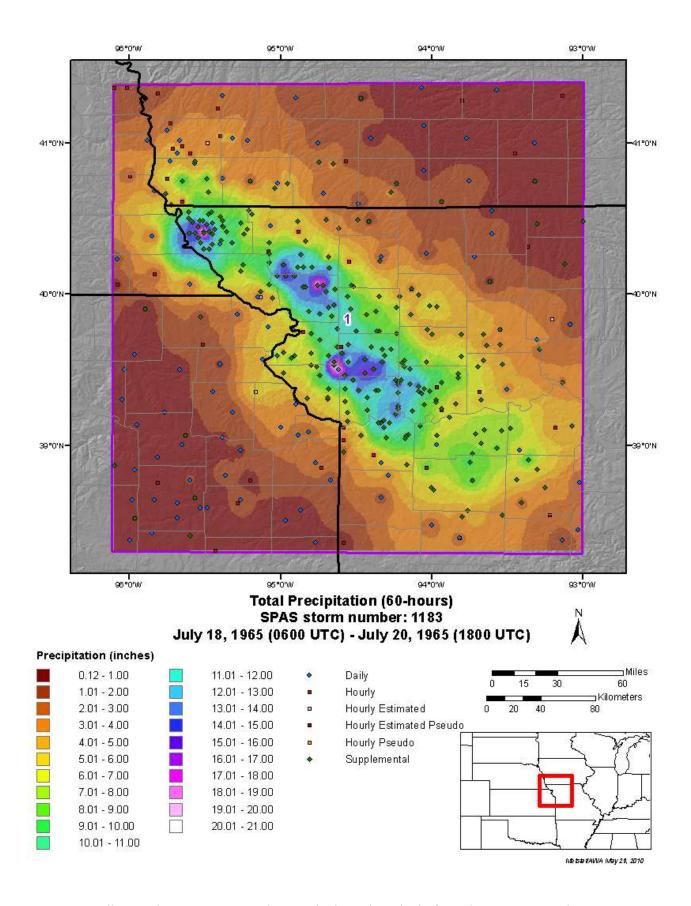
Appendix G: Table G.17: Depth-area-duration values for Edgerton, MO July 18, 1965



Appendix G: Figure G.22: Depth-area-duration chart for Edgerton, MO July 18, 1965



Appendix G: Figure G.23: Mass curve chart for Edgerton, MO July 18, 1965



Appendix G: Figure G.24: Total storm isohyetal analysis for Edgerton, MO July 18, 1965

College Hill, OH, AWA 30

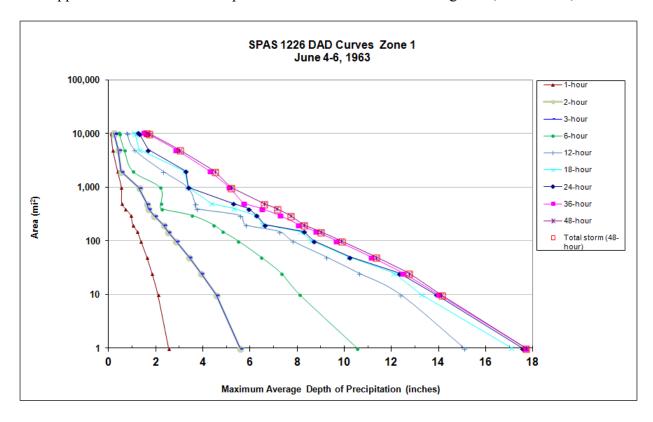
June 3, 1963 Storm Type: MCC

orm Name: College Hi	II, OH SPAS	1226								
rm Date: 6/3-5/1963 VA Analysis Date: 12/14/201	3			Storn	n Adjus	tment f	or ANO	Grid Po	int 8	
nporal Transposition Date	15-Jun									
	Lat	Long			Moisture In	flow Directi	ion	SW @ 95	miles	
rm Center Location	40.09 N	81.65 W			Grid Point	Elevation		1,200	feet	
rm Rep Dew Point Location	39.20 N	83.00 W			Storm Cent	ter Elevation		1,000	feet	
ansposition Dew Point Location	42.84 N	93.99 W			Storm Rep.	Analysis Du	ration	12	hours	
d Point Location	37.50 N	93.00 W								
The storm representative	dew point is	68.5 F	with tota	al precipitable	water above	sea level of			2.10	inches
The in-place maximum	_	76.5 F		al precipitable					3.07	inches
The transpositioned maximum	dew point is	78.0 F		al precipitable					3.29	inches
The in-place ston		1,000		ich subtracts			f precipitable		68.5 F	
The in-place ston		1,000		ich subtracts ich subtracts	0.27 0.28		f precipitable		76.5 F 78.0 F	
The transposition basis The Grid point/inflow ba		1,200 1,000		ich subtracts	0.28		f precipitable f precipitable		78.0 F	
		-,		_						
The in-place st	orm maximizat	ion factor is	1.48			-	_	int value was b		
The transposition/e							s between Ju	me 4-5, 1963 at	KLCK,	
The b	arrier adjustm	ent factor is	1.00		KILN, and I	CHTS.				
The	total adjustm	ent factor is	1.60							
Observed Storm Deptl	Y		6 17	12.77	10 11	24.11	2611	40.17	72.17	1
1 3	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	1
1 sq miles 10 sq miles		5.6 4.6	10.5 8.1	15.1 12.4	17.1 13.3	17.6 13.9	17.7 14.0	17.7 14.1		1
100 sq miles		2.9	5.5	7.8	8.6	8.7	9.7	9.9		1
200 sq miles		2.3	4.5	5.8	6.5	6.6	8.1	8.3	-	
500 sq miles	0.6	1.6	2.2	3.7	4.4	5.3	5.7	6.6	-	
1000 sq miles		1.3	2.2	3.3	3.4	3.4	5.1	5.2	-	
2000 sq miles	0.4	0.5	1.0	2.3	3.2	3.3	4.3	4.5	-	
5000 sq miles		0.4 0.2	0.7 0.5	1.1 0.8	1.3 1.1	1.7 1.3	2.9 1.6	3.0 1.7	-	
10000 sq miles 20000 sq miles		-	- 0.5	- 0.0	1.1 -	- 1.3	-	-	-	
			•				•	-	•	
Adjusted Storm Depth		,	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
	1 Hours	3 Hours 8.9	6 Hours 16.8	12 Hours 24.1	18 Hours 27.3	24 Hours 28.0	36 Hours 28.3	48 Hours 28.3	72 Hours	
Adjusted Storm Depth 1 sq miles 10 sq miles	1 Hours 4.1	3 Hours	•			o		o	72 Hours - -	
1 sq miles	1 Hours 4.1 3.3 2.2	3 Hours 8.9 7.3 4.6	16.8	24.1 19.8 12.4	27.3 21.2 13.7	28.0 22.2 13.9	28.3 22.4 15.4	28.3	72 Hours - - -	
1 sq miles 10 sq miles 100 sq miles 200 sq miles	1 Hours 4.1 3.3 2.2 1.6	3 Hours 8.9 7.3 4.6 3.7	16.8 12.9 8.8 7.1	24.1 19.8 12.4 9.3	27.3 21.2 13.7 10.4	28.0 22.2 13.9 10.6	28.3 22.4 15.4 12.9	28.3 22.5 15.7 13.2	72 Hours - - - -	
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles	1 Hours 4.1 3.3 2.2 1.6 0.9	3 Hours 8.9 7.3 4.6 3.7 2.6	16.8 12.9 8.8 7.1 3.6	24.1 19.8 12.4 9.3 5.8	27.3 21.2 13.7 10.4 7.0	28.0 22.2 13.9 10.6 8.4	28.3 22.4 15.4 12.9 9.1	28.3 22.5 15.7 13.2 10.5		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0	16.8 12.9 8.8 7.1 3.6 3.5	24.1 19.8 12.4 9.3 5.8 5.3	27.3 21.2 13.7 10.4 7.0 5.4	28.0 22.2 13.9 10.6 8.4 5.4	28.3 22.4 15.4 12.9 9.1 8.2	28.3 22.5 15.7 13.2 10.5 8.3		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8	16.8 12.9 8.8 7.1 3.6 3.5	24.1 19.8 12.4 9.3 5.8 5.3 3.7	27.3 21.2 13.7 10.4 7.0 5.4 5.1	28.0 22.2 13.9 10.6 8.4 5.4 5.2	28.3 22.4 15.4 12.9 9.1 8.2 6.9	28.3 22.5 15.7 13.2 10.5 8.3 7.2		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0	16.8 12.9 8.8 7.1 3.6 3.5	24.1 19.8 12.4 9.3 5.8 5.3	27.3 21.2 13.7 10.4 7.0 5.4	28.0 22.2 13.9 10.6 8.4 5.4	28.3 22.4 15.4 12.9 9.1 8.2	28.3 22.5 15.7 13.2 10.5 8.3		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 2000 sq miles 5000 sq miles	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7 0.4	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7 0.4	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7 0.4	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7 0.4	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963 MCC	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type Storm Location	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2 -	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7 0.4	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963 MCC 40.09 N	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7 0.4	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963 MCC	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 2000 sq	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7 0.4	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963 MCC 40.09 N 1,000 19.39 Inches	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 20000 sq	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2 - Name	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963 MCC 40.09 N 1,000 19.39 Inches	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2 - Name	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963 MCC 40.09 N 1,000 19.39 Inches 68.5 F 39.20 N	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 20000 sq miles Storm Or Storm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & I	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2 - Name Duration Dew Point Loc	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963 MCC 40.09 N 1,000 19.39 Inches	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles Storm Center Elevation Storm Center Elevation Precipitation Total & I Storm Representative I Storm Representative I Maximum Dew Point	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2 - Name Duration Dew Point Locur	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963 MCC 40.09 N 1,000 19.39 Inches 68.5 F 39.20 N 76.5 F	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 20000 sq	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 College Hill 6/3-5/1963 MCC 40.09 N 1,000 19.39 Inches 68.5 F 39.20 N 76.5 F SW @ 95	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2 - Name Duration Dew Point Locur Factor on (Date)	3 Hours 8.9 7.3 4.6 3.7 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963 MCC 40.09 N 1,000 19.39 Inches 68.5 F 39.20 N 76.5 F SW @ 95 1.48	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 2000 sq miles 20000 sq	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2 - Name Duration Dew Point Loc r Factor n (Date) int Location	3 Hours 8.9 7.3 4.6 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963 MCC 40.09 N 1,000 19.39 Inches 68.5 F 39.20 N 76.5 F SW @ 95 1.48	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1 81.65 W 48-hours	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2 - Name Duration Dew Point Loc r Factor in (Date) int Location m Dew Point	3 Hours 8.9 7.3 4.6 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1 81.65 W 48-hours	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 500 sq miles 5000 sq miles 5000 sq miles 10000 sq miles 20000 sq m	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2	3 Hours 8.9 7.3 4.6 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 College Hill 6/3-5/1963 MCC 40.09 N 1,000 19.39 Inches 68.5 F 39.20 N 76.5 F SW @ 95 1.48 15-Jun 42.84 N 78.0 F 1.08 1,200	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1 81.65 W 48-hours	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 20000 sq m	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2	3 Hours 8.9 7.3 4.6 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 - College Hill 6/3-5/1963 MCC 40.09 N 1,000 19.39 Inches 68.5 F 39.20 N 76.5 F SW @ 95 1.48 15-Jun 42.84 N 78.0 F 1.08 1,200 14,344	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1 81.65 W 48-hours	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		
1 sq miles 10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq	1 Hours 4.1 3.3 2.2 1.6 0.9 0.8 0.6 0.3 0.2 - Name Duration Dew Point Dow Point Location The Factor In Dew Point Location The Dew Point Location	3 Hours 8.9 7.3 4.6 2.6 2.0 0.8 0.7	16.8 12.9 8.8 7.1 3.6 3.5 1.6 1.1 0.7 College Hill 6/3-5/1963 MCC 40.09 N 1,000 19.39 Inches 68.5 F 39.20 N 76.5 F SW @ 95 1.48 15-Jun 42.84 N 78.0 F 1.08 1,200	24.1 19.8 12.4 9.3 5.8 5.3 3.7 1.7 1.2 - 4, OH SPAS 1 81.65 W 48-hours	27.3 21.2 13.7 10.4 7.0 5.4 5.1 2.1 1.8	28.0 22.2 13.9 10.6 8.4 5.4 5.2 2.7 2.1	28.3 22.4 15.4 12.9 9.1 8.2 6.9 4.6 2.6	28.3 22.5 15.7 13.2 10.5 8.3 7.2 4.8 2.7		

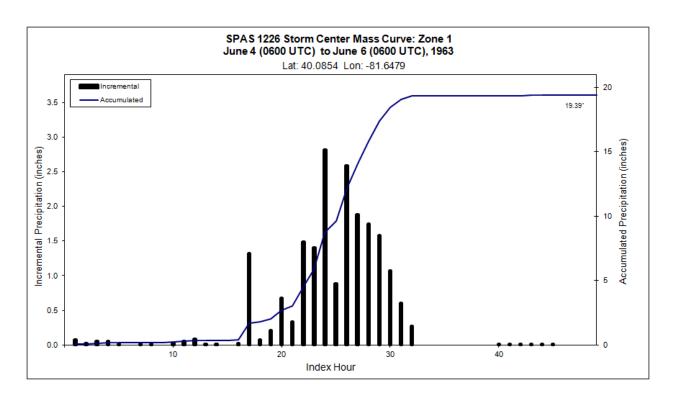
Appendix G: Table G.18: Storm spreadsheet for College Hill, OH, June 3, 1963

Sto	rm 122	6 - Jun	e 4 (06	00 UTC) - June	e 6 (060	00 UTC), 1963	
	MAXIMU	JM AVEF	RAGE DE	PTH OF	PRECI	PITATION	I (INCHE	ES)	
				Du	ration (hou	urs)			
Area (mi²)	1	3	6	12	18	24	36	48	Total
0.1	2.81	6.28	11.5	17.08	18.99	19.16	19.37	19.39	19.39
1	2.54	5.56	10.53	15.07	17.09	17.56	17.7	17.7	17.70
10	2.08	4.56	8.1	12.37	13.28	13.9	14	14.11	14.11
25	1.83	3.9	7.32	10.61	12.1	12.33	12.49	12.72	12.72
50	1.61	3.4	6.46	9.23	10.18	10.23	11.13	11.34	11.34
100	1.36	2.85	5.5	7.79	8.59	8.69	9.66	9.86	9.86
150	1.2	2.5	4.85	7.23	8.14	8.28	8.79	8.98	8.98
200	1.02	2.32	4.45	5.8	6.54	6.62	8.06	8.26	8.26
300	0.93	1.93	3.54	5.55	6.26	6.28	7.28	7.7	7.70
400	0.7	1.67	2.24	3.73	5.31	5.93	6.5	7.13	7.13
500	0.55	1.61	2.23	3.66	4.37	5.28	5.73	6.57	6.57
1,000	0.53	1.28	2.18	3.34	3.37	3.39	5.12	5.19	5.19
2,000	0.37	0.52	1.03	2.3	3.22	3.28	4.3	4.5	4.50
5,000	0.17	0.41	0.67	1.09	1.31	1.67	2.86	3	3.00
10,000	0.1	0.24	0.46	0.78	1.12	1.3	1.61	1.7	1.70
10,512	0.1	0.24	0.44	0.75	1.08	1.26	1.5	1.6	1.60

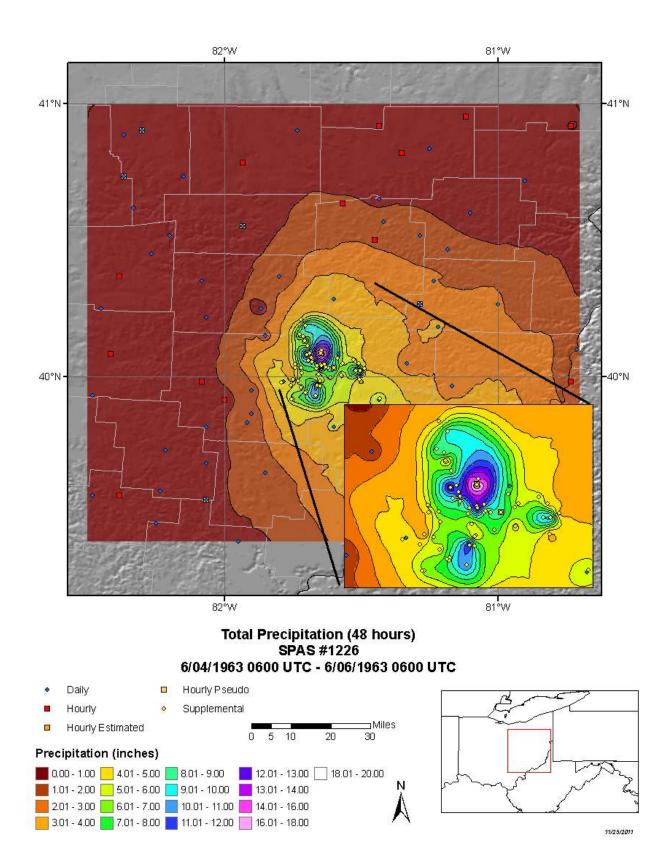
Appendix G: Table G.19: Depth-area-duration values for College Hill, OH June 3, 1963



Appendix G: Figure G.25: Depth-area-duration chart for College Hill, OH, June 3, 1963



Appendix G: Figure G.26: Mass curve chart for College Hill, OH, June 3, 1963



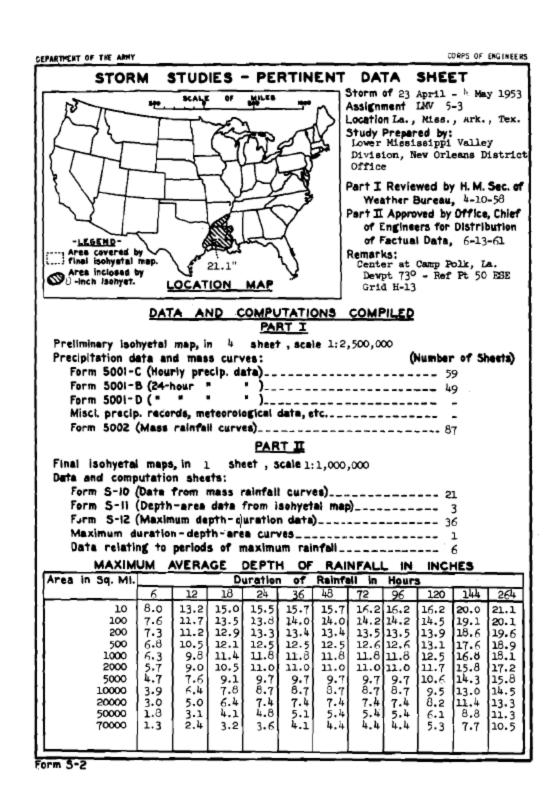
Appendix G: Figure C.27: Total storm isohyetal analysis for College Hill, OH June 1963

Camp Polk, LA, AWA 81

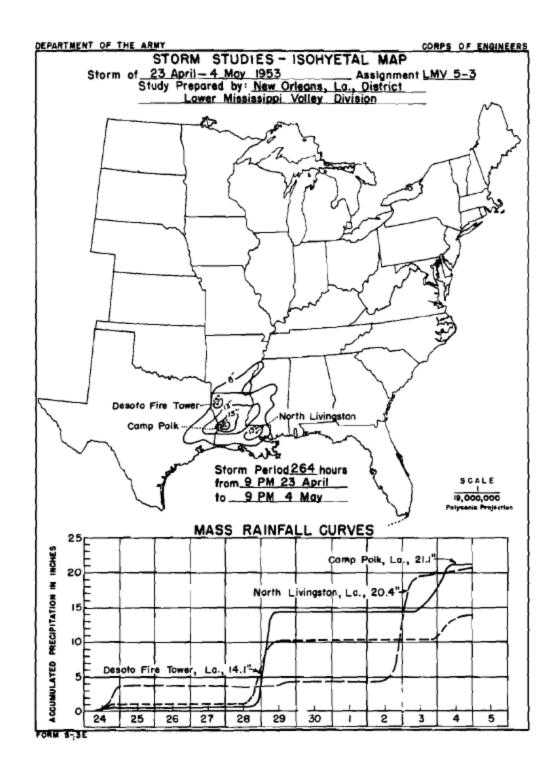
April 23, 1953 Storm Type: Frontal

torm Name: torm Date: WA Analysi	USACE LM 4/24-5-4/19 s Date: 12/17/2013	53	Polk, LA		Storm .	Adjustr	nent fo	r ANO	Grid Po	int 1	
	nsposition Date	15-Mav									
	•	Lat	Long			Moisture I	ıflow Direct	ion:	ESE @ 50	miles	
orm center	location	31.05 N	93.20 W			Grid Point	Elevation		400	feet	
orm Rep SS	T location	30.77 N	92.42 W			Storm Cen	ter Elevation	1	350	feet	
•	Dew Point Location	35.03 N	92.41 W			Storm Rep	Analysis D	uration	12	hours	
rid Point loc	cation	35.31 N	93.23 W								
	The storm representa	tive SST is	75.0 F	with total p	recipitable w	ater above s	ea level of			2.85	inches.
	The in-place maxis		76.5 F		recipitable w					3.07	inches.
The	transpositioned maxin		74.5 F		recipitable w					2.79	inches.
	The in-place storm		350 350		ch subtracts ch subtracts			f precipitabl		75.0 F 76.5 F	
The	The in-place storm transposition storm				ch subtracts			f precipitabl f precipitabl		74.5 F	
	grid point/inflow barn		400		ch subtracts	0.10		f precipitabl		74.5 F	
	•		ion factor is	1.08					5-3. Added 2°I erage climatolo		
		•	ion factor is			hr persisting		ecount for av	erage chinatolo	ogy Hom 12-	
	The elevation/bar	ner adjustm	ent factor is	1.00							
	The to	otal adjustm	ent factor is	0.97							
O	served Storm Depth-			40.7-	24.4-	10.77			400		
	10 3	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		
	10 sq miles 100 sq miles	8.0 7.6	13.2 11.7	15.0 13.5	15.5 13.8	15.7 14.0	16.2 14.2	16.2 14.2	16.2 14.5	20.0 19.1	1
	200 sq miles	7.3	11.2	12.9	13.3	13.4	13.5	13.5	13.9	18.6	
	500 sq miles	6.8	10.5	12.1	12.5	12.5	12.6	12.6	13.1	17.6	
	1000 sq miles	6.3	9.8	11.4	11.8	11.8	11.8	11.8	12.5	16.8	
	2000 sq miles 5000 sq miles	5.7 4.7	9.0 7.6	10.5 9.1	11.0 9.7	11.0 9.7	11.0 9.7	11.0 9.7	11.7 10.6	15.8 14.3	
	10000 sq miles	3.9	6.4	7.8	8.7	9.7 8.7	8.4	8.7	9.5	13.0	
	20000 sq miles	3.0	5.0	6.4	7.4	7.4	7.4	7.4	8.2	11.4	
	50000 sq miles	1.8	3.1	4.1	4.8	5.4	5.4	5.4	6.1	8.8	
	r 16: B d	4 D (
Ac	ljusted Storm Depth-	6 Hours	on 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
<u></u>	10 sq miles	7.8	12.10413	14.6	15.1	15.2	15.7	15.7	15.7	19.4	
	100 sq miles	7.4	11.4	13.1	13.4	13.6	13.8	13.8	14.1	18.5	
	200 sq miles	7.1	10.9	12.5	12.9	13.0	13.1	13.1	13.5	18.1	
	500 sq miles	6.6 6.1	10.2 9.5	11.8 11.1	12.1 11.5	12.1 11.5	12.2 11.5	12.2 11.5	12.7 12.1	17.1 16.3	
	1000 sq miles 2000 sq miles	5.5	9.5 8.7	10.2	10.7	10.7	10.7	10.7	11.4	15.3	
·····	5000 sq miles	4.6	7.4	8.8	9.4	9.4	9.4	9.4	10.3	13.9	
	10000 sq miles	3.8	6.2	7.6	8.4	8.4	8.2	8.4	9.2	12.6	
	20000 sq miles	2.9	4.9	6.2	7.2	7.2	7.2	7.2	8.0 5.0	11.1	
	50000 sq miles	1.7	3.0	4.0	4.7	5.2	5.2	5.2	5.9	8.5	
	orm or Storm Center N	ame		USACE LMV 5	-3 Camp Pol	k, LA					
	orm Date(s)			4/24-5-4/1953							
	orm Type orm Location			Frontal 31.05 N	93.20 W						
	om Center Elevation			350	33.20 W						
	ecipitation Total & Du	ıration (10 s	q mi)	21.10 inches in	264 hours						
		ст		75.0 E	24						-
	orm Representative S orm Representative S		1	75.0 F 30.77 N	24 92.42 W		M				1
	-place Maximum SST			76.5 F	JE.TE W		80				1
	oisture Inflow Vector			ESE @ 50							
In	place Maximization F	actor									
T	mporal Transposition	(Date)		15-May							-
	mporal Transposition ansposition Dewpoin			35.03 N	92.41 W		M				1
	ansposition Maximum			74.5 F			81				
Tr	ansposition Adjustme										
Gr	id Point Elevation ghest Elevation in Ba			400							-
	anact Elemetion in Re-	SIII		14,344							1
Int	flow Barrier Height evation Adjustment F										

Appendix G: Table G.20: Storm spreadsheet for Camp Polk, LA April 23, 1953



Appendix G: Table G.21: Depth-area-duration values for Camp Polk, LA April 23, 1953



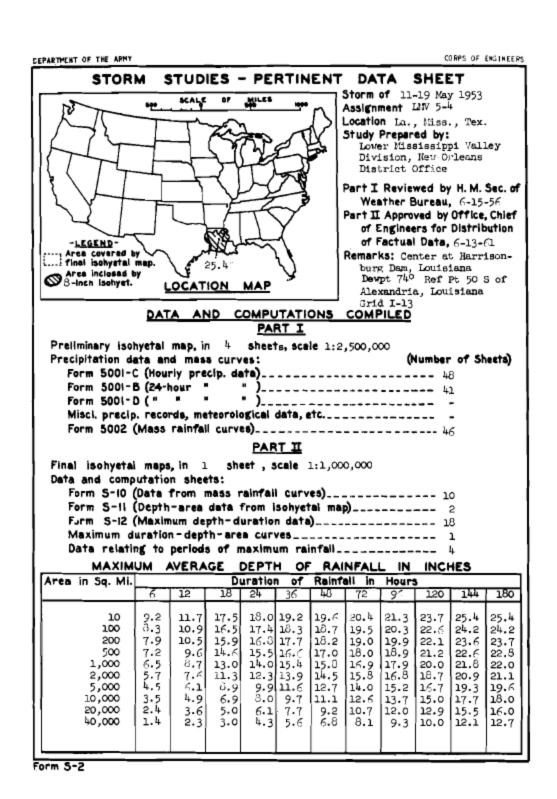
Appendix G: Figure G.28 and Figure G.29: Total storm isohyetal analysis and mass curve chart for Camp Polk, LA April 23, 1953

Harrisonburg Dam, LA, AWA 79

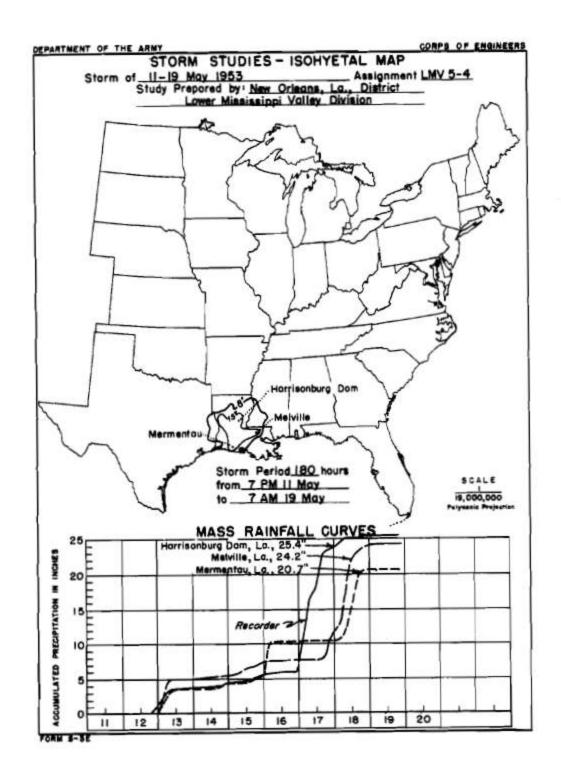
May 11, 1953 Storm Type: MCC

torm Name:		IV 5-4 Harris	onburg Dan		C4	A 41:4	ment f	n A NIO	Crid D	int 1	
torm Date: WA Analysis Date:	5/11-19/19 12/17/2013				Storm	Aajust	ment 10	or ANO	Grid Po	int 1	
emporal Transposi	•	1-Jun									
		Lat	Long			Moisture Ir	ıflow Direct	ion:	SSW @ 90	miles	
orm center location	n	31.77 N	91.82 W			Grid Point	Elevation		400	feet	
orm Rep dew point	location	30.60 N	92.53 W			Storm Cen	ter Elevation	ı	100	feet	
ransposition dewpo		34.15 N	93.97 W			Storm Rep	Analysis Du	ıration	24	hours	
sin location		35.31 N	93.23 W								
The stem	representative	down point is	76.0 F	with tota	al precipitable	matar aban	11 a	4		2.99	inches
	place maximum	-	79.0 F		al precipitable al precipitable					3.44	inches
The transpositi		•	77.0 F		al precipitable					3.14	inches
The	e in-place ston	n elevation is	100	wh	ich subtracts	0.03	inches o	f precipitabl	e water at	76.0 F	
	in-place stom		100		ich subtracts			f precipitabl		79.0 F	
	sposition basii		400		ich subtracts			f precipitabl		77.0 F	
The inflow barr	er/basin eleva	tion neight is	4,400	wn	ich subtracts	0.11	inches o	f precipitabl	e water at	77.0 F	
	The in-place st	orm maximizat	ion factor is	1.15	1	Notes: DAD	values from S	UACE LMV 5	-3. Added 2°F	to the	1
	ransposition/e			0.89			-	ecount for ave	rage climatolog	gy from 12-	
		arrier adjustm		1.00		hr persisting	climatology.				
	The	total adjustm	ent factor is	1.02	_						-
Observed	Storm Depth	-Area-Duratio	on								
	т	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Hours	
	10 sq miles		11.7	17.5	18.0	19.6	20.4	21.3	23.7	25.4	
	100 sq miles	8.3	10.9	16.5	17.4	18.7	19.5	20.3	22.6	24.2	
	200 sq miles		10.5	15.9	16.0	18.2	19.0	19.9	22.1	23.6	1
	500 sq miles	•	9.6 8.7	14.6 13.0	15.5 14.0	17.0 15.8	18.0 16.9	18.9 17.9	21.2 20.0	22.6 21.8	
	1000 sq miles 2000 sq miles		7.6	11.3	12.3	14.5	15.8	16.8	18.7	20.9	
	5000 sq miles	•	6.1	8.9	9.9	12.7	14.0	15.2	16.7	19.3	
	10000 sq miles		4.9	6.9	8.0	11.1	12.6	13.7	15.0	17.7	1
	20000 sq miles	2.4	3.6	5.0	6.1	9.2	10.7	12.0	12.9	15.5	
	50000 sq miles	1.4	2.3	3.0	4.3	6.8	8.1	9.3	10.0	12.1	
A 31	Carena Dressa	A D									
Adjusted	Storm Depth-	6 Hours	n 12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Hours	
	10 sq miles	¢	12.0	17.9	18.4	20.1	20.9	21.8	24.3	26.0	
	100 sq miles	8.5	11.2	16.9	17.8	19.1	20.0	20.8	23.1	24.8	
	200 sq miles	8.1	10.7	16.3	16.4	18.6	19.4	20.4	22.6	24.2	
	500 sq miles	¢	9.8	14.9	15.9	17.4	18.4	19.3	21.7	23.1	
	1000 sq miles		8.9 7.8	13.3 11.6	14.3 12.6	16.2 14.8	17.3 16.2	18.3 17.2	20.5 19.1	22.3	
	2000 sq miles 5000 sq miles	•	6.2	9.1	10.1	13.0	14.3	15.6	17.1	19.8	
	10000 sq miles		5.0	7.1	8.2	11.4	12.9	14.0	15.4	18.1	1
	20000 sq miles	·····	3.7	5.1	6.2	9.4	11.0	12.3	13.2	15.9	
	50000 sq miles	1.4	2.4	3.1	4.4	7.0	8.3	9.5	10.2	12.4	
Storm or	Storm Center N	Vame		USACELM	V 5-4 Harrise	nhuro Dam	. LA				
Storm Da		, with		5/11-19/1953		var g Dalli	,				1
Storm Ty				Frontal							
Storm Lo				31.77 N	91.82 W						
	nter Elevation		>	100	in 180 hours						
rrecipitat	ion Total & D	manon (10 sq	111)	#U mcnes دے	m 100 nours						1
Storm Re	presentative S	ST		76.0 F	24						
	presentative S			30.60 N	92.53 W		M	J			
	Maximum SST			79.0 F			80				1
	Inflow Vector Maximization F			SSW @ 90 1.15							1
III-piace	vaamiization F	actor		1.13							1
Temporal	Transposition	n (Date)		1-Jun							1
	ition Dewpoin			34.15 N	93.97 W		M	J			
	ition Maximur			77.0 F			81				
	ition Adjustm	ent Factor		100							1
	t Elevation Elevation in Ba	rin		400 14,344							1
		SIII		_	+						1
	mier Height			XX							
Inflow Ba	nnier Height Adjustment F	actor		1.00							

Appendix G: Table G.22: Storm spreadsheet for Harrisonburg Dam, LA May 11, 1953



Appendix G: Table G.23: Depth-area-duration values for Harrisonburg Dam, LA May 11, 1953

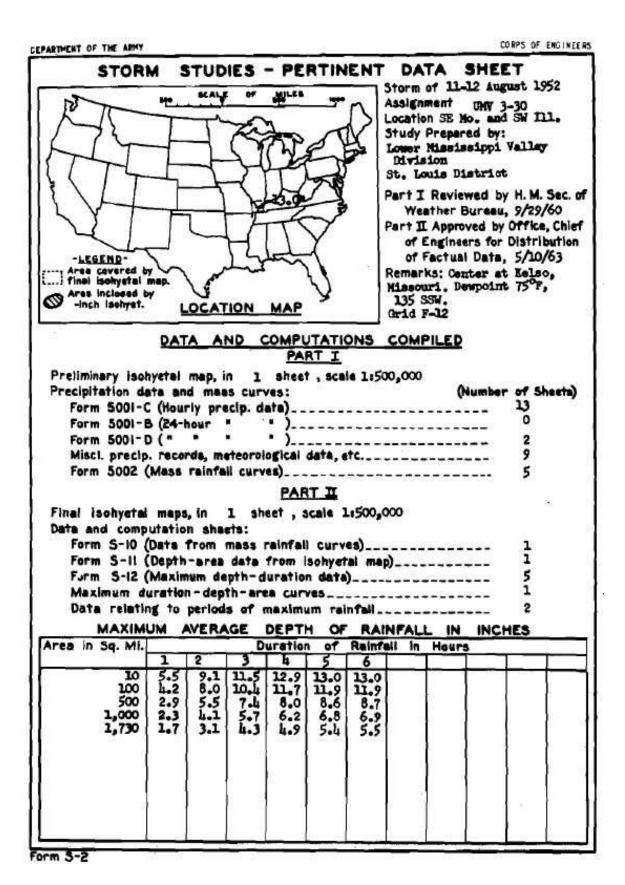


Appendix G: Figure G.30 and Figure G.31: Total storm isohyetal analysis and mass curve chart for Harrisonburg Dam, LA May 11, 1953

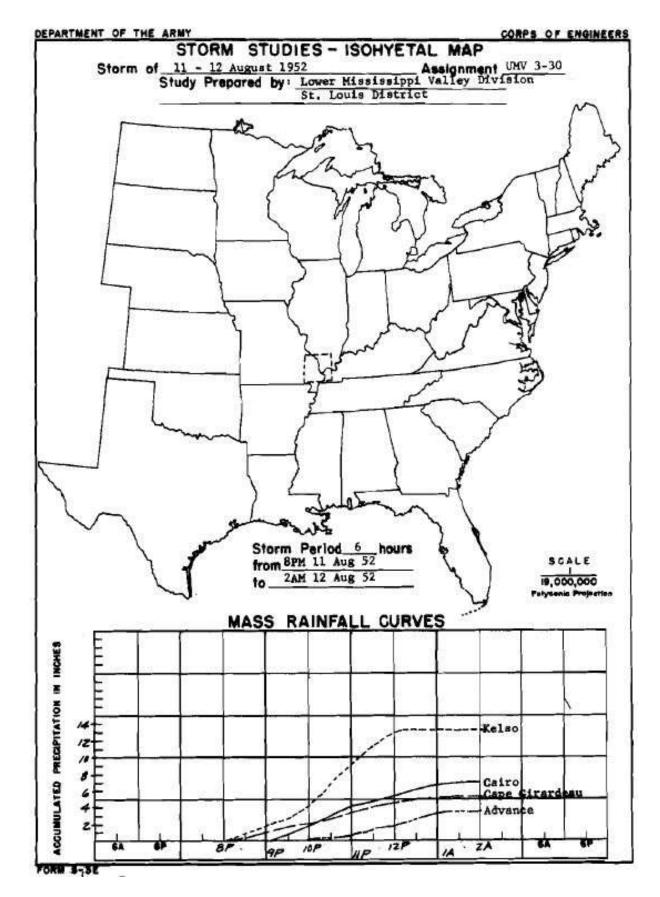
Kelso, MO, AWA 37 August 11, 1952 Storm Type: MCC

	IV 3-30-Kels	o, MO		64	A 42 4			Cuid D	.:4 1	
torm Date: 11-Aug-19 WA Analysis Date: 12/15/2013				Storm	Adjust	ment fo	r ANO	Grid P	oint 1	
mporal Transposition Date	25-Jul									
	Lat	Long			Moisture Ir	ıflow Directi	ion	S @ 140	miles	
orm Center Location	37.19 N	89.55 W			Grid Point	Elevation		350	feet	
orm Rep Dew Point Location	35.17 N	89.50 W			Storm Cent	ter Elevation		500	feet	
ransposition Dew Point Location	40.71 N	92.53 W			Storm Rep	Analysis Du	ration	6	hours	
rid Point Location	35.31 N	93.23 W								
The storm representative	dew point is	76.5 F	with total	l precipitable	water above	e sea level of			3.07	inches.
The in-place maximum	dew point is	81.0 F	with total	l precipitable	water above	e sea level of			3.75	inches
The transpositioned maximum	-	81.5 F		l precipitable					3.83	inches
The in-place stom		500		ch subtracts			f precipitabl		76.5 F	
The in-place stom		500		ch subtracts			f precipitabl		81.0 F	
The transposition basing The Grid point/inflow basing		350 1,000		ch subtracts ch subtracts	0.31		f precipitabl f precipitabl		81.5 F 81.5 F	
				•						
The in-place sto								CE UMV 3-3 on maximum		
The transposition/el	ievation to ba arrier adjustm				•			KMEM, KNO		
The ba	and adjustill	one ractor is	1.00		and KDYR.	_	,		<u>,,,</u>	
The	total adjustm	ent factor is	1.20							
Observed Storm Depth	-Area-Durati	on								
	1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
10 sq miles	5.5	11.5	13.0	-	-	-	-	-	-	
100 sq miles	4.2	10.4	11.9	-	-	-	-	-	-	
200 sq miles	0.0	0.0	0.0	-	-	-	-	-	-	-
500 sq miles	2.9	7.4	8.7	-	-	-	-	<u>-</u>	-	
1000 sq miles	2.3	5.7	6.9	-	-	-	-	-	-	-
5000 sq miles	-	-	-	-	-	-	-	-	-	
10000 sq miles 20000 sq miles	-	-	-	-	-	-	-	-	-	
A.P. 4.164 B. 4	1 B d									
Adjusted Storm Depth-	Area-Duran	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
	6.6	13.8	15.6	-	-	-	-	-	-	
10 sq miles	0.0								:	
10 sq miles 100 sq miles	5.1	12.5	14.3	-	-	-	-	-	-	
100 sq miles 200 sq miles	5.1 0.0	0.0	14.3 0.0	-		-	-	-	-	
100 sq miles 200 sq miles 500 sq miles	5.1 0.0 3.5	0.0 8.9	0.0 10.5		-	:			- - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles	5.1 0.0	0.0	0.0	1	-	-	-	-		
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles	5.1 0.0 3.5 2.8	0.0 8.9 6.9	0.0 10.5 8.3		- - - -	- - -	- - - -	- - -		
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles	5.1 0.0 3.5 2.8	0.0 8.9 6.9 -	0.0 10.5 8.3 -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles	5.1 0.0 3.5 2.8	0.0 8.9 6.9	0.0 10.5 8.3		- - - -	- - -	- - - -	- - -		
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	5.1 0.0 3.5 2.8	0.0 8.9 6.9 -	0.0 10.5 8.3 - -	- - - - -	- - - - -	- - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	5.1 0.0 3.5 2.8	0.0 8.9 6.9 -	0.0 10.5 8.3 - - - - USACE UMV	- - - - - - 7 3-30-Kelso,	- - - - -	- - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles	5.1 0.0 3.5 2.8	0.0 8.9 6.9 -	0.0 10.5 8.3 - - - - - USACE UMV 11-Aug-1952	- - - - - - 7 3-30-Kelso,	- - - - -	- - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	5.1 0.0 3.5 2.8	0.0 8.9 6.9 -	0.0 10.5 8.3 - - - - USACE UMV	- - - - - - 7 3-30-Kelso,	- - - - -	- - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center I Storm Date(s) Storm Type	5.1 0.0 3.5 2.8 - -	0.0 8.9 6.9 -	0.0 10.5 8.3 USACE UMV 11-Aug-1952		- - - - -	- - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center I Storm Date(s) Storm Type Storm Location	5.1 0.0 3.5 2.8 - -	0.0 8.9 6.9 -	0.0 10.5 8.3 - - - - - - - - - - - - - - - - - - -		- - - - - - - , MO	- - - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation	5.1 0.0 3.5 2.8 - - - - Name	0.0 8.9 6.9 -	0.0 10.5 8.3 - - - - - - - - - - - - - - - - - - -		- - - - - - - , MO	- - - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	5.1 0.0 3.5 2.8 - - - - Name	0.0 8.9 6.9 -	0.0 10.5 8.3 - - - - - - - - - - - - - - - - - - -	3-30-Kelso, 89.55 W	- - - - - - - , MO	- - - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I	5.1 0.0 3.5 2.8 - - - - Name	0.0 8.9 6.9 -	0.0 10.5 8.3 - - - - USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches	3-30-Kelso, 89.55 W	- - - - - - - , MO	- - - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative T Storm Representative T Maximum Td Moisture Inflow Vector	5.1 0.0 3.5 2.8 Name Puration	0.0 8.9 6.9 -	0.0 10.5 8.3 USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F S @ 140	3-30-Kelso, 89.55 W	- - - - - - - , MO	- - - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative T Storm Representative T Maximum Td	5.1 0.0 3.5 2.8 Name Puration	0.0 8.9 6.9 -	0.0 10.5 8.3 USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F	3-30-Kelso, 89.55 W 6-hours USA 6		- - - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative T Storm Representative T Maximum Td Moisture Inflow Vector	5.1 0.0 3.5 2.8 Name Ouration of d Control of the control	0.0 8.9 6.9 -	0.0 10.5 8.3 USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F S @ 140	3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W		- - - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 10000 sq miles 20000 sq miles Storm Center I storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative T Maximum Td Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Td Loca	5.1 0.0 3.5 2.8 Name Puration Ed Cd Location or Factor in (Date) ation	0.0 8.9 6.9 -	0.0 10.5 8.3 USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F 82.0 I 40 1.23 25-Jul 40.71 N	3-30-Kelso, 89.55 W 6-hours USA 6		- - - - -	- - - -	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative T Maximum Td Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Td Loca Transposition Maximum Td Loca Transposition Maximum	S.1 0.0 3.5 2.8 Name Puration Ed Gd Location Factor In (Date) attion m Td	0.0 8.9 6.9 -	0.0 10.5 8.3 USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F S @ 140 1.23 25-Jul 40.71 N 81.5 F	3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W				- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative T Maximum Td Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Td Loca Transposition Maximum Transposition Maximum Transposition Adjustm	S.1 0.0 3.5 2.8 Name Puration Ed Gd Location Factor In (Date) attion m Td	0.0 8.9 6.9 -	0.0 10.5 8.3 USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 13.01 Inches 25.17 N 81.0 F 8 @ 140 1.23 25-Jul 40.71 N 81.5 F 0.98	3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W			August	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative T Maximum Td Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Td Loca Transposition Maximum Transposition Adjustm Grid Point Elevation	S.1 0.0 3.5 2.8 Name Puration Id Id Location Factor In (Date) attion m Td lent Factor	0.0 8.9 6.9 -	0.0 10.5 8.3 USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F S @ 140 1.23 25-Jul 40.71 N 81.5 F 0.98	3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W			August	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative T Maximum Td Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Td Loca Transposition Td Loca Transposition Maximum Transposition Adjustin Grid Point Elevation Highest Elevation in Ba	S.1 0.0 3.5 2.8 Name Puration Id Id Location Factor In (Date) attion m Td lent Factor	0.0 8.9 6.9 -	0.0 10.5 8.3 USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F 8 @ 140 1.23 25-Jul 40.71 N 81.5 F 0.98 350 14,344	3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W			August	- - - -	- - - -	
100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative T Maximum Td Moisture Inflow Vector In-place Maximization I Temporal Transposition Total Loca Transposition Td Loca Transposition Maximum Transposition Adjustm Grid Point Elevation	S.1 0.0 3.5 2.8 Name Puration Ed Cd Location Factor In (Date) ation m Td dient Factor	0.0 8.9 6.9 -	0.0 10.5 8.3 USACE UMV 11-Aug-1952 MCC 37.19 N 500 13.00 Inches 76.5 F 35.17 N 81.0 F S @ 140 1.23 25-Jul 40.71 N 81.5 F 0.98	3-30-Kelso, 89.55 W 6-hours USA 6 89.50 W			August	- - - -	- - - -	

Appendix G: Table G.24: Storm spreadsheet for Kelso, MO August 11, 1952



Appendix G: Table G.25: Depth-area-duration chart for Kelso, MO August 11, 1952



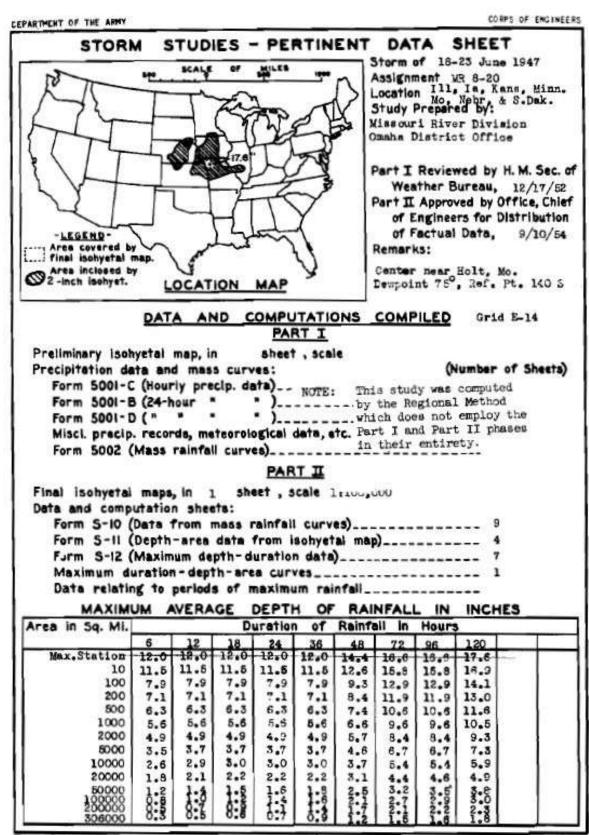
Appendix G: Figure G.32 and Figure G.33: Total storm isohyetal and Mass curve chart for Kelso, MO August 11, 1952

Holt, MO, AWA 40 June 18, 1947

Storm Type: MCC

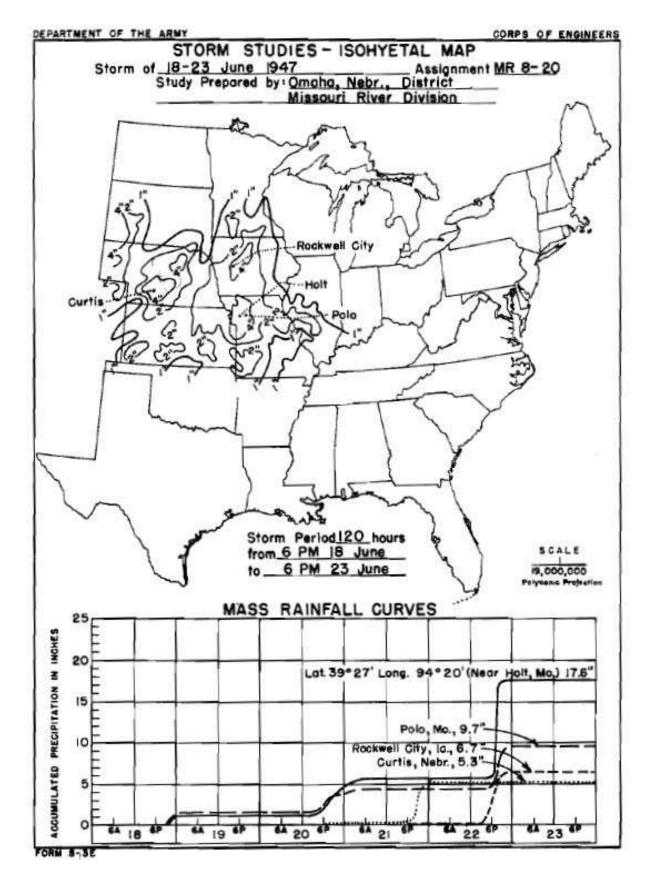
torm Name:		8-20-Holt, M	10		Ct	. A di	tmont f	on A NIO	Culd D-	int 1	
orm Date: WA Analysi	6/18-22/19 is Date: 12/15/2013				Storn	ı Adjus	tment 1	or ANO	Grid Po	int 1	
		5-Jul									
mporai ira	nsposition Date	Lat	Long			Maintura I	nflow Direct	ion	SSW @ 230	miles	
orm Center	Tti	39.45 N	94.34 W			Grid Point		IOII	350	feet	
									1,000		
•	ew Point Location	36.18 N	95.25 W				ter Elevation		6	feet	
ransposition rid Point Lo	Dew Point Location	39.46 N 35.31 N	93.53 W 93.23 W			Storm Kep	Analysis D	iration	0	hours	
Id I offic Lo	cation	35.5111	95.25 W								
The	storm representative	dew noint is	79.0 F	with total	l precipitable	water ahov	e sea level o	4		3.44	inches
	he in-place maximum	•	81.5 F		l precipitable					3.84	inches
	spositioned maximum	-	81.0 F		l precipitable					3.76	inches
	The in-place storm	_	1,000	whi	ch subtracts	0.28	inches o	f precipitabl	e water at	79.0 F	
	The in-place storm	elevation is	1,000	whi	ch subtracts	0.30	inches o	f precipitabl	e water at	81.5 F	
Th	ie transposition basin	elevation at	350	whi	ch subtracts	0.30	inches o	f precipitabl	e water at	81.0 F	
The	Grid point/inflow ban	rier height is	1,000	whi	ch subtracts	0.30	inches o	f precipitabl	e water at	81.0 F	
_											
	The in-place sto	orm maximizati	ion factor is	1.12					CE MR 8-20, 1	•	
	The transposition/el			0.98				•	record rainfall v		
	The ba	arrier adjustm	ent factor is	1.00					Td value was		
							hr Td value	s between Ju	me 22-23, 1947	at KHRO	L
	The	total adjustm	ent factor is	1.09		and KTUL.					1
	10. 5										
Ol	bserved Storm Depth-		on 12 Hours	10 U	24 17	20 U	36 Hours	40 LT	60 U	72 Hours	-
	1 52 mile-	6 Hours 12.0	12 Hours 12.0	18 Hours 12.0	24 Hours 12.0	30 Hours	36 Hours 12.0	48 Hours 14.4	60 Hours	16.6	1
	1 sq miles 10 sq miles	11.5	11.5	11.5	11.5		11.5	14.4		15.8	1
	100 sq miles	7.9	7.9	7.9	7.9	-	7.9	9.3	-	12.9	1
	200 sq miles	7.1	7.1	7.1	7.1	-	7.1	8.4	-	11.9	
	500 sq miles	6.3	6.3	6.3	6.3	-	6.3	7.4	-	10.6	
	1000 sq miles	5.6	5.6	5.6	5.6	-	5.6	6.6	-	9.6	
· · · · ·	5000 sq miles	3.5	3.7	3.7	3.7	-	3.7	4.6	-	6.7	1
	10000 sq miles	2.6	2.9	3.0	3.0	-	3.0	3.7	-	5.4	
	20000 sq miles	1.8	2.1	2.2	2.2	-	2.2	3.1	-	4.4	
Ad	ljusted Storm Depth-	Area-Duratio	n								
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	1 sq miles	13.1	13.1	13.1	13.1	-	13.1	15.8	-	18.2	
	10 sq miles	12.6	12.6	12.6	12.6	-	12.6	13.8	-	17.3	
	100 sq miles	8.7	8.7	8.7	8.7	-	8.7	10.2	-	14.1	
	200 sq miles	7.8 6.9	7.8 6.9	7.8 6.9	7.8 6.9	-	7.8 6.9	9.2	-	13.0	
	500 sq miles 1000 sq miles	6.1	6.1	6.1	6.1	-	6.1	8.1 7.2	-	11.6 10.5	
	5000 sq miles	3.8	4.1	4.1	4.1	-	4.1	5.0	-	7.3	
	10000 sq miles	2.8	3.2	3.3	3.3	-	3.3	4.1	-	5.9	1
	20000 sq miles	2.0	2.3	2.4	2.4	-	2.4	3.4	-	4.8	1
Ste	orm or Storm Center N	Name		USACE MR	8-20-Holt, M	0					
Ste	orm Date(s)			6/18-22/1947							
	om Type			MCC							
	orm Location			39.45 N	94.34 W						1
Ste	orm Center Elevation			1,000							1
				17.6 Inches 6	-hours USA(E MR 8-20					1
Pre	ecipitation Total & D	uration									1
	•			70 0 F	6						
Sto	orm Representative D	ew Point		79.0 F 36 18 N	6 95 25 W						
Sto	•	ew Point	ation	36.18 N	6 95.25 W						
Sto Sto	orm Representative D	ew Point Oew Point Loc	ation	36.18 N 81.5 F	95.25 W						
Sto Sto Ma	orm Representative D orm Representative D aximum Dew Point	Dew Point Dew Point Loc	ation	36.18 N	95.25 W						
Sto Sto Ma	orm Representative D orm Representative D aximum Dew Point oisture Inflow Vector	Dew Point Dew Point Loc	ation	36.18 N 81.5 F SSW @ 230	95.25 W						
Sto Sto Mi Mi In-	orm Representative D orm Representative D aximum Dew Point oisture Inflow Vector	Dew Point Dew Point Loc	ation	36.18 N 81.5 F SSW @ 230	95.25 W						
Sto Sto Mi M In-	om Representative D om Representative D aximum Dew Point oisture Inflow Vector -place Maximization F	Dew Point Dew Point Loc Factor	ation	36.18 N 81.5 F SSW @ 230 1.12	95.25 W		June	July			
Sto Sto M. M. In-	omm Representative D omm Representative D aximum Dew Point oisture Inflow Vector -place Maximization F emporal Transposition	Dew Point Dew Point Loc Factor In (Date) Int Location	ation	36.18 N 81.5 F SSW @ 230 1.12	95.25 W Miles		June	July 82			
Stu Stu M. M. In- Te Tr. Tr.	omm Representative D omm Representative D aximum Dew Point oisture Inflow Vector -place Maximization F emporal Transposition ansposition Dew Point ansposition Maximum ansposition Adjustm	Dew Point Dew Point Loc Sactor In (Date) Int Location In Dew Point	ation	36.18 N 81.5 F SSW @ 230 1.12 5-Jul 39.46 N 81.0 F 0.98	95.25 W Miles						
Sto Sto M. M. In- Te Tr. Tr.	omm Representative D omm Representative D aximum Dew Point oisture Inflow Vector -place Maximization F emporal Transpositior ansposition Dew Poin ansposition Maximum ansposition Adjustm id Point Elevation	Dew Point Loc Factor In (Date) In Location In Dew Point Location In Dew Point In Location In Dew Point In Factor	ation	36.18 N 81.5 F SSW @ 230 1.12 5-Jul 39.46 N 81.0 F 0.98 350	95.25 W Miles						
Sto Sto M. M. In- Te Tr. Tr. Gri	omm Representative D omm Representative D aximum Dew Point oisture Inflow Vector -place Maximization F emporal Transposition ansposition Dew Poin ansposition Maximum ansposition Adjustm id Point Elevation ghest Elevation in Ba	Dew Point Loc Factor In (Date) In Location In Dew Point Location In Dew Point In Location In Dew Point In Factor	ation	36.18 N 81.5 F SSW @ 230 1.12 5-Jul 39.46 N 81.0 F 0.98 350 14,344	95.25 W Miles						
Ste Str M. M. In: Te Tr. Tr. Gri Gri Hii	omm Representative D omm Representative D aximum Dew Point oisture Inflow Vector -place Maximization F emporal Transpositior ansposition Dew Poin ansposition Maximum ansposition Adjustm id Point Elevation	Pew Point Dew Point Loc Factor In (Date) Int Location In Dew Point Ent Factor	ation	36.18 N 81.5 F SSW @ 230 1.12 5-Jul 39.46 N 81.0 F 0.98 350	95.25 W Miles						

Appendix G: Table G.26: Storm spreadsheet for Holt, MO June 18, 1947



Form 5-2

Appendix G: Table G.27: Depth-area-duration chart for Holt, MO June 18, 1947



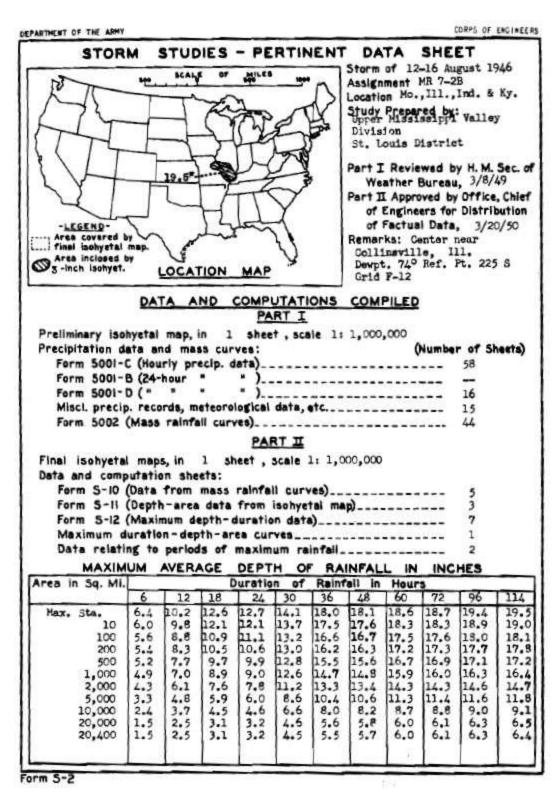
Appendix G: Figure G.34 and Figure G.35: Total storm isohyetal and Mass curve chart for Holt, MO June 1947

Collinsville, IL, AWA 42

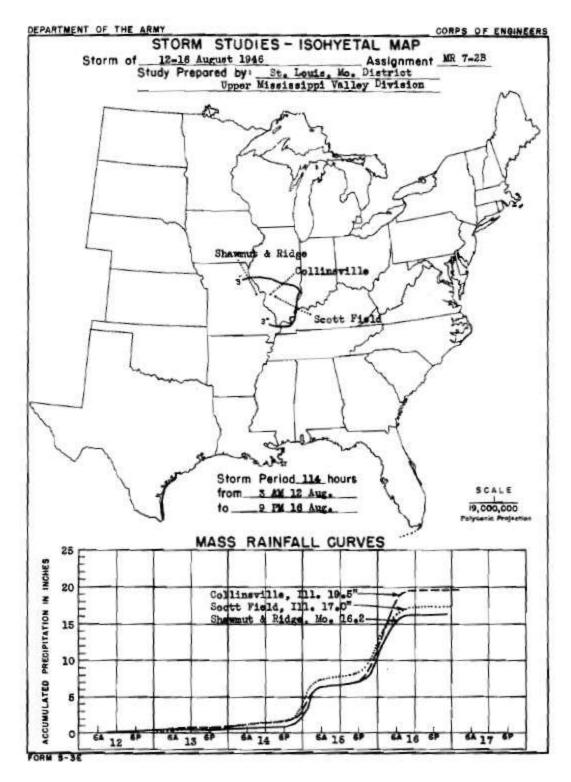
August 12, 1946 Storm Type: Frontal

	R 7-2B-Coll	insville, IL		C/A.	A 31: 4		4370	C-11D		
torm Date: 8/12-15/19 WA Analysis Date: 12/15/2013				Storm	Adjust	ment fo	or ANO	Grid Po	nt 1	
mporal Transposition Date	1-Aug									
inportar Transposition Date	Lat	Long			Moisture I	nflow Direc	tion	SSW @ 455	miles	
orm Center Location	38.67 N	89.98 W			Grid Point	Elevation		350	feet	
orm Rep Dew Point Location	32.55 N	93.00 W			Storm Cen	iter Elevatio	n	500	feet	
ansposition Dew Point Location		95.75 W				Analysis D		24	hours	
id Point Location	35.31 N	93.23 W								
			•							
The storm represent		76.0 F		orecipitable w					2.99	inches
The in-place max		80.5 F		orecipitable w					3.68	inches
The transpositioned max The in-place storm		80.0 F 500		orecipitable w ch subtracts			f precipitabl	o water at	3.60 76.0 F	inches
The in-place storm		500		ch subtracts			f precipitabl		80.5 F	
The transposition storm e		350	whi	ch subtracts			f precipitabl		80.0 F	
The Grid Point/inflow barri	er height is	1,000	whi	ch subtracts	0.29	inches of	f precipitabl	e water at	80.0 F	
				_						
The in-place			1.23					51 DAD Table St entative dew poin		
	transpositi		0.94					ween August 10-1		
The elevation/barr	ier adjustme	nt ractor is	1.00	1	KBAD and R			2		1
The to	tal adjustme	nt factor is	1.16		l					
			_,=0	4						1
Observed Storm Depth	-Area-Dura	tion								
	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	6.4	10.2	12.6	12.7	14.1	18.0	18.1	18.6	18.7	
10 sq miles	6.0	9.8	12.1	12.1	13.7	17.5	17.6	18.3	18.3	1
100 sq miles	5.6 5.4	8.8 8.3	10.9 10.5	11.1 10.6	13.2 13.0	16.6 16.2	16.7 16.3	17.5 17.2	17.6 17.3	
200 sq miles 500 sq miles	5.4	7.7	9.7	9.9	12.8	15.5	15.6	16.7	16.9	-
1000 sq miles	4.9	7.0	8.9	9.0	12.6	14.7	14.8	15.9	16.0	
2000 sq miles	4.3	6.1	7.6	7.8	11.2	13.3	13.4	14.3	14.3	
5000 sq miles	3.3	4.8	5.9	6.0	8.6	10.4	10.6	11.3	11.4	
10000 sq miles	2.4	3.7	4.5	4.6	6.6	8.0	8.2	8.7	8.8	
20000 sq miles	1.5	2.5	3.1	3.2	4.6	5.6	5.8	6.0	6.1	
Adinated Sterms Denth	A D	·*								
Adjusted Storm Depth-	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
1 sq miles	7.4	11.8	14.6	14.7	16.3	20.8	20.9	21.5	21.6	•
10 sq miles	6.9	11.3	14.0	14.0	15.9	20.3	20.4	21.2	21.2	1
100 sq miles	6.5	10.2	12.6	12.8	15.3	19.2	19.3	20.3	20.4	
200 sq miles	6.2	9.6	12.2	12.3	15.0	18.7	18.9	19.9	20.0	
	6.0	8.9	11.2 10.3	11.5 10.4	14.8 14.6	17.9 17.0	18.1	19.3 18.4	19.6 18.5	
500 sq miles		0.1		10.4	14.0	17.0	17.1	·:		
500 sq miles 1000 sq miles	5.7	8.1 7.1		9.0	13.0	15.4	15.5	166		
500 sq miles 1000 sq miles 2000 sq miles	5.7 5.0	7.1	8.8	9.0 6.9	13.0 10.0	15.4 12.0	15.5 12.3	16.6 13.1	16.6	
500 sq miles 1000 sq miles	5.7			9.0 6.9 5.3	13.0 10.0 7.6	15.4 12.0 9.3	15.5 12.3 9.5	16.6 13.1 10.1		
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles	5.7 5.0 3.8	7.1 5.6	8.8 6.8	6.9	10.0	12.0	12.3	13.1	16.6 13.2	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	5.7 5.0 3.8 2.8	7.1 5.6 4.3	8.8 6.8 5.2	6.9 5.3	10.0 7.6	12.0 9.3	12.3 9.5	13.1 10.1	16.6 13.2 10.2	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	5.7 5.0 3.8 2.8 1.7	7.1 5.6 4.3	8.8 6.8 5.2 3.6	6.9 5.3 3.7	10.0 7.6 5.3	12.0 9.3	12.3 9.5	13.1 10.1	16.6 13.2 10.2	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	5.7 5.0 3.8 2.8 1.7	7.1 5.6 4.3	8.8 6.8 5.2 3.6	6.9 5.3 3.7	10.0 7.6 5.3	12.0 9.3	12.3 9.5	13.1 10.1	16.6 13.2 10.2	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles	5.7 5.0 3.8 2.8 1.7	7.1 5.6 4.3	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946	6.9 5.3 3.7 2B-Collinsvi	10.0 7.6 5.3	12.0 9.3	12.3 9.5	13.1 10.1	16.6 13.2 10.2	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	5.7 5.0 3.8 2.8 1.7	7.1 5.6 4.3	8.8 6.8 5.2 3.6	6.9 5.3 3.7 2B-Collinsvi	10.0 7.6 5.3	12.0 9.3	12.3 9.5	13.1 10.1	16.6 13.2 10.2	
500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center I Storm Date(s) Storm Type	5.7 5.0 3.8 2.8 1.7	7.1 5.6 4.3	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500	6.9 5.3 3.7 2B-Collinsvi	10.0 7.6 5.3	12.0 9.3	12.3 9.5	13.1 10.1	16.6 13.2 10.2	
500 sq miles 1000 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles Storm or Storm Center Storm Date(s) Storm Type Storm Location 1000 sq miles 1000	5.7 5.0 3.8 2.8 1.7	7.1 5.6 4.3 2.9	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N	6.9 5.3 3.7 2B-Collinsvi	10.0 7.6 5.3	12.0 9.3	12.3 9.5	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	5.7 5.0 3.8 2.8 1.7	7.1 5.6 4.3 2.9	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in	6.9 5.3 3.7 2B-Collinsvi	10.0 7.6 5.3	12.0 9.3	12.3 9.5	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I	5.7 5.0 3.8 2.8 1.7 Name	7.1 5.6 4.3 2.9	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in '	6.9 5.3 3.7 2B-Collinsvi 89.98 W 72-hours	10.0 7.6 5.3	12.0 9.3 6.5	12.3 9.5 6.7	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D	5.7 5.0 3.8 2.8 1.7 Name	7.1 5.6 4.3 2.9	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in	6.9 5.3 3.7 2B-Collinsvi	10.0 7.6 5.3	12.0 9.3	12.3 9.5	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles Storm Ostorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I	5.7 5.0 3.8 2.8 1.7 Name Puration (10 Dew Point Lew Po	7.1 5.6 4.3 2.9	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in 76.0 F 32.55 N	6.9 5.3 3.7 2B-Collinsvi 89.98 W 72-hours	10.0 7.6 5.3	12.0 9.3 6.5	12.3 9.5 6.7	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles Storm Ostorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Storm Representative I Maximum Dew Point	5.7 5.0 3.8 2.8 1.7 Name Dew Point Lower Point Lower Point Lorent Lore	7.1 5.6 4.3 2.9	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in ' 76.0 F 32.55 N 80.5 F	6.9 5.3 3.7 2B-Collinsvi 89.98 W 72-hours	10.0 7.6 5.3	12.0 9.3 6.5	12.3 9.5 6.7	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I	5.7 5.0 3.8 2.8 1.7 Name Puration (10 Dew Point Low Point Lor	7.1 5.6 4.3 2.9	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in 1 76.0 F 32.55 N 80.5 F SSW @ 455 1.23	6.9 5.3 3.7 2B-Collinsvi 89.98 W 72-hours	10.0 7.6 5.3	12.0 9.3 6.5	12.3 9.5 6.7	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Ostorm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition	5.7 5.0 3.8 2.8 1.7 Name Puration (10 Dew Point Low Po	7.1 5.6 4.3 2.9	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in 7- 76.0 F 32.55 N 80.5F SSW @ 455 1.23	6.9 5.3 3.7 2B-Collinsvi 89.98 W 72-hours 24 93.00 W	10.0 7.6 5.3	Jul 80.5	12.3 9.5 6.7 Aug 80	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Or Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Point	5.7 5.0 3.8 2.8 1.7 Name Puration (10 Dew Point Loew Point Point Loew Point Loew Point Po	7.1 5.6 4.3 2.9 sq mi)	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in ' 76.0 F 32.55 N 80.5 F SSW @ 455 1.23 1-Aug 36.61 N	6.9 5.3 3.7 2B-Collinsvi 89.98 W 72-hours	10.0 7.6 5.3	Jul 80.5	12.3 9.5 6.7 Aug 80	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 20000 sq miles Storm Center I storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum	5.7 5.0 3.8 2.8 1.7 Name Dew Point Low Point Location Dew Point Dew	7.1 5.6 4.3 2.9 sq mi)	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in ' 76.0 F 32.55 N 80.5 F SSW @ 455 1.23 1-Aug 36.61 N 80.0 F	6.9 5.3 3.7 2B-Collinsvi 89.98 W 72-hours 24 93.00 W	10.0 7.6 5.3	Jul 80.5	12.3 9.5 6.7 Aug 80	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Center Is Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Point	5.7 5.0 3.8 2.8 1.7 Name Dew Point Low Point Location Dew Point Dew	7.1 5.6 4.3 2.9 sq mi)	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in ' 76.0 F 32.55 N 80.5 F SSW @ 455 1.23 1-Aug 36.61 N	6.9 5.3 3.7 2B-Collinsvi 89.98 W 72-hours 24 93.00 W	10.0 7.6 5.3	Jul 80.5	12.3 9.5 6.7 Aug 80	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Center I Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vector In-place Maximization I Temporal Transposition Transposition Dew Poi Transposition Maximum Transposition Maximum	5.7 5.0 3.8 2.8 1.7 Name Puration (10 Dew Point Dew Point Lorer factor In (Date) Int Location In Dew Point Lo	7.1 5.6 4.3 2.9 sq mi)	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in 1 76.0 F 32.55 N 80.5 F SSW @ 455 1.23 1-Aug 36.61 N 80.0 F 0.94	6.9 5.3 3.7 2B-Collinsvi 89.98 W 72-hours 24 93.00 W	10.0 7.6 5.3	Jul 80.5	12.3 9.5 6.7 Aug 80	13.1 10.1	16.6 13.2 10.2	
S00 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles Storm Center Istorm Center Istorm Type Storm Location Storm Center Elevation Precipitation Total & D Storm Representative Istorm Representative Inflow Vector In-place Maximum Dew Point Temporal Transposition Transposition Dow Poi Transposition Maximum Transposition Maximum Transposition Adjustm Grid Point Elevation	5.7 5.0 3.8 2.8 1.7 Name Puration (10 Dew Point Lor Factor In (Date) Int Location In Dew Point Factor In Dew Point Factor In Dew Point Factor In Eactor In Dew Point Factor In Eactor In Dew Point Factor In Eactor I	7.1 5.6 4.3 2.9	8.8 6.8 5.2 3.6 USACE MR 7- 8/12-15/1946 General Storm 38.67 N 500 18.7 Inches in 1 76.0 F 32.55 N 80.5 F SSW @ 455 1.23 1-Aug 36.61 N 80.0 F 0.94 350	6.9 5.3 3.7 2B-Collinsvi 89.98 W 72-hours 24 93.00 W	10.0 7.6 5.3	Jul 80.5	12.3 9.5 6.7 Aug 80	13.1 10.1	16.6 13.2 10.2	

Appendix G: Table G.28: Storm spreadsheet for Collinsville, IL August 12, 1946



Appendix G: Table G.29: Depth-area-duration values for Collinsville, IL August 12, 1946



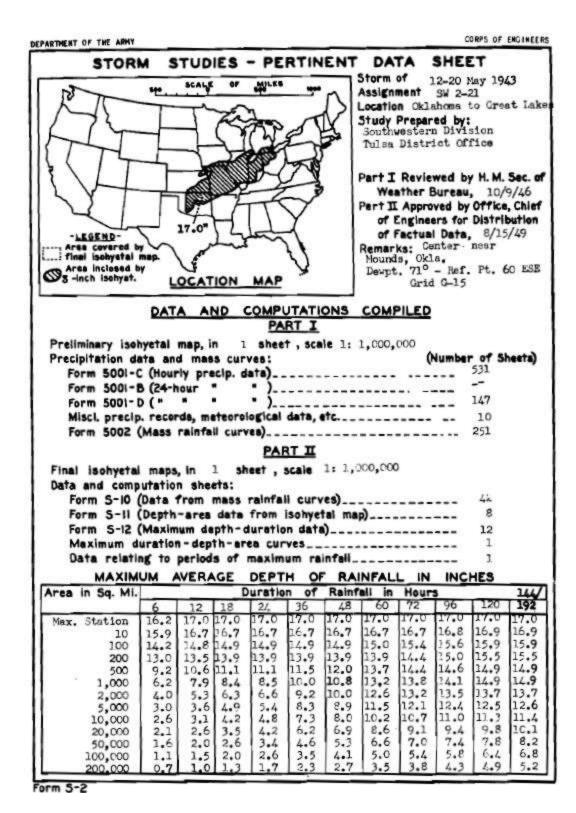
Appendix G: Figure G.36 and Figure G.37: Isohyetal map and mass curve chart for Collinsville, IL August 12, 1946

Mounds, OK, AWA 44

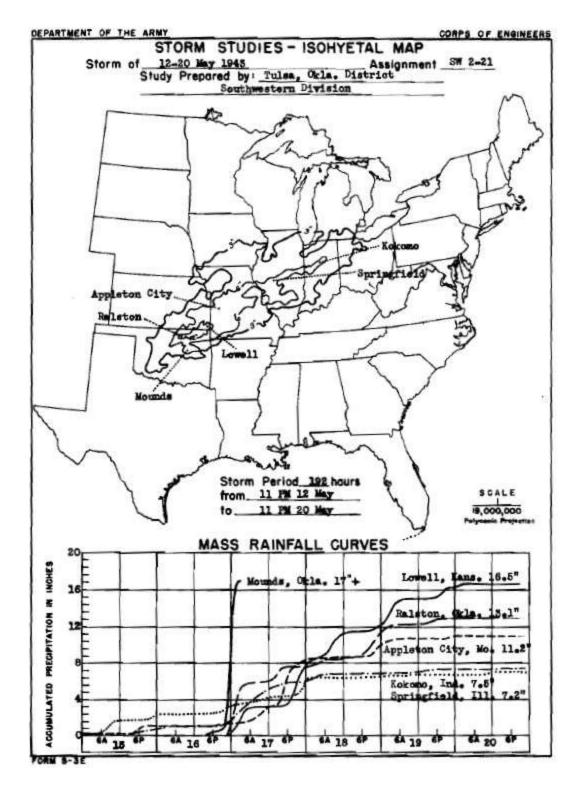
May 16, 1943 Storm Type: MCC

torm Name:		Iounds, OK			C.			4375			
orm Date:	5/15-20/19				Storm	Adjusti	ment fo	or ANO	Grid Po	int 1	
WA Analysis Date:	•										
mporal Transposit	ion Date	1-Jun Lat	Long			Moisture I	nflow Direc	tion	SSW @ 150	miles	
orm Center Locatio	.	35.88 N	96.06 W			Grid Point		tion	350	feet	
orm Rep Dew Point		33.84 N	96.98 W				ter Elevatio	n	750	feet	
ansposition Dew P			93.58 W				Analysis D		6	hours	
id Point Location	onit Eccation	35.31 N	93.23 W			этогш геер	Tinary 515 D	uration		nours	
The storm rep			73.0 F	_	recipitable w					2.60	inches.
The in-place The transpositione	ce maximum d		78.5 F		recipitable w					3.37 3.14	inches.
•	ea maximum a -place storm (•	77.0 F 750		orecipitable w ch subtracts			f precipitabl	e water at	73.0 F	inches.
	-place storm (750		ch subtracts	0.22		f precipitabl		78.5 F	
	sition storm e		350		ch subtracts			f precipitabl		77.0 F	
The Grid poin			1,000	whi	ch subtracts	0.27	inches of	f precipitabl	e water at	77.0 F	
					_						
	The in-place			1.30					hourly surface o we the 6 hour av		
		transpositi		0.91		rep Td.	vii, and NGV	i used to deri	ve the o nour av	erage storm	
The e	levation/barr	ier adjustme	ent factor is	1.00							<u> </u>
	The to	tal adjustme	ent factor is	1.19							
Observed	Storm Depth	-Area-Dura 6 Hours	ition 12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	0 Hours 15.9	12 Hours 16.7	18 Hours 16.7	24 Hours 16.7	30 Hours	30 Hours 16.7	48 Hours	16.7	16.7	
	100 sq miles	14.2	14.8	14.9	14.9	-	14.9	14.9	15.0	15.4	1
	200 sq miles	13.0	13.5	13.9	13.9	-	13.9	13.9	13.9	14.4	
	500 sq miles	9.2	10.6	11.1	11.1	-	11.5	12.0	13.7	14.4	
	000 sq miles	6.2	7.9	8.4	8.5	-	10.0	10.8	13.2	13.8	
	2000 sq miles	4.0	5.3	6.3	6.6	-	9.2	10.0	12.6	13.2	
	000 sq miles 000 sq miles		3.6 3.1	4.9 4.2	5.4 4.8	-	8.3 7.3	8.9 8.0	11.5 10.2	12.1 10.7	-
	0000 sq miles 0000 sq miles	}	2.6	3.5	4.0	-	6.2	6.9	8.6	9.1	
Adjusted 5	Storm Denth.	-Area-Dura				,	· · · · · · · · · · · · · · · · · · ·	·			
	otorin Deptin	6 TT		10 TT		20 II	26 TT			72 11	
		6 Hours 18.0	12 Hours	18 Hours 19.8	24 Hours	30 Hours	36 Hours 19.8	48 Hours	60 Hours	72 Hours	
	10 sq miles	6 Hours 18.9 16.8	12 Hours 19.8 17.6	18 Hours 19.8 17.7	24 Hours 19.8 17.7	-	36 Hours 19.8 17.7	48 Hours 19.8 17.7	60 Hours 19.8 17.8	72 Hours 19.8 18.3	
		18.9	19.8	19.8	19.8		19.8	19.8	19.8	19.8	
	10 sq miles 100 sq miles	18.9 16.8	19.8 17.6	19.8 17.7	19.8 17.7	-	19.8 17.7	19.8 17.7	19.8 17.8	19.8 18.3	
	10 sq miles 100 sq miles 200 sq miles 500 sq miles 000 sq miles	18.9 16.8 15.4 10.9 7.4	19.8 17.6 16.0 12.6 9.4	19.8 17.7 16.5 13.2 10.0	19.8 17.7 16.5 13.2 10.1	- - -	19.8 17.7 16.5 13.6 11.9	19.8 17.7 16.5 14.2 12.8	19.8 17.8 16.5 16.2 15.7	19.8 18.3 17.1 17.1 16.4	
1 2	10 sq miles 100 sq miles 200 sq miles 500 sq miles 000 sq miles 2000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7	19.8 17.6 16.0 12.6 9.4 6.3	19.8 17.7 16.5 13.2 10.0 7.5	19.8 17.7 16.5 13.2 10.1 7.8	- - -	19.8 17.7 16.5 13.6 11.9 10.9	19.8 17.7 16.5 14.2 12.8 11.9	19.8 17.8 16.5 16.2 15.7 14.9	19.8 18.3 17.1 17.1 16.4 15.7	
1 2 2 5 5	10 sq miles 100 sq miles 200 sq miles 500 sq miles 000 sq miles 2000 sq miles 2000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6	19.8 17.6 16.0 12.6 9.4 6.3 4.3	19.8 17.7 16.5 13.2 10.0 7.5 5.8	19.8 17.7 16.5 13.2 10.1 7.8 6.4	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8	19.8 17.7 16.5 14.2 12.8 11.9	19.8 17.8 16.5 16.2 15.7 14.9	19.8 18.3 17.1 17.1 16.4 15.7 14.4	
1 2 5 5 10 10 10 10 10 10 10 10 10 10 10 10 10	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 5000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7	- - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
1 2 2 5 5 100	10 sq miles 100 sq miles 200 sq miles 500 sq miles 000 sq miles 2000 sq miles 2000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6	19.8 17.6 16.0 12.6 9.4 6.3 4.3	19.8 17.7 16.5 13.2 10.0 7.5 5.8	19.8 17.7 16.5 13.2 10.1 7.8 6.4	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8	19.8 17.7 16.5 14.2 12.8 11.9	19.8 17.8 16.5 16.2 15.7 14.9	19.8 18.3 17.1 17.1 16.4 15.7 14.4	
1 2 3 5 10 20 20	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 2000 sq miles 2000 sq miles 2000 sq miles 2000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
11 2 2 3 10 10 20 Storm or S	10 sq miles 100 sq miles 200 sq miles 500 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 1000 sq miles 1000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
1	10 sq miles 100 sq miles 200 sq miles 500 sq miles 000 sq miles 000 sq miles 0000 sq miles 0000 sq miles 0000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
1 2 2 3 10 10 20 Storm or S	10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mour 5/15-20/1943	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Typ Storm Loc	10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mout 5/15-20/1943 MCC	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Typ Storm Loc Storm Cer	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 6000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mout 5/15-20/1943 MCC 35.88 N	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Typ Storm Loc Storm Cer Precipitati	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 10000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mou 5/15-20/1943 MCC 35.88 N 750 17.0 inches in 1	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Dat Storm Typ Storm Loc Storm Cer Precipitati Storm Rep	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 0000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mour 5/15-20/1943 MCC 35.88 N 750 17.0 inches in 1	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0 96.06 W	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7 7.4	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5 8.2	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Dat Storm Typ Storm Loc Storm Cer Precipitati Storm Rep Storm Rep	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 10000 sq miles	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5 Name	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mou 5/15-20/1943 MCC 35.88 N 750 17.0 inches in 1	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Dat Storm Loc Storm Cer Precipitati Storm Rep Storm Rep	10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 6000 sq	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5 Name	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mour 5/15-20/1943 MCC 35.88 N 750 17.0 inches in 1	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0 96.06 W	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7 7.4	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5 8.2	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Dat Storm Typ Storm Loc Storm Cen Precipitati Storm Rep In-place N Moisture	10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5 Name	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mour 5/15-20/1943 MCC 35.88 N 750 17.0 inches in 1	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0 96.06 W	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7 7.4	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5 8.2	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Dat Storm Loc Storm Cer Precipitati Storm Reg Storm Reg In-place N Moisture In-place N	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 6000 sq	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5 Name Puration (10 Td Td Location	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mout 5/15-20/1943 MCC 35.88 N 750 17.0 inches in 1	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0 96.06 W	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7 7.4	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5 8.2	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Dat Storm Typ Storm Cer Precipitati Storm Rep Storm Rep In-place M Moisture In-place M	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 10000 sq miles 10	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5 Name	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mou 5/15-20/1943 MCC 35.88 N 730.8F N 73.0 F 33.84 N 78.5 F SSW @ 150 1.30	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0 96.06 W 96.06 W 12 hours 6 96.98 W	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7 7.4	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5 8.2	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Dat Storm Typ Storm Loc Storm Cer Precipitati Storm Rep Storm Rep In-place N Moisture In-place N Temporal Transposi	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 10000 sq miles 10	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5 Name Puration (10 of the continuous of the	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mouth 5/15-20/1943 MCC 35.88 N 750 17.0 inches in 1 73.0 F SSW @ 150 1.30 1-Jun 40.69 N	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0 96.06 W	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7 7.4	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5 8.2	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Dat Storm Typ Storm Loc Storm Cer Precipitati Storm Rep Storm Rep In-place N Moisture In-place N Temporal Transposi	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 10000 sq miles 10	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5 Name Puration (10 Td Td Location Factor In (Date) Int Location Int Td	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mou 5/15-20/1943 MCC 35.88 N 730.8F N 73.0 F 33.84 N 78.5 F SSW @ 150 1.30	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0 96.06 W 96.06 W 12 hours 6 96.98 W	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7 7.4	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5 8.2	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Dat Storm Loc Storm Cen Precipitati Storm Rep In-place M Moisture In-place M Temporal Transposi Transposi	10 sq miles 100 sq miles 200 sq miles 200 sq miles 500 sq miles 1000 sq	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5 Name Puration (10 Td Td Location Factor In (Date) Int Location Int Td	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mour 5/15-20/1943 MCC 35.88 N 750 17.0 inches in 1 73.0 F SSW @ 150 1.30 1-Jun 40.69 N 77.0 F	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0 96.06 W 96.06 W 12 hours 6 96.98 W	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7 7.4	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5 8.2	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Dat Storm Loc Storm Rep Storm Rep In-place M Moisture In-place M Transposi Transposi Transposi Grid Point Highest E	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 6000 sq	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5 Name Puration (10 Td Location r Factor n (Date) nt Location m Td tent Factor	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mour 5/15-20/1943 MCC 35.88 N 750 17.0 inches in 1 73.0 F 33.84 N 78.5 F SSW @ 150 1.30 1-Jun 40.69 N 77.0 F 0.91	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0 96.06 W	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7 7.4	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5 8.2	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	
Storm or S Storm Dat Storm Loc Storm Rep Storm Rep In-place N Moisture In-place N Transposi	10 sq miles 100 sq miles 200 sq miles 500 sq miles 500 sq miles 5000 sq miles 6000 sq	18.9 16.8 15.4 10.9 7.4 4.7 3.6 3.1 2.5 Name Puration (10 Td Td Location r Factor In (Date) and Location m Td ent Factor asin	19.8 17.6 16.0 12.6 9.4 6.3 4.3 3.7 3.1	19.8 17.7 16.5 13.2 10.0 7.5 5.8 5.0 4.2 SW 2-21-Mour 5/15-20/1943 MCC 35.88 N 750 17.0 inches in 1 73.0 F 33.84 N 78.5 F SSW @ 150 1.30 1-Jun 40.69 N 77.0 F 0.91	19.8 17.7 16.5 13.2 10.1 7.8 6.4 5.7 5.0 96.06 W	- - - - - -	19.8 17.7 16.5 13.6 11.9 10.9 9.8 8.7 7.4	19.8 17.7 16.5 14.2 12.8 11.9 10.6 9.5 8.2	19.8 17.8 16.5 16.2 15.7 14.9 13.6	19.8 18.3 17.1 17.1 16.4 15.7 14.4 12.7	

Appendix G: Table G.30: Storm spreadsheet for Mounds, OK May 16, 1943



Appendix G: Table G.31: Depth-area-duration chart for Mounds, OK May 16, 1943



Appendix G: Figure G.38 and Figure G.39: Isohyetal map and mass curve chart for Mounds, OK May 16, 1943

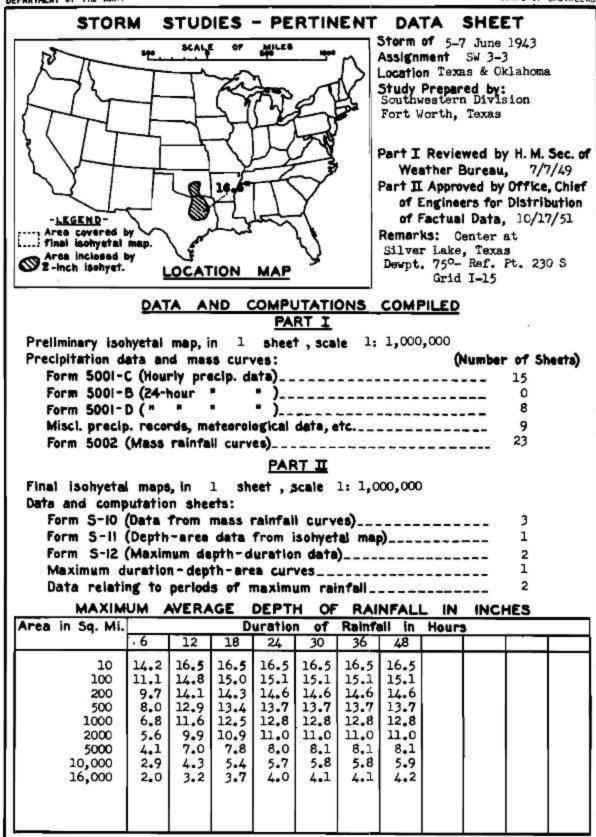
Silver Lake, TX AWA 45

June 5, 1943 Storm Type: MCC

		Silver Lake,	IX								
	5-6/1943				Sto	rm Adjus	stment for	r ANO G	rid Point	1	
A Analysis Date: 12	2/15/2013										
poral Transposition Date		15-Jun									
		Lat	Long			Moisture Infl	ow Direction:		SSW @ 200	miles	
rm center location		32.67 N	95.60 W			Grid Point Ele	evation		350	feet	
rm Rep SST location		30.05 N	97.00 W			Storm Center Elevation			400 feet		
asposition SST location		30.65 N	99.60 W		1		salysis Duratio		6	hours	
d Point location		35.31 N	93.23 W			11000000		3		17.50	
ne-wywarana											
The st	torm represer	stative SST is	77.0 F	with total	precipitable wate	above sea lev	rel of			3.14	inches
		minum SST is	80.0 F		precipitable water					3.60	inches
The transp	positioned ma	nimam SST in	79.0 F	with total	precipitable water	above sealer	rel of			3.44	inches
The	in-place stor	m elevation is	400		which subtracts	0.10	inches	of precipitable	water at	77.0 F	
The	in-place stor	m elevation is	400		which subtracts	0.12	inches	of precipitable	water at	80.0 F	
The trans	position stor	m elevation at	350		which subtracts	0.295	inches	of precipitable	water at	79.0 F	
The Grid po	oint inflow be	urier height is	1,050		which subtracts	0.295	inches	of precipitable	water at	79.0 F	
022	160					E-05/4 - 5/4/5	3800 000				
	Their	n-place maximiz	ation factor is	1.14					ace observations at	KBSM, KEFD,	1
		The transpor	sition factor is	0.90		and KIBO for th	te 6 hour duration	+			
	The elevation	n barrier adjust		1.00							
ž.		The total adjust	ment factor is	1.03							
Name of the last					65 G						
Observed Storm 1	Depth Area I	Duration									
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	14.2	16.5	16.5	16.5	16.5	16.5	16.5	-		
	100 sq miles	11.1	14.8	15.0	15.1	15.1	15.1	15.1	-		1
	200 sq miles	9.7	14.1	14.3	14.6	14.6	14.6	14.6	-	-	_
	500 sq miles	8.0	12.9	13.4	13.7	13.7	13.7	13.7		- 00	1
	000 sq miles	6.8	11.6	12.5	12.8	12.8	12.8	12.8			
	000 sq miles	5.6	9.9	10.9	11.0	11.0	11.0	11.0	-	-	
	000 sq cules	4.1	7.0	7.8	8.0	8.1	8.1	8.1			
	000 sq miles	2.9	4.3	5.4	5.7	5.8	5.8	5.9	-	-	
200	eslim pe 000					-		-		-	1
Adjusted Storm I	Septh-Area-D				4-22-						
		6 Hours	12 Hours	15 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	14.7	17.1	17.1	17.1	17.1	17.1	17.1		-	-
	100 sq miles	11.5	15.3	15.5	15.6	15.6	15.6	15.6	-		-
	200 sq miles	10.0	14.6	14.8	15.1 14.2	15.1	15.1	15.1			-
					14.2		14.2	14.4		-	-
	500 sq miles	8.3				Annual Color Street Color	and the second second				
10	500 sq miles 000 sq miles	7.0	12.0	12.9	13.2	13.2	13.2	13.2	-		1
10	500 sq miles 000 sq miles 000 sq miles	7.0 5.8	12.0 10.2	12.9 11.3	13.2 11.4	13.2 11.4	13.2 11.4	13.2 11.4	-	-	-
10 20 51	500 sq miles 000 sq miles 000 sq miles 000 sq miles	7.0 5.8 4.2	12.0 10.2 7.2	12.9 11.3 8.1	13.2 11.4 8.3	13.2 11.4 8.4	13.2 11.4 8.4	13.2 11.4 8.4	-	-	
10 20 50 100	500 sq miles 500 sq miles 500 sq miles 500 sq miles 500 sq miles	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6	13.2 11.4 8.3 5.9	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
10 20 50 100	500 sq miles 000 sq miles 000 sq miles 000 sq miles	7.0 5.8 4.2	12.0 10.2 7.2	12.9 11.3 8.1	13.2 11.4 8.3	13.2 11.4 8.4	13.2 11.4 8.4	13.2 11.4 8.4	-	-	
10 20 50 100	500 sq miles 500 sq miles 500 sq miles 500 sq miles 500 sq miles	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6	13.2 11.4 8.3 5.9	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
14 24 59 100 200	500 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6	13.2 11.4 8.3 5.9	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
11 24 5 100 200 Storm or Storm Co	500 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6	13.2 11.4 8.3 5.9	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
11 20 5 10 20 10 20 10 10 10 10	500 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 	13.2 11.4 8.3 5.9	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
11 20 51 10 10 10 10 10 10 1	500 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles 000 sq miles	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 - USACE SW 3 6/3-6/1943 MCC	13.2 11.4 8.3 5.9 	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Location	500 sq miles 900 sq miles	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 USACE SW 3 6/3-6/1943 MCC 32.67 N	13.2 11.4 8.3 5.9	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Location Storm Center Elev	500 sq miles 900 sq miles 900 sq miles 900 sq miles 900 sq miles 900 sq miles 900 sq miles enter Name	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 	13.2 11.4 8.3 5.9 	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Location	500 sq miles 900 sq miles 900 sq miles 900 sq miles 900 sq miles 900 sq miles 900 sq miles enter Name	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 USACE SW 3 6/3-6/1943 MCC 32.67 N	13.2 11.4 8.3 5.9 	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Ce Storm Date(s) Storm Location Storm Center Elev Precipitation Tota	500 sq miles 500 sq miles 500 sq miles 500 sq miles 5000 sq miles 5000 sq miles 6000 sq miles	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 5.6 5.6 6.3-6.1943 MCC 82.63 N 490 16.5 inches in	13.2 11.4 8.3 5.9 	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Location Storm Center Elev	500 sq sules 500 sq sules 500 sq sules 500 sq miles 600 s	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 	13.2 11.4 8.3 5.9 	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Type Storm Location Storm Center Elev Precipitation Tota Storm Representa	500 sq sules 500 sq miles 500 sq miles 500 sq miles 600 s	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 	13.2 11.4 8.3 5.9 -3-Silver Lake, 1 95.60 W	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Date(s) Storm Cation Storm Center Elev Precipitation Tota Storm Representa	500 sq miles 500 sq miles 500 sq miles 500 sq miles 600 sq miles 600 sq miles 600 sq miles 600 sq miles enter Name enter Name strive SST strive SST Loc m SST	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 	13.2 11.4 8.3 5.9 -3-Silver Lake, 1 95.60 W	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Date(s) Storm Location Storm Center Elev Precipitation Tota Storm Representa Storm Representa In-place Maximum	500 sq miles 500 sq miles 500 sq miles 500 sq miles 5000 sq miles 5000 sq miles 6000 s	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 	13.2 11.4 8.3 5.9 	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Location Storm Location Storm Location Storm Enter Elev Precipitation Tota Storm Representa Storm Representa In-place Maximum Moestaze Inflow	500 sq miles 500 sq miles 500 sq miles 500 sq miles 5000 sq miles 5000 sq miles 6000 s	7.0 5.8 4.2 3.0	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 	13.2 11.4 8.3 5.9 	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Location Storm Location Storm Location Storm Representa Storm Representa In-place Maximum Moestage Inflow	500 sq sules 500 sq miles 500 sq miles 500 sq miles 600 sq miles 600 sq miles 600 sq miles 600 sq miles enter Name enter Name vation al & Duration ative SST Loc m SST Vector ation Factor	7.0 5.8 4.2 3.0 (10 sq mi)	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 	13.2 11.4 8.3 5.9 	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Or Storm Date(s) Storm Date(s) Storm Type Storm Location Storm Center Elev Precipitation Tota Storm Represents In-place Maximum Mosstage Inflow V In-place Maximum	500 sq sules 500 sq miles 500 sq miles 500 sq miles 500 sq miles 600 s	7.0 5.8 4.2 3.0 (10 sq mi)	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 USACE SW 3 6.5-6-1943 MCC 32.67 N 400 16.5 inches in 77.0 F 30.05 N 80.0 F SSW @ 200	13.2 11.4 8.3 5.9 	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Type Storm Loation Storm Center Elev Precipitation Tota Storm Represents Storm Represents In-place Maximum Mosstage Inflow V In-place Maximum Temporal Transp	500 sq miles 500 sq miles 500 sq miles 500 sq miles 5000 sq miles 5000 sq miles 6000 s	7.0 5.8 4.2 3.0 (10 sq mi)	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6	13.2 11.4 8.3 5.9 - - - - - - - - - - - - - - - - - - -	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Or Storm Date(s) Storm Date(s) Storm Type Storm Location Storm Center Elev Precipitation Tota Storm Represents In-place Maximum Moestner Inflow V In-place Maximum Temporal Transposition De Transposition De Transposition Maximum Transposition Ad	500 sq sules 500 sq miles 500 sq miles 500 sq miles 500 sq miles 5000 sq miles 5000 sq miles 6000 sq	7.0 5.8 4.2 3.0 (10 sq mi)	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 USACE SW 3 65.6 1943 MCC 32.67 N 490 16.5 inches in 77.0 F 880.0 F 88W @ 200	13.2 11.4 8.3 5.9 - - - - - - - - - - - - - - - - - - -	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Date(s) Storm Type Storm Loation Storm Center Elev Precipitation Tota Storm Represents In-place Maximum Mositage Inflow V In-place Maximum Temporal Transposition De Transposition Ma	500 sq sules 500 sq miles 500 sq miles 500 sq miles 600 s	7.0 5.8 4.2 3.0 (10 sq mi)	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6	13.2 11.4 8.3 5.9 - - - - - - - - - - - - - - - - - - -	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Type Storm Location Storm Center Elev Precipitation Tota Storm Representa Storm Representa in-place Maximum Mosture inflow V in-place Maximum Temporal Transportion De Transposition Ma Transposition Ad Ond Point Elevation Highest Elevation	500 sq sules 500 sq sules 500 sq sules 500 sq miles 600 s	7.0 5.8 4.2 3.0 (10 sq mi)	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6 USACE SW 3 6.5-6-1943 MCC 32.67 N 400 16.5 inches in 77.0 F 30.05 N 80.0 F SSW @ 200	13.2 11.4 8.3 5.9 - - - - - - - - - - - - - - - - - - -	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Date(s) Storm Date(s) Storm Location Storm Center Elev Precipitation Tota Storm Representa In-place Maximum Mosture Inflow In-place Maximum Temporal Transposition De Transposition De Transposition Ad Grid Pour Elevate Highest Elevation Inflow Bamer Hei	500 sq sules 500 sq sules 500 sq sules 500 sq sules 5000 sq sules 6000 s	7.0 5.8 4.2 3.0 (10 sq mi)	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6	13.2 11.4 8.3 5.9 - - - - - - - - - - - - - - - - - - -	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		
Storm or Storm Co Storm Date(s) Storm Type Storm Location Storm Center Elev Precipitation Tota Storm Representa Storm Representa in-place Maximum Mosture inflow V in-place Maximum Temporal Transportion De Transposition Ma Transposition Ad Ond Point Elevation Highest Elevation	500 sq sules 500 sq miles 500 sq miles 500 sq miles 500 sq miles 5000 sq miles 6000 sq	7.0 5.8 4.2 3.0 (10 sq mi)	12.0 10.2 7.2 4.4	12.9 11.3 8.1 5.6	13.2 11.4 8.3 5.9 - - - - - - - - - - - - - - - - - - -	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.0	13.2 11.4 8.4 6.1	-		

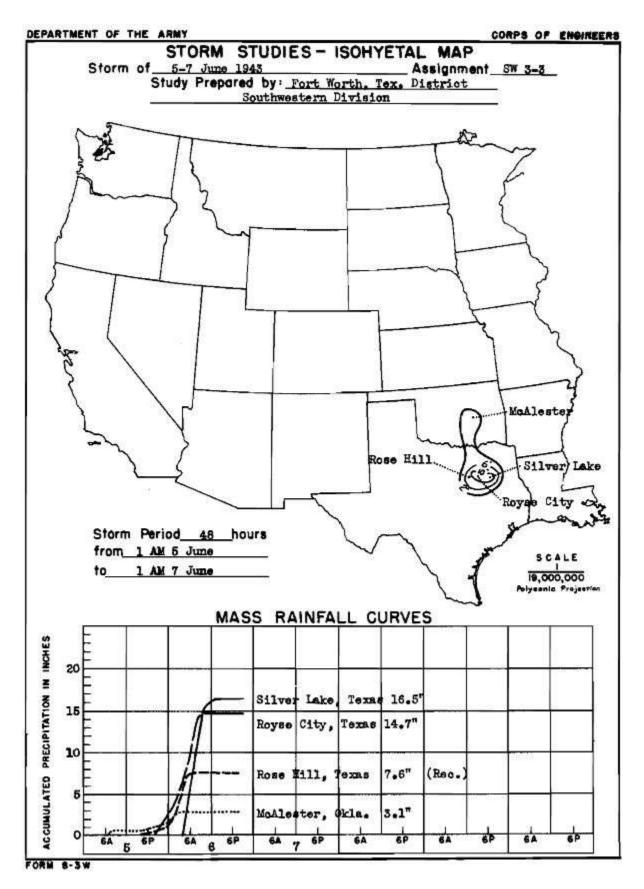
Appendix G: Table G.32: Storm spreadsheet for Silver Lake, TX June 5, 1943

DEPARTMENT OF THE ARMY CORPS OF ENGINEERS



Form 5-2

Appendix G: Table G.33: Depth-area-duration chart for Silver Lake, TX June 5, 1943



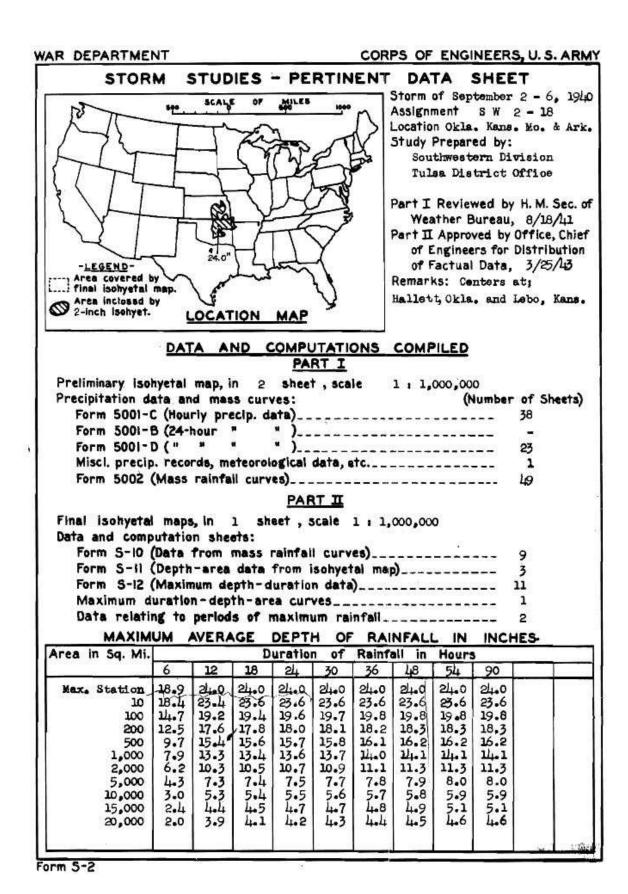
Appendix G: Figure G.40 and Figure G.41: Total storm isohyetal and mass curve chart for Silver Lake, TX June 5, 1943

Hallett, OK AWA 52

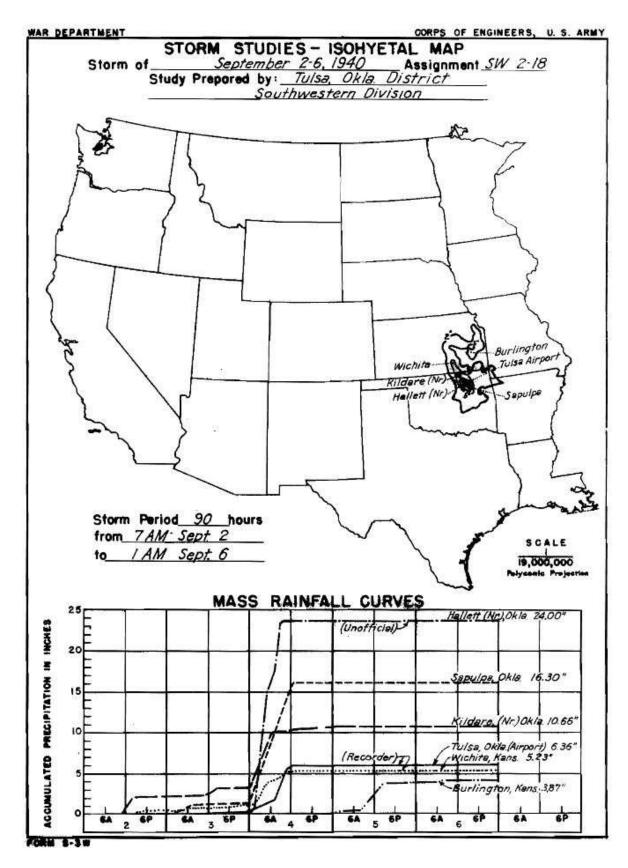
September 2, 1940 Storm Type: MCC

rm Name:	USACE SW 2-	18-Hallert, OK			05900	VISSO NUMBERO	ALLOS STATEMENTS	entragographic son	ngg garagana	2:	
m Date: A Analysis	9/2-4/1940 Date: 12/15/2013		·		Sto	rm Adju	stment fo	or ANO G	rid Point	1	
	sposition Date	17-Aug					_	_			
porar reaso	Spesition Date	Lat	Long			Moisture Inf	low Direction		SE @ 300	miles	_
m Center L	acatlan	36.23 N	96.57 W			Grid Point El			350	feet	
			200100-0000						900		
C301-10 #001010101	Point Location	32.90 N	93.15 W		-	Storm Center				feet	
	Dew Point Location	39.39 N	89.86 W			Storm Rep A	nalysis Durati	PR.	12	hours	
Point Loca	ation	35.31 N	93.23 W								
	The storm representative	e dew point is	77.5 F	with total	precipitable wate	r above sea le	vel of			3.22	inches
	The in-place maximum		80.0 F		precipitable water					3.52	inches
	The transpositioned maximum		80.0 F		precipitable water					3.52	inches
	The in-place stor		900		which subtracts	0.25		s of precipitable	water at	77.5 F	
	The in-place stor	m elevation is	900		which subtracts	0.27	inche	s of precipitable	water at	80.0 F	
	The transposition stor	m elevation at	350		which subtracts	0.29	inches	s of precipitable	water at	80.0 F	
	The Grid point inflow by	unier height is	1,000	(which subtracts	0.29	inche	s of precipitable	water at	80.0 F	
	4000			10000	-				-		
	The	n-place matimiz		1.09				Td using hourly a a tha 6 hour averag		egion Used	
			sition factor is	0.99	1 1	mario, ameraj	and the selling	average	to women talk to be		1
	The elevation	n barrier adjust	ment factor is	1.00							1
		The total adjust	ment factor is	1.09							
			and addition to		tion to	8					
9	Observed Storm Depth Area		10.11	40.77	1.00	26.55	1 0000	la an re	L 20.25	22.25	
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	1
	10 sq miles	18.4	23.4	23.6	23.6	23.6	23.6	23.6	-	-	1
-	100 sq miles	14,7	19.2 17.6	19.4	19.6 18.0	19.7	19.8	19.8	-		1
	200 sq miles	9.7	15.4	17.8	15.7	15.8	18.2	18.3	-	-	1
	500 sq miles 1000 sq miles	7.9	13.3	13.4	13.6	13.7	14.0	14.1			1
	2000 sq miles	6.2	10.3	10.5	10.7	10.9	11.1	11.3		-	1
	5000 sq miles	4.3	7.3	7.4	7.5	7.7	7.8	7.9			1
	10000 sq males	3.0	5.3	5.4	5.5	5.6	5.7	5.8	1		1
	20000 sq miles	2.0	3.9	4.1	42	4.3	4.4	4.5			1
		-									
-	Adjusted Storm Depth-Area-I	6 Hours	12 Hours	13 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	20.0	25.4	25.6	25.6	25.6	25.6	25.6	oo nours	72 EVOLUS	1
	100 sq miles	16.0	20.8	21.1	21.3	21.4	21.5	21.5			1
	100 3d states	13.6	19.1	19.3	19.5	19.7	19.8	19.9			1
	200 sq poles				17.0	and the same of th	17.5	17.6	-		1
	200 sq miles 200 sq miles	10.5	10.7	16.9		17.2					1
	500 sq miles	10.5 8.6	16.7	16.9	14.8	17.2	15.2	15.3	-		
	500 sq miles 1000 sq miles	the state of the s			14.8 11.6	and the second	15.2 12.1	15.3	-	-	1
	500 sq miles	8.6	14.4	14.5		14.9		The second second second			-
	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles	8.6 6.7	14.4 11.2	14.5 11.4	11.6	14.9 11.8	12.1	12.3			
	500 sq mdes 1000 sq mdes 2000 sq mdes	8.6 6.7 4.7	14.4 11.2 7.9	14.5 11.4 8.0	11.6 8.1	14.9 11.8 8.4	12.1 8.5	12.3 8.6			
	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	8.6 6.7 4.7 3.3	14.4 11.2 7.9 5.8	14.5 11.4 8.0 5.9	11.6 8.1 6.0	14.9 11.8 8.4 6.1	12.1 8.5 6.2	12.3 8.6 6.3			
8	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles	8.6 6.7 4.7 3.3	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5	11.6 8.1 6.0	14.9 11.8 8.4 6.1	12.1 8.5 6.2	12.3 8.6 6.3			
_	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles	8.6 6.7 4.7 3.3	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5	11.6 8.1 6.0 4.6	14.9 11.8 8.4 6.1	12.1 8.5 6.2	12.3 8.6 6.3			
5	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles	8.6 6.7 4.7 3.3	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5	11.6 8.1 6.0 4.6	14.9 11.8 8.4 6.1	12.1 8.5 6.2	12.3 8.6 6.3			
5	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Or Storm Center Name Storm Dute(s) Storm Location	8.6 6.7 4.7 3.3	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 92-4-1940 MCC 36.23 N	11.6 8.1 6.0 4.6	14.9 11.8 8.4 6.1	12.1 8.5 6.2	12.3 8.6 6.3			
5	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20009 sq miles 20009 sq miles 20009 sq miles \$10000 sq miles	8.6 6.7 4.7 3.3 2.2	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 9/2-4-1940 MCC	11.6 8.1 6.0 4.6	14.9 11.8 8.4 6.1	12.1 8.5 6.2	12.3 8.6 6.3			
5	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Or Storm Center Name Storm Dute(s) Storm Location	8.6 6.7 4.7 3.3 2.2	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 92-4-1940 MCC 36.23 N	11.6 8.1 6.0 4.6 -18-Hallett, OK	14.9 11.8 8.4 6.1	12.1 8.5 6.2	12.3 8.6 6.3			
5 5 8 8	300 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Date(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Duration	8.6 6.7 4.7 3.3 2.2	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 9/2-4/1940 MCC 36.23 N 900 24.00 inches is	11.6 8.1 6.0 4.6 -18-Hallert, OK	14.9 11.8 8.4 6.1	12.1 8.5 6.2	12.3 8.6 6.3			
5 5 8 8	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20009 sq miles 20009 sq miles 20009 sq miles \$10000 sq miles	8.6 6.7 4.7 3.3 2.2	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 9/2-4-1940 MCC 36.23 N	11.6 8.1 6.0 4.6 -18-Hallett, OK	14.9 11.8 8.4 6.1	12.1 8.5 6.2	12.3 8.6 6.3			
15 15 15 15 15 15 15 15 15 15 15 15 15 1	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Dute(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Duration Storm Representative Dew Po	8.6 6.7 4.7 3.3 2.2	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 9/2-4/1940 MICC 36.23 N 900 24.00 inches in	11.6 8.1 6.0 4.6 1-18-Hallett, OK 96.37 W	14.9 11.8 8.4 6.1	12.1 8.5 6.2 4.8	12.3 8.6 6.3			
5 S S S S S S S S S S S S S S S S S S S	300 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20009 sq miles 20009 sq miles 20009 sq miles 20009 sq miles Storm Date(s) Storm Date(s) Storm Location Storm Center Elevation Precipitation Total & Duration Storm Representative Dew Po	8.6 6.7 4.7 3.3 2.2	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 9/2+1940 MCC 36.23 N 900 24.00 inches is	11.6 8.1 6.0 4.6 1-18-Hallett, OK 96.37 W	14.9 11.8 8.4 6.1	12.1 8.5 6.2 4.8	12.3 8.6 6.3			
5 5 8 8 8 8 8 8 8	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Date(s) Storm Date(s) Storm Location Storm Center Elevation Precipitation Total & Duration Storm Representative Dew Polytom Representative Dew Polytom Representative Dew Polytom Readingum Dew Point	8.6 6.7 4.7 3.3 2.2	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 9/2-4-1940 MCC 16.23 N 900 24.00 inches is 77.5 F 13.90 N 80.0 F	11.6 8.1 6.0 4.6 1-18-Hallett, OK 96.37 W	14.9 11.8 8.4 6.1	12.1 8.5 6.2 4.8	12.3 8.6 6.3			
8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20009 sq miles 20009 sq miles 20009 sq miles 20009 sq miles Storm Dute(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Duration Storm Representative Dew Politication Storm Representative Dew Politication Mosture Inflow Vector In-place Maximization Factor	8.6 6.7 4.7 3.3 2.2	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 9/2.4-1940 MCC 36-23 N 990 24.00 inches is 177.5 F 12.90 N 80.9 F SE @ 300 1.09	11.6 8.1 6.0 4.6 1-18-Hallett, OK 96.37 W	14.9 11.8 8.4 6.1	12.1 8.5 6.2 4.8	12.3 8.6 6.3			
S S S S S S S S S S S S S S S S S S S	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Dute(s) Storm Dute(s) Storm Location Storm Center Elevation Percipitation Total & Duration Storm Representative Dew Polymore Storm Representative Dew Polymore Maximum Dew Point Moesture Inflow Vector In-place Maximum Factor Temporal Transposition (Date	8.6 6.7 4.7 3.3 2.2	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 9/2-4-1940 MCC 16.23 N 900 24.00 inches is 77.5 F 32.90 N 80.0 F 8E 28 300 1.09	11.6 8.1 6.0 4.6 -18-Hallert, OK 96.57 W a 12 hours 12 93.15 W	14.9 11.8 8.4 6.1	12.1 8.5 6.2 4.8	123 8.6 6.3 4.9			
20 00 00 00 00 00 00 00 00 00 00 00 00 0	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Duta(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Duration Storm Representative Dew Poi Maximum Dew Point Moestare Inflow Vector In-place Maximization Factor Temporal Transposition (Date Transposition Dew Point Loca Temporal Transposition (Date Transposition Dew Point Loca	8.6 6.7 4.7 3.3 2.2 1 (10 sq mi) int int Location	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 92.4-1940 MCC 16.23 N 990 24.00 inches is 77.5 F 13.90 N 80.0 F SE ② 300 1.09	11.6 8.1 6.0 4.6 1-18-Hallett, OK 96.37 W	14.9 11.8 8.4 6.1	12.1 8.5 6.2 4.8 A 79.5	123 8,6 6,3 4,9			
50 00 III.	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Dutet(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Duration Storm Representative Dew Polication Storm Representative Dew Polication Total & Duration Storm Representative Dew Polication Total & Duration Control of the Polication Temporal Transposition (Date Transposition Dew Point Location Transposition Maximum Dew	8.6 6.7 4.7 3.3 2.2 (10 sq mi) int int Location	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 9/2-4-1940 MCC 36.23 N 900 24.00 inches is 77.5 F 32.90 N 80.0 F 80.0 F	11.6 8.1 6.0 4.6 -18-Hallert, OK 96.57 W a 12 hours 12 93.15 W	14.9 11.8 8.4 6.1	12.1 8.5 6.2 4.8	123 8.6 6.3 4.9			
50 St B	300 sq miles 2000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Date(s) Storm Date(s) Storm Location Storm Center Elevation Precipitation Total & Duration Storm Representative Dew Por Storm Representative Dew Por Maximum Dew Point Moestage Inflow Vector In-place Maximization Factor Temporal Transposition Dew Point Loca Transposition Dew Point Loca Transposition Maximum Dew Transposition Adjustment Factor	8.6 6.7 4.7 3.3 2.2 (10 sq mi) int int Location	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 9/2.4/1940 MCC 36.23 N 900 24.00 inches is 17/1.5 F 12.90 N 80.0 F SE @ 300 17.0 Aug 19/39 N 80.0 F	11.6 8.1 6.0 4.6 -18-Hallert, OK 96.57 W a 12 hours 12 93.15 W	14.9 11.8 8.4 6.1	12.1 8.5 6.2 4.8 A 79.5	123 8,6 6,3 4,9			
5 S S S S S S S S S S S S S S S S S S S	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Dute(s) Storm Dute(s) Storm Location Storm Center Elevation Precipitation Total & Duration Storm Representative Dew Polymanium Dew Point Moisture Inflow Vector In-place Minomization Factor Temporal Transposition Dew Point Location Transposition Dew Point Location Transposition Dew Point Location Transposition Adjustment Factor	8.6 6.7 4.7 3.3 2.2 (10 sq mi) int int Location	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 972-4-1940 MCC 16.23 N 900 24.00 inches is 77.5 F 32.90 N 80.0 F 8E @ 300 1.09 17.Aug 19.39 N 80.0 F 0.99	11.6 8.1 6.0 4.6 -18-Hallert, OK 96.57 W a 12 hours 12 93.15 W	14.9 11.8 8.4 6.1	12.1 8.5 6.2 4.8 A 79.5	123 8,6 6,3 4,9			
(1) (2) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Duta(s) Storm Type Storm Location Storm Center Elevation Precipitation Total & Duration Storm Representative Dew Poi Maximum Dew Point Moestare Inflow Vector In-place Maximization Factor Temporal Transposition (Date Transposition Dew Point Loca Transposition Dew Point Loca Transposition Maximum Dew Transposition Maximum Dew Transposition Maximum Dew Transposition Maximum Dew Transposition Maximum Basin	8.6 6.7 4.7 3.3 2.2 (10 sq mi) int int Location	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 92.4-1940 MCC 56.23 N 990 24.00 inches is 77.5 F 32.90 N 80.0 F SE @ 300 1.09 17.Aug 19.39 N 80.0 F 30.99 3130 14.344	11.6 8.1 6.0 4.6 -18-Hallert, OK 96.57 W a 12 hours 12 93.15 W	14.9 11.8 8.4 6.1	12.1 8.5 6.2 4.8 A 79.5	123 8,6 6,3 4,9			
55 SS S	500 sq miles 1000 sq miles 2000 sq miles 5000 sq miles 10000 sq miles 10000 sq miles 10000 sq miles 20000 sq miles 20000 sq miles 20000 sq miles Storm Dute(s) Storm Dute(s) Storm Location Storm Center Elevation Precipitation Total & Duration Storm Representative Dew Polymanium Dew Point Moisture Inflow Vector In-place Minomization Factor Temporal Transposition Dew Point Location Transposition Dew Point Location Transposition Dew Point Location Transposition Adjustment Factor	8.6 6.7 4.7 3.3 2.2 (10 sq mi) int int Location	14.4 11.2 7.9 5.8 4.2	14.5 11.4 8.0 5.9 4.5 USACE SW 2 972-4-1940 MCC 16.23 N 900 24.00 inches is 77.5 F 32.90 N 80.0 F 8E @ 300 1.09 17.Aug 19.39 N 80.0 F 0.99	11.6 8.1 6.0 4.6 -18-Hallert, OK 96.57 W a 12 hours 12 93.15 W	14.9 11.8 8.4 6.1	12.1 8.5 6.2 4.8 A 79.5	123 8,6 6,3 4,9			

Appendix G: Table G.34: Storm spreadsheet for Hallett, OK September 2, 1940



Appendix G: Table G.35: Depth-area-duration values for Hallett, OK September 2, 1940
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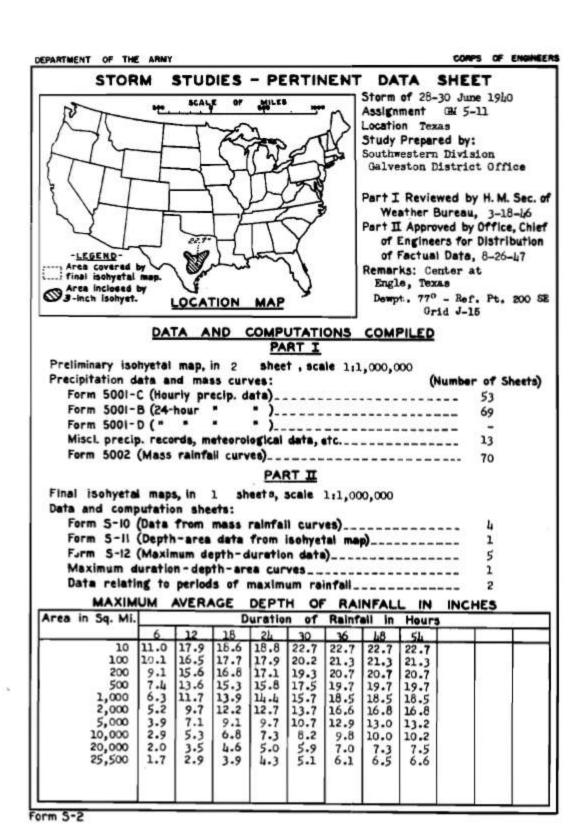


Appendix G: Figure G.42 and Figure G.43: Total storm isohyetal analysis and mass curve chart for Hallett, OK September 2, 1940

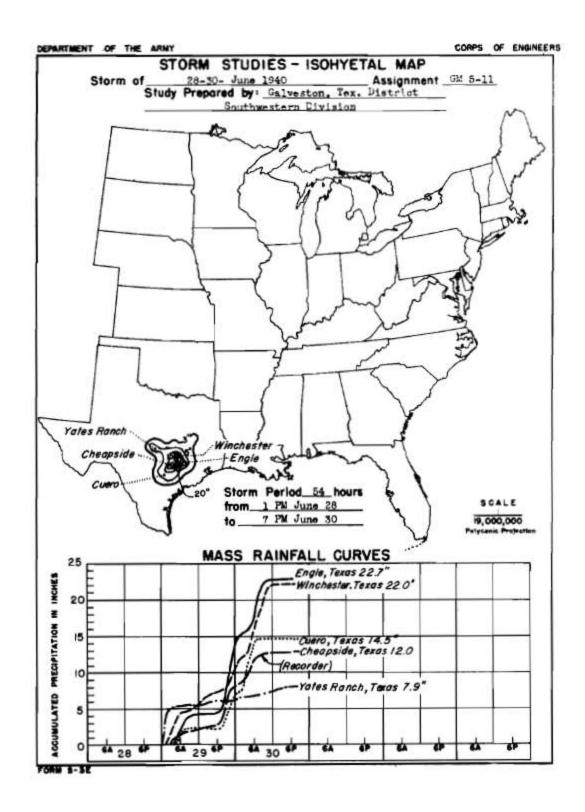
Engle, TX, AWA 83 June 29, 1940 Storm Type: MCC

		5-11-Engle,	TX		C)	4.31		1370	C !! F		
	6/28-30/194 12/17/2013				Storm	Adjust	ment fo	r ANO	Grid Po	oint 1	
emporal Transposition		15-Jul									
imporar Transposition	Date	Lat	Long			Moisture In	flow Directi	on:	WSW @ 90	miles	
torm center location		29.68 N	97.01 W			Grid Point	Elevation		400	feet	
torm Rep dew point loc	ation	29.46 N	98.44 W			Storm Cent	er Elevation		350	feet	
ransposition dewpoint		35.09 N	94.76 W			Storm Rep	Analysis Du	ration	12	hours	
asin location		35.31 N	93.23 W			•	•				
The storm rep		dew point is	76.5 F 80.0 F		il precipitable il precipitable					3.07 3.60	inches
The transposition			81.0 F		il precipitable il precipitable					3.76	inches
•		elevation is	350		ich subtracts	0.08		f precipitabl	e water at	76.5 F	
The in	-place stom	n elevation is	350	wh	ich subtracts	0.105	inches o	f precipitabl	e water at	80.0 F	
•		elevation at	400		ich subtracts			f precipitabl		81.0 F	
The inflow barrier/	basin elevat	ion height is	400	wh	ich subtracts	0.12	inches o	f precipitabl	e water at	81.0 F	
-				115	1	Natas Starm	Td		afce observati	an Starm	•
	-	orm maximizat levation to ba		1.17 1.04			-	-	atce observati SKF and KRNI		
The dan	•	arrier adjustm		1.04				-			
		 j									
	The	total adjustm	ent factor is	1.22							
0110	D	Amer Provide									
Observed St	orm Depth-	Area-Duration 6 Hours	n 12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Hours	
	10 sq miles	11.0	17.9	18.6	18.8	22.7	22.7	22.7	22.7	22.7	
•••••	00 sq miles	10.1	16.5	17.7	17.9	21.3	21.3	21.3	21.3	21.3	
	00 sq miles	9.1	15.6	16.8	17.1	20.7	20.7	20.7	20.7	20.7	
	00 sq miles	7.4	13.6	15.3	15.8	19.7	19.7	19.7	19.7	19.7	
	00 sq miles	6.3	11.7	13.9	14.4	18.5	18.5	18.5	18.5	18.5	
	00 sq miles 00 sq miles	5.2 3.9	9.7 7.1	12.2 9.1	12.7 9.7	16.8 13.0	16.8 13.0	16.8 13.0	16.8 13.0	16.8 13.0	
	00 sq miles	2.9	5.3	6.8	7.3	10.0	10.0	10.0	10.0	10.0	
	00 sq miles	2.0	3.5	4.6	5.0	7.3	7.3	7.3	7.3	7.3	
500	00 sq miles	-	-	-	-	-	-	-	-	-	
Adjusted St	orm Depth-A	Area-Duratio 6 Hours	n 12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Hours	
	10 sq miles	13.4	21.8	22.7	22.9	27.7	27.7	27.7	27.7	27.7	
***************************************	00 sq miles	12.3	20.1	21.6	21.8	26.0	26.0	26.0	26.0	26.0	
2	00 sq miles	11.1	19.0	20.5	20.9	25.2	25.2	25.2	25.2	25.2	
••••••	00 sq miles	9.0	16.6	18.7	19.3	24.0	24.0	24.0	24.0	24.0	
	00 sq miles	7.7	14.3	17.0	17.6	22.6	22.6	22.6	22.6	22.6	
	00 sq miles 00 sq miles	6.3 4.8	11.8 8.7	14.9 11.1	15.5 11.8	20.5 15.9	20.5 15.9	20.5 15.9	20.5 15.9	20.5 15.9	
	00 sq miles	3.5	6.5	8.3	8.9	12.2	12.2	12.2	12.2	12.2	
•	00 sq miles	2.4	4.3	5.6	6.1	8.9	8.9	8.9	8.9	8.9	
		2.7						_	-	-	
500	00 sq miles	-	-	-	-	-	-				
500			-	-	-	-	-				
	00 sq miles	-					-				
Storm or Sto	00 sq miles rm Center N	-		USACE GM	5-11-Engle, 7		-				
	00 sq miles rm Center N s)	-			5-11-Engle, 7		-				
Storm or Sto Storm Date(Storm Type Storm Locat	om Center N	-		USACE GM 6/28-30/1940 MCC 29.68 N	5-11-Engle, 7		-				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente	on sq miles m Center N s) ion r Elevation	- Jame		USACE GM 6/28-30/1940 MCC 29.68 N 350	5-11-Engle, 1 97.01 W		-				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente	on sq miles m Center N s) ion r Elevation	-		USACE GM 6/28-30/1940 MCC 29.68 N	5-11-Engle, 1 97.01 W		-				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation	om Center N s) ion r Elevation	- iame uration (10 sq	mi)	USACE GM 6/28-30/1940 MCC 29.68 N 350 22.7 inches 3	5-11-Engle, 1 97.01 W		-				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation	om Center N s) ion r Elevation r Total & Du sentative S	- iame uration (10 sq	mi)	USACE GM 6/28-30/1940 MCC 29.68 N 350	5-11-Engle, 1 97.01 W		J				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation Storm Repre Storm Repre	om Center N s) ion r Elevation n Total & Du sentative S sentative S sentative S sentative SS	- iame uration (10 sq ST ST Location	mi)	USACE GM 6/28-30/1940 MCC 29.68 N 350 22.7 inches 3	5-11-Engle, 7 97.01 W 90 hours						
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation Storm Repre Storm Repre In-place Ma Moisture Ini	om Center N s) ion r Elevation n Total & Du sentative S sentative S sentative S ximum SST flow Vector	aration (10 sq ST ST Location	mi)	USACE GM 6/28-30/1940 MCC 29.68 N 350 22.7 inches 3 76.5 F 29.46 N 80.0 F WSW @ 90	5-11-Engle, 1 97.01 W 0 hours 12 98.44 W		J				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation Storm Repre Storm Repre	om Center N s) ion r Elevation n Total & Du sentative S sentative S sentative S ximum SST flow Vector	aration (10 sq ST ST Location	mi)	USACE GM 6/28-30/1940 MCC 29.68 N 350 22.7 inches 3 76.5 F 29.46 N 80.0 F	5-11-Engle, 1 97.01 W 0 hours 12 98.44 W		J				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation Storm Repre Storm Repre In-place Ma Moisture In In-place Ma	on sq miles mm Center N s) ion r Elevation r Total & Do sentative S sentative S sentative S Total & So sentative S remains SST Row Vector rimization F	aration (10 sq ST ST Location	mi)	USACE GM 6/28-30/1940 MCC 29.68 N 350 22.7 inches 3 76.5 F 29.46 N 80.0 F WSW @ 90 1.17	5-11-Engle, 1 97.01 W 0 hours 12 98.44 W		J				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation Storm Repre Storm Repre In-place Ma Moisture Int In-place Ma Temporal Tr	mm Center N s) ion r Elevation r Total & Du sentative S sentative S sentative S ximum SST flow Vector ximization F ansposition	arration (10 sq ST ST Location	mi)	USACE GM 6/28-30/1940 MCC 29.68 N 350 22.7 inches 3 76.5 F 29.46 N 80.0 F WSW @ 90 1.17	5-11-Engle, 1 97.01 W 90 hours 12 98.44 W		1				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation Storm Repre Storm Repre In-place Ma Moisture Int	on sq miles mm Center N s) ion r Elevation r Total & Dr sentative S sentative S ximum SST flow Vector ximization F ansposition on Dewpoin	actor (Date) t Location	mi)	USACE GM 6/28-30/1940 MCC 29.68 N 350 22.7 inches 3 76.5 F 29.46 N 80.0 F WSW @ 90 1.17	5-11-Engle, 1 97.01 W 0 hours 12 98.44 W		J				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation Storm Repre Storm Repre In-place Ma Moisture Int In-place Ma Temporal Tr	on sq miles mm Center N s) ion r Elevation t Total & Dt sentative S sentative S sentative S stimum SST flow Vector ximization F ansposition on Dewpoin on Maximum	aration (10 sq ST ST Location actor	mi)	USACE GM 6/28-30/1940 MCC 29.68 N 350 22.7 inches 3 76.5 F 29.46 N 80.0 F WSW @ 90 1.17 15-Jul 35.09 N	5-11-Engle, 1 97.01 W 90 hours 12 98.44 W		1 80 1				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation Storm Repre Storm Repre Storm Repre In-place Ma Moisture Ini In-place Ma Temporal Tr Transpositic Transpositic Grid Point El	on sq miles om Center N s) ion r Elevation r Total & Du sentative S sentative S skimum SST dlow Vector skimization F, ansposition on Dewpoint on Maximum on Adjustme levation	aration (10 sq ST ST Location actor ((Date) t Location t SST ent Factor	mi)	USACE GM 6/28-30/1940 MCC 29.68 N 350 22.7 inches 3 76.5 F 29.46 N 80.0 F WSW @ 90 1.17 15-Jul 35.09 N 81.0 F 1.04 400	5-11-Engle, 1 97.01 W 90 hours 12 98.44 W		1 80 1				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation Storm Repre Storm Repre In-place Ma Moisture Ini In-place Ma Temporal Tr Transpositic Transpositic Grid Point El	on sq miles om Center N s) ion r Elevation r Total & Do sentative S sentative S sentative S sentative S ramposition r man Down Vector ramization F ansposition on Depoin on Adjustme on Adjustme levation ration in Ba	aration (10 sq ST ST Location actor ((Date) t Location t SST ent Factor	mi)	USACE GM 6/28-30/1940 MCC 29-68 N 350 22.7 inches 3 76.5 F 29.46 N 80.0 F WSW @ 90 1.17 15-Jul 35.09 N 81.0 F 1.04	5-11-Engle, 1 97.01 W 90 hours 12 98.44 W		1 80 1				
Storm or Sto Storm Date(Storm Type Storm Locat Storm Cente Precipitation Storm Repre Storm Repre Storm Repre In-place Ma Moisture Ini In-place Ma Temporal Tr Transpositic Transpositic Grid Point El	on sq miles mm Center N s) ion r Elevation r Total & Du sentative S sentative S ximum SST flow Vector ximization F ansposition on Dewpoin on Maximum on Maximum on Maximum or attorn in Ba: er Height	aration (10 sq ST ST Location actor (Date) t Location a SST ent Factor	mi)	USACE GM 6/28-30/1940 MCC 29.68 N 350 22.7 inches 3 76.5 F 29.46 N 80.0 F WSW @ 90 1.17 15-Jul 35.09 N 81.0 F 1.04 400	5-11-Engle, 1 97.01 W 90 hours 12 98.44 W		1 80 1				

Appendix G: Table G.36: Storm spreadsheet for Engle, TX June 29, 1940



Appendix G: Table G.37: Depth-area-duration values for Engle, TX June 29, 1940



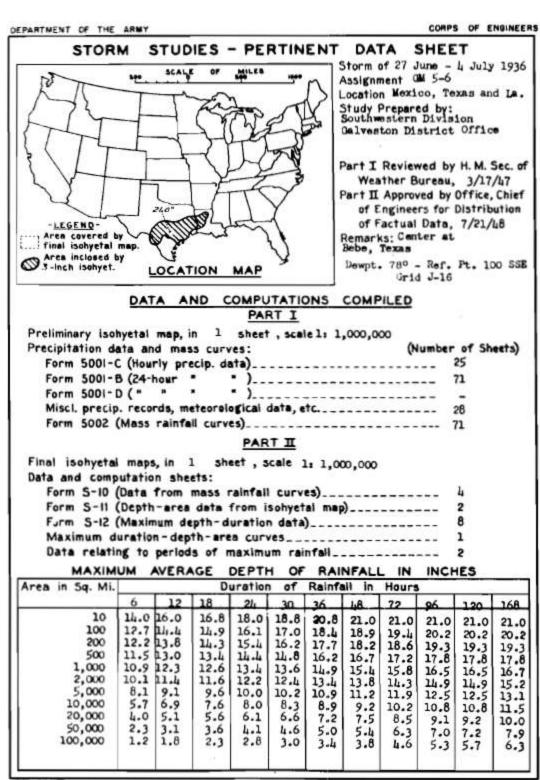
Appendix G: Figure G.44 and Figure G.45: Total storm isohyetal analysis and mass curve chart for Engle, TX June 29, 1940

Bebe, TX, AWA 84 June 30, 1936

Storm Type: MCC

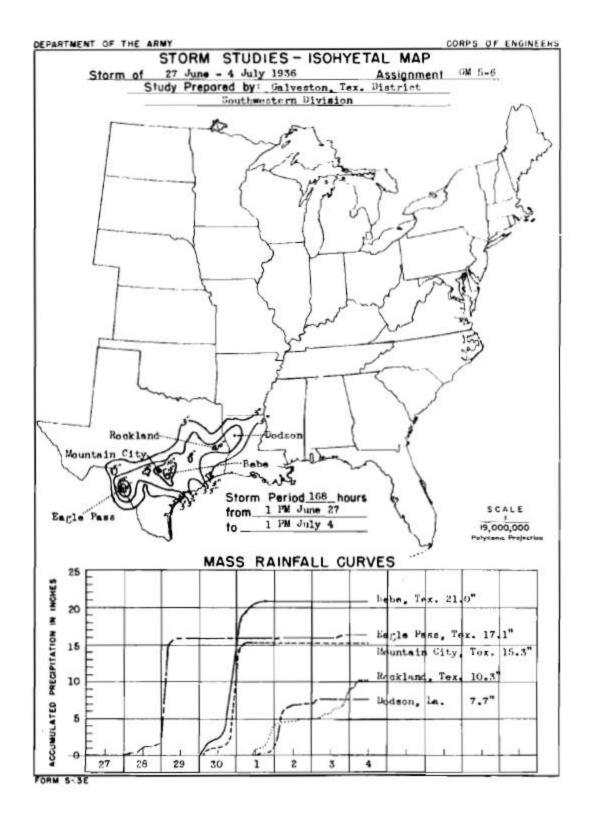
		[5-6-Bebe, T]	X		G.			,	a		
torm Date: WA Analysis Da	6/30-7-4/19				Storm	Adjust	ment fo	or ANO	Grid Po	oint 1	
emporal Transp	osition Date	15-Jul Lat	Long			Moieture In	ıflow Directi	ion:	SSE @ 100	miles	
torm center loca	tion	29.33 N	97.68 W			Grid Point		ion:	400	feet	
		27.90 N	97.50 W				ter Elevation		300	feet	
torm Rep dew po ransposition dev		27.90 N 33.88 N	97.50 W 93.04 W						24	hours	
ransposition dev asin location	vpoint location	35.31 N	93.04 W 93.23 W			Storm Kep.	Analysis Du	iration	24	nours	
			70.20 11								
The sto	orm representative	dew point is	78.0 F	with tota	l precipitable	water above	e sea level of			3.29	inches
	in-place maximum		79.5 F	with tota	l precipitable	water above	e sea level of			3.52	inches
The transpo	sitioned maximum	dew point is	80.5 F	with tota	l precipitable	water above	e sea level of			3.68	inches
	The in-place stom		300		ich subtracts	0.08		f precipitabl		78.0 F	
	The in-place stom		300		ich subtracts	0.09		f precipitabl		79.5 F	
	ransposition basir oarrier/basin elevat		400 400		ich subtracts ich subtracts	0.11 0.12		f precipitabl f precipitabl		80.5 F 80.5 F	
The lillow b	James Dashi elevat	don neight is	400	WIL	ich subtracts	0.12	micries 0	i precipitati	e water at	00.51	
	The in-place sto	orm maximizat	ion factor is	1.07	1	Notes: Used	USACE storm	studies storm	rep Td and int	low vector	1
TI	he transposition/el			1.04		and did not a	djust for EPRI	12-hr average	Td values.		
	•	arrier adjustm		1.00							
		•									
	The	total adjustm	ent factor is	1.11							
Obser	rved Storm Depth-			10.77	24.77	40.77	70.17	06.17	120.77	14477	
	10 1	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Hours	
	10 sq miles 100 sq miles	14.0 12.7	16.0 14.4	16.8 14.9	18.0 16.1	21.0 18.9	21.0 19.4	21.0 20.2	21.0 20.2	21.0 20.2	1
	200 sq miles	12.7	13.8	14.3	15.4	18.2	18.6	19.3	19.3	19.3	
	500 sq miles	11.5	13.0	13.4	14.4	16.7	17.2	17.8	17.8	17.8	1
	1000 sq miles	10.9	12.3	12.6	13.4	15.4	15.8	16.5	16.5	16.7	
	2000 sq miles	10.1	11.4	11.6	12.2	13.8	14.3	14.9	14.9	15.2	
	5000 sq miles	8.1	9.1	9.6	10.0	11.2	11.9	12.5	12.5	13.1	
	10000 sq miles	5.7	6.9	7.6	8.0	9.2	10.2	10.8	10.8	11.5	
_	20000 sq miles	4.0	5.1	5.6	6.1	7.5	8.5	9.1	9.2	10.0	
	50000 sq miles	2.3	3.1	3.6	4.1	5.4	6.3	7.0	7.2	7.9	
Adine	ted Storm Depth-	Avea Duvatio									
Aujus	ited Storm Depth-	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Hours	
	10 sq miles	15.5	17.7	18.6	20.0	23.3	23.3	23.3	23.3	23.3	•
	100 sq miles	14.1	16.0	16.5	17.9	21.0	21.5	22.4	22.4	22.4	
	200 sq miles	13.5	15.3	15.9	17.1	20.2	20.6	21.4	21.4	21.4	
	500 sq miles	12.8	14.4	14.9	16.0	18.5	19.1	19.7	19.7	19.7	
	1000 sq miles	12.1	13.6	14.0	14.9	17.1	17.5	18.3	18.3	18.5	
	2000 sq miles	11.2	12.6	12.9	13.5	15.3	15.9	16.5	16.5	16.9	
······	5000 sq miles 10000 sq miles	9.0 6.3	10.1 7.7	10.6 8.4	11.1 8.9	12.4 10.2	13.2 11.3	13.9 12.0	13.9 12.0	14.5 12.8	
	20000 sq miles	4.4	5.7	6.2	6.8	8.3	9.4	10.1	10.2	11.1	
	50000 sq miles	2.6	3.4	4.0	4.5	6.0	7.0	7.8	8.0	8.8	
									-		
Storm	or Storm Center N	Vame		USACE GM	5-6-Bebe, TX						
	Date(s)			6/30-7-4/1936	5						
				MCC							-
Storm	Туре			29.33 N	97.68 W						-
Storm Storm	Location										
Storm Storm Storm	Location Center Elevation			300		n 24hrs					
Storm Storm Storm	Location			300	8 hours, 18" i	n 24hrs					\vdash
Storm Storm Storm Precip	Location Center Elevation	uration (10 sq	mi)	300		n 24hrs					
Storm Storm Precip Storm	Location Center Elevation oitation Total & Du	uration (10 sq	mi)	300 21.0 inches 4	8 hours, 18" i	n 24hrs	J				
Storm Storm Precip Storm Storm In-pla	Location Center Elevation oitation Total & De Representative S Representative S ce Maximum SST	uration (10 sq ST ST Location	mi)	300 21.0 inches 4 78.0 F 27.90 N 79.5 F	8 hours, 18" i	n 24hrs	J 79.5				
Storm Storm Storm Precip Storm Storm In-pla Moist	Location Center Elevation Sitation Total & Di Representative S Representative S Ce Maximum SST ture Inflow Vector	eration (10 sq SST SST Location	mi)	300 21.0 inches 4 78.0 F 27.90 N 79.5 F SSE @ 100	8 hours, 18" i	n 24hrs	-				
Storm Storm Storm Precip Storm Storm In-pla Moist	Location Center Elevation oitation Total & De Representative S Representative S ce Maximum SST	eration (10 sq SST SST Location	mi)	300 21.0 inches 4 78.0 F 27.90 N 79.5 F	8 hours, 18" i	n 24hrs	-				
Storm Storm Precip Storm Storm In-pla Moist In-pla	Location Center Elevation bitation Total & De Representative S Representative S ce Maximum SST ture Inflow Vector ce Maximization F	SST Location	mi)	300 21.0 inches 4 78.0 F 27.90 N 79.5 F SSE @ 100 1.07	8 hours, 18" i	n 24hrs	-				
Storm Storm Precip Storm Storm In-pla Moist In-pla Tempi	Location Center Elevation bitation Total & De Representative S Representative S Ce Maximum SST Ture Inflow Vector Ce Maximization F oral Transposition	exaction (10 sq SST SST Location actor	mi)	300 21.0 inches 4 78.0 F 27.90 N 79.5 F SSE @ 100 1.07	8 hours, 18" i	n 24hrs	79.5				
Storm Storm Precip Storm Storm Storm In-pla Moist In-pla Tempp Trans	Location Center Elevation itation Total & Di Representative S Representative S ce Maximum SST ture Inflow Vector ce Maximization F oral Transposition position Dewpoin	exaction (10 sq SST SST Location actor	mi)	300 21.0 inches 4 78.0 F 27.90 N 79.5 F SSE @ 100 1.07 15-Jul 33.88 N	8 hours, 18" i	n 24hrs	79.5 J				
Storm Storm Precip Storm Storm Storm In-pla Moist In-pla Temp- Trans Trans	Location Center Elevation itation Total & Di Representative S Representative S ce Maximum SST ture Inflow Vector ce Maximization F oral Transposition position Dewpoin position Maximum	exaction (10 sq SST SST Location actor actor (Date) t Location	mi)	300 21.0 inches 4 78.0 F 27.90 N 79.5 F SSE @ 100 1.07 15-Jul 33.88 N 80.5 F	8 hours, 18" i	n 24hrs	79.5				
Storm Storm Precip Storm Storm Storm In-pla Moist In-pla Tempo Trans Trans Trans	Location Center Elevation itation Total & Di Representative S Representative S ce Maximum SST ture Inflow Vector ce Maximization F oral Transposition position Dewpoin	exaction (10 sq SST SST Location actor actor (Date) t Location	mi)	300 21.0 inches 4 78.0 F 27.90 N 79.5 F SSE @ 100 1.07 15-Jul 33.88 N	8 hours, 18" i	n 24hrs	79.5 J				
Storm Storm Precip Storm Storm Storm In-pla Moist In-pla Temp Trans Trans Grid P	Location Center Elevation itation Total & Di Representative S Representative S ce Maximum SST ture Inflow Vector ce Maximization F oral Transposition position Dewpoin position Maximum position Adjustment	exation (10 sq SST Location actor a(Date) t Location 1 SST ent Factor	mì)	300 21.0 inches 4 78.0 F 27.90 N 79.5 F SSE @ 100 1.07 15-Jul 33.88 N 80.5 F 1.04	8 hours, 18" i	n 24hrs	79.5 J				
Storm Storm Precip Storm Storm Storm In-pla Moist In-pla Temp Trans Trans Grid P Highe Inflow	Location Center Elevation itation Total & Di Representative S Representative S Cee Maximum SST ture Inflow Vector ce Maximization F oral Transposition position Dewpoin position Maximum position Adjustme oint Elevation	aration (10 sq SST SST Location actor a (Date) t Location a SST ent Factor	mi)	300 21.0 inches 4 78.0 F 27.90 N 79.5 F SSE @ 100 1.07 15-Jul 33.88 N 80.5 F 1.04 400	8 hours, 18" i	n 24hrs	79.5 J				

Appendix G: Table G.38: Storm spreadsheet for Bebe, TX June 30, 1936



Form 3-2

Appendix G: Table G.39: Depth-area-duration values for Bebe, TX June 30, 1936



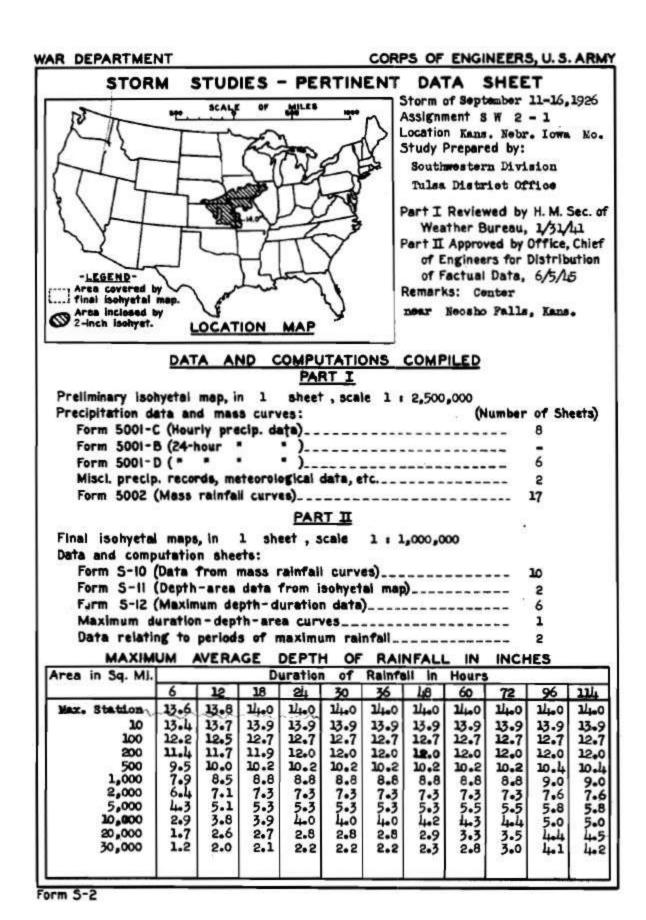
Appendix G: Figure G.46 and Figure G.47: Total storm isohyetal analysis and mass curve chart for Bebe, TX June 30, 1936

Neosho Falls, KS, AWA 61

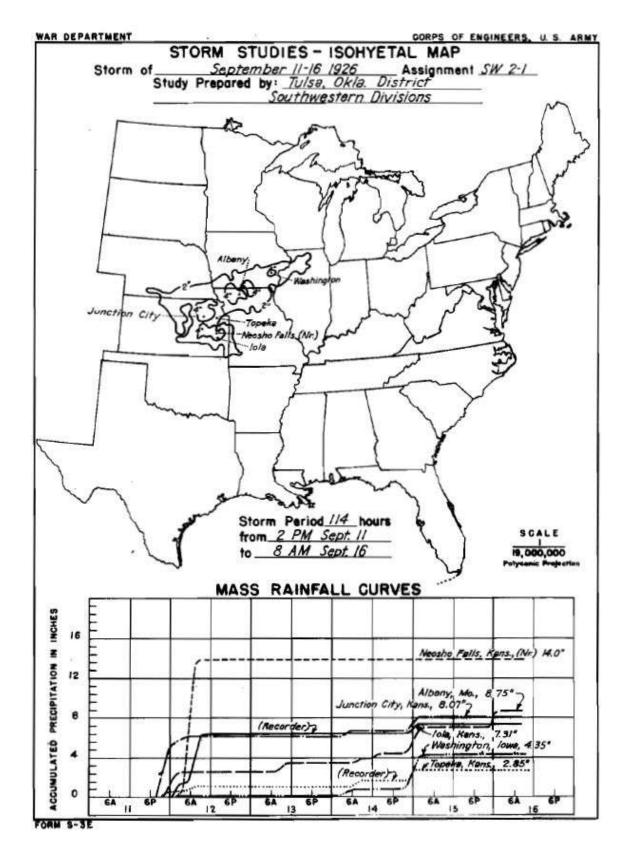
September 12, 1926 Storm Type: MCC

orm Name:		2-1-Neosha	Falls, KS		C	4 31		4.37.0			
rm Date:	11-Sep-192				Storm	ı Adjust	ment fo	or ANO	Grid Po	oint 1	
A Analysis Date: uporal Transposition		25-Aug									
porar Transpositi	III Date	Lat	Long			Moisture Ir	nflow Direct	ion	SSE @ 475	miles	
rm Center Location	n	38.08 N	95.70 W			Grid Point			350	feet	
rm Rep Dew Point		31.35 N	93.80 W				ter Elevation		1,000	feet	
nsposition Dew Po			90.58 W				Analysis Di		6	hours	
d Point Location	int Location	35.31 N	93.23 W			этогш кер	Allalysis Di	iration		nouis	
The storm rep	presentative	dew point is	75.0 F	with tota	al precipitable	e water abov	e sea level o	of		2.85	inches
The in-pla	ice maximum	dew point is	80.5 F	with tota	al precipitable	e water abov	re sea level o	of		3.68	inches
The transposition		•	79.5 F		al precipitable					3.52	inches
	n-place storm		1,000		ch subtracts			f precipitabl		75.0 F	
	n-place storm		1,000		ch subtracts	0.28		f precipitabl		80.5 F	
The Grid poir	osition basin		350 1,000		ich subtracts ich subtracts	0.29		f precipitabl f precipitabl		79.5 F 79.5 F	
The Gha pon	IU II III IOW DAII	ner neight is	1,000	WIII	cii subuacts	0.29	inches o	т ргесіріталі	e water at	/9.5 F	
The	e in-place sto	ım maximizat	ion factor is	1.31	1	Notes: DAI	D values tak	en from USA	CE SW 2-1.	Storm	1
	nsposition/el			0.95					based on ma		
	•	rrier adjustm		1.00		-	_		26 at WBAN		
		•				12945.	•				
	The t	total adjustm	ent factor is	1.24							
Observed S	Storm Depth-		on 12 Hours	18 House	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	1 sq miles	6 Hours 13.6	12 Hours	18 Hours 14.0	24 Hours 14.0	30 Hours 14.0	30 Hours 14.0	48 Hours 14.0	60 Hours 14.0	14.0	1
	10 sq miles	13.4	13.7	13.9	13.9	13.9	13.9	13.9	13.9	13.9	
1	100 sq miles	12.2	12.5	12.7	12.7	12.7	12.7	12.7	12.7	12.7	1
	200 sq miles	11.4	11.7	11.9	12.0	12.0	12.0	12.0	12.0	12.0	1
	500 sq miles	9.5	10.0	10.2	10.2	10.2	10.2	10.2	10.2	10.2	
10	000 sq miles	7.9	8.5	8.8	8.8	8.8	8.8	8.8	8.8	8.8	
•••••	000 sq miles	6.4	7.1	7.3	7.3	7.3	7.3	7.3	7.3	7.3	
••••••	000 sq miles	4.3	5.1	5.3	5.3	5.3	5.3	5.3	5.5	5.5	
	000 sq miles	2.9	3.8	3.9	4.0	4.0	4.0	4.2	4.3	4.4	
200	000 sq miles	1.7	2.6	2.7	2.8	2.8	2.8	2.9	3.3	3.5	_
Adjusted S	torm Depth-	Anna Dunatio									
Aujusteu 3	тогш Берш-	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	1 sq miles	16.9	17.1	17.4	17.4	17.4	17.4	17.4	17.4	17.4	
	10 sq miles	16.6	17.0	17.3	17.3	17.3	17.3	17.3	17.3	17.3	1
	100 sq miles	15.2	15.5	15.8	15.8	15.8	15.8	15.8	15.8	15.8	
	200 sq miles	14.2	14.5	14.8	14.9	14.9	14.9	14.9	14.9	14.9	
***************************************	500 sq miles	11.8	12.4	12.7	12.7	12.7	12.7	12.7	12.7	12.7	
	000 sq miles	9.8	10.6	10.9	10.9	10.9	10.9	10.9	10.9	10.9	
	000 sq miles 000 sq miles	8.0 5.3	8.8 6.3	9.1 6.6	9.1 6.6	9.1 6.6	9.1 6.6	9.1 6.6	9.1 6.8	9.1 6.8	
	000 sq miles	3.6	4.7	4.8	5.0	5.0	5.0	5.2	5.3	5.5	
	000 sq miles	2.1	3.2	3.4	3.5	3.5	3.5	3.6	4.1	4.3	1
Storm or St	torm Center N	Vame		USACE SW	2-1-Neosha	Falls, KS					
Storm Date	` '			9/11/26							
Storm Type					derstorm Con	plex					1
Storm Loca				38.08 N	95.70 W						1
	ter Elevation on Total & Di			1,000 14.00 Inches	10 harres						1
Frecipitatio	II TOTAL & DI	manon		14.00 Inches	10-HOUTS						1
Storm Repr	resentative D	ewpoint		75.0 F	6						1
	resentative D		ation	31.35 N	93.80 W		Aug	Sep			
Maximum I	Dewpoint			80.5 F			79.5	78.5			
	nflow Vector			SSE @ 475							1
	aximization F	actor		1.31							-
Moisture II In-place M											1
In-place M		(D-4-)		25 A							
In-place M Temporal T	Transposition	`		25-Aug 36.00 N	00 58 337		Δ11σ	Sen			1
In-place M Temporal T Transposit	Transposition	t Location		36.00 N	90.58 W		Aug 81	Sep 77			
In-place M Temporal T Transposit Transposit	Transposition ion Dewpoin ion Maximum	t Location Dewpoint			90.58 W		Aug 81	Sep 77			
In-place M Temporal T Transposit Transposit	Transposition ion Dewpoin ion Maximum ion Adjustme	t Location Dewpoint		36.00 N 79.5 F	90.58 W						
In-place M Temporal T Transposit Transposit Transposit Grid Point I Highest Ele	Fransposition tion Dewpoin tion Maximum tion Adjustme Elevation evation in Ba	t Location n Dewpoint ent Factor		36.00 N 79.5 F 0.95 350 14,344	90.58 W						
In-place M Temporal T Transposit Transposit Grid Point I Highest Ele	Fransposition fransposition from Maximum from Adjustmo Elevation evation in Ba frier Height	t Location n Dewpoint ent Factor		36.00 N 79.5 F 0.95 350 14,344 1,000	90.58 W						
In-place M Temporal T Transposit Transposit Transposit Grid Point I Highest Ele Inflow Ban Elevation A	Fransposition tion Dewpoin tion Maximum tion Adjustme Elevation evation in Ba	t Location n Dewpoint ent Factor sin		36.00 N 79.5 F 0.95 350 14,344	90.58 W						

Appendix G: Table G.40: Storm spreadsheet for Neosho Falls, KS September 12, 1926



Appendix G: Table G.41: Depth-area-duration values for Neosho Falls, KS September 12, 1926



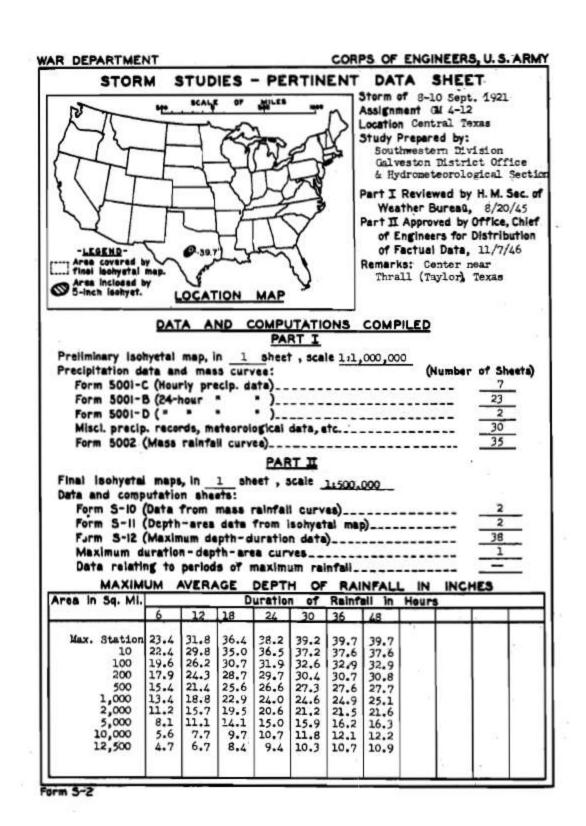
Appendix G: Figure G.48 and Figure G.49: Total storm isohyetal analysis and mass curve chart for Neosho Falls, KS September 12, 1926

THRALL, TX AWA 77

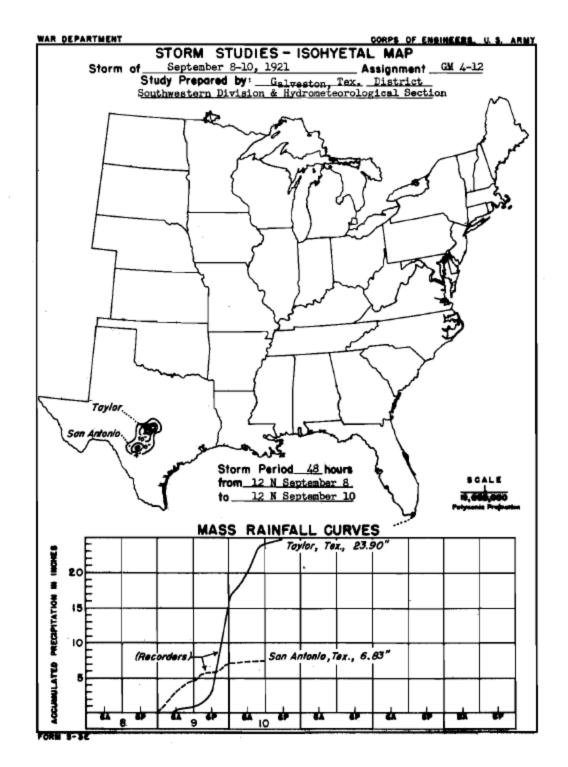
September 9, 1921 Storm Type: Tropical

torm Name:	USACE GM		l, TX		C.			4370	G		
orm Date:	9/9-10/192				Storm	Adjust	ment fo	or ANO	Grid Po	oint 1	
WA Analysis Date:	12/17/2013										
mporal Transposition	on Date	25-Aug	_								
		Lat	Long				nflow Direc	tion:	S @ 250	miles	
orm center location		30.59 N	97.30 W			Grid Point	Elevation		400	feet	
torm Rep SST locatio	on	27.00 N	97.30 W			Storm Cen	iter Elevatio	n	550	feet	
ransposition SST lo	cation	31.72 N	93.23 W			Storm Rep	Analysis D	uration	12	hrs	
asin location		35.31 N	93.23 W								_
								_			
	m representa		77.0 F		precipitable					3.14	inches
	in-place maxi		78.0 F 79.5 F		precipitable					3.29 3.52	inches
•	sitioned maxir 1-place storm		550		precipitable ich subtracts			f precipitabl	e water at	77.0 F	inches
	i-place storm		550		ich subtracts			f precipitabl		78.0 F	
	sition storm		400		ich subtracts			f precipitabl		79.5 F	
•	re inflow barn		N/A		ich subtracts			f precipitabl		79.5 F	
	The in-place	ce maximizat	ion factor is	1.05		Notes: USAC	CE analyzed st	orm rep Td of	77 and in plac	ce max of 78.	1
	•	e transposit		1.08					ed the storm n		
The	elevation/bar	rier adjustm	ent factor is	1.00				ove from the	12-hr persistin	g to the 12hr	
						average dew	pomits.				
	The to	otal adjustm	ent factor is	1.14							J
	a. =										
Observed :	Storm Depth-			10 11-	24 17-	20 11-	26 11.	40 11-	60 11-	72 11-	
	10	6 Hours 22.4	12 Hours 29.8	18 Hours	24 Hours 36.5	30 Hours 37.2	36 Hours 37.6	48 Hours 37.6	60 Hours	72 Hours	
	10 sq miles 100 sq miles	19.6	29.8 26.2	35.0 30.7	31.9	37.2	32.9	37.0	-	-	1
	200 sq miles	17.9	24.3	28.7	29.7	32.0	30.7	30.8	-	-	1
	500 sq miles	17.9	21.4	25.6	26.6	27.3	27.6	27.7	-	-	
	1000 sq miles	13.4	18.8	22.9	24.0	24.6	24.9	25.1	-	-	
	2000 sq miles	11.2	15.7	19.5	20.6	21.2	21.5	21.6			
	5000 sq miles	8.1	11.1	14.1	15.0	15.9	16.2	16.3	_		1
	0000 sq miles	5.6	7.7	9.7	10.7	11.8	12.1	12.2	-	-	
••••••	0000 sq miles	-	-	-	-	-	-	-	-	-	1
	•				•	•	•	•			
Adjusted S	Storm Depth-	Area-Durati	ion								
		6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	10 sq miles	25.5	33.9	39.8	41.5	42.3	42.8	42.8	-	-	
	100 sq miles	22.3	29.8	34.9	36.3	37.1	37.4	37.4	-	-	
	200 sq miles	20.4	27.6	32.6	33.8	34.6	34.9	35.0	-	-	
	500 sq miles	17.5	24.3	29.1	30.2	31.0	31.4	31.5	-	-	
1	1000 sq miles	15.2	21.4	26.0	27.3	28.0	28.3	28.5	-	_	
2	2000 sq miles	12.7	17.9	22.2	23.4	24.1	24.4	24.6	-	-	
	5000 sq miles	9.2	12.6	16.0	17.1	18.1	18.4	18.5	-	-	
***************************************	0000 sq miles	6.4	8.8	11.0	12.2	13.4	13.8	13.9	-	-	
20	0000 sq miles	-	-	-	-	-	-	-	-	-	<u> </u>
a		T		TICLA OF CO.	110 771 171	F37					1
	torm Center N	lame		USACE GM 4	1-12-Thrall,	ı X					1
Storm Date	`			9/9-10/1921							1
Storm Typ				MCC 20.50 N	07.20 337						1
Storm Loca	ation ter Elevation			30.59 N 550	97.30 W						1
	on Total & Di		a mi)	39.7 inches 36	5 hours 38 2"	in 24 hours					1
2 recipitatio	rotal to Di		1)	LU., MICHOS JO							1
Storm Rep	resentative S	ST		77.0 F							1
	resentative S		1	27.00 N	97.30 W		A	S			
In alasa N	Iaximum SST			78.0 F			79	79	AWA		
in-place iv	nflow Vector			S @ 250			78	78	Sunshine A	tlas	
_	Invimination E	actor									
_	I IIIIIIIIIIIIIIIIIIII										1
Moisture I In-place M											1
Moisture I In-place M Temporal 1	Transposition			25-Aug							_
Moisture I In-place M Temporal Transposit	Transposition	t Location		31.72 N	93.23 W		A	S			
Moisture I In-place M Temporal T Transposit Transposit	Transposition tion Dewpoin tion Maximum	t Location 1 SST			93.23 W		A 80.5	S 77.5	AWA		
Moisture I In-place M Temporal Transposit Transposit Transposit	Transposition tion Dewpoin tion Maximum tion Adjustme	t Location SST ent Factor		31.72 N 79.5 F	93.23 W				AWA		
Moisture I In-place M Temporal T Transposit Transposit Transposit Average B	Transposition tion Dewpoin tion Maximun tion Adjustmo asin Elevation	t Location n SST ent Factor n		31.72 N	93.23 W				AWA		
Moisture I In-place M Temporal Transposit Transposit Transposit Average B Highest El	Fransposition tion Dewpoin tion Maximum tion Adjustmo asin Elevation evation in Ba	t Location n SST ent Factor n		31.72 N 79.5 F 400	93.23 W				AWA		
Moisture I In-place M Temporal Transposit Transposit Transposit Average B Highest El	Transposition tion Dewpoin tion Maximun tion Adjustmo asin Elevation	t Location n SST ent Factor n sin		31.72 N 79.5 F	93.23 W				AWA		

Appendix G: Table G.42: Storm spreadsheet for Thrall, TX September 9, 1921



Appendix G: Table G.43: Depth-area-duration values for Thrall, TX September 9, 1921



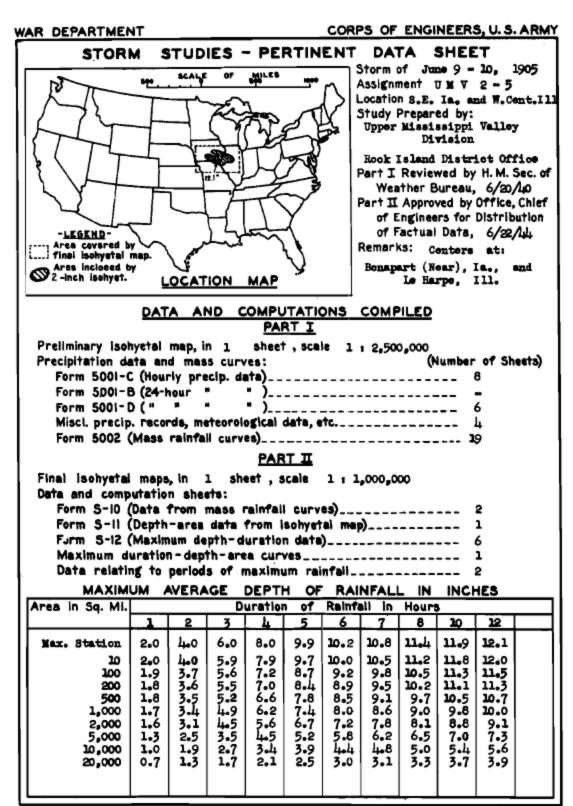
Appendix G: Figure G.50 and Figure G.51: Total storm isohyetal analysis and mass curve chart for Thrall, TX September 9, 1921

Bonaparte, IA, AWA 70 June 10, 1905

June 10, 1905 Storm Type: MCC

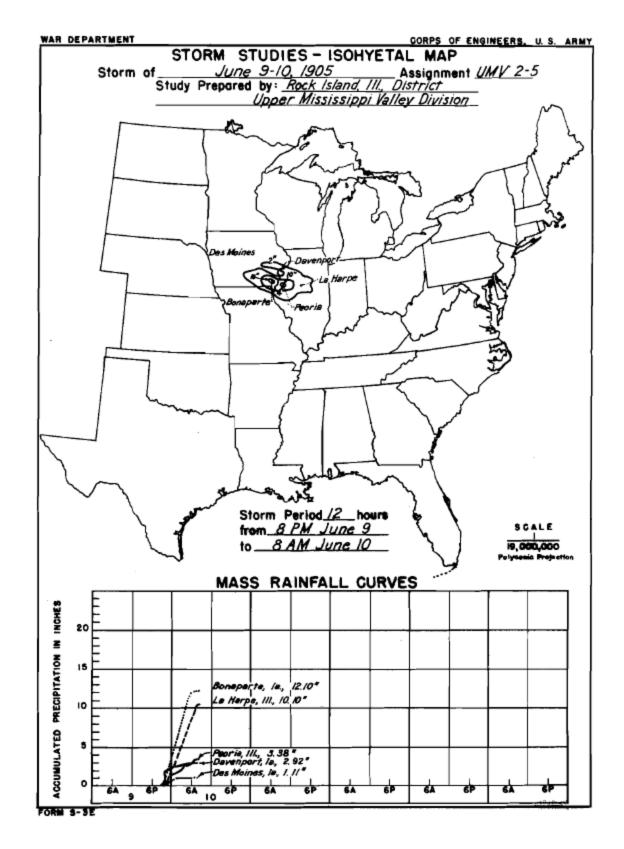
Storm Date: June 9, 19		iparte, IA		Storm A	Adjustn	nent fo	r ANO	Grid Po	oint 2	
AWA Analysis Date: 12/16/201					-		1	ı	ı	
Cemporal Transposition Date	30-Jun	-				. Di		~ ~ 1 = =		
	Lat	Long				nflow Direc	tion	S @ 155	miles	
Storm Center Location	40.77 N	91.75 W			Grid Point			550	feet	
Storm Rep Dew Point Location	38.52 N	91.81 W				ter Elevatio		1,500	feet	
ransposition Dew Point Location		92.64 W			Storm Rep	Analysis D	uration	12	hours	
Grid Point Location	34.50 N	95.50 W								
									• • • •	
The storm representative of	•	77.0 F		precipitable v					3.14	inches.
The in-place maximum of The transpositioned maximum of		80.0 F 80.0 F			water above sea level of water above sea level of				3.60 3.60	inches.
The transpositioned maximum of The in-place storm	•	1,500		precipitable v ich subtracts				e water at	77.0 F	niches.
The in-place storm		1,500		ich subtracts			f precipitabl		80.0 F	
The transposition storm		550		ich subtracts			f precipitabl		80.0 F	
The Grid Point/inflow barn		1.000		ich subtracts			f precipitabl		80.0 F	
		•								
The in-place	e maximizati	on factor is	1.15		Notes: DA	D values tal	cen from US	ACE UMV	2-5. Added	1
	e transpositi				7° to the U	SACE analy	zed storm re	ep dew poin	t based on	
The elevation/ban	•				guidance fi	rom EPRI, N	ebraska, TR	WD.		
The to	tal adjustme	ent factor is	1.20							
				_						
Observed Storm Depth	y		· · · · · · · · · · · · · · · · · · ·							
	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours
1 sq miles		10.2	12.1	-	-	-	-	-	-	-
10 sq miles		10.0	12.0	-	-	-	-	-	-	-
100 sq miles	·	9.2 8.9	11.5 11.3	-	-	-	-	-	-	-
200 sq miles 500 sq miles	1.8 1.8	8.5	10.7	-	<u>-</u>	-	-	-	-	<u>-</u>
1000 sq miles	¢	8.0	10.7		-	-	-	-	-	-
2000 sq miles		7.2	9.1		_	_	_	_	_	
5000 sq miles		5.8	7.3	_	_	_	_	-	_	_
10000 sq miles		4.4	5.6	-	-	-	-	-	-	-
20000 sq miles	\$	3.0	3.9	-	-	-	-	-	-	-
•										
Adjusted Storm Depth	-Area-Dura	tion								
	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours
1 sq miles		12.2	14.5	-	-	-	-	-	-	-
10 sq miles	·	12.0	14.4	-	-	-	-	-	-	-
100 sq miles		11.0	13.8	-	-	-	-	-	-	<u>-</u>
200 sq miles	\$	10.7	13.6	-	-	-	-	-	-	-
500 sq miles	2.2 2.0	10.2 9.6	12.8 12.0	-	-	-	-	-	-	-
1000 sq miles 2000 sq miles	1.9	9.6 8.6	10.9	-	-	-	-	-	-	-
5000 sq miles		7.0	8.8		<u> </u>		-	-	-	<u> </u>
10000 sq miles		5.3	6.7	-	-	-	-	-	-	-
20000 sq miles		3.6	4.7	-	-	-	-	-	-	-
•										
<u>_</u>										
Storm or Storm Center	Name		USACE UMV	2-5-Bonapar	te, IA					
Storm Date(s)			9-Jun-1905							
Storm Type			MCC							
Storm Location			40.77 N	91.75 W						
Storm Center Elevation			1,500							
Precipitation Total & D	Ouration		12.10 Inches 1	2-hours USA	CE UMV 2-:	5				
•			77.0 F	12						-
	Dans D - : 4		77.0 F	12						
Storm Representative I		neation	38 52 N	01 01 337						ł
Storm Representative I		ocation	38.52 N 80 0 F	91.81 W						
Storm Representative I Storm Representative I Maximum Dew Point	Dew Point L	ocation	80.0 F	91.81 W						l
Storm Representative I	Dew Point Lo r	ocation		91.81 W						
Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vecto	Dew Point Lo r	ocation	80.0 F S @ 155	91.81 W						
Storm Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vecto	Dew Point Lo r Factor	ocation	80.0 F S @ 155	91.81 W						
Stom Representative I Stom Representative I Maximum Dew Point Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dew Po	Dew Point Lor r Factor n (Date) int Location		80.0 F S @ 155 1.15	91.81 W 92.64 W		Jun	July			
Stom Representative I Stom Representative I Maximum Dew Point Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dew Po Transposition Maximum	Dew Point Lor f Factor in (Date) int Location m Dew Poin		80.0 F S @ 155 1.15 30-Jun 40.48 N 80.0 F			Jun 79	July 81			
Stom Representative I Stom Representative I Maximum Dew Point Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dew Po Transposition Maximu Transposition Adjustn	Dew Point Lor f Factor in (Date) int Location m Dew Poin		80.0 F S @ 155 1.15 30-Jun 40.48 N 80.0 F 1.04							
Stom Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dew Po Transposition Maximu Transposition Adjustn Grid Point Elevation	r Factor In (Date) Int Location In Dew Point Interpret Factor		80.0 F S @ 155 1.15 30-Jun 40.48 N 80.0 F 1.04							
Stom Representative I Stom Representative I Maximum Dew Point Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dew Po Transposition Maximu Transposition Adjusta Grid Point Elevation Highest Elevation in B	r Factor In (Date) Int Location In Dew Point Interpret Factor		80.0 F S @ 155 1.15 30-Jun 40.48 N 80.0 F 1.04 550 14,344							
Stom Representative I Storm Representative I Maximum Dew Point Moisture Inflow Vecto In-place Maximization Temporal Transpositio Transposition Dew Po Transposition Maximu Transposition Adjustn Grid Point Elevation	r Factor In (Date) Int Location In Dew Poir Internet Factor		80.0 F S @ 155 1.15 30-Jun 40.48 N 80.0 F 1.04							

Appendix G: Table G.44: Storm spreadsheet for Bonaparte, IA June 10, 1905



Form 5-2

Appendix G: Table G.45: Depth-area-duration values for Bonaparte, IA June 10, 1905



Appendix G: Figure G.52 and Figure G.53: Total storm isohyetal analysis and mass curve chart for Bonaparte, IA June 10, 1905