DEPARTMENT OF PUBLIC WORKS

FLOOD CONTROL ● LAND DEVELOPMENT & CONSTRUCTION
SOLID WASTE MANAGEMENT ● SURVEYOR ● TRANSPORTATION

COUNTY OF SAN BERNARDINO

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Director of Public Works

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Hydrology Manual User:

Our San Bernardino County Hydrology Manual was developed in 1983 and revised in 1986 by our consultant Dr. Ted Hromadka. The best available data at the time was the National Oceanic and Atmospheric Administration (NOAA) Atlas II rainfall records and statistics published in 1973; it was the basis of our manual. The County participated with NOAA by providing a portion of the funding to study an additional 30 years of rainfall records. NOAA Atlas XIV was published in 2004 and revised 2006. We asked Dr. Hromadka to review the new rainfall numbers and assess any impacts to our manual. We looked at all areas of the County to see if any changes or revisions were justified. Only the arid desert regions were affected.

We are pleased to announce the new rainfall numbers led to updating our manual with an addendum. Briefly, this addendum addresses the Antecedent Moisture Condition (AMC) for arid regions of the County. The attached map, ADD-1, identifies where AMC I may now be used.

Please use the attached link to our website to access the addendum (March 2010); also included is a list of Frequently Asked Questions (FAQ's) and a map of the affected area. A GIS version of the map is also available.

If you have any questions, please contact Mike Fox, Chief-Water Resources Division at (909) 387-8213.

Sincerely,

KEVIN B. BLAKESLEE, P.E.
Deputy Director-Flood Control

KBB:MJF:bfb

County of San Bernardino Hydrology Manual Addendum for Arid Regions

April 2010

I. INTRODUCTION

After publication of the NOAA Atlas 14 rainfall atlas and the associated data base (NOAA, 2004, revised 2006), the County of San Bernardino Water Resources Division assessed the new publication towards the possibility of updating its Hydrology Manual (1983, revised 1986), particularly in the arid regions of the County. NOAA Atlas 2 (NOAA, 1973) served as the basis for the San Bernardino Hydrology Manual dated 1986. The updated NOAA Atlas 14 publication includes data from several rain gages which were not available at the time of the prior publication of NOAA Atlas 2, as well as 25 years of additional data at several of the rain gages used in NOAA Atlas 2. Consequently, thousands of additional station years of data are included in the updated NOAA Atlas 14. Upon assessing the new NOAA Atlas 14 rainfall statistics and mapping, the County updated their Hydrology Manual criteria to reflect the changes in rainfall statistics and trends developed with NOAA Atlas 14. This Addendum provides a summary of these updated criteria.

It is noted that numerous rain gages found in the NOAA Atlas 14 study area are not included in the NOAA Atlas 14 update and therefore care is needed when applying the updated Hydrology Manual criteria. Hydrology studies need to consider all available rainfall data by identifying rain gages located near or in the vicinity of the study area and need to obtain and review the relevant rainfall data. Such additional rainfall information includes, but is by no means limited to: NOAA (http://www.nws.noaa.gov/), CA-DWR (http://cdec.water.ca.gov/), CIMIS (http://wwwcimis.water.ca.gov/cimis/welcome.jsp), as well as gage data available from San Bernardino County. The results of such a review should be compared with the NOAA Atlas 14 results and a determination made as to the appropriateness in using the NOAA Atlas 14 results or whether a re-assessment of all rainfall data relevant to the study area should be made. Such determinations and reviews must be coordinated with the County in order to conclude the most appropriate rainfall statistics to use, including assessments of station record length and quality, among other factors.

The primary topics considered in the Addendum are:

1. Rainfall quantities for various peak durations of rainfall, and related return periods;
2. Antecedent Moisture Conditions (or "AMC") used in hydrology studies for design and planning;
3. Soil Grouping designations and related maps.

II. RAINFALL STATISTICS

The County of San Bernardino Hydrology Manual (1986) contains isohyetal curves developed for estimating the 2-year return frequency values for the peak 6- and 24-hour durations of rainfall, the 10-year 1-hour rainfalls, and the 100-year 1-hour, 6-hour and 24-hour rainfalls. These isohyetal maps are based upon use of the NOAA Atlas 2 (1973) information. The NOAA Atlas 14 provides information for various peak durations of rainfall depths and for various return periods (return frequencies), including all of the key durations and return periods detailed in the Hydrology Manual.

Access to the NOAA Atlas 14 information is found at http://hdsc.nws.noaa.gov/hdsc/pfds/.

Another resource available for assessing rainfall for hydrology studies is the depth duration frequency studies developed by the California Department of Water Resources (DWR). Some of the gages analyzed by DWR are not included in the NOAA Atlas 14 and should be considered for appropriateness in studies submitted to the county. The depth-duration frequency tables can be obtained as Microsoft Excel files from the DWR website at the following address:

http://www.water.ca.gov/floodmgmt/hafoo/csc/climate_data/.

It is noted that the Hydrology Manual provides interpolation methods for development of rainfall estimates for the 5-minute, 30-minute, 1-, 3-, 6-, and 24-hours of peak rainfall, including recommendations regarding log-log slopes of the relevant mass rainfall plots (for example, see Hydrology Manual Figures E-36 through E-45). The NOAA Atlas 14 provides estimates for these peak durations of rainfall depths directly in tabular form, on a rain gage by rain gage basis (for those gages used in the NOAA Atlas 14 analysis). Hydrology studies prepared using this Addendum should develop the relevant rainfall quantities required for the Hydrology Manual using the newer NOAA Atlas 14 estimates and, if available, the DWR estimates to assess the appropriate rainfall quantities to be used. Additionally, the study should consider all other rain gage information available in the proximity of the study watershed. The submittal should consider these several forms of rainfall information and provide a recommendation as to the appropriate rainfall information to use.

III. ANTECEDENT MOISTURE CONDITIONS (AMC)

The Antecedent Moisture Condition (AMC) concept is a classification of the watershed runoff conditions and is related to the prior five-day precipitation. By examining this prior five-day rainfall, the watershed can be categorized as being wet, average or dry. This classification of the watershed impacts the runoff which can be expected during a particular storm event. Original literature regarding AMC conditions were published by the Soil Conservation Service (SCS) in 1964 in the National Engineering Handbook,

Section 4. (The SCS had since changed to be the Natural Resources Conservation Service (NRSC).) In the 1993 update to the National Engineering handbook, the NRSC revised the AMC concept to that of Antecedent Runoff Condition (ARC), where ARC values correspond to statistical envelopments of the relevant rainfall-runoff information, versus the AMC concept correlating to contemplated prior moisture conditions of the watershed. Similar to many other agencies, the County continues to use the AMC approach in order to determine runoff quantities appropriate for design and planning purposes. The AMC approach should be used in all hydrologic studies prepared for County review or approval as presented in the Hydrology Manual (1986), without modification.

Based on the NOAA Atlas 14 statistical data, updated AMC designations for use in arid region hydrology studies are as shown in Addendum Figures ADD-1. It is noted that the NOAA Atlas 14 did not include all available rain gages, and therefore the hydrology study should examine other relevant rainfall gages to assess the appropriateness of the AMC designations shown in Addendum Figures ADD-1. Regional or Master Plan studies should consider all sources of information. The AMC condition used for these studies must be approved by the County.

IV. SOIL GROUPING DESIGNATIONS

The soil grouping information contained in Section C of the Hydrology Manual (1986) has been updated and can be accessed at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Use of this information follows the directions provided in the Hydrology Manual (1986).

V. REFERENCES

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