

Discovery Report

Lower Cimarron – Skeleton Watershed, HUC 8 - 11050002

*Alfalfa, Blaine, Canadian, Garfield, Kingfisher, Logan, Major, and
Oklahoma Counties, Oklahoma*

August 9, 2013



FEMA

Project Area Community List

Community Name	CID
<i>Alfalfa County Communities</i>	
Alfalfa County and Unincorporated Areas	400004
Town of Helena	400388
Town of Goltry	40X044
<i>Blaine County Communities</i>	
Blaine County and Unincorporated Areas	400011
Town of Hitchcock	40X055
Town of Okeene	400015
<i>Canadian County Communities</i>	
Canadian County and Unincorporated Areas	400485
City of El Reno	405377
City of Piedmont (Kingfisher)	400027
<i>Garfield County Communities</i>	
Garfield County and Unincorporated Areas	400473
Town of Breckenridge	400530
Town of Carrier	400526
Town of Covington	400362
Town of Douglas	400531
Town of Drummond	400527
City of Enid	400062
Town of Fairmont	400528
Town of Lahoma	400294
Town of North Enid	400425
Town of Waukomis	400338
<i>Kingfisher County Communities</i>	
Kingfisher County and Unincorporated Areas	400471
Town of Cashion (Logan)	400277
Town of Dover	400081
Town of Hennessey	400389
City of Kingfisher	400082
Town of Loyal	400083
Town of Okarche (Canadian)	400428
<i>Logan County Communities</i>	
Logan County and Unincorporated Areas	400096
Town of Cedar Valley	40X016
Town of Cimarron City	40X019
City of Crescent	400098
City of Guthrie	400099

Community Name	CID
Town of Marshall	400306
<i>Major County Communities</i>	
Major County and Unincorporated Areas	400110
Town of Ames	40X004
City of Fairview	400112
Town of Meno	400113
Town of Ringwood	400323
<i>Oklahoma County Communities</i>	
Oklahoma County and Unincorporated Areas	400466
City of Bethany	400254
City of Edmond	400252
City of Nichols Hills	400423
City of Oklahoma City (Canadian)	405378
City of The Village	400420
City of Warr Acres	400449

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The basis and format of this document is derived from FEMA Guidance and Specification, Procedure Memorandums, Operational Guidance, Regional Standard Operating Procedures, and current draft revisions and proposed guidance to include, but not limited to;

Guidance and Specifications: Appendix I - Discovery

Guidance and Specifications: Appendix M - Data Capture Standards

PM 56: Guidelines for Implementation of Coordinated Needs Management Strategy (CNMS)

PM 59: Guidance for Implementation of Watershed-Based Studies

PM 60: Guidance for Flood Risk Assessment Data Development and Analysis

Operational Guidance No. 1-11: Risk MAP Guidance for Incorporating Mitigation Planning Technical Assistance and Training into Flood Risk Projects

Operational Guidance No. 4-11: Risk MAP Meeting Guidance

FEMA Region 6 Discovery & Project Pre-Planning SOP

Any revisions or changes to this document will require FEMA Region 6 Authorization prior to implementation.

Acronyms and Abbreviations

BFE	base (1-percent-annual-chance) flood elevation
cfs	cubic feet per second
CEO	Chief Executive Officer
CID	Community Identification number
CLOMR	Conditional Letter of Map Revision
CNMS	Coordinated Needs Management Strategy
CRS	Community Rating System
CTP	Cooperative Technical Partner
DEM	Digital Elevation Model
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FPA	Floodplain Administrator
GIS	geographic information system
GPS	global positioning system
HEC-1/-2	Hydrologic Engineering Center – Hydrologic Model Program
HEC-HMS	Hydrologic Engineering Center – Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center—River Analysis System
HEC-SSP	Hydrologic Engineering Center – Statistical Software Package
H&H	hydrologic and hydraulic
HMP	Hazard Mitigation Plan
HMGP	Hazard Mitigation Grant Program
HUC	Hydrologic Unit Code
LOMA	Letter of Map Amendment
LOMC	Letter of Map Change
LOMR	Letter of Map Revision
MXD	Map Exchange Document
NFIP	National Flood Insurance Program
NHD	National Hydrologic Dataset
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NVUE	New Validated or Updated Engineering
ODCEM	Oklahoma Department of Civil Emergency Management

OK	Oklahoma
OWRB	Oklahoma Water Resources Board
RAMPP	Risk Assessment, Mapping, and Planning Partners
Risk MAP	Risk Mapping, Assessment, and Planning
RL	Repetitive Loss
PMR	Physical Map Revision
RSC	Regional Service Center
SFHA	Special Flood Hazard Area
SHMO	State Hazard Mitigation Officer
SRL	Severe Repetitive Loss
TR-20	Hydrology Rainfall-Runoff Model
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WSP-2	Water Surface Profile Model

I. Discovery Overview

The Federal Emergency Management Agency (FEMA) is currently implementing the Risk Mapping, Assessment, and Planning (Risk MAP) Program across the Nation. The purpose of Risk MAP is continued improvement of flood hazard information for the National Flood Insurance Program (NFIP), the promotion of increased national awareness and understanding of flood risk and the support of Federal, State, and local mitigation actions to reduce risk.

The vision and intent of the Risk MAP program is to, through collaboration with State, Local, and Tribal entities, deliver quality data that increases public awareness and leads to mitigation actions that reduce risk to life and property. To achieve this vision, FEMA has transformed its traditional flood identification and mapping efforts into a more integrated process of more accurately identifying, assessing, communicating, planning and mitigating flood risks. Risk MAP attempts to address gaps in flood hazard data and form a solid foundation for risk assessment, floodplain management, and provide State, Local, and Tribal entities with information needed to mitigate flood related risks.

The FEMA Region 6 office, in partnership with the State of Oklahoma Water Resources Board (OWRB), began the Discovery process in the Lower Cimarron – Skeleton watershed in December 2012 to gather local information and readily available data to determine project viability and the need for Risk MAP products to assist in the movement of communities towards resilience. The watershed location can be seen in Figure 1.

Through the Discovery process, FEMA can determine which areas of the Hydrologic Unit Code – 8 (HUC8) Discovery watersheds may/will be funded for further flood risk identification and assessment in a collaborative manner, taking into consideration the information collected from local communities during this process. Discovery initiates open lines of communication and relies on local involvement for productive discussions about flood risk. The process provides a forum for a watershed-wide effort to understand how the included watershed community’s flood risks are related to flood risk throughout the watershed. In Risk MAP, projects are analyzed on a watershed basis, so Discovery Meetings target numerous stakeholders from throughout the watershed on local, regional, State, and Federal levels.

Table 1 provides basic information about the Lower Cimarron – Skeleton watershed, and Figure 1 shows the location and communities of the watershed.

Table 1: Watershed Data

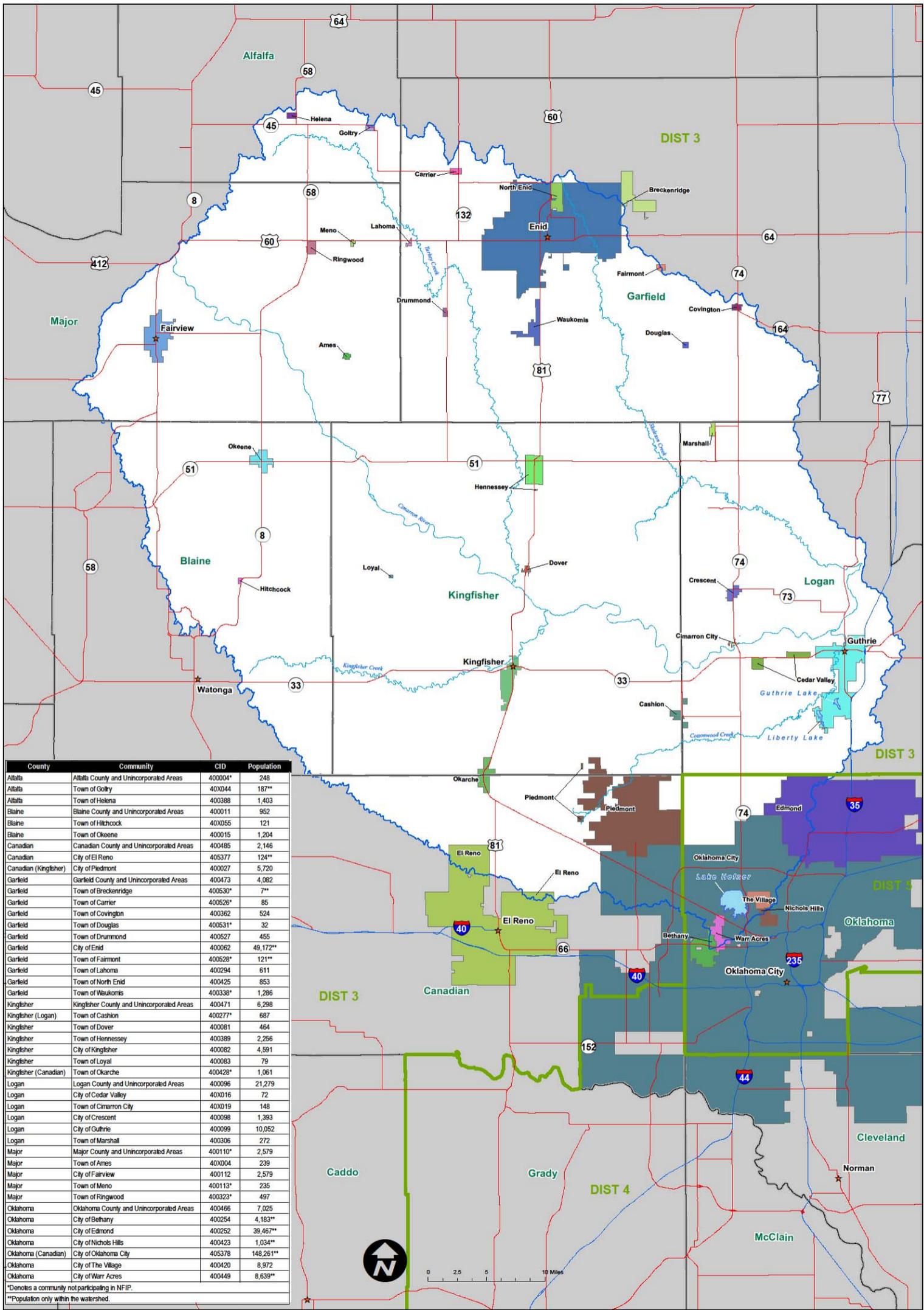
Watershed	Lower Cimarron - Skeleton	
Major Stream(s):	Cimarron River, Cottonwood Creek, Kingfisher Creek, Skeleton Creek, Turkey Creek	HUC 8 Code: 11050002
Multiple Regions:	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes	Region: 6
Population within the Watershed (2010 Census)	341,695	
Additional Notes:	The Lower Cimarron – Skeleton watershed covers approximately 3,200 square miles and involves 8 counties and 37 communities.	

In May 2013, FEMA and the State held a Discovery Meeting in this watershed area. During Discovery, FEMA and the State reached out to local communities to:

- Gather information about local or Tribal flood risk and flood hazards.
- Reviewed current and historic mitigation plans to understand local or Tribal mitigation capabilities, hazard risk assessments, and current or future mitigation activities.
- Include multi-disciplinary staff from within their community to participate and assist in the development of a watershed vision.
- For each community, identify current staff capacity, capability, and resources for risk communication and technical capability, including Geographic Information Systems (GIS).
- Identify delivery requirements for future project selection decisions and investments.
- Identify opportunities to transfer ownership of natural hazard risk assessment and communication to local communities and watershed partners.
- Promote more resilient communities within the State of Oklahoma.

Figure 1: Watershed and Communities

Discovery Map: Lower Cimarron-Skeleton Watershed Locator



MAP SYMBOLOGY

- Flood Hazard Areas**
Source: FEMA
- HUC-8
 - River
 - County Boundary
 - Municipal Boundary
 - Primary Limited Access or Interstate
 - Primary US and State Highway
 - Congressional District
 - County Seat

NOTES TO USERS

All information on this map came from public data. Roads and political boundaries were supplied by the University of Oklahoma and ESRI. Hydrographic Features (Streams and HUC Boundaries) were provided by USGS National Hydrography Dataset (NHD) or delineated using USGS NED data.

For more information about the data displayed on this map please contact:
FEMA Region 6 Regional Support Center
723 South Innis Avenue 3SE, Suite 230
Denver, Texas 76035

WATERSHED LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM
DISCOVERY MAP: LOCATOR

LOWER CIMARRON-SKELETON WATERSHED, OKLAHOMA

HUC-8 Code
11050002

RELEASE DATE
08/09/2013

i. Watershed Selection

For the Discovery process, watersheds are selected and analyzed at the HUC 8 level and evaluated using three major factors (or trifecta factors): population, topographic data availability and risk decile. Decile risk is calculated from 9 parameters including total population density, historical population growth, predicted population growth, housing units, flood policies, single claims, repetitive losses, repetitive loss properties and declared disasters.

The Lower Cimarron – Skeleton Watershed (HUC 11050002) encompasses an area of approximately 3,200 square miles and extends across portions of 8 counties in central Oklahoma including Alfalfa, Blaine, Canadian, Garfield, Kingfisher, Logan, Major, and Oklahoma counties. Tribal Lands belonging to the Cheyenne-Arapaho Tribe are located in counties that intersect the watershed. There may also be small portions of land belonging to Wichita & Affiliated Tribes, Caddo Nation, and Delaware Nation located within the watershed. Major communities include the cities of Oklahoma City, Enid, Edmond, Guthrie and Piedmont. There are a total of 37 communities and 8 unincorporated counties with CID numbers located within the watershed.

The population in the Lower Cimarron – Skeleton Watershed totals 341,695 people, based on the 2010 census. Oklahoma City is the watershed’s highest population center (population: 579,999 total; 148,261 within the watershed) containing 43% of the watershed’s total population. There are in total 37 populated areas inside this watershed. Figure 2 shows population densities within the Lower Cimarron – Skeleton Watershed.

Table 2 provides a snapshot of each community in the watershed.

Table 2: Project Area Community List

County	Community Name	CID	Participating Community?	CRS Rating	FIRM Date	FIRM Status	Population (2010 Census)
Alfalfa	Alfalfa County and Unincorporated Areas	400004	Not Participating	NA	No published FIRM	Never Mapped	248
Alfalfa	Town of Goltry	40X044	Not Participating	No data	No data	No data	187**
Alfalfa	Town of Helena	400388	Participating	NA	No published FIRM	All Zone C and X - No Published FIRM	1,403
Blaine	Blaine County and Unincorporated Areas	400011	Participating	NA	8/02/1995	Original	952
Blaine	Town of Hitchcock	40X055	Not Participating	No data	No data	No data	121

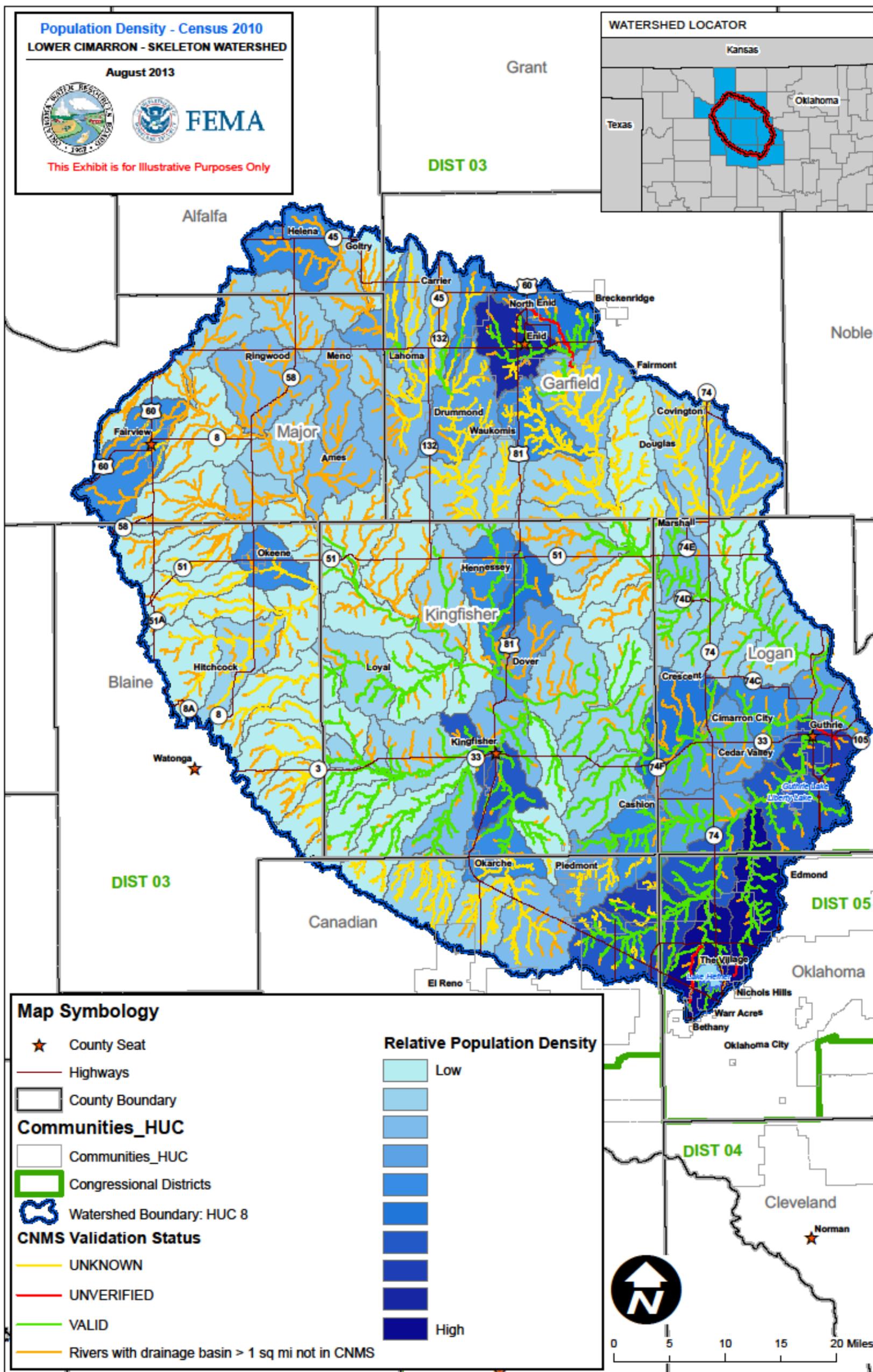
County	Community Name	CID	Participating Community?	CRS Rating	FIRM Date	FIRM Status	Population (2010 Census)
Blaine	Town of Okeene	400015	Participating	NA	11/15/1985	All Zone A, C, and X - No elevation determined	1,204
Canadian	Canadian County and Unincorporated Areas	400485	Participating	NA	9/26/2008	Revised	2,146
Canadian	City of El Reno	405377	Participating	NA	9/26/2008	Revised	124**
Canadian (Kingfisher)	City of Piedmont	400027	Participating	NA	8/19/2010	Revised	5,720
Garfield	Garfield County and Unincorporated Areas	400473	Participating	NA	6/19/2012	Revised	4,082
Garfield	Town of Breckenridge	400530	Not Participating	NA	6/19/2012	All Zone A, C, and X - No elevation determined	7**
Garfield	Town of Carrier	400526	Not Participating	NA	6/19/2012	All Zone C & X Published FIRM	85
Garfield	Town of Covington	400362	Participating	NA	6/19/2012	All Zone A, C, and X - No elevation determined	524
Garfield	Town of Douglas	400531	Not Participating	NA	6/19/2012	All Zone C & X Published FIRM	32
Garfield	Town of Drummond	400527	Participating	NA	6/19/2012	All Zone C & X Published FIRM	455
Garfield	City of Enid	400062	Participating	8	6/19/2012	Revised	49,172**
Garfield	Town of Fairmont	400528	Not Participating	NA	6/19/2012	All Zone C & X Published FIRM	121**
Garfield	Town of Lahoma	400294	Participating	NA	6/19/2012	Revised	611

County	Community Name	CID	Participating Community?	CRS Rating	FIRM Date	FIRM Status	Population (2010 Census)
Garfield	Town of North Enid	400425	Participating	NA	6/19/2012	Revised	853
Garfield	Town of Waukomis	400338	Not Participating	NA	6/19/2012	All Zone A, C, and X - No elevation determined	1,286
Kingfisher	Kingfisher County and Unincorporated Areas	400471	Participating	NA	8/19/2010	Revised	6,298
Kingfisher (Logan)	Town of Cashion	400277	Not Participating	NA	9/29/2010	All Zone A, C, and X - No elevation determined	687
Kingfisher	Town of Dover	400081	Participating	NA	8/19/2010	Revised	464
Kingfisher	Town of Hennessey	400389	Participating	NA	8/19/2010	Revised	2,256
Kingfisher	City of Kingfisher	400082	Participating	NA	8/19/2010	Revised	4,591
Kingfisher	Town of Loyal	400083	Participating	NA	8/19/2010	Revised	79
Kingfisher (Canadian)	Town of Okarche	400428	Not Participating	NA	8/19/2010	All Zone C & X Published FIRM	1,061
Logan	Logan County and Unincorporated Areas	400096	Participating	NA	9/29/2010	Revised	21,279
Logan	Town of Cedar Valley	40X016	Not Participating	No data	No data	No data	72
Logan	Town of Cimarron City	40X019	Not Participating	No data	No data	No data	148
Logan	City of Crescent	400098	Participating	NA	9/29/2010	Revised	1,393
Logan	City of Guthrie	400099	Participating	NA	9/29/2010	Revised	10,052
Logan	Town of Marshall	400306	Participating	NA	9/29/2010	Revised	272
Major	Major County and Unincorporated Areas	400110	Not Participating	NA	No published FIRM	Never Mapped	2,579
Major	Town of Ames	40X004	Not Participating	No data	No data	No data	239
Major	City of Fairview	400112	Participating	NA	3/4/1988	Original	2,579

County	Community Name	CID	Participating Community?	CRS Rating	FIRM Date	FIRM Status	Population (2010 Census)
Major	Town of Meno	400113	Not Participating	NA	No published FIRM	All Zone C & X - No Published FIRM	235
Major	Town of Ringwood	400323	Not Participating	NA	No published FIRM	Never Mapped	497
Oklahoma	Oklahoma County and Unincorporated Areas	400466	Participating	NA	12/18/2009	Revised	7,025
Oklahoma	City of Bethany	400254	Participating	NA	12/18/2009	Revised	4,183**
Oklahoma	City of Edmond	400252	Participating	7	12/18/2009	Revised	39,467**
Oklahoma	City of Nichols Hills	400423	Participating	NA	12/18/2009	Revised	1,034**
Oklahoma (Canadian)	City of Oklahoma City	405378	Participating	NA	2/20/2013	Revised	148,261**
Oklahoma	City of The Village	400420	Participating	NA	12/18/2009	Revised	8,972
Oklahoma	City of Warr Acres	400449	Participating	NA	12/18/2009	Revised	8,639**

**Population only within the watershed.

Figure 2: Population Density in the Watershed



The primary river in the watershed is the Cimarron River. The Cimarron River originates in northeastern New Mexico and drains approximately 13,000 square miles to the most downstream portion of the watershed. The river is approximately 600 miles long upstream from this point to its headwaters. The Cimarron River drains parts of New Mexico, Colorado, Oklahoma, and Kansas, and is a tributary of the Arkansas River.

Recent acquisitions of topographic data have been made for parts of Garfield, Kingfisher, Canadian, and Blaine counties, totaling approximately 1,370 square miles. Topographic coverage totals are at about 43% for the entire watershed. Areas that are noted to be lacking updated topographic information are all of Logan, Major, and Alfalfa counties, the western half of Garfield County, and the eastern part of Kingfisher County. Only the U.S. Geological Survey (USGS) 10 meter digital elevation model (DEM) data is available for these missing areas and is not suitable for detailed study modeling and floodplain mapping.

The scale of Risk Decile ranking is 1-10 with 1 being the highest and 10 being the lowest ranking for a portion of the watershed. Table 3 lists the overall rankings of the Lower Cimarron – Skeleton watershed when compared nationally to other HUC 8 watersheds. This information, along with rankings of smaller HUC 12 sub-basins, helps identify stream segments or locations where risk evaluation can be targeted, and is used as an overview for the Lower Cimarron – Skeleton watershed. This represents the HUC 12 sub-basin risk decile, the availability of topographic data, and a combined analysis of the Risk Factors for each stream segment reflecting the information in this overview. The combination of factors was key to the selection of this watershed for a Discovery Project.

Table 3: Watershed Risk Factor Rankings

Lower Cimarron – Skeleton Watershed Selection Rankings	
National Risk Factor Rank: 209	Region 6 Risk Factor Rank: 34
National Risk Decile: 2	Region 6 Risk Decile: 1
Average Annualized Loss: \$25.8M	Average Annualized Loss: \$25.8M
National Average Annualized Loss Rank: 352	Region 6 Average Annualized Loss Rank: 43
National Overall Rank: 103	Region 6 Overall Rank: 23

The measured amount of risk (or risk decile) for the Lower Cimarron – Skeleton watershed is 1. Decile risk is calculated from 9 parameters including total population density, historical population growth, predicted population growth, housing units, flood policies, single claims, repetitive losses, repetitive loss properties and declared disasters. Nationally, this HUC’s risk decile rating ranks in the top 5% of all HUC-8s in the United States, and top 5% for HUC-8s within Region 6. Considering the historical flooding events that have happened in the last decade or so within Oklahoma, this makes the risk numbers for this watershed increasingly relevant.

The Lower Cimarron – Skeleton watershed is located in northern central Oklahoma, in a prairie region with low rolling hills and level plains. This flat topography, in combination with large quantities of ground and surface water, makes the area prone to flooding events during severe, sporadic, frontal storm system occurrences. These types of storms occur mainly in the spring, summer, and fall months, can generate very heavy rainfall, and can cause both regional flooding

and flash flooding to occur. Rainfall rates in excess of 2 inches per hour can occur during these storms. A large flooding event in 1973, for example, resulted from rainfall rates of 12 inches in 3 hours in the town of Enid. These floods cause significant risk to human life and agricultural, residential, and commercial properties. This area of Oklahoma can also be impacted by large tropical storm events such as tropical storm Erin in 2007, which caused an estimated \$500,000 in property damage in Kingfisher County alone. Local reports, historical records, and the documented FEMA Disaster Declarations (see Table 12) all indicate a history of significant and reoccurring flooding in this region. The most recent disaster declaration involving flooding was in Alfalfa County in June 2012.

Currently, there are no other active physical map revisions (PMRs) or studies within the Lower Cimarron – Skeleton Watershed. Other active map actions in adjacent watersheds consist of the Middle North Canadian HUC 1100301 (FY11 CTP) and Lower Canadian Walnut OK HUC 11090202 (FY12 CTP Watershed).

Of the eight counties in the Lower Cimarron – Skeleton watershed, two counties and their unincorporated areas, Alfalfa County and Major County, are not participating in the NFIP. Of the 37 communities, 14 are not participating in the NFIP including the Towns of Ames, Breckenridge, Carrier, Cashion, Cedar Valley, Cimarron City, Douglas, Fairmont, Goltry, Hitchcock, Meno, Okarche, Ringwood, and Waukomis. The towns of Ames, Carrier, Douglas, Drummond, Fairmont, Hitchcock, Helena, Goltry, Meno, Okarche, and Ringwood contain no Special Flood Hazard Areas (SFHA) or are unmapped.

FEMA looks to promote mitigation action within the watershed. After internal and partner review of the communities within the watershed, the following are overarching opportunities identified to promote community action within the watershed:

- Engage communities on their status in terms of actions they have identified in their mitigation plan
- Identify community's intentions on what they are trying to improve
- Identify higher priority actions that were not previously identified in their mitigation action plans
- Identify opportunities for communities to collaborate in order to leverage resources
- Identify critical areas of need that may be more dynamic than those represented in the HMPs, such as repetitive loss structures

There are many opportunities for partnership between Federal, State and Local authorities. Neighboring communities are better informed about what is happening upstream and downstream of them and they can identify larger flooding issues that they maybe weren't aware of previously. There is an opportunity for shared information, flood studies, hydrologic and hydraulic (H&H) studies, and local resources.

Within the Lower Cimarron – Skeleton watershed, the only significant amount of federal land is Vance Air Force Base, located in central Garfield County near the northern boundary of the watershed. The Base occupies approximately 18 square miles and has been in operation since 1941. Tribal lands within the watershed include lands belonging to the Cheyenne-Arapaho Tribe, a federally recognized Tribe with approximately 12,000 enrolled members. There may also be small portions of land belonging to Wichita & Affiliated Tribes, Caddo Nation, and Delaware Nation located within the watershed. Roman Nose State Park is located near the southwest boundary of the watershed in Blaine County, approximately 6 miles north of the town of Watonga. This park is the location of one state-owned dam structure, and has an area of just under one square mile.

II. Pre-Discovery Coordination

i. Watershed Team and Community Contacts

The Regional Project Team was made up of the following staff:

Organization	Name/E-Mail	Responsibility
FEMA R6 – Risk Analysis (Engineering & Mapping)	Jim Orwat james.orwat@fema.dhs.gov 940-898-5302	Project Monitor – Engineering and Mapping Lead
FEMA R6 – Risk Analysis (Mitigation Planning)	David Reiff david.reiff@fema.dhs.gov 940-898-5493	Mitigation Planning Support
FEMA R6 – Floodplain Management & Insurance	Roberto Ramirez roberto.ramirez@fema.dhs.gov 940-383-7329	Compliance and Insurance Specialist
FEMA R6 – Hazard Mitigation Assistance	Danielle Brown-Rainwater danielle.brown2@fema.dhs.gov 940-898-5336	Hazard Mitigation Assistance Specialist
FEMA R6 – Tribal Liaison	Shanene Thomas shanene.thomas@fema.dhs.gov 940-898-5492	Tribal Liaison
FEMA R6 – Risk Communications	Diane Howe diane.howe@fema.dhs.gov 940-898-5171	Outreach Specialist
State of Oklahoma – NFIP Coordinator	Gavin Brady jgbrady@owrb.ok.gov 918-581-2924	NFIP Coordinator
State of Oklahoma Water Resources Board – Environmental Specialist	Matt Rollins mjrollins@owrb.ok.gov 405-530-8800	State Partner
State of Oklahoma Water Resources Board – Planning and Management Division	Julie Cunningham jmcunningham@owrb.ok.gov 405-530-8800	State Partner
State of Oklahoma – State Hazard Mitigation Officer	Bill Penka bill.penka@oem.ok.gov 405-521-2481	State Hazard Mitigation
State of Oklahoma – State Recovery Manager	Art Jones art.jones@oem.ok.gov 405-521-2481	State Recovery Manager
Production and Technical Services Contractor – RAMPP/CTP	Remmet deGroot remmet.degroot@urs.com 801-904-4020	RAMPP Study Manager
Coordinator, Region VI - RAMPP Regional Support Center	Rigel Rucker rigel.rucker@urs.com 575-526-1180	RSC Coordinator

ii. Pre-Discovery Efforts

The Risk Assessment, Mapping, and Planning Partners (RAMPP) team attempted to contact all watershed communities via phone approximately seven weeks prior to the Discovery Meeting. The vast majority of communities were able to be reached, providing additional contact names as well as information about flood risks and mitigation work within their communities. Approximately five weeks prior to the Discovery Meeting, a letter was sent to each community, Tribal Nation, and several state agencies. This letter served as an invitation to the Discovery Meeting, as well as requested any additional information or data that the community may have regarding flood hazards and mitigation opportunities. During the phone calls, several communities requested a Discovery Locator Map be provided via email. The State, Federal, Tribal and local agencies that were invited to the Discovery and pertinent communications (letters and emails) are included in the supplemental digital data accompanying this report.

i. Pre-Discovery Community Engagement

FEMA and the Regional Project Team were in contact with watershed stakeholders via letters, email, and/or phone calls prior to the Discovery meeting to request local participation. In addition to assisting in scheduling the meeting, locals were asked to help identify additional key contacts that should be included in the Discovery process and acquire any information or data that would assist in the risk identification and assessment for the Lower Cimarron – Skeleton watershed. The size of the communities within the watershed varies greatly, ranging from the large metropolitan area of Oklahoma City to small rural communities with a very small municipal staff. Many of the mayors of these smaller communities are volunteer or part-time positions, and there is often no specialized staff such as a Floodplain Administrator (FPA). Communities without access to email were engaged via letter and phone call specifically. This variation in the resources and capabilities of the communities within the watershed must be taken into account when performing outreach and engagement during the Discovery process.

In preparation for the Discovery meeting, the Regional Project Team:

- Gathered information about local flood risk and flood hazards
- Gathered information on the history of FEMA engagement with communities (see Table 4)
- Reviewed mitigation plans to understand local mitigation capabilities, hazard risk assessments, current or future mitigation activities, and areas of mitigation interest (see Table 5)
- Encouraged communities within the watershed to develop a vision for the watershed's future
- Used all information gathered to determine which areas of the watershed may require further study through a Risk MAP project

The Regional Project Team began outreach efforts to the local governments within the watershed, Congressional and public officials, and other organizations to inform them of the Discovery process and to invite them to participate and contribute information about the watershed and any water resource concerns. The following are key steps that were taken before the Discovery meetings:

- Initial Coordination meeting held with FEMA, the State of Oklahoma (NFIP and State Hazard Mitigation Officer (SHMO)) and contract personnel to set the stage for co-participation and sharing of the meeting. Established potential meeting times and locations
- Initial calls by the RAMPP Study Manager and/or FEMA made to the local communities to request information that may be pertinent to the watershed
- Mailed invitation letters to the CEO and FPA of each community
- FEMA followed up with email of meeting information one week before meeting
- FEMA followed up with phone calls to personally invite the larger communities and remind them of the meeting details and logistics to ensure attendance of the major watershed players
- FEMA coordinated internally for meeting attendees to support the project
- Invited U.S. Army Corps of Engineers (USACE), the Association of Central Oklahoma Governments, U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), State and Federally elected officials, and other stakeholders to actively participate as active members of the project team
- Congressional briefing before the meeting
- Media briefing after the meeting - or as determined appropriate by External Affairs (Public Affairs)

Stakeholders that have been identified in the Lower Cimarron – Skeleton watershed include the USDA/NRCS, USACE, the Northern Oklahoma Development Authority, the Association of Central Oklahoma Governments, and Oklahoma Emergency Management. Discussions are being held with these agencies about potential partnership opportunities, as well as their help in identifying flood risk throughout the watershed. The above organizations were all invited to participate in the May 2013 Discovery Meeting.

Table 4 summarizes the last 10 years of FEMA and State engagement in the watershed, showing the history of Community Assistance Calls and Community Assistance Visits by community. Table 5 provides information on mitigation action measures in each community, as well as information about each hazard mitigation plan status.

Table 4: FEMA History of Engagement (2003-2013)

Community Name	Type of Engagement	Date	Agency
Bethany, City of	Community Assistance Call	5/9/2007	STATE
Bethany, City of	Community Assistance Call	3/6/2009	FEMA
Blaine County	Community Assistance Call	11/9/2006	STATE
Blaine County	Community Assistance Call	9/29/2009	STATE
Blaine County	Community Assistance Call	5/31/2012	STATE
Canadian County	Community Assistance Call	8/7/2012	STATE
Cashion, Town of	Community Assistance Call	9/18/2007	FEMA
Crescent, City of	Community Assistance Call	3/10/2009	FEMA
Dover, Town of	Community Assistance Call	9/2/2009	STATE
Drummond, Town of	Community Assistance Call	5/29/2012	STATE
Edmond, City of	Community Assistance Call	2/12/2009	STATE
Edmond, City of	Community Assistance Call	3/2/2009	FEMA

Community Name	Type of Engagement	Date	Agency
El Reno, City of	Community Assistance Visit	6/21/2010	STATE
El Reno, City of	Community Assistance Visit	7/30/2012	STATE
Enid, City of	Community Assistance Visit	6/16/2011	STATE
Fairview, City of	Community Assistance Call	7/9/2008	STATE
Fairview, City of	Community Assistance Call	9/15/2008	STATE
Fairview, City of	Community Assistance Visit	3/6/2009	STATE
Garfield County	Community Assistance Call	5/22/2012	STATE
Guthrie, City of	Community Assistance Call	3/3/2004	STATE
Guthrie, City of	Community Assistance Call	7/12/2005	STATE
Guthrie, City of	Community Assistance Call	3/10/2009	FEMA
Guthrie, City of	Community Assistance Visit	7/23/2012	STATE
Helena, Town of	Community Assistance Call	7/7/2008	STATE
Hennessey, Town of	Community Assistance Call	5/29/2012	STATE
Kingfisher County	Community Assistance Call	4/14/2004	STATE
Kingfisher County	Community Assistance Call	9/14/2007	FEMA
Kingfisher, City of	Community Assistance Call	3/19/2004	STATE
Kingfisher, City of	Community Assistance Call	4/14/2004	STATE
Kingfisher, City of	Community Assistance Call	9/14/2007	FEMA
Kingfisher, City of	Community Assistance Call	11/17/2011	STATE
Kingfisher, City of	Community Assistance Visit	4/9/2012	STATE
Logan County	Community Assistance Call	4/23/2003	STATE
Logan County	Community Assistance Call	3/3/2004	STATE
Logan County	Community Assistance Call	12/7/2004	STATE
Logan County	Community Assistance Call	3/11/2009	FEMA
Logan County	Community Assistance Visit	8/6/2012	STATE
Marshall, Town of	Community Assistance Call	3/10/2009	FEMA
Marshall, Town of	Community Assistance Call	9/24/2010	STATE
Nichols Hills, City of	Community Assistance Call	5/9/2007	STATE
Nichols Hills, City of	Community Assistance Call	3/5/2009	FEMA
Nichols Hills, City of	Community Assistance Call	10/8/2009	STATE
Oklahoma City, City of	Community Assistance Call	3/3/2009	FEMA
Oklahoma City, City of	Community Assistance Visit	6/11/2012	STATE
Oklahoma City, City of	Community Assistance Call	8/7/2012	STATE
Oklahoma County	Community Assistance Call	10/10/2003	STATE
Oklahoma County	Community Assistance Call	6/10/2004	STATE
Oklahoma County	Community Assistance Call	3/3/2009	FEMA
Oklahoma County	Community Assistance Visit	6/11/2012	STATE
Piedmont, City of	Community Assistance Call	1/6/2009	STATE
Piedmont, City of	Community Assistance Call	5/22/2012	STATE
The Village, City of	Community Assistance Call	5/14/2007	STATE
The Village, City of	Community Assistance Call	3/2/2009	FEMA

Community Name	Type of Engagement	Date	Agency
The Village, City of	Community Assistance Visit	12/29/2009	STATE
The Village, City of	Community Assistance Call	6/11/2010	STATE
Warr Acres, City of	Community Assistance Call	3/5/2009	FEMA
Warr Acres, City of	Community Assistance Visit	3/12/2012	STATE

Table 5: Mitigation Plan Information

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Alfalfa County and Unincorporated Areas	Identify unmapped floodplain areas Obtain funding for floodplain administrator Join the NFIP Improve warning systems for natural hazards Purchase and distribute weather radios Provide portable generators Wildfire education outreach	Alfalfa County	Expired	N/A	6/4/2009
Town of Goltry	Identify unmapped floodplain areas Obtain funding for floodplain administrator Join the NFIP Improve warning systems for natural hazards Purchase and distribute weather radios Provide portable generators Wildfire education outreach	Alfalfa County	Expired	N/A	6/4/2009

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Town of Helena	Identify unmapped floodplain areas Obtain funding for floodplain administrator Joined NFIP since last HMP Improve warning systems for natural hazards Purchase and distribute weather radios Provide portable generators Wildfire education outreach Application for safe room rebate program Ditches and culverts cleaned on a regular basis In process of completing new county-wide HMP	Alfalfa County	Expired	N/A	6/4/2009
Blaine County and Unincorporated Areas	Limit development in the floodplain Identify buildings in 100 and 500 year FP Education outreach for all hazards Provide dam monitoring equipment Obtain and distribute weather radios - Improve warning system Purchase generators and hardwire critical facilities Safe room rebate program Fund community safe rooms Improve minimum building codes Bury power lines Upgrade to metal roofing in schools and critical facilities Analyze current drainage improvements for deficiencies Clean and clear channels and ditches and culverts Upgrade undersized culverts-- priority for schools and public buildings Mitigate flooding at schools and public buildings Identify areas of localized or unmapped flooding	Blaine County	Approved	3/21/2011	3/20/2016

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Town of Hitchcock	Limit development in the floodplain Identify buildings in 100 and 500 year floodplain Education outreach for all hazards Provide dam monitoring equipment Obtain and distribute weather radios - Improve warning system Purchase generators and hardwire critical facilities Safe room rebate program Fund community safe rooms Improve minimum building codes Bury power lines Upgrade to metal roofing in schools and critical facilities Analyze current drainage improvements for deficiencies Clean and clear channels and ditches and culverts Upgrade undersized culverts Mitigate flooding at schools and public buildings Identify areas of localized or unmapped flooding	Blaine County	Approved	3/21/2011	3/20/2016

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Town of Okeene	Limit development in the floodplain Identify buildings in 100 and 500 year floodplain Education outreach for all hazards Provide dam monitoring equipment Obtain and distribute weather radios - Improve warning system Purchase generators and hardwire critical facilities Safe room rebate program Fund community safe rooms Improve minimum building codes Bury power lines Upgrade to metal roofing in schools and critical facilities Analyze current drainage improvements for deficiencies Clean and clear channels and ditches and culverts Upgrade undersized culverts Mitigate flooding at schools and public buildings Identify areas of localized or unmapped flooding	Blaine County	Approved	3/21/2011	3/20/2016

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Canadian County and Unincorporated Areas	Education outreach for all hazards Acquire/distribute NOAA Weather Radios Upgrade warning system Install shatter resistant glass in critical facilities Install Safe Rooms at Critical facilities and schools Implement Individual safe room program Adopt ordinance for safe rooms at new mobile home parks Modify/adopt zoning ordinance to address natural hazards Acquisition/Demolition of repetitive loss properties Restrict development in floodplains Provide defensible space around wildfire prone structures Study Basin to identify and prioritize cost-effective drainage projects	Canadian County	Approved	8/14/2013	08/14/2018
City of El Reno	Education outreach for all hazards Acquire/distribute NOAA Weather Radios Upgrade warning system Install shatter resistant glass in critical facilities Install Safe Rooms at Critical facilities and schools Implement Individual safe room program Adopt ordinance for safe rooms at new mobile home parks Modify/adopt zoning ordinance to address natural hazards Acquisition/Demolition of repetitive loss properties Restrict development in floodplains Provide defensible space around wildfire prone structures Study Basin to identify and prioritize cost-effective drainage projects	Canadian County	Approvable Pending Adoption	Pending Adoption	Pending Adoption

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
City of Piedmont	<p><u>2004 HMP</u> - Education outreach for all hazards Upgrade water lines to increase capacity for adequate fire protection Safe rooms at critical facilities Bury power lines Upgrade inadequate bridges to facilitate the 100 year storm Community safe rooms Safe rooms at day-care facilities Safe room rebate program for residential Require foundation piers as part of building code <u>2013 HMP</u> - Education outreach for all hazards Acquire/distribute NOAA Weather Radios Upgrade warning system Install shatter resistant glass in critical facilities Install Safe Rooms at critical facilities/schools Implement Individual safe room program Adopt ordinance for safe rooms at new mobile home parks Modify/adopt zoning ordinance to address natural hazards Acquisition/Demolition of repetitive loss properties Restrict development in floodplains Provide defensible space around wildfire prone structures Study Basin to identify and prioritize cost-effective drainage projects</p>	Canadian County	Approvable Pending Adoption	Pending Adoption	Pending Adoption

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Garfield County and Unincorporated Areas	Raise Scholtz bridge on Skelton Creek Raise Castelle Bridge on Otter Creek Improve warning system and distribute weather radios Education outreach on all hazards and construction techniques	Garfield County	Expired	N/A	9/16/2009
Town of Breckenridge	No Plan	N/A	N/A	N/A	N/A
Town of Carrier	No Plan	N/A	N/A	N/A	N/A
Town of Covington	Improve warning system Provide backup generators at fire station Safe room rebate program Community safe room Education outreach for all hazards Encourage 1' freeboard in all new construction Clean and clear culverts and ditches Upgrade inadequate culverts	Covington	Expired	N/A	4/26/2012
Town of Douglas	No Plan	N/A	N/A	N/A	N/A
Town of Drummond	Improve warning system Provide backup generators at pump station and hardwire facility Safe room rebate program Education outreach for all hazards	Drummond	Expired	N/A	6/4/2012
City of Enid	Improve warning system and distribute weather radios Hardwire sewer treatment plant for generator Clean and clear Boggy Creek and widen north Boggy creek channel Acquisition of FP property Water detention facility Dike to protect Brookside and Valleyview subdivisions Education outreach for all hazards	Enid	Approved	1/12/2009	1/12/2014
Town of Fairmont	No Plan	N/A	N/A	N/A	N/A

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Town of Lahoma	Purchase generators and hardwire critical facilities Permanent fixed generators for fire, police, and public works department Storm sirens and distribute weather radios Adopt new building codes Replace utilities pipeline with more flexible pipe Encourage 1' freeboard Education outreach for all hazards Limit building in FP Identify and mitigate high hazard flood areas Adopted 2 foot freeboard since last HMP	Lahoma	Expired	N/A	10/3/2012
Town of North Enid	Improve warning system - distribute weather radios and install sirens Hard wire town sewer system to accept backup generator Clean and clear Skeleton Creek to improve capacity Encourage 1' freeboard Inspect privately owned dams for safety Education outreach for all hazards	North Enid	Expired	N/A	4/26/2012
Town of Waukomis	No Plan	N/A	N/A	N/A	N/A

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Kingfisher County and Unincorporated Areas	Generators and hardwiring at critical facilities Improve warning system and distribute weather radios Register residential safe rooms Education outreach on construction and mitigation Acquisition of rep loss properties Develop and implement components of flood risk mitigation action plan Elevate utilities and manholes Obtain Dam breach inundation mapping Bridge improvements throughout county to reduce flooding Clear and clean creeks, culverts and ditches Community safe room construction and residential safe room rebate program	Kingfisher County	Approved	2/23/2012	2/22/2017
Town of Cashion	Generators and hardwiring at critical facilities Improve warning system and distribute weather radios Register residential safe rooms Education outreach on construction and mitigation Acquisition of rep loss properties Develop and implement components of flood risk mitigation action plan Elevate utilities and manholes Obtain Dam breach inundation mapping Bridge improvements throughout county to reduce flooding Clear and clean creeks, culverts and ditches Community safe room construction and residential safe room rebate program	Kingfisher County	Approved	2/23/2012	2/22/2017

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Town of Dover	Generators and hardwiring at critical facilities Improve warning system and distribute weather radios Register residential safe rooms Education outreach on construction and mitigation Acquisition of rep loss properties Develop and implement components of flood risk mitigation action plan Elevate utilities and manholes Obtain Dam breach inundation mapping Bridge improvements throughout county to reduce flooding Clear and clean creeks, culverts and ditches Community safe room construction and residential safe room rebate program	Kingfisher County	Approved	2/23/2012	2/22/2017
Town of Hennessey	Generators and hardwiring at critical facilities Improve warning system and distribute weather radios Register residential safe rooms Education outreach on construction and mitigation Acquisition of repetitive loss properties Develop and implement components of flood risk mitigation action plan Elevate utilities and manholes Obtain Dam breach inundation mapping Bridge improvements throughout county to reduce flooding Clear and clean creeks, culverts and ditches Community safe room construction and residential safe room rebate program	Kingfisher County	Approved	2/23/2012	2/22/2017

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
City of Kingfisher	Generators and hardwiring at critical facilities Improve warning system and distribute weather radios Register residential safe rooms Education outreach on construction and mitigation Acquisition of repetitive loss properties Develop and implement components of flood risk mitigation action plan Elevate utilities and manholes Obtain Dam breach inundation mapping Bridge improvements throughout county to reduce flooding Clear and clean creeks, culverts and ditches Community safe room construction and residential safe room rebate program	Kingfisher County	Approved	2/23/2012	2/22/2017
Town of Loyal	Generators and hardwiring at critical facilities Improve warning system and distribute weather radios Register residential safe rooms Education outreach on construction and mitigation Acquisition of repetitive loss properties Develop and implement components of flood risk mitigation action plan Elevate utilities and manholes Obtain Dam breach inundation mapping Bridge improvements throughout county to reduce flooding Clear and clean creeks, culverts and ditches Community safe room construction and residential safe room rebate program	Kingfisher County	Approved	2/23/2012	2/22/2017

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Town of Okarche	Education outreach for all hazards Acquire/distribute NOAA Weather Radios Upgrade warning system Install shatter resistant glass in critical facilities Install Safe Rooms at Critical facilities and schools Implement Individual safe room program Adopt ordinance for safe rooms at new mobile home parks Modify/adopt zoning ordinance to address natural hazards Provide defensible space around wildfire prone structures Study Basin to identify and prioritize cost-effective drainage projects	Canadian County	Approved	8/14/2013	8/14/2018
Logan County and Unincorporated Areas	Construct community safe rooms Education Outreach for all hazards Early warning systems Generators for critical facilities Install retention ponds to prevent flooding in low areas - Install dry hydrants Annual infrastructure review plan to minimize flooding Address remapping issues/needs Bury power lines Develop individual safe room rebate program Eliminate flooding at Seward and Midwest by straightening road Replace wooden bridge on University east of Midwest to increase capacity Mitigate flooding at low water crossing on Meridian road between Waterloo and Simmons Rd Replace culverts to improve drainage Mitigate bridge on Eo630 Road Low water crossing on MacArthur	Logan County	Approved	9/15/2011	9/14/2016

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Town of Cedar Valley	Drainage improvements as identified Construct community safe rooms Education Outreach for all hazards Early warning systems Generators for critical facilities Install retention ponds to prevent flooding in low areas - Install dry hydrants Annual infrastructure review plan to minimize flooding Address remapping issues/needs Bury power lines Develop individual safe room rebate program	Logan County	Approved	9/15/2011	9/14/2016
Town of Cimarron City	No Plan	N/A	N/A	N/A	N/A
City of Crescent	Drainage improvements as identified Construct community safe rooms Education Outreach for all hazards Early warning systems Generators for critical facilities Install retention ponds to prevent flooding in low areas - Install dry hydrants Annual infrastructure review plan to minimize flooding Address remapping issues/needs Bury power lines Develop individual safe room rebate program	Logan County	Approved	9/15/2011	9/14/2016

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
City of Guthrie	City wide sewer line restoration Drainage improvements as identified Construct community safe rooms Education Outreach for all hazards Early warning systems Generators for critical facilities Install retention ponds to prevent flooding in low areas - Install dry hydrants Annual infrastructure review plan to minimize flooding Address remapping issues/needs Bury power lines Develop individual safe room rebate program	Logan County	Approved	9/15/2011	9/14/2016
Town of Marshall	Construct community safe rooms Education Outreach for all hazards Early warning systems Generators for critical facilities Install retention ponds to prevent flooding in low areas - Install dry hydrants Annual infrastructure review plan to minimize flooding Address remapping issues/needs Bury power lines Develop individual safe room rebate program Install culverts to improve drainage under North Missouri, Lake, Cedar, and Oklahoma St	Logan County	Approved	9/15/2011	9/14/2016

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Major County and Unincorporated Areas	Obtain funding for county floodplain administrator Have flood-prone areas identified and mapped Improve warning systems by distributing weather radios to residents Develop and implement safe room rebate program Install community safe rooms at schools Purchase generators and hardwire critical facilities Education outreach for all hazards Adopt/update building codes for wind hazards Acquisition/Demolition of flood-prone structures Clean and clear drainage ditches Upgrade under-sized culverts Implement Firewise Program	Major County	Approved	6/25/2013	6/25/2018
Town of Ames	Obtain funding for county FP administrator Have flood-prone areas identified and mapped Education outreach for all hazards Improve warning systems by distributing weather radios to residents Develop and implement safe room rebate program Install community safe rooms at schools Purchase generators and hardwire critical facilities Adopt/update building codes for wind hazards Adopt/update building codes for wind hazards Acquisition/Demolition of flood-prone structures Clean and clear drainage ditches Upgrade under-sized culverts Implement Firewise Program	Major County	Approved	6/25/2013	6/25/2018

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
City of Fairview	Obtain funding for county FP administrator Education outreach for all hazards Flood proof, elevate flood-prone structures Clean/clear channels and retention basins Improve warning systems by distributing weather radios to residents Develop and implement safe room rebate program Install community safe rooms at schools Purchase generators and hardwire critical facilities Adopt/update building codes for wind hazards Adopt/update building codes for wind hazards Acquisition/Demolition of flood-prone structures Clean and clear drainage ditches Upgrade under-sized culverts Implement Firewise Program	Major County	Approved	6/25/2013	6/25/2018

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Town of Meno	Obtain funding for county FP administrator Have flood-prone areas identified and mapped Education outreach for all hazards Improve warning systems by distributing weather radios to residents Develop and implement safe room rebate program Install community safe rooms at schools Purchase generators and hardwire critical facilities Adopt/update building codes for wind hazards Adopt/update building codes for wind hazards Acquisition/Demolition of flood-prone structures Clean and clear drainage ditches Upgrade under-sized culverts Implement Firewise Program	Major County	Approved	6/25/2013	6/25/2018

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
Town of Ringwood	Obtain funding for county FP administrator Have flood-prone areas identified and mapped Education outreach for all hazards Improve warning systems by distributing weather radios to residents Develop and implement safe room rebate program Install community safe rooms at schools Purchase generators and hardwire critical facilities Adopt/update building codes for wind hazards Adopt/update building codes for wind hazards Acquisition/Demolition of flood-prone structures Clean and clear drainage ditches Upgrade under-sized culverts Implement Firewise Program	Major County	Approved	6/25/2013	6/25/2018
Oklahoma County and Unincorporated Areas	NW 192nd Street Bridge Replacement NW 178th Street Bridge Replacement Henney Road Bridge Replacement Crooked Oak Creek Drainage Improvement Deep Fork and Cottonwood channel improvements Elevate NW 178th and install culverts, NW 220th Street, and NW 234th Street Waterloo Flood Control Crutco Flood Control	Oklahoma County	Expired	N/A	9/9/2012
City of Bethany	No Plan	N/A	N/A	N/A	N/A

Community Name	Community Mitigation Action	Hazard Mitigation Plan Name	Plan Status	Plan Approved	Plan Expires
City of Edmond	Education Outreach for all hazards Turtle Creek Detention Pond Bury power lines Willowood Addition Flood Mitigation Project	Oklahoma County	Expired	N/A	9/9/2012
City of Nichols Hills	Improve warning system	Oklahoma County	Expired	N/A	9/9/2012
City of Oklahoma City	Education Outreach for all hazards Safe room rebate program - ongoing Implement stormwater conveyance or control structures to protect structures - Ongoing Construct safe rooms at critical facilities - ongoing Acquisition with drainage improvements at site Implement mitigation measures for flood prone properties as identified in drainage plans Develop master drainage plans NOAA weather radios at all critical facilities Generators at critical facilities Install backflow valves in all city buildings Relocate/mitigate utilities and infrastructure subject to flooding All residential development in floodplain require 1 foot freeboard	Oklahoma City	Approved	7/11/2012	7/11/2017
City of The Village	Improve warning system Dan failure preparedness Education Outreach all hazards Improved utility line installation	Oklahoma County	Expired	N/A	9/9/2012
City of Warr Acres	Improve drainage at NW 34th and Hammond	Oklahoma County	Expired	N/A	9/9/2012

Table 6 and Figure 3 display the locations and types of mitigation grant activities in the Lower Cimarron – Skeleton watershed which have been approved by FEMA. This map only shows approved grant activity. There may be additional grants being pursued at both the state and local level within the watershed. Table 6 and Figure 3, and the information below provide details of these grant activities.

Alfalfa County – Alfalfa County Hazard Mitigation Grant Program (HMGP) activity includes a County-wide, Multi-Jurisdictional Hazard Mitigation Plan update as well as Hazard Mitigation Plans for the communities of Goltry and Helena.

Blaine County – Blaine County HMGP activity includes a County-level All Hazard Plan and a County-wide, Multi-Jurisdictional Hazard Mitigation Plan update. Grants for physical improvements include all hazard/weather radios for the County as well as a generator for the County Sheriff's office. The Town of Okeene also has a Multi-Hazard Mitigation Plan.

Canadian County – Canadian County HMGP activity includes a County All Hazard Plan, a county GIS project, and a County-wide Multi-Jurisdictional Hazard Mitigation Plan update. The County also has a grant for public awareness brochures. The City of El Reno has a GIS/GPS Multi-Hazard Mitigation Project grant and Darlington Public School and Riverside Public School, both located in the City of El Reno, have grants for a storm shelter. The City of El Reno also has a grant for a warning siren system, and the City of Piedmont has a grant for National Oceanic and Atmospheric Administration (NOAA) weather radios. Finally, the Cheyenne-Arapaho Tribe has a grant for their Hazard Mitigation Plan.

Garfield County – Garfield County HMGP activity includes a County-level All Hazard Plan as well as a County-wide, Multi-Jurisdictional Hazard Mitigation Plan update. Additionally, the towns of Covington, Drummond, Enid, Lahoma, and North Enid all have grants for Multi-Hazard Mitigation Plans.

Kingfisher County – Kingfisher County HMGP activity includes a County-wide Hazard Mitigation Plan update, as well as Hazard Mitigation Plans in the towns of Cashion, Dover, Hennessey, and Kingfisher. Grants shown on Figure 3 include a weather station for the Town of Cashion, as well as an acquisition/demolition project in the City of Kingfisher. Other City of Kingfisher grants include additional acquisition work, NOAA weather radios, and dry flood-proofing. Kingfisher County also has grants for a generator and NOAA hazard radios.

Logan County – Logan County HMGP activity includes a County-level Multi-Hazard Mitigation Plan, an All Hazard Plan in the City of Guthrie, and safe room shelters for the County.

Major County – Major County HMGP activity includes a County-wide, Multi-Jurisdictional Multi-Hazard Mitigation Plan update and a County-level All Hazard Plan. Additionally, the towns of Ringwood and Fairview have Multi-Hazard Mitigation Plans, and Fairview also has a Stormwater Management Plan grant.

Oklahoma County – Oklahoma County HMGP activity includes a County Plan Update as well as a County-level Multi-Hazard Mitigation Plan. The Oklahoma Office of State Finance received approval for a grant for a facility safe room, and the Oklahoma Department of Civil Emergency Management (ODCEM) has approved grants for management costs, emergency preparedness for public education, a hearing-impaired warning system, and EAS software. Oklahoma City has approved grants for a city Hazard Mitigation Plan as well as a city plan update. John Marshall High School, located in Oklahoma City, received a grant for a safe room project, and the Regional Food Bank of Oklahoma received a grant for a backup generator. Both the City of Oklahoma City as well as the Oklahoma City Fire Department also received grants for generators as well. The City of Edmond received grants for weather radios, and both Deer Creek Middle School and Deer Creek Elementary School received grants for safe room projects. The Deer Creek Fire Protection District received a grant for a

generator, and the City of Edmond also has an approved grant for the Willowood Flood Protection Project. Additionally, the University of Central Oklahoma, located in Edmond, received approval for a DRU competitive grant proposal. Finally, the City of Warr Acres received an approved grant for the Putnam City Public Schools NOAA.

Table 6: Grant Activity

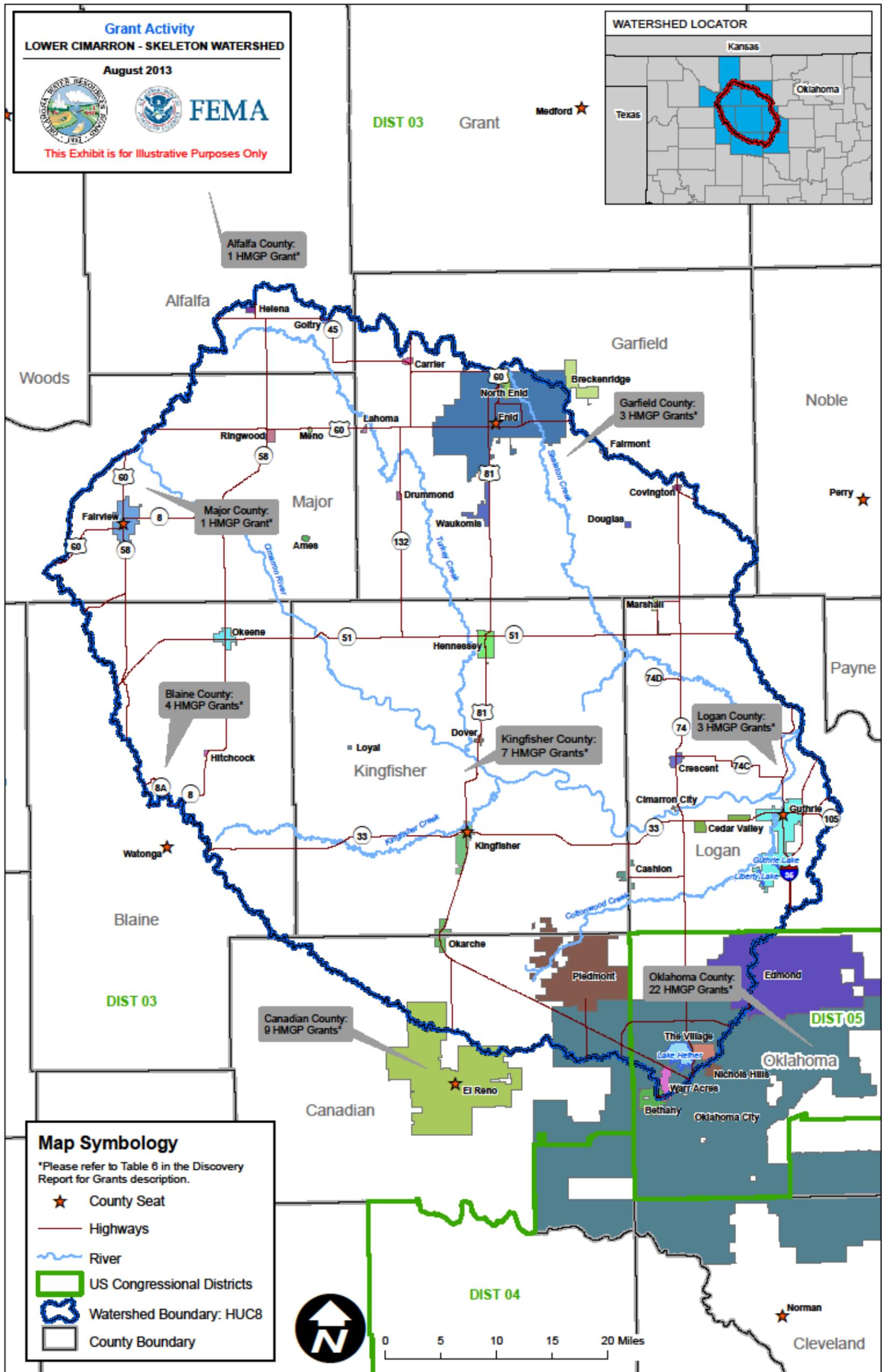
County	Disaster Number	Project Number	Project Title	Federal Share Obligated
Alfalfa	1970	0005	Alfalfa County Multi-Jurisdictional Hazard Mitigation Plan Update	\$46,321.00
Blaine	1401	0055	Okeene Multi-Hazard Mitigation Plan	\$1,860.00
Blaine	1718	0013	Blaine County Sheriff's Office Generator	\$30,000.00
Blaine	1678	0031	Blaine County, All Hazard/Weather Radios	\$6,540.00
Blaine	1678	0051	Blaine County Multi-Jurisdictional Multi-Hazard Mitigation Plan Update	\$43,500.00
Canadian	1401	0017	City of Piedmont NOAA Weather Radios	\$405.00
Canadian	1401	0130	Riverside Public School Storm Shelter	\$131,588.00
Canadian	1395	0007	Canadian County Public Awareness Brochures	\$2,930.00
Canadian	1355	0148	Darlington Public School Storm Shelter	\$130,000.00
Canadian	1401	0295	Canadian County GIS Project	\$63,625.00
Canadian	1712	0033	El Reno, City of, Warning Siren System	\$39,750.00
Canadian	1712	0010	Cheyenne and Arapaho Tribe Hazard Mitigation Plan	\$62,423.00
Canadian	1678	0047	Canadian County Multi-Jurisdictional Multi-Hazard Mitigation Plan Update	\$191,596.00
Canadian	1678	0027	City of El Reno GIS/GPS Multi-Hazard Mitigation Project	\$0.00
Garfield	1401	0223	Lahoma Multi Hazard Mitigation Plan	\$1,500.00
Garfield	1401	0254	Enid Multi Hazard Mitigation Plan	\$30,000.00

County	Disaster Number	Project Number	Project Title	Federal Share Obligated
Garfield	1883	0019	Garfield County Multi-Jurisdictional Multi-Hazard Mitigation Plan Update	\$75,790.00
Kingfisher	1355	0166	City of Kingfisher Acquisition/Demolition Project	\$164,431.00
Kingfisher	1678	0063	Kingfisher, City of, NOAA Weather Radios	\$9,000.00
Kingfisher	1735	0013	Kingfisher County NOAA All Hazards Radios	\$6,750.00
Kingfisher	1718	0012	Kingfisher County Hazard Mitigation Plan Update	\$56,658.00
Kingfisher	1735	0009	Kingfisher County Generator	\$30,000.00
Kingfisher	1876	0016	Kingfisher, City of, Dry Flood-proofing	\$160,254.00
Kingfisher	1883	0034	Kingfisher, City of, Acquisition	\$5,823,842.00
Logan	1355	0008	City of Guthrie All Hazard Plan	\$22,500.00
Logan	1355	0118	Logan County Safe Room Shelters	\$749,763.00
Logan	1401	0268	Logan County Multi-Hazard Mitigation Plan	\$22,500.00
Major	1883	0028	Major, County of, Multi-Jurisdictional Multi-Hazard Plan Update	\$33,095.00
Oklahoma	1401	0009	Regional Food Bank of Oklahoma City Backup Generator	\$81,440.00
Oklahoma	1401	0122	Putnam City Public Schools NOAA	\$3,791.00
Oklahoma	1384	0005	City of Edmond Weather Radios	\$2,501.00
Oklahoma	1452	0001	ODCEM Management Costs	\$35,908.00
Oklahoma	1384	0007	ODCEM Emergency Preparedness for Public Education	\$42,365.00
Oklahoma	1355	0141	ODCEM EAS Software	\$1,276.00
Oklahoma	1401	0238	Deer Creek Middle School Safe Room/Shelter Project	\$337,500.00

County	Disaster Number	Project Number	Project Title	Federal Share Obligated
Oklahoma	1401	0275	OKC MAPS (John Marshall High School) Safe Room Project	\$375,000.00
Oklahoma	1401	0163	Oklahoma County Multi Hazard Mitigation Plan	\$150,000.00
Oklahoma	1401	0315	Deer Creek ISD Elementary School Safe Room Project	\$245,250.00
Oklahoma	1355	0142	ODCEM Hearing Impaired Warning System	\$23,437.00
Oklahoma	1401	0045	ODCEM Emergency Preparedness for Public Education	\$143,714.00
Oklahoma	1355	0135	ODCEM Emergency Preparedness for Public Education	\$140,677.00
Oklahoma	1735	0039	Oklahoma City Fire Department Generator Project	\$18,547.00
Oklahoma	1735	0016	Oklahoma City, City of Generator	\$30,000.00
Oklahoma	1678	0078	Oklahoma OSF Facility Safe Room	\$521,250.00
Oklahoma	1735	0006	Deer Creek Fire Protection District Generator	\$19,960.00
Oklahoma	1678	0052	Edmond, City of, Willowood Flood Protection Project	\$2,416,597.00
Oklahoma	1735	0073	Oklahoma City Plan Update	\$73,493.00
Oklahoma	1735	0074	Oklahoma County Plan Update	\$45,000.00
Oklahoma	9032	0001	Oklahoma City Hazard Mitigation Plan	\$100,000.00
Oklahoma	9416	F001	University of Central Oklahoma DRU Competitive Grant Proposal	\$75,000.00

Figure 3 shows the location of Hazard Mitigation Grant Activity in the watershed.

Figure 3: Grant Map



ii. Pre-Discovery Congressional and Media Engagement

In order to achieve success with any Region 6 Risk MAP project, members of Congress and their staff members, as well as the media must be aware and understand the study process. Working with FEMA External Affairs to inform both legislators and the media will improve credibility and open the door to understanding risk in a more holistic, comprehensive manner. Legislators were contacted by regional FEMA representatives in advance, and media will be provided packet material at the Discovery Meeting, as well as be engaged after the Discovery Meeting.

As of January 3, 2013, Oklahoma’s federally elected congressmen within the Lower Cimarron – Skeleton Watershed included Senators James “Jim” Inhofe and Thomas Coburn, and Representatives Frank Lucas (3rd Congressional District) and James Lankford (5th Congressional District). Senator Inhofe is a ranking member on the Committee on Environment and Public Works, which is responsible for dealing with matters related to the environment and infrastructure. He has offices in both Oklahoma City and Enid. Senator Coburn is a ranking member on the Permanent Sub-committee on Investigations within the Homeland Security and Governmental Affairs Committee, as well as a member of the Permanent Subcommittee on Energy, Natural Resources, and Infrastructure within the Committee on Finance.

Congressman Frank Lucas represents Oklahoma’s 3rd Congressional District, which covers the majority of the Lower Cimarron – Skeleton Watershed and is the largest congressional district in the state. Representative Lucas is the Chairman of the House Committee on Agriculture, and has brought millions of dollars of agricultural subsidies to his home district. Congressman Lankford serves on the Sub-committee on Water Resources and the Environment within the Committee on Transportation and Infrastructure, and is also a member of the Edmond, OK Chamber of Commerce. None of the four congressmen live within the Lower Cimarron – Skeleton watershed boundaries.

Table 7: Congressional Information

Senator	District Number	Term Expiration	FEMA History of Engagement
Tom Coburn	Senator	2017	No recent posts
Jim Inhofe	Senator	2015	No recent posts
James Lankford	5 th District	2015	No recent posts
Frank Lucas	3 rd District	2015	No recent posts

Contact information for the community and additional stakeholders can be found in the supplemental digital data.

iii. Pre-Discovery Tribal Engagement

The Cheyenne-Arapaho Tribe has land located in the Lower Cimarron – Skeleton watershed, and the Wichita & Affiliated Tribes, Caddo Nation, and Delaware Nation all have lands located in very close proximity to the watershed. All Tribal Nations were mailed a packet of information approximately five weeks prior to the Discovery meeting, which included an

invitation letter, a list of organizations that had been invited to the meeting, a watershed locator map, and a newsletter. This letter served as an invitation to the Discovery Meeting, as well as requested any additional information or data that the Tribal Nation may have regarding flood hazards and mitigation opportunities. The supplemental digital data includes the State, Federal, Tribal and local agencies that were invited to the Discovery Meeting.

iv. Pre-Discovery Data Collection

Table 8 provides a brief summary of some of the data that was collected during the Pre-Discovery phase of the project.

Table 8: Pre-Meeting Data Collection for the Watershed

Data Types	Deliverable/Product	Source
Average Annualized Loss Data	Discovery Map Geodatabase	FEMA
Boundaries: Community, County and State	Discovery Map Geodatabase	University of Oklahoma Center for Spatial Analysis
Boundaries: Watersheds	Discovery Map Geodatabase	USGS NHD
Census Data	Discovery Report	U.S. Census Bureau
Contacts	Project Discovery Initiation	Local Web Sites, State/FEMA Updates, Phone Calls
Community Assistance Visits	Discovery Report	FEMA's Community Information System (CIS)
Community Rating System (CRS)	Discovery Report	FEMA's "Community Rating System Communities and Their Classes"
Dams and Levees	Discovery Report	USACE/OWRB
Claims, Repetitive Losses, Severe Repetitive Losses	Discovery Report	FEMA
Grants	Discovery Report	FEMA
Mitigation Actions	Discovery Report	Local Floodplain Administrators, Hazard Mitigation Plans, Discovery Meeting
Disaster Declarations	Discovery Report	FEMA
Roads	Discovery Map Geodatabase	University of Oklahoma Center for Spatial Analysis
Streams	Discovery Map Geodatabase	USGS NHD
Flood Hazards	Discovery Map Geodatabase	FEMA

iii. Discovery Meeting

One two-hour Discovery Meeting was held for the Lower Cimarron-Skeleton watershed on May 16, 2013. The meeting was held in the City of Kingfisher, Oklahoma, at the InterBank Community Building from 10:00 AM until noon. The meeting was organized as an opportunity for communities and other local stakeholders to interact with the Regional Project Team (FEMA, OWRB, and RAMPP) to listen, discuss, and document any issues within the watershed.

The Discovery Meeting opened with a presentation by OWRB that outlined the Risk MAP program, explained the Discovery stage of the process, gave an overview of the Lower Cimarron-Skeleton watershed, and provided a brief history of the area and summarized local issues. The attendees were also given an overview of the three different interactive stations at the meeting, as well as a list of examples of issues that would be relevant to each station. The attendees were briefed on what type of information the Regional Project Team was hoping to collect at the meeting, as well as given a idea of what steps would come after the Discovery Meeting.

Attendees then rotated between three different stations; Hazard Mitigation Planning/Hazard Mitigation Assistance, Compliance, and Floodplain Mapping. Each station had large-format "working" maps that displayed an aerial photograph of the watershed, rivers and streams, floodplains, municipal and county boundaries, and road names for mark-up purposes. Color-coded stickers were available for attendees to identify specific areas of concern on the maps, with corresponding Data Collection Sheets to provide more detail on the area of concern.

Additionally, several laminated versions of some of the Figures contained in this report were provided at stations relating to the map's content (for a list of meeting materials, see the supplemental digital data). At each station, attendees were asked to contribute information about their concerns, and members of the Project Team were available to listen and help document those concerns.

The Community Assessment Tool provided useful guidance for suggested talking points with communities at the Discovery Meeting. Potential questions and topics include:

1. What is your sense of how the community will receive the new flood study results and associated flood maps (*believers, skeptical/non-believers, defiant*)?
2. Because no two communities are alike and come in so many types and sizes, they all have unique outreach needs. Are there populations that require special attention such as non-English speakers, elderly, populations downstream of a dam or protected by a levee, etc.? (*if this info is known, present it for validation, i.e., "our data shows these populations as likely being at some risk to flooding, are there key leaders or community organizations that should be included in our outreach?"*)
3. Each community has unique opportunities and challenges for outreach due to their local floodplain management programs and the local conditions that impact that community. Your community appears to have (*insert: levee issues, a dam, repetitive flood loss neighborhood, low percentage of insurance in the floodplain, additional properties likely to be in the floodplain*). What is the current awareness level about this

issue among your citizens? With FEMA's help, would you be willing to serve as a Subject Matter Expert on this topic?

4. Based on our work in other communities, we've gathered this list of individuals and groups who should probably be made aware of this project:
 - a. Is the name/contact info correct?
 - b. Is any group or organization missing?
 - c. Do you anticipate any concerns from anyone on the list? What would they be?
 - d. Do you know any of these people personally? How often do you meet/speak with them?
 - e. Does the Mayor/Executive's Public Affairs office have these groups on his/her mailing list?
 - f. Are there regular meetings that these stakeholders hold where a status on this project might be appropriate to add to the agenda?
 - g. If we provided information about the project to you/the Mayor/Executive, would your community be willing to send a letter inviting them to a meeting or providing project update(s)? (you could get CRS points for outreach)

5. (If no Mitigation Plan was indicated in Section 1), Have you applied for a grant to create a Mitigation Plan?

(If a Mitigation Plan was indicated in Section 1), Is your community currently developing or updating your Mitigation Plan? What is the timeline for updating it? How are you implementing your Mitigation Plan (i.e., project(s) underway, new ordinances)?

6. If the community's Mitigation Plan was prepared on a regional/county/watershed basis, can you use the relationship with that group to assist in outreach for this community? Is everyone listed on our project stakeholder list or should some individuals be added?
7. At the end of this project, FEMA will provide you with new data and risk assessment tools that will help you and your constituents better understand and visualize your risks. With customizable outreach tools and templates provided by FEMA, would you and/or your community be willing to take a proactive approach in educating people who live and work in your community about their risk and the steps they can take to protect themselves?
8. If yes, can we set up a call/meeting to discuss the community's capabilities and support resources that may be needed from FEMA? Who else should we include on that call that has knowledge about existing community outreach? Specifically, we would like to discuss:
 - Website information, email lists
 - Mailings to citizens and key stakeholders
 - Press releases, media briefings, op-ed articles
 - Public meeting (and associated invitations, displays, handouts, etc.)
 - Key stakeholder briefings/calls

9. On behalf of your community, in terms of improving citizen's awareness and understanding of their flood risk, and the community's efforts to help citizens recognize and manage this risk, how would you define success for this project?

Additional community engagement guidance is provided in the Risk Communications Guidebook for Local Officials, two copies of which were made available at the Discovery Meeting. This guidebook provides tools and templates for community officials to use in both internal and external communication of hazards, and outlines the engagement process that FEMA will follow during the Discovery phase of a watershed study. Some of these steps include:

- Develop a Watershed Plan, which will be available to communities prior to the Discovery Meeting
- Determine the level and types of mitigation planning technical assistance needed
- Determine the capabilities of the communities, including GIS, in order to determine appropriate assistance in possible future Risk MAP product deployment
- Identify, collect, and validate data that may be used in Risk MAP products, both regulatory (Flood Insurance Rate Map [FIRM] and Flood Insurance Study [FIS] reports) and non-regulatory (Flood Risk Database, Flood Risk Report, and Flood Risk Map)
- Identify factors that may be contributing (positively or negatively) to flooding and flood losses in a watershed
- Identify potential mitigation actions
- Assess communication capabilities and outlets
- Review of information collected from mitigation plans and model/mapping review and assessment in Pre-Discovery
- Understand community staff education needs regarding the process and products
- Understand community resources and capabilities for risk communication (outreach)

The Project Team will gather this data from communities and other stakeholders within the watershed, as well as utilize research from FEMA data systems, other federal agencies, and state agencies. This information includes the communities' flood hazards, flood risks, and stormwater and floodplain management activities along with possibly socioeconomic data and information about economic drivers in the watershed. The interactive, collaborative nature of the Discovery Meeting provided the appropriate working environment for this kind of data collection. Following the Discovery Meeting, FEMA will use the information and data collected to determine if further risk assessment is needed for the watershed. A follow-up meeting, the Discovery Close-Out, will be held in the watershed to share the findings of the Discovery Report, the flood risk tools, possible training opportunities for local community staff to understand the tools and their use in communicating natural hazard risk, and to encourage the development of mitigation strategies with the updated understanding of risk.

iv. Data Gathering Review

The Lower Cimarron-Skeleton Watershed Discovery Meeting was attended by many local stakeholders, including local community elected officials and councilpersons, local floodplain managers, emergency management staff, public works staff, and state agencies.

It should be noted that no personnel attended the Discovery Meeting from the following organizations: Alfalfa, Blaine, Major, and Logan Counties; the Cities of Bethany, Crescent, Guthrie, Nichols Hills, The Village, and Warr Acres; and the Towns of Ames, Breckenridge,

Carrier, Cedar Valley, Cimarron City, Covington, Douglas, Dover, Drummond, Fairmont, Goltry, Helena, Hennessey, Hitchcock, Loyal, Marshall, Meno, North Enid, Okarche, Okeene, Ringwood, and Waukomis. A web conference was held on July 1, 2013 with the City of Guthrie and Logan County as they were identified as being the larger communities out of those that did not attend the meeting in Kingfisher. The purpose of the web conference, attended by members of FEMA, OWRB, and RAMPP, in addition to the City of Guthrie and Logan County, was to re-cap the Discovery meeting and capture needs and actions from these communities.

Information about the Lower Cimarron-Skeleton Watershed was gathered both prior to the Discovery Meeting as well as interactively during the Discovery Meeting. Communities that both did and did not attend the meeting were also invited to continue to submit data after the meeting. Table 9 summarizes the data that was collected at the Discovery Meeting.

Table 9: Data Collected at the Discovery Meeting

Data Location	Data Custodian	Data Set Description
City of Fairview	City of Fairview	Specification and Contracts Documents - Fairview Southwest Detention and Channel
City of Fairview	City of Fairview	Hazard Profile: Flood document
City of Fairview	City of Fairview	2013 Recodification - Article 5 Flood Damage Prevention document
City of Fairview	City of Fairview	Engineering plan sheets for detention and channel plan
City of Enid	City of Enid	Color contour map of Boggy Creek area near Oakdale Drive & Eisenhower (FIS correction area) and photocopy of associated FIRM panel 0195E
City of Enid	City of Enid	Color contour map of area of concern and photocopy of associated FIRM panel 0220E
City of Enid	City of Enid	Digital data on CD: PDFs of contours, maps, plans, stormwater materials, land use maps.
City of Enid	City of Enid	Digital data on CD: 2-foot elevation contour data and 3-foot elevation contour data.
City of Piedmont	City of Piedmont	Map showing areas of BFE priority (ranked high, medium, low).
City of Kingfisher	Meshek Engineering	Digital data on CD: elevation contours (CAD file)

Data Location	Data Custodian	Data Set Description
City of Kingfisher	Meshek Engineering	Digital data on CD: Kingfisher Creek Flood Hazard Mitigation Study: Hydrology and Hydraulic Report PDF
City of Edmond	City of Edmond	Photocopy of section of FIRM panel 0069G, corresponding aerial photograph
City of Edmond	City of Edmond	Photocopy of section of FIRM panel 0045H, corresponding aerial photograph with floodways and cross-sections overlaid
City of Oklahoma City	City of Oklahoma City	Map showing areas of current or planned major development
City of Oklahoma City	City of Oklahoma City	Digital data: Geodatabase of city data including dams, bridges, 2-foot elevation contours, detention ponds and other storm water and basemap data

In addition to the data described above, the comments that were collected at the three Discovery Meeting stations were compiled in both tabular and GIS format, and are shown in Figure 4 and Table 10.

In Figure 4, data that were not location-specific (e.g., “all Zone As within the county”) were generally placed at the approximate center point of the area of concern. Comments from all of the stations were compiled into two datasets, one representing point locations of concern and one representing areas of concern.

In Table 10, the comments that were made at each meeting station were summarized. The unique identification number ties directly to the data shown on Figure 5 and the data collection sheets. In addition, comments or information collected in pre-Discovery phone calls with local community officials have also been placed on the map and summarized in the table, as well as information that was collected after the Discovery Meeting via email and phone call.

A copy of all Discovery Meeting materials is provided in the supplemental digital data, including the sign-in sheets, mark-up maps, data collection sheets, any hardcopy data submitted by the communities, and a list of all materials that were utilized at the Meeting and in the Community Packets. Digital data (e.g., MXDs and contour data provided by the communities) is provided in the supplemental data accompanying this report.

Table 10: Comments Collection Summary

Item	Flooding Source	Information Provided By	Action or Need Identified from HMP, Community Call, or Discovery Meeting
1	NA	City of Bethany	City is in the process of updating their emergency operations plan.
2	NA	City of Edmond	City officials are seeing LOMAs with incorrect BFE determinations.
3	Chisholm Creek	City of Edmond	Edmond/OKC boundary continuity issues, quite a few re-mappings done over the years. Edmond does not want BFEs changed based on Oklahoma City study on Chisholm Creek. Focus on tie-ins with Oklahoma City studies.
4	Santa Fe Creek	City of Edmond	Retirement area with lake, floodway going through lake on first countywide (2002). 2009 floodway through homes and lots; Edmond wants FEMA to verify this area.
5	Turtle Creek	HMP/City of Edmond	Action identified in HMP includes Turtle Creek detention pond.
6	NA	HMP/City of Edmond	Action identified in HMP includes Willowood Addition Flood Mitigation Project.
7	NA	City of El Reno	CRS Information; no issues.
8	Unnamed tributary of Boggy Creek	City of Enid	Study Zone As; development in the southwest part of town [provided contour data].
9	North Boggy Creek	City of Enid	North Boggy Creek--property acquisition--estimated 134 properties that cannot be otherwise protected.
10	Boggy Creek	City of Enid	Boggy Creek--Update map to match actual contours as provided. This area was where the map change and FIS correction were made.
11	NA	City of Enid	5 of 13 detention facilities have been built. Current hydrology reflects future flows; can provide McLaughlin Report. Funding source identification needed.

Item	Flooding Source	Information Provided By	Action or Need Identified from HMP, Community Call, or Discovery Meeting
12	NA	City of Enid	3rd & Oak Street--2 fatalities have occurred here. If flooding occurs, there is early inundation; too many people drive through; need solutions. Request assistance for developing flood protection plan.
13	Tributary to Boggy Creek	City of Enid	FEMA map does not match existing contours.
14	Skeleton Creek	City of Enid	Repetitive loss structure; assistance with resolving flooding.
15	Old Channel Boggy Creek	City of Enid	City of Enid purchased/demolished 12 properties in floodplain/floodway and built parking lots. Was told at CRS class no credit/points since it was not preserved as open space.
16	Skeleton Creek	City of Enid	The east side of town has un-numbered Zone As that the city would like to develop BFEs for.
17	Boggy Creek	City of Enid	The top action item the city wants to implement is to develop a comprehensive plan for lower Boggy Creek; identify issues and develop/implement solutions in a proactive manner.
18	Old Channel Boggy Creek and Boggy Creek	HMP/City of Enid	Dike to protect Brookside and Valleyview subdivisions.
19	Boggy Creek	HMP/City of Enid	Clean and clear Boggy Creek and widen north Boggy Creek Channel.
20	NA	Oklahoma Emergency Management, on behalf of City of Enid	Walnut & 3rd Street solution discussed--structural barricades or putting in bridges. Possible favorite HMGP project they would like to do is heavy permanent barricades.
21	Gypsum Creek, Sand Creek	City of Fairview	Digital format and current maps (1983) is the only data that exists; more detail and aerial pictures will provide a flood map overlay with aerial culvert projects.

Item	Flooding Source	Information Provided By	Action or Need Identified from HMP, Community Call, or Discovery Meeting
22	Sand Creek	City of Fairview	Recently finished HMGP. Low elevation, lots of flooding issues; built retention area and channel. Planning on second retention area to help issues. Need additional scoping for alternatives. Interested in any multi-jurisdictional large projects they could do for retention. Fairview is having more and more flooding issues.
23	Gypsum Creek, Sand Creek	City of Fairview	Plans for second detention system; drainage and flooding an issue on northeast side of town. Two studies done on drainage issue. State emergency manager to take lead for funding and plans.
24	Gypsum Creek, Sand Creek	City of Fairview	Drainage filters to creek but creek backs up.
25	NA	City of Fairview	The city has a good deal of new development going on, some of it in the floodplain. The FPA is concerned about the current BFE versus the actual risk if analyzed today.
26	NA	City of Fairview	City has very high need for a full study to identify and manage risk, and to identify/scope potential solutions.
27	Cottonwood Creek	City of Guthrie	Proposed ODOT bridge spanning approximately 7 city blocks above Cottonwood Creek in Guthrie. City unsure what would happen with a major flood event.
28	Cottonwood Creek	City of Guthrie	Small area on east side of town, Walker Lane cul-de-sac, with several LOMAs.
29	Cottonwood Creek	City of Guthrie/Meshek Engineering	Buy-outs in Guthrie on repetitive loss structures. Long history of flooding.

Item	Flooding Source	Information Provided By	Action or Need Identified from HMP, Community Call, or Discovery Meeting
30	NA	Town of Helena	Town is putting together an application for a safe room rebate program.
31	NA	Town of Helena	Town has joined NFIP since last HMP.
32	NA	Town of Helena	Town would like to purchase generators for critical facilities but there is no funding in place.
33	Multiple	City of Kingfisher/Meshek Engineering	NRCS dam decommissioning (multiple locations).
34	Kingfisher Creek Lower Reach	City of Kingfisher/Meshek Engineering	Buy-out area on north end of town; stated that they are not happy with the BFEs but are generally fine with the extent.
35	Tributary of Kingfisher Creek	City of Kingfisher/Meshek Engineering	Area of new 30-acre development coming; lots of changes, possible new study.
36	Kingfisher Creek Lower Reach	City of Kingfisher/Meshek Engineering	Residence is low (near airport)--potential acquisition or elevation project.
37	Kingfisher Creek Lower Reach	City of Kingfisher/Meshek Engineering	New concrete airport built outside of town (was formerly a dirt airstrip).
38	NA	City of Kingfisher/Meshek Engineering	1-foot topo available for northern property.
39	Campbell Creek	City of Kingfisher/Meshek Engineering	Reeding Road--new bridge construction to alleviate flooding.
40	Lahoma Tributary of Turkey Creek	Town of Lahoma	Property owner moved mobile home into floodplain and entire property is in A-1 Zone; advised has 30 days to remove mobile home or come into compliance; needs hydraulic survey, elevation certificate, tie down; elevate propane tanks recommend GAC from water board.

Item	Flooding Source	Information Provided By	Action or Need Identified from HMP, Community Call, or Discovery Meeting
41	Lahoma Tributary of Turkey Creek	Town of Lahoma	Recent erosion of creek bed boundary under-cutting residential property and possibly undercutting county road (state).
42	NA	Town of Lahoma	Town mows and maintains a green belt around the community to mitigate flooding.
43	NA	Town of Lahoma	Town has a sinkhole with unknown cause; interested in Risk MAP process helping to identify solutions.
44	NA	Oklahoma Emergency Management, on behalf of Town of Lahoma	Town of Lahoma is very concerned due to the fact that the Garfield County Emergency Manager has been working to update the Hazard Mitigation Plan for 3.5 years now. Plan is still not done. Town of Lahoma not able to get hazard mitigation projects complete. County HMP taken from NODA Contractor and given to another contractor. Lahoma concerned due to inability to get funding for flooding projects and all other projects.
45	Tributaries to Horse Creek	HMP/Town of Marshall	As identified in the HMP, the town wants to install culverts to improve drainage under North Missouri, Lake, Cedar, and Oklahoma Streets.
46	NA	Town of Meno	Town administrator said that the main flooding issues were at the intersections of Main Street and Frederick Street, and the intersection of Prospect Avenue and Park Street. Flooding occurs when they get more than 2-3" of rain at a time and the main culvert backs up into peoples' yards.
47	Skeleton Creek	HMP/Town of North Enid	As identified in the HMP, the town wants to clean and clear Skeleton Creek to improve capacity. City is currently out to bid on this project.

Item	Flooding Source	Information Provided By	Action or Need Identified from HMP, Community Call, or Discovery Meeting
48	NA	City of Oklahoma	New residential development. Need for better defined flood risk.
49	Tributaries of Deer Creek	City of Oklahoma	Working on CRS application.
50	Chisholm Creek	City of Oklahoma	Chisholm Creek ongoing watershed study--restudy--LOMR in next year. Floodplain inaccurate and flooding in 2010-2011. Need to identify issues and prioritize solutions. Final study will be submitted to FEMA for map revision.
51	Bluff Creek	City of Oklahoma City	LOMR by developer; major development pressure.
52	Tributary of Deer Creek	City of Oklahoma City	LOMR with FEMA.
53	Bluff Creek	City of Oklahoma City	Conditional Letter of Map Revision (CLOMR) filed preemptively by the developer.
54	Chisholm Creek	City of Oklahoma City	Major flooding in 2010-2011. Rapid development on the north end of the city. New study in progress by local engineering firm. Currently no detention criteria; looking to implement with new development.
55	NA	City of Oklahoma City	Multiple planned drainage improvements. Need to be represented in mapping.
56	NA	City of Oklahoma City	City is completing studies basin by basin to eventually end up with full drainage plan.
57	NA	City of Oklahoma City	Areas of heavy development pressure. Need for better defined flood risk.
58	Soldier Creek, Tributary of Deer Creek, Cottonwood Creek	City of Piedmont	Need for detailed study for areas in red noted on Figure 4 (polygons on map). Zone A expanded with last FIRM including many existing residential structures. Development will occur in the areas over the next 3-5 years (or sooner).

Item	Flooding Source	Information Provided By	Action or Need Identified from HMP, Community Call, or Discovery Meeting
59	NA	City of Piedmont	Community's top priority is to accurately map floodplain and develop BFEs.
60	Soldier Creek	City of Piedmont	Olde Town subdivision is a newer development that was built out approximately 7 years ago. The development included drainage improvements, and the last FIRMs expanded the Zone A boundary. FPA wants to know if the drainage improvements were considered in the remapping. Is Zone A accurately reflected for this development?
61	NA	City of Piedmont	City has a drainage plan, but not at the level of detail needed for master plan.
62	NA	City of Piedmont	City still has needs for bridge improvements.
63	NA	City of Warr Acres	City is applying to the state for a grant to purchase and install generators at critical facilities.
64	NA	City of Warr Acres	The Twin Lakes development is primary SFHA - several homes in the development received LOMA.
65	NA	HMP/City of Warr Acres	City would like to improve drainage at NW 34th & Hammond Road.
66	NA	Blaine County	Action items that the County would like to implement include upgrading culverts at various locations including priorities on schools and public buildings.
67	Otter Creek	HMP/Garfield County	Raise Castelle Bridge on Otter Creek.
68	Skeleton Creek	HMP/Garfield County	Raise Scholtz Bridge on Skeleton Creek.
69	Turkey Creek	Kingfisher County	New road and larger bridge to be built in 2014. Road and two bridges going west out of Dover, OK, to be redone.

Item	Flooding Source	Information Provided By	Action or Need Identified from HMP, Community Call, or Discovery Meeting
70	NA	Kingfisher County	Map of bridge replacements for District #1.
71	Kingfisher Creek	Kingfisher County	Railroad bridge backs up flood--repetitive losses--not a part of buyout--ideally would remove.
72	NA	Kingfisher County	All Zone A in county should be converted to AE.
73	Kingfisher Creek Lower Reach	Kingfisher County	Repetitive loss area.
74	NA	Logan County	Action items that the County would like to implement include FEMA safe room rebate program, obtain and distribute weather radios, road mitigation projects to reduce or eliminate flooding, generators for fire stations, master drainage plan.
75	Skeleton Creek	Logan County	Area near Highway 74 on Skeleton Creek is high enough that it should not be in the floodplain; possible detailed study or LOMA.
76	Cimarron River	Logan County	Twin Lakes area just east of the Kingfisher County line on the Cimarron River is a private area where residents own their homes but lease the land. Many LOMAs in this area have created an unrealistic financial burden on the residents; possible need for a detailed study in this area.
77	Cimarron River	Logan County	Cimarron City has had issues with people living on the bluffs requiring flood insurance. Estimated 12-15 LOMAs since 2002; possibly need a detailed study in this area. Two houses have fallen off an embankment due to erosion and undercutting.

Item	Flooding Source	Information Provided By	Action or Need Identified from HMP, Community Call, or Discovery Meeting
78	Cimarron River	Logan County	Highway 77 bridge north of Guthrie; maps show the floodplain extending further north from the bridge than it really does. The flooding tends to back up south of the bridge into Cottonwood Creek.
79	Tributaries to Cottonwood Creek	HMP/Logan County	Eliminate flooding at Seward Road and Midwest Boulevard intersection by straightening road.
80	Bird Creek	HMP/Logan County	Replace wooden bridge on University Road east of Midwest Road to increase capacity.
81	Tributaries to Deer Creek	HMP/Logan County	Mitigate flooding at low water crossing on Meridian Road between Waterloo and Simmons Road.
82	NA	HMP/Logan County	Replace culverts to improve drainage.
83	NA	HMP/Logan County	Mitigate bridge on Eo630 Road.
84	NA	HMP/Logan County	Low water crossing on MacArthur Road.
85	NA	Major County	Obtain funding for county floodplain administrator.
86	Bloody Rush Creek	Oklahoma County	Development along approximate Zone A mostly in Logan City; floodplain may be wider than shown.
87	Deer Creek	Oklahoma County	Preliminary stage study of bridge construction to raise road to serve as an emergency route out of the area when it floods.
88	Deer Creek	Oklahoma County	Request for additional CRS & SRL and insurance claim information.
89	Bluff Creek	Oklahoma County	Tie-in with Oklahoma City on Bluff Creek re-study--possible concern upstream channelization.

Item	Flooding Source	Information Provided By	Action or Need Identified from HMP, Community Call, or Discovery Meeting
90	NA	Oklahoma County	Significant new development in area north of Oklahoma City; largest development going in at MacArthur Road and Route 78 - south of floodplain - 198 homes planned on 160 acres.
91	Deer Creek	Oklahoma County	Primary area of concern is Deer Creek development. Homes typically do not flood, but the access roads frequently do, cutting off the community (including a school) from emergency services. County is trying to develop access route through the development, an elevated road/bridge to maintain access during events. Estimated \$9-10 million project.
92	NA	Oklahoma County	Bridge replacements at NW 192nd Street, NW 178th Street, Henney Road.
93	Multiple	HMP/Oklahoma County	Crooked Oak Creek drainage improvement, Deep Fork and Cottonwood channel improvements, Waterloo flood control, Crutco flood control.
94	Multiple	HMP/Oklahoma County	Elevate NW 178th and install culverts, NW 220th Street and NW 234th Street.

All supporting information, data, and files for this report are included in the supplemental digital data submitted with this report. The directory structure is as shown in the following list of the files, folders, and associated data. The data is available upon request and will be sent to the communities at the close out meeting.

11050002\Discovery

- Transmittal letter
- RAMPP Quality Validation Form
- \Project_Discovery_Initiation**
- Community Contact List
- Project Team Information
- \Discovery_Meeting**
- Community Packets
- Correspondence
 - Additional Outreach
 - Discovery Meeting Reminder Email
 - Follow-Up Email
 - Invitation Letters
- Data Collection Forms
- Data Collection Maps
- Photos
- Presentation
- Sign-In Sheets
- \Post_Discovery**
- Discovery Maps
- Discovery Report
- Geospatial Data Summary
- National Metrics
- \Supplemental_Data**
- Congressional Briefing Info
- Data From Communities
 - City of Enid
 - City of Kingfisher (Meshek Engineering)
 - NRCS
 - Oklahoma City
- GIS—The following folders contain GIS files used to create exhibits and Discovery Maps (ArcMap 10.1 file geodatabases and ESRI ArcGIS 10.1 .mxds)
 - LCS_UTM14N.gdb
 - Logos
 - MXD
 - Tables
- Metadata File
- Mitigation Action
 - Hazard Mitigation Plans
- Outreach Newsletters
 - Pre-Discovery Newsletter
 - Discovery Newsletter

III. Watershed Analysis

Significant streams in this watershed include the Cimarron River, Cottonwood Creek, Kingfisher Creek, Skeleton Creek, and Turkey Creek. In addition to the significant streams, Guthrie Lake, Hefner Lake, and Liberty Lake are significant water resources within the watershed. The USGS provides a National Hydrologic Dataset (NHD) which can be used to identify stream miles that reflect drainage areas of at least one square mile from available topographic data. The NHD stream mileage may be used to gain a sense of the total potential stream miles for a watershed. Using the NHD there are approximately 3,044 miles of streams in the Lower Cimarron – Skeleton watershed.

The Coordinated Needs Management Strategy (CNMS) Inventory provides a snapshot of the status and attributes of currently studied streams existing within FEMA’s floodplain study inventory. In general, the stream mileage shown in CNMS reflects streams with an approximately one-mile drainage area and that currently have effective SFHA designated for them. CNMS does not reflect the total potential of stream miles to be studied within a watershed. Table 11 compares the NHD data to the CNMS data for the watershed.

In addition to listing the miles of studied stream within a watershed, CNMS documents certain physiological, climatological, or engineering methodological factors that may have changed since the date of the effective study. The stream miles shown in CNMS are attributed with an evaluation of a Validation Status and Status Type that allows an examination of the condition of a given study or group of studies. Studies which are considered ‘valid’ in CNMS are the only studies which contribute to the New Validated or Updated Engineering (NVUE) metric.

The NVUE metric is used as an indicator of the status of studies for FEMA's mapped SFHA Inventory. Those studies which are categorized as ‘unverified’, typically indicate that there are some factor of change since the SFHA became effective or may have a deficiency warranting restudy. CNMS stream mileage categorized as ‘Requires Assessment’ require further input to determine their validity, often because they represent paper inventory or non-modernized studies. CNMS aids in identifying areas to consider for study during the Discovery process by highlighting needs on a map, quantifying them (mileage), and providing further categorization of these needs in order to differentiate factors that identify the needs.

Within the Lower Cimarron – Skeleton watershed and using these criteria from CNMS, approximately 21 miles of Zone AE areas were identified as being unverified, while 1,005 miles of Zone A and 8.5 miles of Zone AE were identified as being unknown. Streams included in the unverified grouping include Tributary A to Boggy Creek Tributary, Skeleton Creek, Bird Creek, Chisholm Creek, and Spring Creek of Bluff Creek, with approximately 30 miles of Zone AE flagged as requiring further assessment or to be studied. Additionally, approximately 897 miles of Zone A and approximately 407 miles of Zone AE in the watershed were characterized as being valid under the NVUE metrics. A graphic of these streams is shown in Figure 5. Table 11 summarizes the Validated NVUE stream mileage from CNMS.

Table 11: NVUE Approximate Stream Mileage in the Watershed

NVUE Validation	Stream Miles
NHD Streams (streams with a drainage area of greater than one square mile)	3,044.9
CNMS Streams (streams with effective SFHA)	2,337.5
Stream Miles not accounted for in CNMS	706.1
CNMS Valid Zone AE / AH	407.1
CNMS Valid Zone A	896.7
CNMS Unverified Zone AE / AH	21.4
CNMS Unverified Zone A	0
CNMS Zone AE / AH Requiring Further Assessment or in the process of being studied	8.6
CNMS Zone A Requiring Further Assessment	1,003.7

This watershed contains structures that are managed by the USACE Tulsa District. In addition to numerous dams and a levee located in Enid, the watershed contains a major metropolitan water supply managed by the Oklahoma City Water Utilities Trust. The OWRB coordinates the Oklahoma Dam Safety Program to ensure the safety of more than 4,700 dams in the state, especially those that could impact downstream life and property. The program requires inspections every five and three years for low and significant hazard structures, respectively. It requires annual inspection of the state's 370 high-hazard dams, so designated due to the presence of occupied dwellings immediately downstream. According to OWRB, of the 194 structures in the Lower Cimarron – Skeleton watershed, 11 are under the ownership of local government, 147 are under private ownership, and 35 are under state ownership. There is one dam located in Alfalfa County, six located in Blaine County, 30 located in Canadian County, nine located in Garfield County, 33 located in Kingfisher County, 68 located in Logan County, seven located in Major County, and 39 located in Oklahoma County. Dams receive a hazard rating of low (failure results in no probable loss of human life or economic/environmental losses), significant (no probable human life loss, but can cause economic loss or environmental damage), or high (probable loss of human life); 156 have a hazard rating of low, 8 have a hazard rating of significant, and 26 have a hazard rating of high. Three dams within the watershed have been drained. Multiple dams have been or are slated to be decommissioned along Uncle John’s Creek and Cottonwood Creek.

The Lower Cimarron – Skeleton watershed has had a history of flooding, as demonstrated by numerous presidential disaster declarations, with 26 issued in the past 40 years. According to FEMA’s History of Disaster Declarations (see Table 12: Disaster Declarations in the Watershed), all counties in the Lower Cimarron – Skeleton watershed have experienced reoccurring severe storm and flooding disasters, as each county has had at least seven separate disaster declarations. Logan County has had the most, with a total of 16 spanning 1974-2011. Canadian County has had 14 declarations, Kingfisher and Oklahoma counties have had 13, Major County has had 12, Blaine County has had 11, Alfalfa County has had 8, and Garfield County has had 7 during this time period. Multiple disaster declarations involving flooding have been made in each decade since the 1970s, with the strongest concentration falling in the 2000s; declarations involving flooding were made in 2000, 2001, 2007, 2008, 2010, 2011, 2012, and 2013. The most recent declaration was

made in Canadian and Oklahoma counties, in May 2013, for severe storms, tornadoes, and flooding. All flooding disasters in the watershed have been associated with severe storm events.

Historical documents, stream gage data, and local oral histories all indicate reoccurring flooding events throughout the watershed. The largest events that are recorded across multiple locations within the watershed occurred in 1914, 1932, 1948, 1965, 1973-74, 1983, 1993, and 2007. In Kingfisher County, flooding in 1948 on both Kingfisher Creek and Uncle John Creek produced the largest flood flow known in recent times in the area. The 1973 flood event, a result of the aforementioned extreme rainfall event, resulted in the deaths of 9 people and damage estimated by the Oklahoma Civil Defense to be approximately \$78 million. In Logan County, flooding events in 1949, 1959, 1965, 1974, 1983, and 1993 all had peak water-surface elevations of at least 930 feet, which is significantly higher than the flood stage elevation of 924 feet. The regional flooding in 2007 was due to rainfall from localized storm systems followed by additional rainfall from tropical storm Erin that pushed inland. This flood event resulted in a disaster declaration being made for all eight counties in the Lower Cimarron – Skeleton watershed in July 2007, with additional declarations made in Blaine, Canadian, Kingfisher, Logan, and Oklahoma Counties in August 2007. The most recent disaster declarations were made in May, 2013, for Canadian and Oklahoma counties for severe storms, tornadoes, and flooding. This massive storm system killed 24 people in the Oklahoma City metropolitan area, including seven children in Plaza Towers Elementary School in Moore, OK, and caused an estimated \$2 billion in damages. Based on available data, it is unclear what percentage of fatalities occurred from flooding versus tornados.

Table 12 lists disaster declarations for multiple hazards within the watershed.

Table 12: Disaster Declarations in the Watershed

Date of Declaration	Watershed Counties Declared	For Hazard
6/13/1973	Canadian & Garfield Counties	Severe Storms, Flooding, & Tornadoes
10/13/1973	Garfield & Kingfisher Counties	Severe Storms & Flooding
6/10/1974	Logan & Oklahoma Counties	Severe Storms & Flooding
11/26/1974	Canadian, Logan, Major, & Oklahoma Counties	Severe Storms & Flooding
7/9/1975	Blaine, Kingfisher, & Major Counties	Severe Storms, Flooding & Tornadoes
6/18/1982	Blaine, Kingfisher, & Logan Counties	Severe Storms & Flooding
10/26/1983	Canadian, Logan, & Oklahoma Counties	Severe Storms & Flooding
10/14/1986	Blaine, Canadian, Garfield, Kingfisher, Logan, Major, & Oklahoma Counties	Severe Storms & Flooding
7/9/1987	Canadian, Kingfisher, & Logan Counties	Severe Storms & Flooding
5/18/1990	Kingfisher, Logan, & Oklahoma Counties	Severe Storms, Tornadoes & Flooding

Date of Declaration	Watershed Counties Declared	For Hazard
5/12/1993	Alfalfa, Blaine, Canadian, Kingfisher, Logan, Major, & Oklahoma Counties	Severe Storms, Tornadoes & Flooding
6/26/1995	Alfalfa, Canadian, Kingfisher, Logan, & Major Counties	Tornadoes, Severe Storms & Flooding
9/1/1995	Alfalfa, Blaine, Canadian, Major, & Oklahoma Counties	Severe Storms & Flooding
11/27/2000	Oklahoma County	Severe Storms & Flooding
6/29/2001	Alfalfa, Blaine, Canadian, Garfield, Kingfisher, Major, & Oklahoma Counties	Severe Storms, Flooding, & Tornadoes
6/7/2007	Blaine, Canadian, & Logan Counties	Severe Storms, Tornadoes & Flooding
7/7/2007	Alfalfa, Blaine, Canadian, Garfield, Kingfisher, Logan, Major, & Oklahoma Counties	Severe Storms, Flooding, & Tornadoes
8/24/2007	Blaine, Canadian, Kingfisher, Logan, & Oklahoma Counties	Severe Storms, Tornadoes, & Flooding
8/31/2007	Logan County	Severe Storms, Flooding, & Tornadoes
5/9/2008	Kingfisher & Logan Counties	Severe Storms, Tornadoes, & Flooding
7/9/2008	Alfalfa, Blaine, Garfield, & Major Counties	Severe Storms & Flooding
10/9/2008	Alfalfa, Garfield, & Major Counties	Severe Storms, Tornadoes, & Flooding
7/26/2010	Logan, Major, & Oklahoma Counties	Severe Storms, Tornadoes, Straight-Line Winds, & Flooding
6/6/2011	Blaine, Canadian, Kingfisher, Logan, & Major Counties	Severe Storms, Tornadoes, Straight-Line Winds, & Flooding
6/14/2012	Alfalfa County	Severe Storms, Tornadoes, Straight-Line Winds, & Flooding
5/20/2013	Canadian & Oklahoma Counties	Severe Storms, Tornadoes, & Flooding

Figure 6 depicts the distribution of NFIP insurance claims within the Lower Cimarron – Skeleton watershed. A high concentration of claims appears in the areas of the City of Kingfisher, the City of Enid, the City of Guthrie, and the City of Oklahoma City metropolitan area. The HUC 12 areas in which these claims are located include Lower Kingfisher Creek and Lower Uncle John Creek, Boggy Creek, Outlet Cottonwood Creek, and Bluff Creek and Chisholm Creek areas, respectively. Lower concentrations (7-23 claims) occur near the towns of Fairview (Sand Creek HUC 12 area), Dover (Cimarron River), and Cimarron City (Cimarron River).

In addition to NFIP claims, there are several locations of Repetitive Loss (RL) or Severe Repetitive Loss (SRL) properties within the Lower Cimarron – Skeleton watershed. A high concentration of these locations appears in the areas of the City of Kingfisher and the City of Guthrie within the Lower Kingfisher Creek and Outlet Cottonwood Creek HUC 12 areas that make up the HUC 8 watershed. Lower concentrations occur in the Oklahoma City metropolitan area in the Bluff Creek and Chisholm Creek HUC 12 areas. Finally, 1-2 RL/SRL properties occur in the areas around the towns of Fairview, Enid, Waukomis, Hennessey, and Piedmont. These areas are located within

the Sand Creek, Boggy Creek, Hackberry Creek, Skeleton Creek, Little Turkey Creek, Upper Deer Creek, and Cimarron River HUC 12 areas. Figure 7 shows the approximate location of these losses.

Over 100 Letters of Map Change (LOMC) have been identified in the Lower Cimarron – Skeleton Watershed, with the majority being located in the Oklahoma City metropolitan area and the City of Enid. Of the five Letters of Map Revision (LOMR) identified in the watershed, four are located in Oklahoma City proper and one is located in a suburb of Oklahoma City in The Village. The remaining LOMCs are mostly comprised of Letters of Map Amendment (LOMA), Letters of Map Revision based on Fill (LOMR-F), and Letters of Map Revision Floodway (LOMR-FW). Figure 8 displays the approximate location of the LOMCs that have been identified in the Lower Cimarron – Skeleton Watershed.

Figure 6: Single Claims in the Watershed

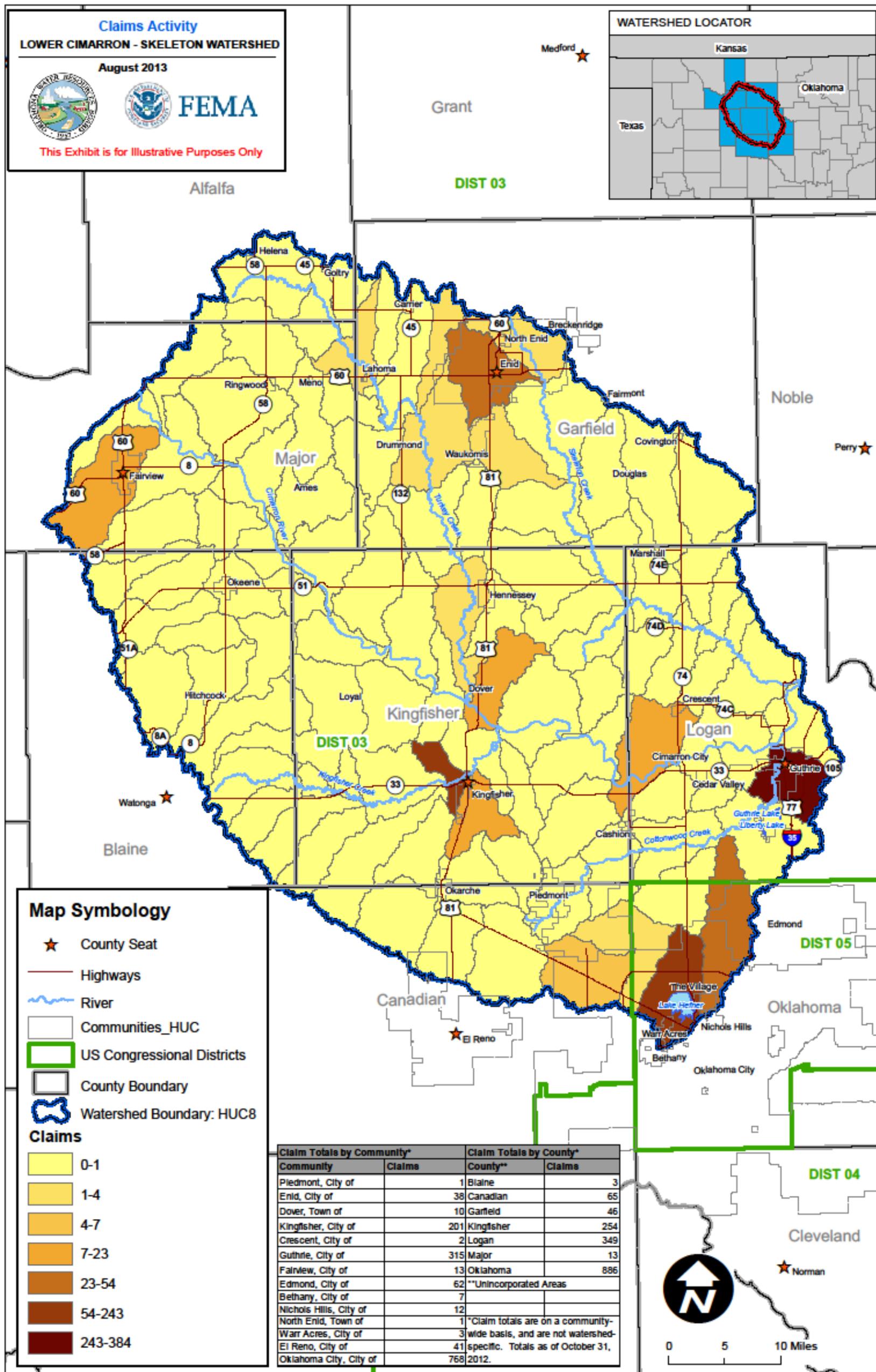
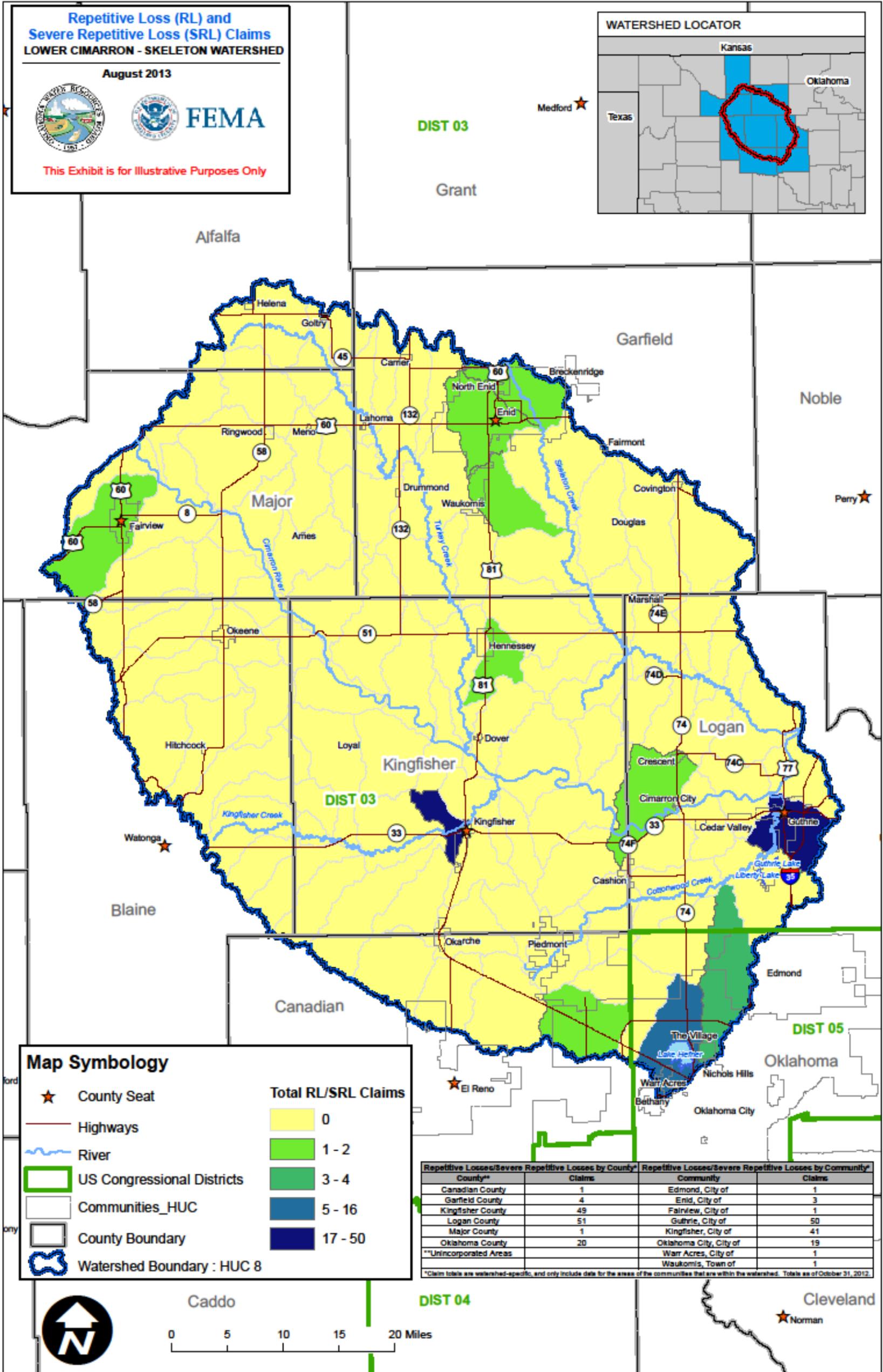
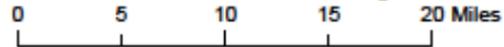


Figure 7: Repetitive and Severe Repetitive Losses



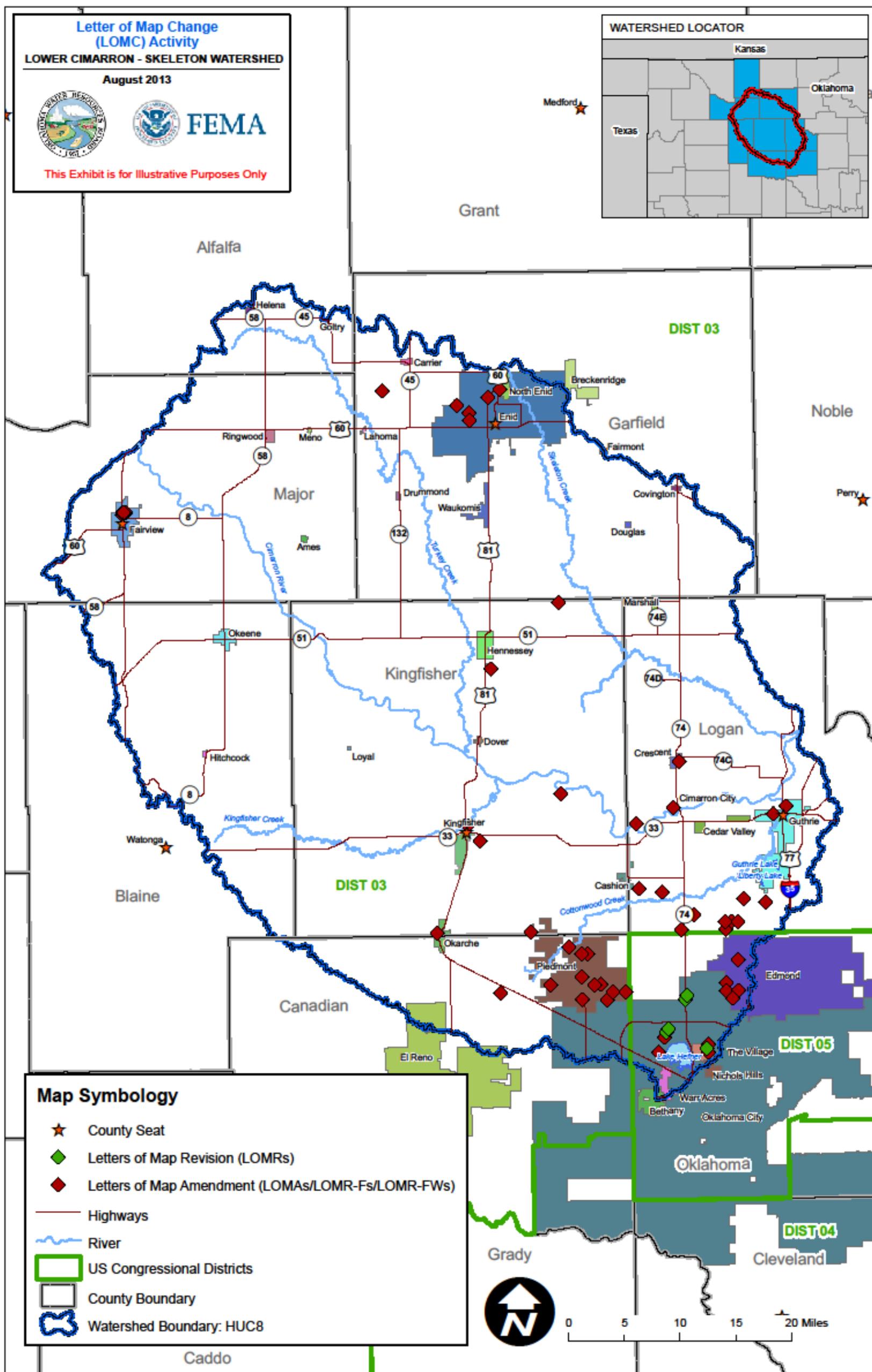


Caddo



0 5 10 15 20 Miles

Figure 8: Letter of Map Change (LOMC)



i. Engineering Review

As a first step, any engineering related comments provided by the communities during the Discovery were initially validated. Comments were looked at both in terms of hydrologic or hydraulic issues within the watershed and with any general floodplain or BFE related comments. Any supporting appeal or protest information, correspondence from communities, or anecdotal information was researched and expanded on as a concern if impacts to hydrologic analysis were substantiated.

During the Discovery process, a theme expressed by many communities was to update the latest Approximate Zone Studies that were added to the watershed during the 2010 mapping update. Base Flood Elevations were generally thought to be a better tool for managing the floodplains and areas with increasing development pressure. Undersized bridges in backwater locations along the Cimarron River appear to be performing differently than shown on the effective maps. These locations are captured in the Action Items (Table 19), and may possibly result in split flow analysis for Risk MAP updates.

Coordination with the NRCS determined that while there was suspected to be multiple decommissioned dams throughout the watershed, there is in fact only one along Cottonwood Creek. This decommissioning will have an effect on the hydrology downstream until the confluence with the Cimarron River.

Concerns about inconsistent BFEs were supported by data provided by the communities. Data to be used as leverage for studies or for general information on ongoing drainage studies and upcoming LOMRs were received from the following communities (relevant data listed):

- City of Enid
 - Surface data
 - Stormwater master plan data
 - Exhibits of surface discrepancies for effective BFEs
 - Flood Control Ordinance
 - Exhibit of buildings previously removed from floodplains
 - Emergency operations plan for Garfield County
 - North Boggy Creek Master Drainage Plan
 - Land Use Map
- City of Kingfisher (from Meshek Engineering)
 - Kingfisher Creek Flood Hazard Mitigation Study Hydrology and Hydraulic Report
 - Kingfisher Creek HEC-RAS model
 - Kingfisher HEC-HMS model
 - Contour data for Kingfisher City
- NRCS Watershed Maps
- Oklahoma City
 - Marked development pressure areas
 - GIS data for groundcover, contours, roads, building footprints.

ii. Discovery Hydrology

Two limited reviews of hydrologic information were performed as part of the Discovery analysis within the Lower Cimarron – Skeleton watershed. The reviews were kept at a high level of informational research and were performed by senior engineering staff that relied on engineering judgment, some limited analysis, and regional experience. These reviews were focused on evaluation of peak discharges and limited gage analysis for the watershed.

For the watershed as a whole, the one-percent annual chance peak discharges were reviewed for all streams within and across community boundaries looking for discharge anomalies and places where LOMRs demonstrate that the effective discharges may be suspect on a more global basis. Any notes were added if these changes can be eliminated as a concern due to hydrologic factors including local flood control structures, detention, flow break outs, sinks or other natural or manmade factors that may significantly alter hydrology flows. Finally, a watershed-wide high-level gage analysis was conducted comparing the information on any available gages within the watershed that had appropriate historical information to the effective FIS, discharges for streams with gages. This analysis could potentially flag any anomalies that would indicate that the hydrology may be out of date, too high, or too low for sub-basin areas within the watershed.

There are no LOMRs on record that affect hydrology within the watershed.

iii. Review of Peak Discharges

Peak discharges were reviewed based on available FIS reports, hydraulics models, flow gages and available LOMRs within the watershed at the crossing of SHFAs at corporate limits (county, city and town). A comparison of discharges was made for the same streams across county boundaries as shown in Table 13. No hydrology data is available for the streams with a Zone A designation, so these were not reviewed. With the exception of Turkey Creek, the differences in flows between the FIS studies were found to be minimal. The reported Turkey Creek flows are at locations approximately 50 miles apart, which explains in part why the flow differences between the two FIS studies is significant.

Table 13: Discharge Comparison at Community Limits

Stream Name	County/Parish	Effective one-percent annual chance discharge (cfs)	Effective Discharges Source (FIS number)	Notes
Chisholm Creek	Logan County	22,700	40083CV000A	At upstream Oklahoma County Line
Chisholm Creek	Oklahoma County	22,700	40109CV001A	At Logan County Line
Coon Creek	Logan County	15,200	40083CV000A	At downstream Oklahoma County Line
Coon Creek	Oklahoma County	15,220	40109CV001A	Just upstream of Logan County Line

Stream Name	County/Parish	Effective one-percent annual chance discharge (cfs)	Effective Discharges Source (FIS number)	Notes
Deer Creek	Canadian County	10,374	40017CV001B	At County Line Road
Deer Creek	Oklahoma County	10,374	40109CV001A	At County Line Road
Deer Creek	Logan County	58,000	40083CV000A	At the confluence with Cottonwood Creek
Deer Creek	Oklahoma County	58,890	40109CV001A	Just downstream of Logan County Line
Deer Creek Tributary 3 West Branch	Canadian County	1,304	40017CV001B	0.25 miles downstream of County Line Road
Deer Creek Tributary 3 West Branch	Oklahoma County	1,304	40109CV001A	1,320 feet downstream of County Line Road
Mustang Creek	Canadian County	10,820	40017CV001B	At County Line Road
Mustang Creek	Oklahoma County	10,820	40109CV001A	At County Line Road
North Canadian River	Canadian County	44,500	40017CV001B	At U.S. Highway 66
North Canadian River	Oklahoma County	44,500	40109CV001A	At U.S. Highway 66
Turkey Creek	Garfield County	28,422	40047CV000A	At U.S. Route 60
Turkey Creek	Kingfisher County	56,152	40073CV000B	At confluence with Cimarron River

iv. Frequency Analysis

Frequency analyses were performed for all the gages within the Lower Cimarron – Skeleton watershed. Frequency analyses were performed using Hydrologic Engineering Center-Statistical Software Package (HEC-SSP) computer software. The comparison between discharges from FIS and from gage analysis was made and listed in Table 14. The discharges from gage analysis are significantly different than the effective FIS discharges. Number of peaks in record at gages ranges from 6 to 56. The largest storm captured throughout the available gage record data is consistently repeated in October of 1986 for gages that were operational during this storm event. This event is controlling the large storm frequencies and has not been exceeded since. Recent significant flooding occurred in 2007 when a tropical depression reached as far inland as Kingfisher Creek in Logan County. 2008 was an additional greater than average runoff year. Reviewing and updating the gage data record and the frequency analysis since the last hydrologic study will provide a better record with a more refined 95% confidence interval, but will not likely result in an increase in flood frequencies.

Table 14: Comparison of One-Percent-Annual Peak Flows of Gage Frequency Analysis and Effective Discharges

Stream Name	Drainage Area from USGS Gage (square mile)	Effective discharges Source (FIS number)	Effective one-percent annual chance discharge (cfs)	95 confidence limits lower (cfs) (Gage)	one-percent annual chance discharge from HEC-SSP (Gage)	95% confidence limits upper (cfs) (Gage)	Number of peaks in record
Cimarron River near Dover, OK	15,809	400073CVo ooB	151,000	98,060	139,600	228,270	38
Cottonwood Creek near Navina, OK	247	No data	No data	NA	NA	NA	8
Cottonwood Creek near Seward, OK	320	No data	No data	41,340	72,320	170,810	23
Kingfisher Creek near Kingfisher, OK	157	400073CVo ooB	46,000	46,180	124,860	646,860	18
Preacher Creek near Dover, OK	14.5	No data	No data	2,590	5,860	19,830	26
Salt Creek near Okeene, OK	196	No data	No data	13,400	20,830	48,690	12
Skeleton Creek at Enid, OK	70.0	No data	No data	9,470	14,250	29,260	15
Skeleton Creek near Lovell, OK	412	No data	No data	57,100	88,590	157,900	56
Turkey Creek near Drummond, OK	248	No data	No data	29,110	55,790	146,430	28
Turkey Creek near Goltry, OK	5.1	No data	No data	3,420	7,540	27,450	19
Cimarron River near Isabella, OK	0.6	No data	No data	NA	NA	NA	9
Salt Creek near Okeene, OK	8.2	No data	No data	5,760	15,170	94,090	12

Stream Name	Drainage Area from USGS Gage (square mile)	Effective discharges Source (FIS number)	Effective one-percent annual chance discharge (cfs)	95 confidence limits lower (cfs) (Gage)	one-percent annual chance discharge from HEC-SSP (Gage)	95% confidence limits upper (cfs) (Gage)	Number of peaks in record
Bluff Creek above Lake Hefner near Oklahoma City, OK	1.6	40109CV001A	3,500	NA	NA	NA	6
Watershed W-VI near Guthrie, OK	0.14	No data	No data	190	400	1,560	14
West Beaver Creek near Orlando, OK	13.9	No data	No data	4,510	7,840	18,550	21

v. Discovery CNMS Analysis

Table 15 shows the detailed study streams in the Lower Cimarron – Skeleton watershed that have failed one or more validation elements during the CNMS stream reach level validation process. The CNMS validation elements attempt to identify changes to the Physical Environment, Climate and Engineering Methodologies since the date of the Effective Analysis (different from the Effective issuance date). Per the CNMS validation process, the study is considered as having a need or assigned an ‘unverified’ status, if one of seven critical elements fail, or if four or more of the ten secondary elements fail during stream reach level validation.

Table 15: CNMS Analysis

Stream Name	County	Validation Status	Failed CNMS Elements	Miles
Bethany Creek	Garfield	VALID	None	2.45
Biddy Creek	Oklahoma	VALID	S7, S10	4.84
Bird Creek	Logan	UNVERIFIED	C5, S4, S5, S10	2.98
Bloody Rush Creek	Oklahoma	VALID	S4, S7	7.42
Bluff Creek Above Lake Hefner	Oklahoma	VALID	S2, S3, S6	0.81
Bluff Creek Tributary A	Oklahoma	VALID	S3, S6	3.79
Bluff Creek Tributary A1	Oklahoma	VALID	S3, S6	1.39
Bluff Creek	Oklahoma	VALID	S3, S6	9.30
Boggy Creek Tributary West Branch	Garfield	VALID	S4, S10	0.16
Boggy Creek Tributary	Garfield	VALID	S10	1.88
Boggy Creek	Garfield	VALID	S4, S10	14.53

Stream Name	County	Validation Status	Failed CNMS Elements	Miles
Brush Creek of Dry Creek	Oklahoma	VALID	S6	1.01
Chisholm Creek Tributary 3 (Pond Creek)	Oklahoma	VALID	S3, S6, S10	1.66
Chisholm Creek Tributary 6	Oklahoma	VALID	S3, S6, S10	1.71
Chisholm Creek Tributary 8	Oklahoma	VALID	S3, S6, S10	1.24
Chisholm Creek Tributary 9	Oklahoma	VALID	S3, S6, S10	0.33
Chisholm Creek	Oklahoma	UNVERIFIED	S3, S4, S6, S10	1.21
Chisholm Creek	Oklahoma	VALID	None	15.69
Chisholm Creek	Logan	VALID	S10	7.07
Cimarron River	Kingfisher	VALID	S4	51.15
Clear Creek - Sand Creek	Garfield	VALID	None	3.64
Cooper Creek	Kingfisher	VALID	None	2.75
Cottonwood Creek	Logan	VALID	None	26.89
Covell Creek	Oklahoma	VALID	S3, S6	2.56
Deer Creek Tributary 1	Oklahoma	VALID	None	1.68
Deer Creek Tributary 11	Canadian	VALID	None	2.79
Deer Creek Tributary 12	Canadian	VALID	None	0.95
Deer Creek Tributary 13	Canadian	VALID	None	1.71
Deer Creek Tributary 14	Canadian	VALID	None	2.04
Deer Creek Tributary 2	Oklahoma	VALID	S6, S7, S10	1.47
Deer Creek Tributary 3 West Branch	Canadian	VALID	None	1.10
Deer Creek Tributary 3 West Branch	Oklahoma	VALID	S6, S7, S10	0.35
Deer Creek Tributary 3	Canadian	VALID	None	0.13
Deer Creek Tributary 3	Oklahoma	VALID	S6, S7, S10	4.65
Deer Creek Tributary 4	Canadian	VALID	None	3.44
Deer Creek Tributary 5	Canadian	VALID	None	3.90
Deer Creek Tributary 5A	Canadian	VALID	None	1.19
Deer Creek Tributary 6	Canadian	VALID	None	1.67
Deer Creek Tributary 7	Canadian	VALID	None	4.04
Deer Creek Tributary 8	Canadian	VALID	None	3.54
Deer Creek	Canadian	VALID	None	11.83
Deer Creek	Logan	VALID	S10	6.91
Deer Creek	Oklahoma	VALID	S7, S10	14.00
Dinker Creek	Garfield	VALID	S4	3.01
Dinker Overflow Tributary	Garfield	VALID	None	0.85
Dorf Creek (Tributary 2)	Oklahoma	VALID	S4, S7	5.63
Dry Creek of Bluff Creek	Oklahoma	VALID	S2, S3, S6	4.41
Green Valley Creek	Garfield	VALID	None	1.61
Gypsum Creek	Major	UNKNOWN	None	0.74

Stream Name	County	Validation Status	Failed CNMS Elements	Miles
Hunters Creek Tributary	Oklahoma	VALID	S3, S6	0.75
Hunters Creek	Oklahoma	VALID	S3, S6	3.97
Kingfisher Creek Lower Reach	Kingfisher	VALID	None	8.00
Kingfisher Creek Lower Reach	Kingfisher	VALID	S2, S4	6.73
Kingfisher Creek Tributary A	Kingfisher	VALID	None	1.90
Kingfisher Creek Tributary B	Kingfisher	VALID	S4	1.15
Kingfisher Creek Upper Reach	Kingfisher	VALID	None	2.13
Lahoma Tributary	Garfield	VALID	None	1.96
Levengood Creek	Garfield	VALID	None	1.85
Little Turkey Creek	Kingfisher	VALID	None	6.56
Mander Creek	Oklahoma	VALID	S3, S6	2.20
Mill Creek	Oklahoma	VALID	S3, S6	1.27
North Boggy Creek	Garfield	VALID	S4, S10	4.73
North Creek	Garfield	VALID	None	0.79
Oak Creek	Oklahoma	VALID	S3, S6	2.51
Old Channel Boggy Creek	Garfield	VALID	S10	2.12
Phillips University Tributary	Garfield	VALID	S10	1.35
Pleasantdale Creek	Garfield	VALID	None	0.92
Sand Creek	Major	UNKNOWN	None	2.94
Santa Fe Creek	Oklahoma	VALID	S3, S6	4.60
Silver Creek of Spring Creek	Oklahoma	VALID	S3, S6	1.02
Skeleton Creek Tributary 22	Garfield	VALID	S10	0.47
Skeleton Creek Tributary 26	Garfield	VALID	S10	0.54
Skeleton Creek Tributary	Garfield	VALID	S10	1.07
Skeleton Creek	Garfield	UNVERIFIED	C2, S10	1.74
Skeleton Creek	Garfield	UNVERIFIED	C2, S2, S10	8.62
Snake Creek	Logan	VALID	S10	2.04
Soldier Creek South Branch	Canadian	VALID	S4	2.48
Soldier Creek Tributary to Deer Creek	Oklahoma	VALID	S7, S10	2.53
Soldier Creek	Canadian	VALID	S4, S10	5.22
Spring Creek of Bluff Creek	Oklahoma	UNVERIFIED	S2, S3, S4, S6	6.67
Spring Creek Of Deer Creek	Canadian	VALID	None	4.91
Spring Creek West Branch	Oklahoma	VALID	S3, S6	4.86
Trail Creek	Oklahoma	VALID	S3, S6	0.92
Tributary 1 to Tributary 3	Garfield	VALID	None	0.62
Tributary 1	Garfield	VALID	S4	2.79
Tributary 2	Garfield	VALID	None	5.19
Tributary 3 Reach 2	Garfield	VALID	None	0.79
Tributary 3 to Tributary 3	Garfield	VALID	None	0.49

Stream Name	County	Validation Status	Failed CNMS Elements	Miles
Tributary 3	Garfield	VALID	None	6.22
Tributary 4	Garfield	VALID	None	2.71
Tributary A to Boggy Creek Tributary	Garfield	UNVERIFIED	C5, S10	0.22
Tributary A to Deer Creek Tributary 7	Canadian	VALID	None	0.23
Tributary B to Deer Creek Tributary 7	Canadian	VALID	None	0.53
Turkey Creek Split Flow	Kingfisher	VALID	S4	2.44
Turkey Creek	Garfield	VALID	None	5.93
Turkey Creek	Kingfisher	VALID	S4	18.35
Uncle Johns Creek	Kingfisher	VALID	None	4.38
Unnamed Tributary of Dinker Creek	Garfield	VALID	None	0.56
Unnamed Tributary of Dry Creek of Bluff Creek	Oklahoma	VALID	S3, S6	0.21
Unnamed Tributary of Lahoma Tributary	Garfield	VALID	S4	0.59
Unnamed Tributary of Turkey Creek Near Fish Hatchery	Garfield	VALID	None	3.36
Unnamed Tributary of Turkey Creek Northeast of Fish Hatchery	Garfield	VALID	None	1.38
Unnamed Tributary to Soldier Creek Tributary to Deer Creek	Oklahoma	VALID	None	1.08
Walnut Creek Tributary 1	Oklahoma	VALID	S4, S7	2.99
Walnut Creek	Oklahoma	VALID	S4, S6, S7	10.24
West Boggy Creek	Garfield	VALID	S10	1.14
Whistler Creek	Oklahoma	VALID	S6, S7	2.38
Wildwood Creek	Kingfisher	VALID	S4	2.66
Willow Creek	Oklahoma	VALID	S3, S6	0.94
Winding Creek	Oklahoma	VALID	S3, S6	0.61
Winter Camp Creek	Kingfisher	VALID	S4	1.72

Table 16 provides a description of the validation elements that failed as identified in the CNMS database.

Table 16: CNMS Category Descriptions

Element Name	Issue being identified by the Element	Element Description
C2	<i>Updated and effective peak discharges differ significantly based on confidence limits criteria in FEMA G&S for Flood Hazard Mapping Partners?</i>	This element identifies if the discharge used for the Effective studies are outside the 68% confidence interval for updated peak discharges based on USGS PeakFQ program using current gage data.

Element Name	Issue being identified by the Element	Element Description
C5	<i>Channel reconfiguration outside the SFHA</i>	This element compares digital special flood hazard area boundaries to current aerial imagery to determine whether or not the flood source channel has been reconfigured outside of the SFHA since the date of effective study.
S2	<i>Repetitive losses outside the SFHA</i>	This element fails when repetitive losses have been noted outside of the SFHA. Repetitive losses determined to be from an unmapped source, or due to local drainage issues are not considered.
S3	<i>Increase in impervious area in sub-basin of more than 50%?</i>	Failure of this element identifies a significant increase in impervious area (due to urban development since the study date) based on best available landuse / landcover data sources.
S4	<i>More than 1 and less than 5 new or removed hydraulic structures (bridge/culvert) impacting BFEs</i>	This element identifies addition or removal of more than one, but less than five hydraulic structures along the studied streams since the date of the effective Study. Please note, pursuant to guidance from FEMA, all structures identified using aerial imagery were to be counted for this element, including footbridges.
S5	<i>Channel Improvements / Shoreline Changes</i>	Failure of this element indicates that channel improvements such as straightening / channelization or armoring have occurred since the date of effective analysis.
S6	<i>Better topographic / bathymetric data available</i>	This element investigates whether better topographic / bathymetric data has become available since the date of effective study. Availability of better data causes this element to fail.
S7	<i>Changes to vegetation or land use?</i>	Failure of this element identifies a significant change to overall land use changes on a HUC12 level.
S10	<i>New regression equations available</i>	Failure of this element indicates updates to regression equations since the date of study for studies that used a regression analysis for hydrology.

vi. Summary of CNMS Concerns

i. Alfalfa County, OK

Alfalfa County has not been assessed through CNMS stream-reach level validation. Alfalfa County does not have any streams in the CNMS database which fall within the Lower Cimarron - Skeleton Watershed because it has never been mapped.

ii. Blaine County, OK

Blaine County has not been assessed through CNMS stream-reach level validation. The Blaine County streams which fall within the Lower Cimarron - Skeleton Watershed (199.1 miles) are all Non-Model Backed Approximate studies, and therefore have a Validation Status of UNKNOWN. Among the flooding sources studied by approximate methods are Bitter Creek, Cimarron River, Cooper Creek, Elm Creek, Otter Creek, Salt Creek, Spring Creek, Willow Creek, and multiple unnamed tributaries.

iii. Canadian County, OK

Canadian County has been assessed through CNMS stream-reach level validation.

Approximate Studies

The Canadian County Approximate study streams which fall within the Lower Cimarron - Skeleton Watershed (204.8 miles) are all Non-Model Backed Approximate studies, and therefore have a Validation Status of UNKNOWN.

VALID Detailed Studies

Among the Detailed Studies, Soldier Creek (5.2 miles), and Soldier Creek South Branch (2.5 miles) failed Secondary Element S₄, indicating that 4 or less hydraulic structures have been added or removed since the date of effective analysis, as identified by aerial imagery. Soldier Creek also failed Secondary Element S₁₀, indicating that this study used regression methods and that new regression equations have been published for this geographic area since the date of effective analysis.

The remaining 44 miles of Detailed Studies did not fail a single element. These include Deer Creek Tributary 11, Deer Creek Tributary 12, Deer Creek Tributary 13, Deer Creek Tributary 14, Deer Creek Tributary 3 West Branch, Deer Creek Tributary 3, Deer Creek Tributary 4, Deer Creek Tributary 5, Deer Creek Tributary 5A, Deer Creek Tributary 6, Deer Creek Tributary 7, Deer Creek Tributary 8, Deer Creek, Spring Creek of Deer Creek, Tributary A to Deer Creek Tributary 7, and Tributary B to Deer Creek Tributary 7.

iv. Garfield County, OK

Garfield County has been assessed through CNMS stream-reach level validation.

Approximate Studies

The Garfield County Approximate study streams which fall within the Lower Cimarron - Skeleton Watershed (601.5 miles) are all Non-Model Backed Approximate studies, and therefore have a Validation Status of UNKNOWN.

UNVERIFIED Detailed Studies

Among the Detailed Studies, 10.6 miles are UNVERIFIED due to their assessment through the CNMS elements during Phase 3.

Skeleton Creek (10.4 miles), failed Critical Element 2, which identifies if the discharge used for the Effective studies are outside the 68% confidence interval for updated peak discharges based on USGS PeakFQ program using current gage data. Skeleton Creek also failed Secondary Elements 2 and 10. Secondary Element 2 fails when repetitive loses have been noted outside of the SFHA. Repetitive loses determined to be from an unmapped source, or due to local drainage issues are not considered. Failure of Secondary Element 10 indicates updates to regression equations since the date of study for studies that used a regression analysis for hydrology.

Tributary A to Boggy Creek Tributary (0.2 miles), failed Critical Element 5, which compares digital special flood hazard area boundaries to current aerial imagery to determine whether or not the flood source channel has been reconfigured outside of the SFHA since the date of effective study. It also failed Secondary Element 10, indicating that there have been updates to regression equations since the date of study for studies that used a regression analysis for hydrology.

VALID Detailed Studies

A total of 34.4 miles of Detailed Studied streams failed one or two Secondary Elements. Boggy Creek Tributary West Branch, Boggy Creek, and North Boggy Creek failed Secondary Elements 4 and 10. Dinker Creek, Tributary 1, and Unnamed Tributary of Lahoma Tributary failed Secondary Element 4. Boggy Creek Tributary, Old Channel Boggy Creek, Phillips University Tributary, Skeleton Creek Tributary 22, Skeleton Creek Tributary 26, Skeleton Creek Tributary, and West Boggy Creek failed Secondary Element 10.

Secondary Element 4 identifies addition or removal of more than 1, but less than 5 hydraulic structures along the studied streams since the date of the effective Study. Please note, pursuant to guidance from FEMA, all structures identified using aerial imagery were to be counted for this element, including footbridges. Failure of Secondary Element 10 indicates updates to regression equations since the date of study for studies that used a regression analysis for hydrology.

A total of 41.3 miles of Detailed Studies did not fail any CNMS elements. This includes Detailed Studies along Bethany Creek, Clear Creek - Sand Creek, Dinker Overflow Tributary, Green Valley Creek, Lahoma Tributary, Levingood Creek, North Creek, Pleasantdale Creek, Tributary 1 to Tributary 3, Tributary 2, Tributary 3 Reach 2, Tributary 3 to Tributary 3, Tributary 3, Tributary 4, Turkey Creek, Unnamed Tributary of Dinker Creek, Unnamed Tributary of Turkey Creek Near Fish Hatchery, and Unnamed Tributary of Turkey Creek Northeast of Fish Hatchery.

v. Kingfisher County, OK

Kingfisher County has been assessed through CNMS stream-reach level validation.

Approximate Studies

The Kingfisher County Approximate study streams which fall within the Lower Cimarron - Skeleton Watershed (566.1 miles) are all Model Backed Approximate studies, and therefore are VALID.

VALID Detailed Studies

A total of 25.7 miles of the Kingfisher County Detailed study streams which fall within the Lower Cimarron - Skeleton Watershed (25.7 miles) are all VALID and do not fail any CNMS

Elements. These streams include Cooper Creek, Kingfisher Creek Lower Reach, Kingfisher Creek Tributary A, Kingfisher Creek Upper Reach, Little Turkey Creek, and Uncle John's Creek.

A total of 77.5 miles of the Kingfisher County detailed study streams which fall within the Lower Cimarron - Skeleton Watershed are VALID and fail Secondary Element 4, which identifies addition or removal of more than 1, but less than 5 hydraulic structures along the studied streams since the date of the effective Study. This includes Detailed Studies along Cimarron River, Kingfisher Creek Tributary B, Turkey Creek Split Flow, Turkey Creek, Wildwood Creek, and Winter Camp Creek.

Kingfisher Creek Lower Reach (6.7 miles), fails CNMS Secondary Elements 2 and 4. Secondary Element 2 fails when repetitive loses have been noted outside of the SFHA. Repetitive loses determined to be from an unmapped source, or due to local drainage issues are not considered. Secondary Element 4, fails when the addition or removal of more than 1, but less than 5 hydraulic structures along the studied streams since the date of the effective Study.

vi. Logan County, OK

Logan County has been assessed through CNMS stream-reach level validation.

Approximate Studies

The Logan County Approximate study streams which fall within the Lower Cimarron - Skeleton Watershed (303.6 miles) are all Model Backed Approximate studies, and therefore are VALID.

VALID Detailed Studies

Within Logan County there are 45.9 miles of Detailed study streams which fall within the Lower Cimarron - Skeleton Watershed. These include Bird Creek, Chisholm Creek, Cottonwood Creek, Deer Creek, and Snake Creek. Cottonwood Creek (26.9 miles) is VALID and does not fail any CNMS Elements.

Chisholm Creek (7.1 miles), Deer Creek (6.9 miles), and Snake Creek (2.0 miles), are VALID but failed CNMS Secondary Element 10, which indicates updates to regression equations since the date of study for studies that used a regression analysis for hydrology.

UNVERIFIED Detailed Studies

Bird Creek (3.0 miles), is UNVERIFIED because it failed Critical Element 5, and Secondary Elements 4, 5, and 10. Critical Element 5 compares digital special flood hazard area boundaries to current aerial imagery to determine whether or not the flood source channel has been reconfigured outside of the SFHA since the date of effective study. Secondary Element 4, fails when the addition or removal of more than 1, but less than 5 hydraulic structures along the studied streams since the date of the effective Study. Secondary Element 5 element indicates that channel improvements such as straightening / channelization or armoring have occurred since the date of effective analysis. CNMS Secondary Element 10, indicates updates to regression equations since the date of study for studies that used a regression analysis for hydrology.

vii. Major County, OK

Major County has not been assessed through CNMS stream-reach level validation.

The Major County CNMS streams which fall within the Lower Cimarron - Skeleton Watershed (8.6 miles) are all Detailed studies, and were not assessed through stream-reach level validation, and therefore are UNKNOWN. These streams are limited to the City of Fairview, which is the only community in Major County to have been mapped.

viii. Oklahoma County, OK

Oklahoma County and has been assessed through CNMS stream-reach level validation. The Oklahoma County Approximate study streams which fall within the Lower Cimarron - Skeleton Watershed (27.7 miles) are all Model Backed Approximate studies, and therefore are VALID. Within Oklahoma County there are 134.9 miles of detailed study streams which fall within the Lower Cimarron - Skeleton Watershed. 7.9 miles of these Detailed Studied streams are UNVERIFIED. 127.0 miles of these Detailed Studied streams are VALID.

UNVERIFIED Detailed Studies

Chisholm Creek (1.2 miles) and Spring Creek of Bluff Creek (6.7 miles) are UNVERIFIED because they failed four secondary elements. Chisholm Creek failed Secondary Elements 3, 4, 6, and 10. Spring Creek of Bluff Creek failed Secondary Elements 2, 3, 4, and 6. Secondary Element 2 fails when repetitive losses have been noted outside of the SFHA. Repetitive losses determined to be from an unmapped source, or due to local drainage issues, are not considered. Secondary Element 3 failure indicates a significant increase in impervious area (due to urban development since the study date) based on best available landuse/landcover data sources. Secondary Element 4 failure indicates addition or removal of more than one, but less than five, hydraulic structures along the studied streams since the date of the effective study. Please note, pursuant to guidance from FEMA, all structures identified using aerial imagery were to be counted for this element, including footbridges. Secondary Element 6 investigates whether better topographic/bathymetric data has become available since the date of effective study. Availability of better data causes this element to fail. Secondary Element 10 failure indicates updates to regression equations since the date of study for studies that use a regression analysis for hydrology.

VALID Detailed Studies

Chisholm Creek, Deer Creek Tributary 1, and Unnamed Tributary to Soldier Creek Tributary to Deer Creek are VALID and did not fail any CNMS elements.

Bluff Creek above Lake Hefner and Dry Creek of Bluff Creek are VALID but failed CNMS Secondary Elements 2, 3, and 6. Secondary Element 2 fails when repetitive losses have been noted outside of the SFHA. Repetitive losses determined to be from an unmapped source, or due to local drainage issues, are not considered. Secondary Element 3 failure indicates a significant increase in impervious area (due to urban development since the study date) based on best available landuse/landcover data sources. Secondary Element 6 investigates whether better topographic/bathymetric data has become available since the date of effective study. Availability of better data causes this element to fail.

Bluff Creek Tributary A, Bluff Creek Tributary A1, Bluff Creek, Covell Creek, Hunters Creek Tributary, Hunters Creek, Mander Creek, Mill Creek, Oak Creek, Santa Fe Creek, Silver Creek of Spring Creek, Spring Creek West Branch, Trail Creek, Unnamed Tributary of Dry Creek of Bluff Creek, Willow Creek, and Winding Creek are VALID but failed CNMS Secondary Elements 3 and 6. Secondary Element 3 failure indicates a significant increase in impervious area (due to urban development since the study date) based on best available landuse/landcover data sources. Secondary Element 6 investigates whether better

topographic/bathymetric data has become available since the date of effective study. Availability of better data causes this element to fail.

Chisholm Creek Tributary 3 (Pond Creek), Chisholm Creek Tributary 6, Chisholm Creek Tributary 8, Chisholm Creek Tributary 9 are VALID but failed CNMS Secondary Elements 3, 6, and 10. Secondary Element 3 failure indicates a significant increase in impervious area (due to urban development since the study date) based on best available landuse/landcover data sources. Secondary Element 6 investigates whether better topographic/bathymetric data has become available since the date of effective study. Availability of better data causes this element to fail. Secondary Element 10 failure indicates updates to regression equations since the date of study for studies that use a regression analysis for hydrology.

Walnut Creek is VALID but failed CNMS Secondary Elements 4, 6, and 7. Secondary Element 4 failure indicates addition or removal of more than one, but less than five, hydraulic structures along the studied streams since the date of the effective study. Please note, pursuant to guidance from FEMA, all structures identified using aerial imagery were to be counted for this element, including footbridges. Secondary Element 6 investigates whether better topographic/bathymetric data has become available since the date of effective study. Secondary Element 7 failure indicates identified significant change to overall land use changes on a HUC 12 level.

Bloody Rush Creek, Dorf Creek (Tributary 2), and Walnut Creek Tributary 1 are VALID but failed CNMS Secondary Elements 4 and 7. Secondary Element 4 failure indicates addition or removal of more than one, but less than five, hydraulic structures along the studied streams since the date of the effective study. Please note, pursuant to guidance from FEMA, all structures identified using aerial imagery were to be counted for this element, including footbridges. Secondary Element 7 failure indicates identified significant change to overall land use changes on a HUC 12 level.

Brush Creek of Dry Creek is VALID but failed CNMS Secondary Element 6. Secondary Element 6 investigates whether better topographic/bathymetric data has become available since the date of effective study. Availability of better data causes this element to fail.

Whistler Creek is VALID but failed CNMS Secondary Elements 6 and 7. Secondary Element 6 investigates whether better topographic/bathymetric data has become available since the date of effective study. Availability of better data causes this element to fail. Secondary Element 7 failure indicates identified significant change to overall land use changes on a HUC 12 level.

Deer Creek Tributary 2, Deer Creek Tributary 3 West Branch, and Deer Creek Tributary 3 are VALID but failed CNMS Secondary Elements 6, 7 and 10. Secondary Element 6 investigates whether better topographic/bathymetric data has become available since the date of effective study. Availability of better data causes this element to fail. Secondary Element 7 failure indicates identified significant change to overall land use changes on a HUC 12 level. Secondary Element 10 failure indicates updates to regression equations since the date of study for studies that use a regression analysis for hydrology.

Biddy Creek, Deer Creek, and Soldier Creek Tributary to Deer Creek are VALID but failed CNMS Secondary Elements 7 and 10. Secondary Element 7 failure indicates identified significant change to overall land use changes on a HUC 12 level. Secondary Element 10 failure indicates updates to regression equations since the date of study for studies that use a regression analysis for hydrology.

vii. Discovery Hydraulics and Floodplain Analysis

The information presented in this report is compiled from cursory reviews of the Army Corps of Engineers National Levee Database, the effective maps from all of the counties and communities within the Lower Cimarron-Skeleton HUC 8 watershed limits, and the effective maps encompassing those watersheds. A variety of acceptable engineering methods have been used to delineate the effective maps to date. All communities have been asked to provide additional studies that may have been done since the last mapping update, as well as data that may not have been included into previous updates. No additional hydraulic modeling or verification has been performed at this time. Table 17 shows the hydraulic analyses used for streams studied by enhanced methods and their current CNMS Status.

Table 17: Summary of Hydraulic Analysis

Stream Name	County	Validation Status	Date of Effective Analysis	Hydrology Model	Hydraulic Model
Bethany Creek	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Biddy Creek	Oklahoma	VALID	5/1/1980	REGRESSION EQUATIONS	OTHER
Bird Creek	Logan	UNVERIFIED	2/1/1979	REGRESSION EQUATIONS	HEC-2
Bloody Rush Creek	Oklahoma	VALID	4/1/1997	HEC-1	HEC-2
Bluff Creek Above Lake Hefner	Oklahoma	VALID	5/1/1980	OTHER	OTHER
Bluff Creek Tributary A	Oklahoma	VALID	5/1/1980	OTHER	OTHER
Bluff Creek Tributary A1	Oklahoma	VALID	5/1/1980	OTHER	OTHER
Bluff Creek	Oklahoma	VALID	5/1/1980	OTHER	OTHER
Boggy Creek Tributary West Branch	Garfield	VALID	10/1/1976	REGRESSION EQUATIONS	OTHER
Boggy Creek Tributary	Garfield	VALID	10/1/1976	REGRESSION EQUATIONS	OTHER
Boggy Creek	Garfield	VALID	10/1/1976	REGRESSION EQUATIONS	OTHER
Brush Creek of Dry Creek	Oklahoma	VALID	9/1/1989	HEC-1	HEC-2
Chisholm Creek Tributary 3 (Pond Creek)	Oklahoma	VALID	8/1/1978	REGRESSION EQUATIONS	HEC-2
Chisholm Creek Tributary 3 (Pond Creek)	Oklahoma	VALID	5/1/1980	REGRESSION EQUATIONS	OTHER
Chisholm Creek Tributary 6	Oklahoma	VALID	5/1/1980	REGRESSION EQUATIONS	OTHER
Chisholm Creek Tributary 8	Oklahoma	VALID	5/1/1980	REGRESSION EQUATIONS	OTHER
Chisholm Creek Tributary 9	Oklahoma	VALID	5/1/1980	REGRESSION EQUATIONS	OTHER
Chisholm Creek	Oklahoma	UNVERIFIED	6/16/1997	REGRESSION EQUATIONS	HEC-2

Stream Name	County	Validation Status	Date of Effective Analysis	Hydrology Model	Hydraulic Model
Chisholm Creek	Oklahoma	VALID	5/1/2007	HEC-HMS	HEC-RAS
Chisholm Creek	Logan	VALID	4/1/1997	REGRESSION EQUATIONS	HEC-2
Cimarron River	Kingfisher	VALID	5/1/1998	OTHER	HEC-RAS 2.2 (SEPTEMBER 1998)
Clear Creek - Sand Creek	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Cooper Creek	Kingfisher	VALID	1/1/1989	HEC-1	HEC-2
Cottonwood Creek	Logan	VALID	9/1/1987	HEC-1	HEC-2
Covell Creek	Oklahoma	VALID	8/1/1978	HEC-1	HEC-2
Deer Creek Tributary 1	Oklahoma	VALID	5/1/2007	HEC-HMS	HEC-RAS
Deer Creek Tributary 11	Canadian	VALID	6/1/2006	REGRESSION EQUATIONS	OTHER
Deer Creek Tributary 12	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Deer Creek Tributary 13	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Deer Creek Tributary 14	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Deer Creek Tributary 2	Oklahoma	VALID	5/1/1980	REGRESSION EQUATIONS	OTHER
Deer Creek Tributary 3 West Branch	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Deer Creek Tributary 3 West Branch	Oklahoma	VALID	5/1/1980	REGRESSION EQUATIONS	OTHER
Deer Creek Tributary 3	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Deer Creek Tributary 3	Oklahoma	VALID	5/1/1980	REGRESSION EQUATIONS	OTHER
Deer Creek Tributary 4	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Deer Creek Tributary 5	Canadian	VALID	6/1/2006	REGRESSION EQUATIONS	OTHER
Deer Creek Tributary 5A	Canadian	VALID	6/1/2006	HEC-1	HEC-2
Deer Creek Tributary 6	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Deer Creek Tributary 7	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Deer Creek Tributary 8	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Deer Creek	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Deer Creek	Logan	VALID	9/1/1987	REGRESSION EQUATIONS	HEC-2
Deer Creek	Oklahoma	VALID	5/1/1980	REGRESSION EQUATIONS	OTHER
Dinker Creek	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Dinker Overflow Tributary	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Dorf Creek (Tributary 2)	Oklahoma	VALID	4/1/1997	HEC-1	HEC-2

Stream Name	County	Validation Status	Date of Effective Analysis	Hydrology Model	Hydraulic Model
Dry Creek of Bluff Creek	Oklahoma	VALID	5/1/1980	OTHER	OTHER
Green Valley Creek	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Gypsum Creek	Major	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN
Hunters Creek Tributary	Oklahoma	VALID	8/1/1978	HEC-1	HEC-2
Hunters Creek	Oklahoma	VALID	8/1/1978	HEC-1	HEC-2
Kingfisher Creek Lower Reach	Kingfisher	VALID	1/1/1989	HEC-1	HEC-2
Kingfisher Creek Lower Reach	Kingfisher	VALID	5/1/1998	HEC-1	HEC-RAS
Kingfisher Creek Tributary A	Kingfisher	VALID	1/1/1989	HEC-1	HEC-2
Kingfisher Creek Tributary B	Kingfisher	VALID	1/1/1989	HEC-1	HEC-2
Kingfisher Creek Upper Reach	Kingfisher	VALID	1/1/1989	HEC-1	HEC-2
Lahoma Tributary	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Levengood Creek	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Little Turkey Creek	Kingfisher	VALID	5/1/1998	HEC-1	HEC-RAS
Mander Creek	Oklahoma	VALID	8/1/1978	HEC-1	HEC-2
Mill Creek	Oklahoma	VALID	8/1/1978	HEC-1	HEC-2
North Boggy Creek	Garfield	VALID	10/1/1976	REGRESSION EQUATIONS	OTHER
North Creek	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Oak Creek	Oklahoma	VALID	8/1/1978	HEC-1	HEC-2
Old Channel Boggy Creek	Garfield	VALID	10/1/1976	REGRESSION EQUATIONS	OTHER
Phillips University Tributary	Garfield	VALID	10/1/1976	REGRESSION EQUATIONS	OTHER
Pleasantdale Creek	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Sand Creek	Major	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN
Santa Fe Creek	Oklahoma	VALID	8/1/1978	HEC-1	HEC-2
Silver Creek of Spring Creek	Oklahoma	VALID	5/1/1980	OTHER	OTHER
Skeleton Creek Tributary 22	Garfield	VALID	10/1/1976	REGRESSION EQUATIONS	OTHER
Skeleton Creek Tributary 26	Garfield	VALID	10/1/1976	REGRESSION EQUATIONS	OTHER
Skeleton Creek Tributary	Garfield	VALID	10/1/1976	REGRESSION EQUATIONS	OTHER

Stream Name	County	Validation Status	Date of Effective Analysis	Hydrology Model	Hydraulic Model
Skeleton Creek	Garfield	UNVERIFIED	10/1/1976	REGRESSION EQUATIONS	OTHER
Skeleton Creek	Garfield	UNVERIFIED	10/1/1978	REGRESSION EQUATIONS	OTHER
Snake Creek	Logan	VALID	2/1/1979	REGRESSION EQUATIONS	HEC-2
Soldier Creek South Branch	Canadian	VALID	11/1/1997	HEC-1	HEC-2
Soldier Creek Tributary to Deer Creek	Oklahoma	VALID	5/1/1980	REGRESSION EQUATIONS	OTHER
Soldier Creek	Canadian	VALID	1/1/1980	REGRESSION EQUATIONS	OTHER
Spring Creek of Bluff Creek	Oklahoma	UNVERIFIED	5/1/1980	HEC-1	HEC-2
Spring Creek Of Deer Creek	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Spring Creek West Branch	Oklahoma	VALID	5/1/1980	HEC-1	OTHER
Trail Creek	Oklahoma	VALID	8/1/1978	HEC-1	HEC-2
Tributary 1 to Tributary 3	Garfield	VALID	4/1/1990	HEC-1	HEC-2
Tributary 1	Garfield	VALID	4/1/1990	HEC-1	HEC-2
Tributary 2	Garfield	VALID	4/1/1990	HEC-1	HEC-2
Tributary 3 Reach 2	Garfield	VALID	4/1/1990	HEC-1	HEC-2
Tributary 3 to Tributary 3	Garfield	VALID	4/1/1990	HEC-1	HEC-2
Tributary 3	Garfield	VALID	4/1/1990	HEC-1	HEC-2
Tributary 4	Garfield	VALID	4/1/1990	HEC-1	HEC-2
Tributary A to Boggy Creek Tributary	Garfield	UNVERIFIED	10/1/1976	REGRESSION EQUATIONS	OTHER
Tributary A to Deer Creek Tributary 7	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Tributary B to Deer Creek Tributary 7	Canadian	VALID	6/1/2006	UNKNOWN	OTHER
Turkey Creek Split Flow	Kingfisher	VALID	5/1/1998	HEC-1	HEC-RAS
Turkey Creek	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Turkey Creek	Kingfisher	VALID	5/1/1998	HEC-1	HEC-RAS
Uncle Johns Creek	Kingfisher	VALID	5/1/1998	HEC-1	HEC-RAS
Unnamed Tributary of Dinker Creek	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Unnamed Tributary of Dry Creek of Bluff Creek	Oklahoma	VALID	5/1/1980	OTHER	OTHER
Unnamed Tributary of Lahoma Tributary	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2

Stream Name	County	Validation Status	Date of Effective Analysis	Hydrology Model	Hydraulic Model
Unnamed Tributary of Turkey Creek Near Fish Hatchery	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Unnamed Tributary of Turkey Creek Northeast of Fish Hatchery	Garfield	VALID	6/1/1989	TR-20 (FEBRUARY 1992)	WSP-2
Unnamed Tributary to Soldier Creek Tributary to Deer Creek	Oklahoma	VALID	2/24/2004	HEC-1	HEC-2
Walnut Creek Tributary 1	Oklahoma	VALID	4/1/1997	HEC-1	HEC-2
Walnut Creek	Oklahoma	VALID	4/1/1997	HEC-1	HEC-2
West Boggy Creek	Garfield	VALID	10/1/1976	REGRESSION EQUATIONS	OTHER
Whistler Creek	Oklahoma	VALID	4/1/1997	HEC-1	HEC-2
Wildwood Creek	Kingfisher	VALID	5/1/1998	HEC-1	HEC-RAS
Willow Creek	Oklahoma	VALID	8/1/1978	HEC-1	HEC-2
Winding Creek	Oklahoma	VALID	8/1/1978	HEC-1	HEC-2
Winter Camp Creek	Kingfisher	VALID	1/1/1989	HEC-1	HEC-2

Hydraulics, floodplain, and floodways were reviewed based on the FIS reports, available hydraulic models, and FIRMs. As a result of the research, no hydraulic modeling data was available for the streams in the Zone A floodplains within the watershed, and research could not conclude if any re-delineated streams within the watershed were model based. Models that support Zone A areas and re-delineated streams may be available in the FEMA library. However, there are certain LOMRs that revised hydraulics within the watershed, shown in Table 18. The LOMRs indicate that there have been updates to the respective stream sources since the respective FIS was published. This also suggests the need to revisit the accuracy of the respective streams' hydraulics and hydrologic status for future updates to the FIRM and FIS in the watershed.

Table 18: LOMRs that Revise Hydraulics in the Watershed

Stream Name	Case Number	Notes
Bluff Creek / Bluff Creek Tributary A	12-06-2435P	New Topographic Data, Hydraulics, Floodplain, Floodway, BFE
Bluff Creek Tributary A-1	10-06-1633P (re-issuance of 03-06-1389)	New Topographic Data, Hydraulics, Floodplain, Floodway, BFE
Spring Creek of Bluff Creek	11-06-1177P (partial re-issuance of 05-06-0201P)	New Topographic Data, Hydraulics, Floodplain, Floodway, BFE

Stream Name	Case Number	Notes
Spring Creek of Bluff Creek	10-06-3038P	Floodplain mapping

Two of these LOMRs (10-06-1633P and 11-06-1177P) were either fully or partly re-issued LOMRs that were inadvertently not incorporated in the Countywide update for Oklahoma County dated December 18, 2009. None of the LOMRs listed in Table 18 present disconnects or inconsistencies with surrounding flood hazard information.

Mismatches or disconnects at corporate limits or county boundaries often appear when community-based FIRMs and FISs are compiled together into countywide mapping products. Additionally, when evaluating SFHAs watershed-wide mismatches often occur between adjacent counties.

For the Lower Cimarron-Skeleton Watershed mismatches and other engineering issues of note include:

- The Zone AE floodplain on the Cimarron River in Kingfisher County does not match the Zone A Cimarron River floodplain upstream in Blaine County. Blaine County has not yet been modernized and while it has Zone As mapped throughout, there is no published FIS for this County.
- Major County is unmapped with the exception of the City of Fairview. This means that the connectivity of streams between these communities cannot be verified. However, since the City of Fairview FIS indicates the floodplain mapping was conducted using USGS topography, its relative accuracy is unknown. There is no FIS for Major County aside from the incorporated area of Fairview.
- The water surface elevations for the City of Fairview analysis were determined with SCS WSP-2 and should be verified with HEC-RAS and updated topography and hydrology based on the development occurring in the upper watersheds.
- The City of Fairview FIS is referenced to the NGVD 1929 datum and should be converted to NAVD 88.
- There is no FIS data available for Alfalfa County or the Town of Helena. Alfalfa County is entirely unmapped in the watershed.
- There is a BFE disconnect along Kingfisher Creek within the City of Kingfisher at the right overbank and unincorporated Kingfisher County on the left overbank. The left and right limits of BFEs do not coincide with the ground elevations.
- Several flooding sources have approximate floodplains within one county and detailed floodplains in adjacent counties. For example, the Cimarron River in Logan County is Zone A which changes to a Zone AE in Kingfisher County. While there does not seem to be an apparent mismatch in the extent of the floodplain across the county boundary, Logan County did request a Zone AE to be established for a section of the Cimarron River immediately adjacent to Kingfisher County and it is important that consistency is ensured when it comes to the engineering data used for the possible new study.

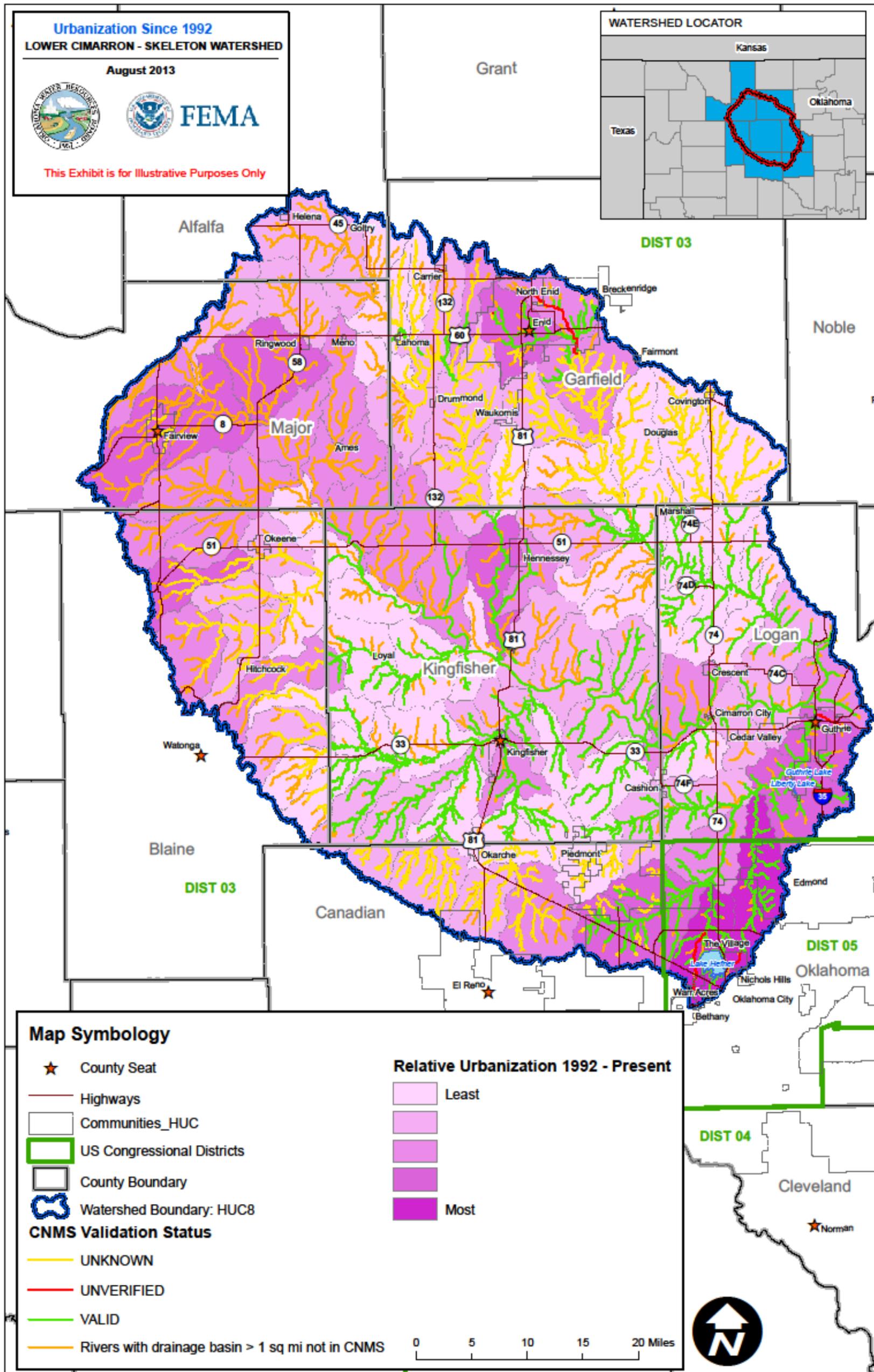
- There is currently a third-party study underway in Oklahoma City on Chisolm Creek in the northeastern part of the city which will lead to a LOMR. While there are no current mismatches between the Oklahoma City Chisolm Creek flood hazard data and data from Chisolm Creek and upstream tributaries in the City of Edmond and Oklahoma County, consistency will have to be ensured between the results of the LOMR engineering analysis and current floodplain delineations in adjacent streams. This was an expressed concern at the Discovery Meeting.
- There is a decommissioned NRCS dam upstream of the City of Piedmont and the City of Guthrie in the Cottonwood Creek watershed. This will affect hydrology and hydraulics downstream towards the city as Cottonwood Creek joins the Cimarron River.
- While the majority of the populated areas have either a Zone A or more refined study, there are many miles of rivers with drainage basins greater than 1 square mile that have no associated study. Managing future growth in these areas would be assisted with approximate studies throughout the entire basin.
- The upper third of the Cimarron River within the watershed has not been studied. This area should be considered for an approximate study to identify the risk associated with the largest flooding source in the watershed.
- Discharge values in the Logan County FIS for Cottonwood Creek increase and decrease downstream depending on the timing of the study. No reason is given. Discharges for Coon Creek in the current FIS reflect a HEC-1 model using 1995 development conditions. This model and flows should be updated to reflect current or build-out conditions.
- The Cimarron River discharges are not reported in the Logan County FIS.
- The City of Guthrie was studied by detailed methods while just outside the boundaries there are studies performed using approximate methods; extension of the detailed analysis should be considered for possible future annexation and stream connectivity.
- In the City of Guthrie, a without-levee analysis was done around the Furniture Factory, and the Cottonseed Oil Company levees. The effect of the levee increased BFEs and may be considered for restudy with the new Levee Analysis and Mapping Procedures.
- Kingfisher (hydrology) annual rainfall used for the regression equations was based on USGS water resources investigation report 84-4358. Considerations should be given to updating all regression equation based hydrology to the updated depths in NOAA Atlas 14. This could potentially have impacts to flood limits.
- Garfield County, Enid. There are discrepancies in the BFE elevations compared to the most recent topographic data provided by Enid as leverage data. This data should be used as a boundary standards check for the modeling effort. Specifically, concerns were raised at 3rd and Oak for North Boggy Creek, at the intersection of Eisenhower and Chestnut near the confluence of Boggy Creek and Boggy Creek Tributary (Panel 195E), and at the tributary confluence of Sooner Road (Panel 0220 E).

- Garfield County FIS failed to mention the levee in Enid in Section 2.4 of the study; this should be corrected in the next revision.
- Water surface elevations for portions of the county were developed with the USGS computer program E-431 and may need to be verified with HEC-RAS.
- The Canadian County FIS as well as other FISs within the watershed will need to be updated to capture the flooding that occurred in 2010.

Figure 9 identifies the current relative percent urban cover for areas in the watershed.

Figure 10 shows the changes in the percent urban coverage that have occurred in the watershed within the last 5 years while Figure 11 shows the relative urbanization between the years 1992-2006.

Figure 11: Urban Changes between 1992 and 2006



IV. Watershed Options

In conjunction with the assessment of risk, need, and the availability of topographic data, as well as the input of stakeholders, it is recommended that future projects be initiated within the Lower Cimarron – Skeleton Watershed. After internal and partner review of the community information for the Watershed, the following overarching opportunities were identified:

- Risk Identification and Communication – traditional flood studies and data updates
- NFIP Community Actions – insurance-related mitigation or information
- Mitigation Planning and Mitigation Actions – items related to planning updates
- Community Benefits and Grant Opportunities – outreach and disaster activities as well as non-flooding hazards like safe room information

Table 19 provides some specific evaluation guidelines for streams or areas that could benefit from additional study. Additionally, any FEMA-based metrics that would be met if the need or issue were addressed are noted, as well as any current FEMA map actions that would affect the activity. Any comments or concerns raised by a stakeholder during the Discovery process that could be tied to one of the needs or actions for the Watershed were also noted. Some needs and/or actions are listed that were not raised by a particular community, but were identified as general improvements that could be made in the Lower Cimarron – Skeleton Watershed to meet general FEMA regional goals.

Needs are identified as high, medium, or low priority, or as a task that could be assigned to a State or local community to complete and are identified as:

High – The local community would immediately benefit from the action, and FEMA’s metrics would also be met

Medium – The local community would benefit over the longer term from the action, and a portion of FEMA’s metrics may be met

Low – The local community activities can continue without this revision, and FEMA’s metrics are not affected

Community Action – The activity would be more appropriate as a community-led action rather than a FEMA-led action

Table 19: Metrics and Rankings of Needs

Item	* Description of Need Evaluation Guide: High = local community would immediately benefit from the action, and FEMA's metrics would also be met Medium = local community would benefit over the longer term from the action, and a portion of FEMA's metrics may be met Low = local community activities can continue without this revision, and FEMA's metrics are not affected Community Action = activity would be more appropriate as a community-led action rather than a FEMA-led action		Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation
	Location of Need/Project	Details			
1	Helena, Town of	Town is currently putting together an application for a safe room rebate program.	No Current Map Actions	Action	Community Action
2	Helena, Town of	Town has joined NFIP since last HMP. Update HMP to show this action. Possible FEMA training/education/outreach opportunity.	No Current Map Actions	Awareness	Community Action
3	Helena, Town of	Looking for grant opportunity to purchase generators for critical facilities.	No Current Map Actions	Action	Community Action
4	Blaine County	Looking for grant opportunities to fund culvert improvements at various locations, previously identified. Priorities on schools and public buildings.	No Current Map Actions	Action	Community Action
5	Soldier Creek Tributary of Deer Creek and Cottonwood Creek (Piedmont, City of)	Community Requests Restudy in this area as a result of new development and disagreement with current Zone A. 48.81 Miles of New Detailed (or New Limited Detailed Study) 7 Panels, 3 Communities	No Current Map Actions	48.81 NVUE Miles	High
6	Soldier Creek (Piedmont, City of)	Community Requests Restudy near Olde Town Subdivision based on recent drainage improvements and disagreement with current Zone A. 2.2 Miles of New Detailed (Limited Detailed) Study 2 Panels, 1 Community	No Current Map Actions	2.2 NVUE Miles	High
7	Piedmont, City of	City still has needs for bridge improvements. Several bridges can't adequately convey 100-year storm. City has plans to improve inadequate bridges but is currently seeking funding source for improvements	No Current Map Actions	Action	Community Action
8	Piedmont, City of	City has insufficient level of detail (H&H) for a master plan. Requesting new H&H through the City. Detailed Study requested. 9 panels, 3 communities	No Current Map Actions	79.86 NVUE Miles	High
9	Piedmont, City of	The community has drafted a new HMP that should go to the council to finalize the draft on April 22, 2013 (awaiting approval).	No Current Map Actions	Action and Awareness	Community Action
10	Enid, City of	5 of 13 detention facilities have been built. Current hydrology reflects future flows. Remaining 7 detention facilities need to be implemented but need to identify funding. Incorporate LOMR if reflects current conditions or restudy. 9 panels, 3 communities	No Current Map Actions	Action Measure 1 Action Measure 2 64.52 NVUE Miles	Medium
11	Tributary of Boggy Creek (Enid, City of)	Community requests restudy along Boggy Creek. Has provided updated Contour / Topo Data. New 2.8 miles of Detailed Study 1 Panel, 1 community	No Current Map Actions	2.8 NVUE Miles	High

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Item	Location of Need/Project	Details	Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation
12	North Boggy Creek (Enid, City of)	Detailed study requested. Acquisition of an estimated 134 properties that cannot be otherwise protected. Non-regulatory products would assist in cost benefit analysis by providing elevations at lower storm frequencies. 2 panels, 1 community	No Current Map Actions	Community Action 4.62 NVUE Miles	High
13	Boggy Creek (Enid, City of)	Map needs to be updated using contour data provided by the community. Area has had map change and FIS correction. 4 panels, 1 community	No Current Map Actions	14.53 NVUE Miles	High
14	North Boggy Creek (Enid, City of)	Drainage improvements required at intersection of 3rd & Oak. Two fatalities have occurred here; when flooding occurs, inundation happens early.	No Current Map Actions	Action and Awareness	Community Action
15	Tributary to Boggy Creek (Enid, City of)	Area in east Enid where the FEMA map does not match existing contours. 2 panels, 1 community	No Current Map Actions	Action 6.15 NVUE Miles	Medium
16	Skeleton Creek (Enid, City of)	New or refined detailed study requested. Acquisition or elevation for a repetitive loss structure in east Enid. Drainage improvements may be more feasible alternative but need assistance scoping to make final mitigation determination. 5 panels, 3 communities	No Current Map Actions	Action 10.27 NVUE Miles	Low
17	Old Channel Boggy Creek (Enid, City of)	The City purchased/demolished 12 properties in the floodplain/floodway and built parking lots. Was informed at a CRS class it was ineligible for points/credit because it was not preserved as open space. FEMA / Community / State to provide CRS training for this lesson learned.	No Current Map Actions	Awareness	Community Action
18	North Boggy Creek (Enid, City of)	Drainage improvements required at 3rd & Walnut to alleviate flooding problems. Possible HMGP project would be heavy permanent barricades.	No Current Map Actions	Action	Community Action
19	Boggy Creek (Enid, City of)	Construct dike to protect Brookside and Valleyview subdivisions.	No Current Map Actions	Action	Community Action
20	Boggy Creek and North Boggy Creek (Enid, City of)	Clean and clear Boggy Creek and widen North Boggy Creek channel.	No Current Map Actions	Action	Community Action
21	Skeleton Creek and Tributaries (Enid, City of)	Detailed study requested. City plans to develop BFEs for Unnumbered Zone As on east side of city. 2 panels, 1 community affected	No Current Map Actions	20.21 NVUE Miles	High
22	Boggy Creek (Enid, City of)	Incorporate existing 3rd party study for Lower Boggy Creek into FIRMs as a PMR or a LOMR. 5 panels, 3 communities	No Current Map Actions	Action and Awareness 14.45 NVUE Miles	Medium
23	Boggy Creek (Enid, City of)	Develop comprehensive drainage plan for Boggy Creek. City to seek grant to fund and implement plan.	No Current Map Actions	Action	Community Action
24	Skeleton Creek and Otter Creek (Garfield County)	City plans to raise Scholtz Bridge on Skeleton Creek and Castelle Bridge on Otter Creek to increase storm flow capacity. Actively seeking funding to implement improvements	No Current Map Actions	Action	Community Action

Item	* Description of Need Evaluation Guide: High = local community would immediately benefit from the action, and FEMA's metrics would also be met Medium = local community would benefit over the longer term from the action, and a portion of FEMA's metrics may be met Low = local community activities can continue without this revision, and FEMA's metrics are not affected Community Action = activity would be more appropriate as a community-led action rather than a FEMA-led action		Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation
	Location of Need/Project	Details			
25	Lahoma Tributary of Turkey Creek (Lahoma, Town of)	Resident moved mobile home into floodplain and entire property is in A-1 Zone. Required to complete hydraulic survey, elevation certificate, tie-down and elevate propane tanks to meet compliance. Action: Community Enforcement of local ordinances.	No Current Map Actions	Action	Community Action
26	Lahoma Tributary of Turkey Creek (Lahoma, Town of)	Recent erosion of creek bed boundary undercutting residential property and county road. Scoping required to identify and implement channel improvements.	No Current Map Actions	Action and Awareness	Community Action
27	Lahoma, Town of	Garfield County HMP not completed; Town of Lahoma concerned due to inability to get funding for flooding and other projects. The Lahoma FPA is actively pursuing completion of HMP.	No Current Map Actions	Action	Community Action
28	Lahoma, Town of	Community would like Risk Map Products and Mitigation Assistance to help resolve mysterious sink hole.	No Current Map Actions	Action	Medium Community Action
29	Skeleton Creek (North Enid, Town of)	Town plan identifies cleaning and clearing Skeleton Creek to improve channel capacity. Project is currently out to bid. This action is in progress, as funding is in place and the project will be implemented upon contractor selection. Channel improvement will need to be submitted as a LOMR.	No Current Map Actions	Action Measure 2	Community Action
30	Turkey Creek (Kingfisher County)	New road and larger bridge to be built in 2014. Road and two bridges going west out of Dover, OK, to be redone to mitigate flooding. Improvement will need to be submitted as a LOMR.	No Current Map Actions	Action Measure 1	Community Action
31	Kingfisher County	Bridge replacements for District #1, to alleviate flooding. Larger bridges were put in place. District #1 is located in the southeast corner of Kingfisher County. Rural community would benefit from a new limited detailed study. 10 panels, 2 communities	No Current Map Actions	118.72 NVUE Miles 130 total miles	Low
32	Kingfisher Creek (Kingfisher County)	Repetitive loss area where railroad bridge backs up floodwaters. Not part of buyout area, so ideally would remove. BFEs need to be refined and possibly re-studied. New Detailed Study required. 3 panels, 2 communities	No Current Map Actions	8.75 NVUE Miles	High
33	Kingfisher County	All Zone A should be converted to Zone AE countywide. 44 panels, 8 communities	No Current Map Actions	343.85 NVUE Miles	High
34	Kingfisher Creek Lower Reach (Kingfisher County)	Repetitive loss area on north end of town. Currently being mitigated through a buyout program. New detailed study may refine additional buyout properties. 3 panels, 2 communities	No Current Map Actions	Awareness 8.75 NVUE Miles	Community Action
35	Uncle Johns Creek and Tributaries (Kingfisher, City of)	NRCS dam decommissioning on Cottonwood Creek. Impacts to hydrology and floodplain. New detailed study down to confluence with Cimarron River requested. CNMS Status is "Unknown" on 41.26 NVUE Miles 5 panels, 4 communities	No Current Map Actions	87.55 NVUE Miles	High

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Item	Location of Need/Project	Details	Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation
36	Kingfisher Creek Lower Reach (Kingfisher, City of)	New detailed study requested to refine BFEs. Buy-out area on north end of town; stated that they are not happy with the BFEs but are generally fine with the extent. 4 panels, 2 communities	No Current Map Actions	0.8 NVUE Miles	High
37	Tributary of Kingfisher Creek (Kingfisher, City of)	Area of new 30 acre development coming on west side of town. New Detailed Study required. 1 panel, 2 communities	No Current Map Actions	1.87 NVUE Miles	High
38	Kingfisher, City of	1-foot topo data available for northern portion of Kingfisher Creek and tributaries. Can be used as leveraged data for an additional study.	No Current Map Actions	Action Measure 1 and Awareness	High
39	Kingfisher Creek Lower Reach (Kingfisher, City of)	New detailed study requested. Low house near airport (northwest of town). Potential acquisition or elevation project. 5 panels, 2 communities	No Current Map Actions	17.24 NVUE Miles	High
40	Campbell Creek (Kingfisher, City of)	New bridge construction at Reeding Road to alleviate flooding. Improvement will need to be submitted as a LOMR	No Current Map Actions	Action Measure 1	Community Action
41	Cottonwood Creek (Guthrie, City of)	New detailed study requested. Proposed ODOT bridge spanning approximately 7 city blocks above Cottonwood Creek in Guthrie along HWY 33. 4 panels, 2 communities	No Current Map Actions	10.63 NVUE Miles	High
42	Bird Creek Tributary of Cottonwood Creek (Guthrie, City of)	New detailed study requested. Small area on east side of town, Walker Lane cul-de-sac, with several LOMAs. LOMAs need to be incorporated. 2 panels, 1 community	No Current Map Actions	3.01 NVUE Miles	High
43	Cottonwood Creek (Guthrie, City of)	New detailed study recommended as part of Cottonwood Creek dam decommissioning to better define risk. Previous buyouts in Guthrie on repetitive loss structures. Long history of flooding. 5 panels, 2 communities	No Current Map Actions	Action and Awareness 20.2 NVUE Miles	Medium
44	Tributaries to Cottonwood Creek (Logan County)	County has identified mitigation opportunity to eliminate flooding at Seward Road and Midwest Boulevard by straightening the road. Awaiting funding opportunity to implement.	No Current Map Actions	Action and Awareness	Community Action
45	Bird Creek (Logan County)	County wants to replace the wooden bridge on University east of Midwest in order to increase capacity. Awaiting funding opportunity.	No Current Map Actions	Action	Community Action
46	Logan County	Actions that the county has identified as priorities: FEMA safe room rebate program, obtain and distribute weather radios, road mitigation projects to reduce or eliminate flooding, generators for fire stations. Awaiting funding opportunities to implement.	No Current Map Actions	Action	Community Action
47	Logan County	The county would like to replace culverts to improve drainage. They are looking into funding mechanisms for this.	No Current Map Actions	Action	Community Action

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Item	Location of Need/Project	Details	Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation
48	Tributaries to Deer Creek (Logan County)	County has identified flood mitigation needs at low water crossings on Meridian Road between Waterloo Road and Simmons Road, as well as a low water crossing on MacArthur. Seeking funding opportunities to install bridges or box culverts to eliminate risk at crossings.	No Current Map Actions	Action	Community Action
49	Skeleton Creek (Logan County)	County has identified need to mitigate bridge on Eo630 Road. Seeking funding opportunity to implement.	No Current Map Actions	Action	Community Action
50	Skeleton Creek (Logan County)	Bluff area near Highway 74 on Skeleton Creek should not be in the floodplain. Detailed study or LOMA required. 2 panels, 1 community	No Current Map Actions	14.82 NVUE Miles	High
51	Cimarron River (Logan County)	Multiple LOMAs in Twin Lakes area just east of the Kingfisher County line. Need for a detailed study in this area. 4 panels, 3 communities	No Current Map Actions	26.61 NVUE Miles	High
52	Cimarron River (Logan County)	Bluff area in Cimarron City should not be in the floodplain. Estimated 12-15 LOMAs since 2002. Need for a detailed study in this area. Two houses have fallen off an embankment due to erosion and undercutting. Possible FEMA training/education/outreach opportunity. 4 panels, 3 communities	No Current Map Actions	32.97 NVUE Miles Action Measure 1	High
53	Cimarron River and Cottonwood Creek (Logan County)	Current maps show inaccurate flooding at Highway 77 bridge north of Guthrie. Need for a detailed study in this area. 4 panels, 2 communities	No Current Map Actions	11.17 NVUE Miles	High
54	Tributaries to Horse Creek (Marshall, Town of)	Town plans to install culverts to improve drainage under North Missouri St, Lake St, Cedar St, and Oklahoma St.	No Current Map Actions	Action	Community Action
55	Sand Creek (Fairview, City of)	Built retention area and channel; planning on second retention area to help significant flooding issues. Detailed study requested. CNMS Status is "Unknown" 2 paper panels (Fairview); 0 panels currently exist for Major County 2 communities	No Current Map Actions	Action Measure 1 Action Measure 2 2.81 NVUE Miles	High
56	Gypsum Creek and Sand Creek (Fairview, City of)	Existing maps are from 1983. New detailed study needed throughout community. Extensive new construction in or near the floodplain creating greater risk of flooding due to outdated maps. Flood mitigation may be necessary in area to relieve flooding from increased runoff. CNMS Status is "Unknown" 2 paper panels (Fairview); 0 panels currently exist for Major County 2 communities	No Current Map Actions	Map modernization 8.5 NVUE Miles 50.73 total miles	High
57	Gypsum Creek and Sand Creek (Fairview, City of)	Two studies have been done on the drainage issues on the NE side of town, one with and one without multi-jurisdictional funding. Need leads for funding and plans. Implement drainage improvements indicated in studies to reduce flooding when funding is obtained. LOMR would need to be incorporated.	No Current Map Actions	Action	Community Action

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Item	Location of Need/Project	Details	Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation
58	Gypsum Creek and Sand Creek (Fairview, City of)	Drainage channel filters to a creek but the creek backs up. Channel improvements needed to improve capacity and prevent backup. Community needs funding for study and improvements. LOMR would need to be incorporated.	No Current Map Actions	Action	Community Action
59	Gypsum Creek and Sand Creek (Fairview, City of)	New detailed study needed throughout community. FEMA mitigation training/education/outreach opportunity to help community identify and manage risk. City seeking funding opportunities for comprehensive study and implementation of findings. CNMS Status is "Unknown" 2 paper panels (Fairview); 0 panels currently exist for Major County 2 communities	No Current Map Actions	8.5 NVUE Miles 50.73 total miles	High Community Action
60	Fairview, City of	Substantial residential development, some in the floodplain. Actively seeking funding opportunities for comprehensive study and to implement findings. CNMS Status is "Unknown" 2 paper panels (Fairview); 0 panels currently exist for Major County 2 communities	No Current Map Actions	8.5 NVUE Miles 50.73 total miles	High Community Action
61	Major County	County wants to obtain funding for county floodplain administrator.	No Current Map Actions	Action and Awareness	Community Action
62	Meno, Town of	Anytime the town gets more than 2-3" of rain at a time, the main culvert in town can back up into people's front yards. The main flooding issues are at the intersection of Main St & Frederick St, and at the intersection of Prospect Ave & Park Street. Seeking funding opportunities to improve drainage at this site.	No Current Map Actions	Action Measure 1	Community Action
63	Bethany, City of	City is in the process of updating their emergency operations plan.	No Current Map Actions	Action	Community Action
64	Edmond, City of	City officials are seeing LOMAs with incorrect BFE determinations. 3 communities, 2 panels	No Current Map Actions	Action and Awareness	Medium
65	Chisholm Creek (Edmond, City of)	Edmond/OKC boundary; continuity issues, quite a few re-mappings done over the years. Edmond does not want BFEs changed based on OKC study on Chisholm Creek. Focus on tie-ins with OKC studies. 4 panels, 3 communities	No Current Map Actions	23.13 NVUE Miles Awareness	High
66	Santa Fe Creek (Edmond, City of)	Retirement area with lake, floodway going through lake on first countywide (2002). 2009--floodway through homes and lots; Edmond wants FEMA to verify this area. 2 panels, 2 communities	No Current Map Actions	4.59 NVUE Miles	High
67	Turtle Creek (Edmond, City of)	Action identified in HMP includes Turtle Creek detention pond. Seeking funding opportunity to implement.	No Current Map Actions	Action	Community Action
68	Edmond, City of	Action identified in HMP includes Willowood Addition Flood Mitigation Project. Seeking funding opportunity to implement.	No Current Map Actions	Action	Community Action

Item	* Description of Need Evaluation Guide: High = local community would immediately benefit from the action, and FEMA's metrics would also be met Medium = local community would benefit over the longer term from the action, and a portion of FEMA's metrics may be met Low = local community activities can continue without this revision, and FEMA's metrics are not affected Community Action = activity would be more appropriate as a community-led action rather than a FEMA-led action		Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation
	Location of Need/Project	Details			
69	Bluff Creek and Tributaries (Oklahoma City, City of)	Compliance issue: new residential development pressures north of downtown Oklahoma City. New detailed study requested to regulate development in floodplain. 3 panels, 2 communities	No Current Map Actions	Awareness 14.37 NVUE Miles	High
70	Oklahoma City, City of	Working on CRS application.	No Current Map Actions	Action	Community Action
71	Chisholm Creek (Oklahoma City, City of)	Need to identify mitigation solutions and implement drainage improvements to reduce/eliminate flooding on Chisholm Creek.	No Current Map Actions	Action and Awareness	Community Action
72	Tributary of Deer Creek (Oklahoma City, City of)	LOMR with FEMA near Canadian County/Oklahoma County boundary. LOMR will need to be incorporated. 2 panels, 2 communities	No Current Map Actions	6 NVUE Miles	High
73	Bluff Creek (Oklahoma City, City of)	LOMR by developer; major development pressure in northern Oklahoma City. LOMR will need to be incorporated. 5 panels, 3 communities	No Current Map Actions	32.17 NVUE Miles	High
74	Chisholm Creek (Oklahoma City, City of)	Major flooding in 2010-2011. Rapid development on the north end of the city. New watershed study in progress by local engineering firm. Developing detention basin criteria to address impacts of flooding events in 2010-2011. Will be utilized to lessen impact of development. LOMR will need to be incorporated.	No Current Map Actions	Action Measure 2	Medium
75	Oklahoma City, City of	City is in the process of developing a comprehensive drainage plan to identify local drainage issues.	No Current Map Actions	Action Measure 2	Community Action
76	Bloody Rush Creek (Oklahoma County)	Development along approximate Zone A mostly in Logan City - floodplain may be wider than shown. Convert Zone A to detailed study. 1 panel, 1 community	No Current Map Actions	4.09 NVUE Miles	High
77	Deer Creek (Oklahoma County)	Preliminary stage study of bridge construction to raise road to serve as an emergency route out of the area when it floods (north of Oklahoma City in Oklahoma County).	No Current Map Actions	Action and Awareness	Community Action
78	Oklahoma County	Request for additional CRS & SRL and insurance claim information.	No Current Map Actions	Awareness	Low
79	Bluff Creek (Oklahoma County)	Tie-in with OKC on Bluff Creek re-study--possible concern upstream channelization. 5 panels, 3 communities	No Current Map Actions	32.17 NVUE Miles	Medium
80	Oklahoma County	Actively seeking funding opportunities for bridge replacements at NW 192nd Street, NW 178th Street, and Henney Road to increase capacity and reduce flooding.	No Current Map Actions	Action	Community Action

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Item	Location of Need/Project	Details	Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation
81	Oklahoma County	Significant new development in area north of Oklahoma City. Largest development going in at MacArthur Road and Route 78 - south of floodplain - 198 homes planned on 160 acres. New hydrology and modeling requested. 5 panels, 3 communities	No Current Map Actions	32.17 NVUE Miles	High
82	Crooked Oak Creek, Deep Fork Creek, Cottonwood Creek, Crutco Creek (Oklahoma County)	Actively seeking funding opportunities for Crooked Oak Creek drainage improvement, Deep Fork and Cottonwood channel improvements, Waterloo flood control, Crutco flood control to reduce flooding.	No Current Map Actions	Action and Awareness	Community Action
83	Oklahoma County	County is considering elevating NW 178th and install culverts, NW 220th Street and NW 234th Street to reduce flooding.	No Current Map Actions	Action	Community Action
84	Deer Creek (Oklahoma County)	Primary area of concern is the Deer Creek Development. Homes typically do not flood but access roads flood frequently, cutting community (including a school) off from emergency services. County is in the process of developing an access route through the area - Planning to elevate road or build bridge in order to maintain access during events. Estimated \$9-10 million project. 5 panels, 2 communities	No Current Map Actions	26.66 NVUE Miles Action Measure 2	High
85	Warr Acres, City of	City would like to improve drainage at NW 34th & Hammond. Seeking funding opportunity to implement.	No Current Map Actions	Action	Community Action
86	Warr Acres, City of	City is applying to the state for a grant to purchase and install generators at critical facilities.	No Current Map Actions	Action	Community Action
87	Warr Acres, City of	The Twin Lakes development is primary SFHA - several homes in the development received LOMA. 4 panels, 3 communities	No Current Map Actions	8.53 NVUE Miles	High
88	Lahoma Tributary Turkey Creek (Lahoma, Town of)	Convert Zone A to a detailed study 1 panel, 2 communities	No Current Map Actions	2.51 NVUE Miles	High
89	Blaine County	County is currently in paper format and needs to be converted to digital format. Additional flood study needs and level of detail to be determined.	No Current Map Actions	Map modernization 63.11 NVUE Miles 97.22 total miles in watershed	High
90	Alfalfa County	Determine Flood Hazards in Alfalfa County within Watershed as county is currently unmapped. Number of panels and level of study to be determined, 2 communities.	No Current Map Actions	Map modernization 0 NVUE Miles 53.19 total miles in watershed	Low

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Item	Location of Need/Project	Details	Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation
91	Major County	Determine Flood Hazards in Major County within Watershed as majority of county is currently unmapped. Number of panels and level of study to be determined, 4 communities.	No Current Map Actions	Map modernization 8.55 NVUE Miles in Town of Fairview 438.71 total miles in watershed	Low
92	Kingfisher County	Cottonwood Creek Dam Decommissioning may have effect on hydraulics 28 panels, 5 communities	No Current Map Actions	334.32 NVUE Miles Awareness	High