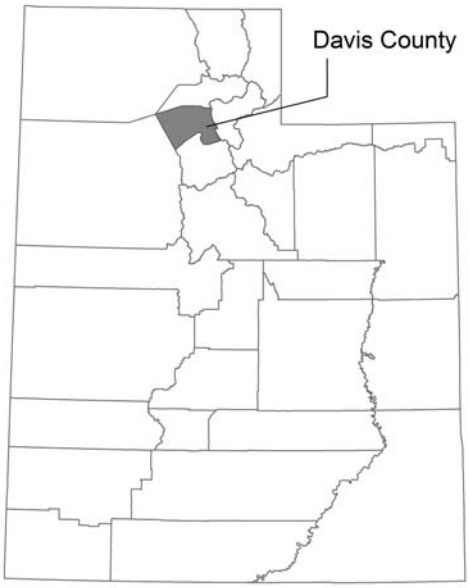
FLOOD INSURANCE STUDY

DAVIS COUNTY, UTAH,

AND INCORPORATED AREAS
VOLUME 1 OF 3



Community Name	Community Number
Bountiful, City of	490039
Centerville, City of	490040
Clearfield, City of	490041
*Clinton, City of	490042
Farmington, City of	490044
Fruit Heights, City of	490045
Kaysville, City of	490046
Layton, City of	490047
North Salt Lake, City of	490048
South Weber, City of	490049
Sunset, City of	490050
*Syracuse, City of	490051
West Bountiful, City of	490052
West Point, City of	490053
Woods Cross, City of	490054
Davis County (Unincorporated Areas)	490038

* No Special Flood Hazard Areas Identified

REVISED:

PRELIMINARY
FEBRUARY 28, 2014

Federal Emergency Management Agency
FLOOD INSURANCE STUDY NUMBER
49011CV001B

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

This FIS report was revised on _____. Users should refer to Section 10.0, Revisions Description, for further information. Section 10.0 is intended to present the most up-to-date information for specific portions of this FIS report. Therefore, users of this FIS report should be aware that the information presented in Section 10.0 supersedes information in Sections 1.0 through 9.0 of this FIS report.

Initial Countywide Effective Date: June 18, 2007

Revised Countywide Effective Date: _____

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1

1.1 Purpose of Study 1
1.2 Authority and Acknowledgments 1
1.3 Coordination 2

2.0 AREA STUDIED 7

2.1 Scope of Study 7
2.2 Community Description 14
2.3 Principal Flood Problems 23
2.4 Flood Protection Measures 28

3.0 ENGINEERING METHODS 30

3.1 Coastal Hydrologic Analyses 30
3.2 Riverine Hydrologic Analyses 31
3.3 Coastal Hydraulic Analyses 36
3.4 Riverine Hydraulic Analyses 39
3.5 Vertical Datum 43

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS 43

4.1 Floodplain Boundaries 43
4.2 Floodways 44

5.0 INSURANCE APPLICATIONS 63

6.0 FLOOD INSURANCE RATE MAP 63

7.0 OTHER STUDIES 66

8.0 LOCATION OF DATA 66

9.0 BIBLIOGRAPHY AND REFERENCES 66

10.0 REVISIONS DESCRIPTION 70

10.1 Physical Map Revision (2013) 70

TABLE OF CONTENTS (Cont'd)

Page

FIGURES

Figure 1 - Transect Location Map 38
Figure 2 - Floodway Schematic 45

TABLES

Table 1 – Summary of Streams Studied 10
Table 2 – Peak Flow Values along the Weber River 27
Table 3 – Summary of Coastal Stillwater Elevations 30
Table 4 – Summary of Discharges 33
Table 5 – Transect Data 37
Table 6 – Manning's "n" Values 39
Table 7 – Floodway Data Table 46
Table 8 – Community Map History 65
Table 9 – Letters of Map Revision 74

Volume II

EXHIBITS

Exhibit 1 - Flood Profiles

Baer Creek	Panels	001P – 012P
Barton Creek Lower Reach	Panels	013P – 019P
Barton Creek Upper Reach	Panels	020P – 027P
Barton Creek 500 South Split	Panels	028P – 031P
Davis Creek	Panels	032P – 033P
Davis Creek 55 West Split	Panel	034P
Davis Creek I-15 Split	Panel	035P
Dry Hollow #2	Panels	036P – 040P
Farmington Creek	Panels	041P – 045P
Haight Creek	Panels	046P – 057P
Holmes Creek	Panels	058P – 073P
Holmes Creek Lower Reach	Panels	074P – 075P
Holmes Creek Diversion	Panel	076P
Holmes Creek Tributary	Panels	077P – 078P
Hooper Canyon Creek	Panels	079P – 095P
Jordan River	Panels	096P – 097P
Kays Creek and North Fork Kays Creek	Panels	098P – 104P
Kays Creek Bike Path Split	Panel	105P
Kays Creek I-15 Split	Panel	106P
Kays Creek Railroad Split	Panel	107P
Middle Fork Kays Creek Lower Reach	Panels	108P – 110P
Middle Fork Kays Creek Upper Reach	Panels	111P – 113P

Volume III

Mill Creek	Panels	114P – 124P
North Canyon Creek	Panels	125P – 136P
North Canyon Creek Split	Panel	137P
North Fork Holmes Creek	Panels	138P – 148P
North Fork Holmes Creek I-15 Split	Panel	149P
North Fork Holmes Creek Diversion	Panels	150P – 158P
North Fork Stone Creek	Panels	159P – 165P
Ricks Creek	Panels	166P – 168P
Rudd Creek	Panel	169P
Shepard Creek	Panel	170P
Snow Creek	Panels	171P – 180P
South Fork Kays Creek	Panels	181P – 187P
Steed Creek	Panels	188P – 192P
Stone Creek	Panels	193P – 207P
Stone Creek Split	Panel	208P
Weber River Upper Reach	Panels	209P – 213P

PUBLISHED SEPARATELY:
Flood Insurance Rate Map

FLOOD INSURANCE STUDY
DAVIS COUNTY, UTAH, AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Davis County, including the cities of Bountiful, Centerville, Clearfield, Clinton, Farmington, Fruit Heights, Kaysville, Layton, North Salt Lake, South Weber, Sunset, Syracuse, West Bountiful, West Point, Woods Cross and the unincorporated areas of Davis County (referred to collectively herein as Davis County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that on the effective date of this study, the cities of Clinton and Syracuse have no mapped Special Flood Hazard Areas (SFHA). This does not preclude future determinations of SFHAs that could be necessitated by changed conditions affecting the community (i.e. annexation of new lands) or the availability of new scientific or technical data about flood hazards.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence, and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the original study for the City of Bountiful were performed by the U.S. Army Corps of Engineers (USACE), Sacramento District, for the Federal Insurance Administration, under Interagency Agreement No. IAA-H-16-75, Project Order No. 17. This work, which was completed in August 1976, covered all significant flooding sources affecting the City of Bountiful.

The hydrologic and hydraulic analysis for the original study for the cities of Centerville, Farmington, Fruit Heights, Kaysville, Layton, South Weber, and West Bountiful, and the unincorporated areas of Davis County were performed by Gingery Associates, Inc., for the Federal Emergency Management Agency (FEMA) under Contract No. H-4790. This work for the cities of Farmington, Fruit Heights, and West Bountiful was completed in December of 1979. The analysis for the unincorporated areas of Davis County was completed in July of 1980. The analysis for the cities of Kaysville and Layton were completed in August of 1980. The analysis for the City of South Weber was completed in January of 1980. The analysis for the City of Centerville was completed in November of 1980.

In June of 1988 for the cities of Centerville and Farmington, and August of 1988 for the City of Bountiful, the first revision for these cities was published to incorporate the results of a mud flow analysis. The hydrologic and hydraulic analyses for this study were performed by the USACE, Omaha District, for FEMA, under Interagency Agreement No. EMW-84-E-1506.

The hydrologic analysis for the original study of the Jordan River was performed by Rollins, Brown, and Gunnell, Inc., for FEMA under contract no H-4593. This study was revised on September 30, 1994, to include a restudy of the Jordan River conducted by CH2M Hill, for FEMA under contract No. EMW-90-C-3104. This work was completed in September 30, 1997. These analyses were performed for the Salt Lake County FIS.

Initial Countywide FIS

No new hydrologic and hydraulic analyses were completed as part of for the initial County-wide study in 2007.

Physical Map Revision (2013)

Please refer to Section 10.0 for details on this revision.

1.3 Coordination

City of Bountiful

During the original study, direct contacts were made with the City Manager, City Engineer, City Planning Director, local Chamber of Commerce, and the University of Utah Library.

An initial coordination meeting for the original FIS was held on December 4, 1974. Information on study procedures, data required, and floodways and their determinations was presented. The meeting was attended by representatives of the Federal Housing Administration; Federal Insurance Administration; State of Utah; City of Bountiful; and the USACE, Sacramento District.

On August 2, 1976, an intermediate coordination meeting was attended by representatives of the Federal Insurance Administration, Federal Highway Administration, Utah Department of Transportation, City of Bountiful, and the study contractor. Technical data relative to the study were reviewed in the meeting. Questions on flow values used in the study were raised by the representatives of the city and the Utah Department of Highways but could not be resolved during the meeting. In a letter dated July 13, 1977, the Federal Insurance Administration directed that the Flood Insurance Report be completed using flow values originally determined in the hydrologic analyses made for the study by the study contractor.

The results of the original study were reviewed at a final coordination meeting held in the city's council chambers on September 21, 1977. The meeting was attended by members of the city council; the Mayor; the City Planner, Manager, Engineer, Attorney, and Treasurer; representatives of the Federal Insurance Administration and the Sacramento District USACE, and South Division; the local press; and several residents. There were no adverse comments regarding the study.

On August 5, 1983, an initial coordination meeting was held at the Bountiful City Office Building to determine which streams in the community were affected by mudflow and mud flood hazards, and what historical data for mudflow and mud flooding in Bountiful were available. The meeting was attended by representatives of the City of Bountiful, FEMA Region 8, the USACE Omaha District, and the Hydrologic Engineering Center, Davis, California.

On November 9, 1987, an intermediate coordination meeting was held in the Bountiful City Office Building to present the preliminary results of the mudflow portion of the study to the community. This meeting was attended by representatives of the City of Bountiful, Davis County, FEMA Region 8, and the USACE Omaha District. Some minor revisions were incorporated into the final study results because of input from participants at this meeting.

On April 7, 1988, a second intermediate coordination meeting was held in the Bountiful City Office Building to present the preliminary results of the total study to the community. This meeting was attended by representatives of the City of Bountiful, Davis County, FEMA Region 8, and the USACE Omaha District.

The results of the study were reviewed at the final Consultation and Coordination Officer Meeting held on April 10, 1991, and attended by representatives of the City of Bountiful and FEMA. All questions raised at that meeting have been addressed in this study.

Please refer to section 10.0 for the 2013 Physical Map Revision affecting the City of Bountiful.

City of Centerville

Streams requiring detailed study were identified at a meeting attended by representatives of the study contractor, FEMA, and the City of Centerville on April 25, 1978.

During the course of the work done by the study contract, hydrologic and other flood information coordinate with representatives from FEMA, Davis County Planning Commission, the USACE, the U.S. Geological Survey, and the City of Centerville.

The final coordination meeting for the original study was held on April 13, 1981, and was attended by representatives of the study contractor, and citizens and officials of the City of Centerville. No problems were raised at this meeting.

On August 4, 1983, an initial coordination meeting was held at the Centerville City Office Building to determine which streams in the community were affected by mudflow and mud flood hazards, and what historical data for mudflow and mud flooding in Centerville were available. The meeting was attended by representatives of the City of Centerville, FEMA Region 8, the USACE Omaha District, and the Hydrologic Engineering Center, Davis, California.

On November 9, 1987, an intermediate coordination meeting was held in the Centerville City Office Building to present the preliminary results of the mudflow portion of the study to the community. This meeting was attended by representatives of the City of Centerville, Davis County, FEMA Region 8, and the USACE Omaha District. Some minor revisions were incorporated into the final study results because of input from participants at this meeting.

On April 7, 1988, a second intermediate coordination meeting was held in the Centerville City Office Building to present the preliminary results of the total study to the community. This meeting was attended by representatives of the City of Centerville, ESI Engineering, Davis County, FEMA Region 8, and the USACE Omaha District. Some minor revisions were incorporated into the final study results because of input from participants at this meeting.

On November 20, 1990, the results of the restudy were reviewed at an intermediate/final community coordination meeting. This meeting was attended by representatives of the City of Centerville, the state of Utah, FEMA and the study contractor.

At this meeting, the city protested to the Special Flood Hazard Areas (SFHA) on Ricks and Parrish Creeks. To support their protest, Centerville submitted to FEMA technical information regarding mudflow volumes and debris basin capacities developed by Davis County, Utah. A review of this data showed that the mudflow volumes developed by the Davis County model more accurately represents the physical conditions of these canyons and that the debris basins along Ricks and Parrish Creeks have adequate storage capacities for the calculated mudflow volumes. Therefore, downstream of the debris basin on Ricks and Parrish Creeks, the SFHA has not been revised. Upstream of the basin, the SFHA is shown as approximate flooding using the boundaries which were determined by the USACE.

City of Farmington

For the original study, streams requiring detailed and approximate study were identified at a meeting attended by representatives of the study contractor, the Federal Insurance Administration, and the City of Farmington on April 25, 1978. During the course of work done by the study contractor, hydrologic and other flood information was coordinated with the Federal Insurance Administration and the other agencies involved.

The results of the original study were reviewed at the final community coordination meeting held on September 10, 1980. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the city. No problems were raised at the meeting.

On August 4, 1983, an initial coordination meeting was held at the Farmington City Office Building to determine which streams in the community were affected by mudflow and mud flood hazards, and what historical data for mudflow and mud flooding in Farmington were available. The meeting was attended by representatives of the City of Farmington, FEMA Region 8, the USACE Omaha District, and the Hydrologic Engineering Center, Davis, California.

On November 10, 1987, an intermediate coordination meeting was held in the Davis County Courthouse Building to present the preliminary results of the mudflow portion of the study to the community. This meeting was attended by representatives of the City of Farmington, Davis County, FEMA Region 8, and the USACE Omaha District. Some minor revisions were incorporated into the final study results because of input from participants at this meeting.

On April 7, 1988, a second intermediate coordination meeting was held in the Davis County Courthouse Building to present the preliminary results of the total study to the community. This meeting was attended by representatives of the City of Farmington, ESI

Engineering, Davis County, FEMA Region 8, and the USACE Omaha District. Some minor revisions were incorporated into the final study results because of input from participants at this meeting.

The results of this study were reviewed at the final Consultation Coordination Officer Meeting held on February 5, 1992, and attended by representatives of Farmington, Davis County, and FEMA.

At this meeting, the city protested the SFHAs on Shepard, Farmington, Rudd, Steed, and Davis Creeks. To support their protest, Farmington submitted to FEMA technical information regarding mudflow volumes and debris basin capacities developed by Davis County personnel. A review of this data showed that the mudf1ow volumes developed by the Davis County model more accurately represent the physical conditions of these canyons. Therefore, based on this information, the SFHAs on Shepard and Rudd Creeks were revised to show the flooding contained within the channel downstream of the canyon mouth to the debris basins. No information was submitted regarding the channel capacities of Farmington and Steed Creeks, and no debris basin exists along Davis Creek. Therefore, no changes to those SFHAs were warranted.

Please refer to section 10.0 for the 2013 Physical Map Revision affecting the City of Farmington.

City of Fruit Heights

Streams requiring detailed and approximate study were identified at a meeting attended by representatives of the study contractor, the Federal Insurance Administration, and the City of Fruit Heights on April 25, 1978.

During the course of the study, hydrologic procedures, flood elevations, flood boundaries, and floodway delineations were reviewed with officials of the Federal Insurance Administration and other agencies involved.

The results of this study were reviewed at a final community coordination meeting held on September 8, 1980. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the city. No problems were raised at the meeting.

Please refer to section 10.0 for the 2013 Physical Map Revision affecting the City of Fruit Heights.

City of Kaysville

Streams requiring detailed and approximate study were identified at a meeting attended by representatives of the study contractor, FEMA, and the City of Kaysville on April 24, 1978. During the course of work done by the study contractor, hydrologic procedures, flood elevations, flood boundaries, and floodway delineations were reviewed with officials of the Utah Department of Natural Resources and the Federal Emergency Management Agency.

The final coordination meeting was held on March 10, 1981, and was attended by city residents and representatives of the FEMA, the study contractor, and city officials. No problems were raised at the meeting.

Please refer to section 10.0 for the 2013 Physical Map Revision affecting the City of Kaysville.

City of Layton

Streams requiring detailed and approximate study were identified at a meeting attended by representatives of the study contractor, the FEMA, and the City of Layton on April 25, 1978. Results of the hydrologic analyses were coordinated through the USACE, Sacramento District; the Utah Division of Water Resources; the U.S. Geological Survey; the Davis County Planning Commission; and other agencies involved.

The final community meeting was held on March 12, 1981, and attended by representatives of the FEMA, the study contractor, and the city. No problems were raised at the meeting.

Please refer to section 10.0 for the 2013 Physical Map Revision affecting the City of Layton.

City of South Weber

Stream reaches requiring detailed and approximate study were identified at an initial coordination meeting held in April 1978. This meeting was attended by community officials, representatives of the Federal Insurance Administration, and the study contractor.

The results of this study were reviewed at a final community coordination meeting held on June 10, 1980. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the city. No problems were raised at the meeting.

Please refer to section 10.0 for the 2013 Physical Map Revision affecting the City of South Weber.

Unincorporated Areas of Davis County

Streams requiring detailed and approximate study were identified at a meeting attended by representatives of the study contractor, FEMA, and Davis County on April 25, 1978. During the course of work done by the study contractor, hydrologic and other flood information was coordinated with FEMA and the other agencies involved.

The final coordination meeting was held on April 13, 1981, and was attended by representatives of FEMA, the study contractor, and the county. No problems were raised at the meeting.

Please refer to section 10.0 for the 2013 Physical Map Revision affecting the Unincorporated Areas of Davis County.

City of West Bountiful

Streams requiring detailed and approximate study were identified at a meeting attended by representatives of the study contractor, the Federal Insurance Administration, and the City of West Bountiful, on April 25, 1978. Results of the hydrologic analyses were presented to the Utah Department of Natural Resources, which was the state coordinator for Utah at the time.

During the course of the study, hydrologic procedures, flood elevations, flood boundaries, and floodway delineations were reviewed with officials of the Utah Department of Natural Resources and the Federal Insurance Administration.

The results of this study were reviewed at a final community coordination meeting held on September 9, 1980. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the city. No problems were raised at the meeting.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Davis County, Utah, including the incorporated communities listed in Section 1.1. Table 1, "Summary of Streams Studied" lists all streams studied. Limits of those streams studied by detailed methods are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

The areas studied by detailed methods were originally selected and studied with priority given to all known flood hazards and areas of projected development or proposed construction through 1985. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

The studies updated in 2013 were chosen with consideration given to all proposed construction and forecasted development through June 2010 (please refer to Section 10.0).

City of Bountiful

The limits of detailed and approximate study in the City of Bountiful were determined by the Federal Insurance Administration after consultation with the community and the study contractor.

City of Centerville

Floods caused by overflow of Ricks Creek (Ford Creek), Barnard Creek, Parrish Creek, Stone Creek (Ward Creek), and Deuel Creek (Centerville Creek) through Centerville were studied in detail for the original study. The limits of study on Ricks, Barnard, and Parrish Creeks are the eastern corporate limits (as of 1992) and the Railroad. The study segments on Stone and Deuel Creeks are defined by the 1992 corporate limits. Approximate methods of analysis were used to study 0.9 mile of Lone Pine Creek. Lone Pine Creek, Ricks Creek, Barnard Creek, Parrish Creek, Deuel Creek and Stone Creek were all restudied by detailed and limited detailed methods in 1988 to determine the hazard associated with mudflow and mud flood events.

City of Farmington

Floods caused by the overflow of Davis Creek, Steed Creek, Farmington Creek, Rudd Creek, Shepard Creek, and Haight Creek were studied in detail for the original study. The upstream and downstream study limits of these streams, with the exception of Rudd and Shepard creeks, were defined by the Farmington corporate limits (as of 1996). Rudd Creek was studied from its confluence with Farmington Creek upstream to the Farmington corporate limits. Shepard Creek was studied from approximately 1,000 feet downstream of State Highway 106 upstream to the 1996 corporate limits.

Davis Creek, Steed Creek, Farmington Creek, Rudd Creek, and Shepard Creek were all restudied to determine the hazards associated with mudf1ow, and mud flood events. The upstream and downstream study limits of these streams are the same as the original study.

City of Fruit Heights

Floods caused by the overflow of Baer Creek, Haight Creek, and Shepard Creek were studied in detail. The lengths of these study reaches are 1.2, 1.3, and 0.01 miles, respectively. Approximate methods were used to study the flood hazards of three small unnamed creeks located between Shepard and Haight Creeks.

City of Kaysville

Streams studied by detailed methods were Holmes Creek, Holmes Creek Tributary, North Fork Holmes Creek, and Baer Creek. The lengths of these study reaches are 3.2, 1.1, 0.1, and 1.2 miles, respectively.

City of Layton

The limits of detailed and approximate studies were determined by the Federal Insurance Administration with community and study contractor consultation at the meeting in April 1978.

Streams studied by detailed methods were North Fork Holmes, Snow, Kays, South Fork Kays, Middle Fork Kays, and North Fork Kays Creeks. The lengths of these study reaches are 1.6, 3.5, 3.2, 2.2, 1.7, and 2.5 miles respectively.

City of South Weber

Weber River was studied by limited detailed methods for approximately 3.5 miles in western South Weber and by approximate methods for approximately 1.0 mile in eastern South Weber, due to lack of development.

Unincorporated Areas of Davis County

The limits of detailed and approximate studies were determined by the Federal Insurance Administration, with community and study contractor consultation, at the meeting in April 1978.

Streams studied in detail were the following: Hooper Canyon Creek, North Canyon Creek, Davis Creek, Steed Creek, Farmington Creek, Haight Creek, Baer Creek, Holmes Creek, North Fork Holmes Creek, Kays Creek, Snow Creek, Rudd Creek, and Barton Creek.

Flooding along Weber River was evaluated by approximate analyses from the City of South Weber 2.4 miles upstream to the Davis County-Morgan County limits.

City of West Bountiful

The limits of detailed and approximate studies in West Bountiful were determined by the Federal Insurance Administration with community and study contractor consultation at the meeting in April 1978.

Floods caused by the overflow of Barton Creek, Mill Creek, Stone Creek, and Deuel Creek through West Bountiful were studied in detail. The length of these study reaches are 1.6, 1.1, 0.9, and 0.7 miles, respectively. Due to the nature of flooding along Deuel Creek, this stream was studied by shallow-flooding methods.

Table 1. Summary of Streams Studied

Community Name	Flooding Sources
Contract No. H-4790	
City of Centerville	Ricks Creek
	Stone Creek
City of Farmington	Farmington Creek
	Haight Creek
	Steed Creek
City of Fruit Heights	Baer Creek
	Haight Creek
	Shepard Creek
City of Kaysville	Baer Creek
	Holmes Creek
	Holmes Creek Tributary
	North Fork Holmes Creek
City of Layton	Kays Creek
	North Fork Holmes Creek
	Middle Fork Kays Creek
	North Fork Kays Creek
	Snow Creek
	South Fork Kays Creek
City of South Weber	Weber River

Table 1. Summary of Streams Studied (Continued)

Community Name	Flooding Sources
Unincorporated Areas of Davis County	Baer Creek Barton Creek Farmington Creek Haight Creek Holmes Creek Hooper Canyon Creek Kays Creek North Canyon Creek North Fork Holmes Creek Rudd Creek Snow Creek Steed Creek
City of West Bountiful	Barton Creek Mill Creek Stone Creek
Contract No. EMW-84-E-1506	
City of Bountiful	Zone A Mudflow Analysis
City of Centerville	Zone A Mudflow Analysis
City of Farmington	Zone A Mudflow Analysis
Contract No. H-4953	
Salt Lake County	Jordan River
Contract No. EMW-90-C-3104	
Salt Lake County	Jordan River
Contract No. EMD-2009-GR-0980	
Unincorporated Areas of Davis County	
City of South Weber	Weber River (Highway 89 to County Boundary)

Table 1. Summary of Streams Studied (Continued)

Community Name	Flooding Sources
Contract No. EMD-2010-GR-1080 (2013 FIS Update)	
City of Bountiful	Barton Creek (Limited Detail Study – 3.5 Mi.) Reach: Bountiful Blvd to corporate limits
	Dry Hollow #2 (Limited Detail Study – 1.0 Mi.) Reach: East corporate limit to Orchard Drive
	Mill Creek (Limited Detail Study – 3.7 Mi.) Reach: East corporate Limit to I-15
	North Canyon Creek (Detailed Study – 0.8 Mi.) Reach: 400 East Street to Orchard Drive
	North Canyon Creek (Limited Detail Study – 2.1 Mi.) Reach: 1.5 Mi. upstream of Bountiful Blvd to 400 East
	North Fork Stone Creek (Detailed Study – 1.5 Mi.) Reach: East corporate limit to Stone Creek
	Stone Creek (Limited Detail Study – 3.5 Mi.) Reach: East to west Bountiful corporate limit
City of Farmington	Davis Creek (Detailed Study – 1.0 Mi.) Reach: From 200 East to I-15)
	Farmington Creek (Detailed Study – 1.0 Mi.) Reach: From I-15 to 500 South
City of Fruit Heights	Haight Creek (Detailed Study – 1.5 Mi.) Reach: From Mountain Road to Main Street

Table 1. Summary of Streams Studied (Continued)

Community Name	Flooding Sources
City of Kaysville	Baer Creek (Approximate Study – 0.7 Mi.) Reach: I-15 to Shepard Lane
	Holmes Creek Diversion (Limited Detail Study – 1.3 Mi.) Reach: Holmes Cr. to 1.3 Mi. downstream of Holmes Cr.
	North Fork Holmes Creek (Limited Detail Study – 1.8 Mi.) Reach: I-15 to Holmes Creek
City of Layton	Kays Creek (Detailed Study – 4.8 Mi.) Reach: South Fork Kays to corporate limit)
	Middle Fork Kays Creek (Detailed Study – 1.6 Mi.) Reach: corporate limit to South Fork of Kays Creek)
	North Fork Holmes Creek (Detailed Study–1.8 Mi.) Reach: I-15 to Holmes Creek
	North Fork Holmes Creek Diversion (Limited Detail Study) – 2.0 Mi.) Reach: Highway 89 to North Fork of Holmes Creek)
	North Fork Kays Creek (Detailed Study – 3.0 Mi.) Reach: Highway 89 to Kays Creek
	Snow Creek (Detailed Study – 1.5 Mi.) Reach: Adams Reservoir Dam to North Fork of Holmes Creek)
	South Fork Kays Creek (Detailed Study – 2.7 Mi.) Reach: Corporate limit to Kays Creek

2.2 Community Description

City of Bountiful

For most of its history, the City of Bountiful has had an economy based primarily on agriculture. Over time the city has become an increasingly popular residential area for people who work in Salt Lake City and Ogden and at various military bases within commuting distances, but who prefer to live in the quiet, less hurried atmosphere of a small community. However, agriculture is still important in the economy of Bountiful, and it has developed as the business and professional center of south Davis County and cannot be strictly considered a developing bedroom community.

Bountiful is located approximately 4 miles north of Salt Lake City and 30 miles south of Ogden, the two largest cities in Utah, and has a population of 42,552 (U.S. Department of Commerce, 2010). The city is in the southeast corner of Davis County, which is in north-central Utah. Bountiful borders Centerville on the north, West Bountiful and Woods Cross on the west, and an unincorporated area known as Val Verde on the south. Great Salt Lake lies a short distance to the west and the Sessions Mountains, a sub-range of the Wasatch cordillera, rise immediately to the east. The city lies in an extensive area of fertile, arable land on a series of terraces and benches left by the prehistoric recession of Lake Bonneville.

The floodplains of the streams under study abound with residential and commercial structures. A hospital and associated professional buildings are located along Barton Creek, which crosses the downtown section of Bountiful. The city hall, public library, and a number of commercial buildings are located along Mill Creek, and there are schools and shopping centers along Stone Creek. Numerous city streets, State Highways 131 and 106, and various public utilities either cross or are located in floodplain areas. In general, the west and west-central sections of the city are developed for commercial and some light industrial uses, and the northern, eastern, and southern sections are devoted to residential uses. Continuing development in the city is expected, and pressure leading to intensified floodplain use will undoubtedly accompany such development.

Bountiful is served by Interstate Highway 15 and U.S. Highways 89 and 91, and is at the junction of State Highways 131 and 106. Rail transportation is provided by two railroad lines. Passenger and air freight services from many major carriers are available at Salt Lake City International Airport.

Dry Hollow No.2 is an intermittent stream which originates approximately 1 mile northeast of the Bountiful city limits at an elevation of 6,800 feet. It flows in a southwesterly direction to a point approximately 1,700 feet east of 400 East Street where the channel becomes undefined. Streambed slopes range from 1,500 feet per mile in the upper basin to 420 feet per mile near the downstream study limit.

Stone Creek is a perennial stream which has a well-defined channel through the City of Bountiful. It originates about 3 miles east of Bountiful at an elevation of about 8,600 feet. It flows in a northwesterly direction and empties into the marshlands along the Farmington Bay of the Great Salt Lake at an elevation of about 4,200 feet. It has a large, deep channel above the canyon mouth and a smaller well-defined channel through the developed area of Bountiful. Streambed slopes on Stone Creek vary from over 1,500 feet per mile in the upper basin to 100 feet per mile in the lower basin near the mouth, with an overall basin slope of 550 feet per mile.

The North Fork Stone Creek is a right bank tributary of Stone Creek that originates approximately 2 miles northeast of Bountiful at an elevation of 7,600 feet. The North Fork Stone Creek flows in

a southwesterly direction to its confluence with Stone Creek just upstream of 400 East Street. Streambed slopes on the North Fork Stone Creek range from over 1,000 feet per mile in the upper basin to 400 feet per mile in the lower basin near the mouth, with an overall streambed slope of 900 feet per mile.

Barton Creek originates approximately four miles east of Bountiful at an elevation of about 8,700 feet and flows in a northwesterly direction through Bountiful. Barton Creek empties into the marshlands along the Farmington Bay of the Great Salt Lake at an elevation of about 4,200 feet. It has a large, deep channel above the canyon mouth and a smaller well-defined channel through the developed area of Bountiful. Streambed slopes on Barton Creek vary from over 1,000 feet per mile in the upper basin to 100 feet per mile in the lower basin near the mouth, with an overall basin slope of 500 feet per mile.

Mill Creek originates about five miles east of Bountiful at an elevation of approximately 9,200 feet. It flows in a northwesterly direction through Bountiful. Mill Creek empties into the marshlands along the Farmington Bay of the Great Salt Lake at an elevation of about 4,200 feet. It has a large, deep channel above the canyon mouth and a smaller well-defined channel through the developed area of Bountiful. Streambed slopes on Mill Creek vary from over 900 feet per mile in the upper basin to 100 feet per mile in the lower basin near the mouth, with an overall basin slope of 450 feet per mile.

The extremely steep slopes on the easternmost edge of the Bountiful corporate limit are not conducive to development or agricultural uses. Below the steep mountain sides of the Wasatch Front, the topography flattens to the foothills and then to the lake plain. As the slopes flatten traveling west from the mountains, the land use changes to agricultural, then to moderately dense developed city, and finally back to agricultural or swampy areas along the edge of the Great Salt Lake. Orchard fruits are grown on the relatively steep undeveloped lake plain areas. Much of the swampy area along the Great Salt Lake near Bountiful is part of the Farmington Bay National Wildlife Refuge.

The native vegetation consists mainly of salt grass and wire grass on the low terraces and bottom lands. Sage brush and brushy oak grow on the higher terraces and as far up as approximately 7,500 feet. Above that elevation are plain forests of aspen, fir, pine, and spruce.

The climate in Bountiful is classified as temperate semi-arid. Average annual precipitation varies from approximately 14 inches per year in the city to 40 inches per year in the headwaters areas.

Winter time precipitation usually occurs as snow, and a snow pack usually accumulates in the higher elevations. Consecutive cloudburst storms that produce intense, short-duration rainfall can be expected from mid-April through September, but they most frequently occur in spring and fall. In the lower elevations, temperatures range from winter lows around 9 degrees Fahrenheit (°F) to summer highs around 100°F.

City of Centerville

Centerville lies in eastern Davis County, in north-central Utah, approximately 10 miles north of Salt Lake City, and has a population of 15,335 (U.S. Department of Commerce, 2010). It is bordered by the City of Bountiful, Utah, on the south, the City of Farmington, Utah, on the north, unincorporated Davis County on the east, and Farmington Bay of the Great Salt Lake on the west. The corporate limits presently include an area of approximately 3,780 acres. Most of the land use in the floodplains studied in detail is low density residential and commercial or open space.

Lone pine Creek originates on Bountiful Peak at an elevation about 8,000 feet. The bed slope of Lone Pine Creek varies from 1,400 feet per mile in the upper reaches of the drainage basin to 30 feet per mile near the mouth, with an overall average basin slope of 910 feet per mile.

Ricks Creek originates on Bountiful Peak at an elevation of about 9,300 feet. Streambed slopes on Ricks Creek vary from 1,850 feet per mile in the upper basin to 30 feet per mile in the lower basin near the mouth, with an overall basin slope of 1,070 feet per mile.

Bernard Creek originates approximately three miles east of Centerville at an elevation of about 8,700 feet. Streambed slopes range from 1,400 feet per mile in the upper basin to 30 feet per mile in the lower basin near the mouth, with an overall streambed slope of 840 feet per mile.

Parrish Creek originates approximately three miles east of Centerville at an elevation of 8,900 feet. Streambed slopes range from 1,500 feet per mile in the upper basin to 30 feet per mile in the lower basin near the mouth, with an overall streambed slope of 850 feet per mile.

Deuel Creek originates approximately four miles east of Centerville at an elevation of about 8,900 feet. Streambed slopes range from 2,000 feet per mile in the upper basin to 30 feet per mile in the lower basin near the mouth, with an overall streambed slope of 690 feet per mile.

A short segment of Stone Creek flows through Centerville in a concrete-lined channel from the corporate limits north of Pages Lane northward along Interstate Highway 15 for 0.3 mile before heading west into West Bountiful.

The extremely steep slopes on the easternmost edge of the Centerville corporate limits are not conducive to development or agricultural uses. Below the steep mountain sides of the Wasatch Front, the topography flattens to the foothills and then to the lake plain. As the slopes flatten traveling west from the mountains, land changes from agricultural to moderately dense developed city, and finally back to agricultural or swampy areas along the edge of the Great Salt Lake. Orchard fruits are grown on the relatively steep foothills with grains and vegetables grown on the undeveloped lake plain areas. Much of the swampy area along the Great Salt Lake near Centerville is part of the Farmington Bay National Wildlife Refuge.

The native vegetation consists mainly of salt grass and wiregrass on the low terraces and bottom lands. Sagebrush and brushy oak grow on the higher terraces and as far up as approximately 7,500 feet. Above that elevation are alpine forests of aspen, fir, pine, and spruce (U.S. Department of Agriculture, 1968).

Centerville has a temperate, sub-humid climate with four well defined seasons. The summers are warm and dry and the winters are cold but usually not severe. Average monthly temperatures range from 29°F in January to 76°F in July, with an average annual temperature of 52°F. Annual precipitation totals nearly 20 inches, with April being the wettest month and July being the driest month (U.S. Department of Commerce, August 1977).

The primary underlying soils east of State Highway 106 are of the Kilburn Association. They are well-drained to excessively well drained, gravelly, sandy loams and comprise the alluvial fans and high terraces (U.S. Department of Agriculture, 1968).

Most of the soils west of Highway 106 are in the Ironton-Logan-Draper Association. These are moderately well-drained to very poorly drained soils on floodplains and in depressions (U.S. Department of Agriculture, 1968).

City of Farmington

Farmington is in eastern Davis County, in north-central Utah, approximately 15 miles north of Salt Lake City. It was originally settled in 1848. Four years later, it was selected as the Davis County seat. The community is served by two major highways, Interstate Highway 15 and U.S. Highway 89. Farmington has a current population of 18,275 (U.S. Department of Commerce, 2010). The corporate limits presently include an area of approximately 6,320 acres.

There is low density development in the floodplain areas, with the exception of the lower end of Farmington Creek, which has some commercial development.

Farmington Creek is a perennial stream with a well-defined channel, and is the largest drainage through Farmington. It originates on Bountiful Peak at an elevation of about 9,300 feet. It flows into the Farmington Bay of the Great Salt Lake approximately 2 miles west of the downstream corporate limit of the City of Farmington at an elevation of approximately 4,200 feet. The bed slope of Farmington Creek varies from 550 feet per mile in the upper reaches of the drainage basin, to 45 feet per mile near the downstream study limit, with an overall average basin slope of 290 feet per mile. Rudd Creek is an intermittent left bank tributary of Farmington Creek. It originates about 2 miles east of Farmington at an elevation of about 8,300 feet and flows into Farmington Creek at an elevation of about 4,260 feet. Rudd Creek has a large deep channel above the canyon mouth, but is undefined in the developed area of Farmington. Streambed slopes on Rudd Creek vary from over 2,000 feet per mile in the upper basin to 550 feet per mile in the lower basin near the mouth, with an overall basin slope of 1,500 feet per mile.

Both Steed and Davis Creeks are intermittent streams with well-defined channels above, and poorly defined channels below State Highway 106. Both creeks originate on Bountiful Peak east of Farmington. Steed Creek originates at an elevation of about 9,300 feet and Davis at an elevation of about 9,100 feet. Both streams flow westerly through the southern part of Farmington and empty into the Farmington Bay of the Great Salt Lake at an elevation of about 4,200 feet. Streambed slopes on both Steed Creek and Davis Creek range from over 2,500 feet per mile in the upper basin to 550 feet per mile in the lower basin near the mouth, with an overall streambed slope of 830 feet per mile on Steed Creek and 1,700 feet per mile on Davis Creek.

Shepard Creek originates approximately 3 miles northeast of Farmington at an elevation of about 9,200 feet and flows westerly through the northern end of Farmington. Shepard Creek has a steep well-defined channel above State Highway 106. Below that point the channel becomes small and ill-defined, and has been obliterated by commercial development at the downstream study limit, approximately 1,000 feet downstream of State Highway 106. Its elevation at the downstream study limit is about 4,290 feet. Streambed slopes range from over 2,600 feet per mile in the upper basin to around 150 feet per mile at the downstream study limit with an overall basin slope of 1,180 feet per mile.

The extremely steep slopes on the easternmost edge of the Farmington corporate limit are not conducive to development or agricultural uses. Below the steep mountainsides of the Wasatch Front the topography flattens to the foothills and then to the lake plain. As the slopes flatten traveling west from the mountains, the land use changes to agricultural, then to moderately dense developed city, and finally back to agricultural or swampy areas along the edge of the Great Salt Lake. Orchard fruits are grown on the relatively steep foothills with grains and vegetables grown on the undeveloped lake plain areas. Much of the swampy area along the Great Salt Lake near Farmington is part of the Farmington Bay National Wildlife Refuge.

The native vegetation consists mainly of salt grass and wiregrass on the low terraces and bottom lands. Sagebrush and brushy oak grow on the higher terraces and as far up as approximately 7,500 feet. Above that elevation, there are alpine forests of aspen, fir, pine, and spruce (U.S. Department of Agriculture, 1968).

Farmington has a temperate, sub-humid climate with four well-defined seasons. The summers are warm and dry and the winters are cold but usually not severe. The average annual temperature is 52°F and the annual precipitation is about 20 inches (U.S. Department of Commerce, August 1977).

The primary underlying soils east of State Highway 106 are of the Kilburn Association. They are well-drained to somewhat excessively well-drained, gravelly, sandy loams and comprise the alluvial fans and high terraces.

Most of the soils west of Highway 106 are in the Ironton-Logan-Draper Association. These are moderately well-drained to very poorly drained soils on the floodplains and in depressions (U.S. Department of Agriculture, 1968).

City of Fruit Heights

Fruit Heights is in northeastern Davis County, in north-central Utah, approximately 15 miles north of Salt Lake City, and has a population of 4.987 (U.S. Department of Commerce, 2010). The corporate limits of Fruit Heights include an area of approximately 1,460 acres.

Fruit Heights has a temperate, semiarid climate characterized by warm, dry summers and cold, but usually not severe, winters. The average temperature in Fruit Heights is 51.5°F, and the annual precipitation totals 20 inches (U.S. Department of Commerce, August 1977).

The changes in topography in the area are often dramatic, with the high mountain peaks dropping abruptly to the low terraces and lake plains. Streams generally begin in the mountain basins and flow westerly through steep canyons of the Front Range of peaks into the urbanized lake plain. The native vegetation consists mainly of salt grass and wiregrass on the low terraces, and sage-brush and brushy oak on the higher terraces, as far up as approximately 7,500 feet. Above that elevation, alpine forest of aspen, fir, pine, and spruce is predominant.

The primary soils at Fruit Heights are of the Parleys-Timpanogos-Kidman Association. They are well-drained, and moderately well -drained loams (U.S. Department of Agriculture, 1968).

City of Kaysville

The City of Kaysville is in northeastern Davis County, in north-central Utah. The city has an area of approximately 2,250 acres, and a population of 27,300 (U.S. Department of Commerce, 2010).

Kaysville has a temperate, semiarid climate with four well-defined seasons with warm, dry summers and cold, but usually not severe, winters.

The average temperature is 51.5°F, and the annual precipitation totals 20 inches (U.S. Department of Commerce, August 1977).

The changes in topography are often dramatic with the high mountain peaks dropping to the low terraces and lake plains.

Streams generally begin in the mountain basins and flow westerly in steep canyons cut through the Front Range, toward the urbanized terrace and lake plain.

The native vegetation consists mainly of grasses (salt grass and wiregrass) at the low terraces and changes to small bushes and shrubs (sagebrush and brushy oak) at the higher terraces.

Above 7,500 feet, alpine forest of aspen, fir, pine, and spruce is predominant (U.S. Department of Agriculture, 1968; and U.S. Department of the Army, June 1974).

All four creeks flow southwesterly through Kaysville. Holmes Creek flows at an average slope of 106 feet per mile. At the canyon mouth, it has a drainage area of 2.5 square miles, and drains a total area of 4.6 square miles at the downstream limit of study. Holmes Creek Tributary flows at an average slope of 260 feet per mile. It has a drainage area of 1.3 square miles at the downstream study limit. North Fork Holmes Creek flows at an average slope of 20 feet per mile. At the canyon mouth, it has a drainage area of 2.3 square miles, and has a total drainage area of 5.8 square miles at the downstream study limit. Baer Creek flows at an average slope of 58 feet per mile. At the canyon mouth, it drains an area of 3.4 square miles, and has a total drainage area of 4.6 square miles at the downstream study limit.

The primary underlying soils are of the Ironton-Logan-Draper Association. They are moderately well drained to very poorly drained (U.S. Department of Agriculture, 1968).

City of Layton

The City of Layton is in northeastern Davis County, in north-central Utah. The city has an area of approximately 8,400 acres, and a population of 67,311 (U.S. Department of Commerce, 2010).

The population of Layton grew from 9,027 in 1960 to 13,603 in 1970 to 22,603 in 1980. During this timeframe the City of Layton annexed the City of East Layton, thereby increasing its land area by 1,370 acres and its population by approximately 900 according to 1970 figures.

Layton has a temperate, semiarid climate with four well-defined seasons having warm, dry summers and cold but usually not severe, winters. The average temperature is 51.5°F, and annual precipitation totals 20 inches (U.S. Department of Commerce, August 1977).

The changes in topography are dramatic with the high mountain peaks dropping to the low terraces and lake plains.

Streams generally begin in the mountain basins and flow westerly, in canyons cut through the Front Range, toward the urbanized terrace and lake plain.

The native vegetation consists mainly of grasses (salt grass and wire grass) at the low terraces, and changes to small bushes and shrubs (sagebrush and brushy oak) at the higher terraces. Above 7500 feet, alpine forest of aspen, fir, pine, and spruce is predominant (U.S. Department of Agriculture, 1977; and U.S. Department of the Army, June 1977).

All six creeks studied by detailed methods flow southwesterly through Layton. North Fork Holmes Creek flows at an average slope of 275 feet per mile. It drains an area of 2.3 square miles at its canyon mouth and has a total drainage area of 5.8 square miles at the downstream limit of study. Snow Creek flows at an average slope of 202 feet per mile. At its canyon mouth, the drainage area is 1.1 square miles, and it drains a total area of 2.1 square miles at the downstream limit of study. Kays Creek flows at an average slope of 52 feet per mile. It drains a total area of

13.2 square miles at the downstream limit of study. South Fork of Kays Creek flows at an average slope of 513 feet per mile. It drains an area of 1.8 square miles at the canyon mouth and has a total drainage area of 6.3 square miles at the downstream limit of study. Middle Fork of Kays Creek flows at an average slope of 520 feet per mile. At its canyon mouth, the drainage area is 1.7 square miles, and it drains a total area of 3.1 square miles at the downstream limit of study. North Fork Kays Creek flows at an average slope of 168 feet per mile. It drains an area of 1.4 square miles at its canyon mouth.

The primary underlying soils are of the Ironton-Logan-Draper Association. They are moderately well drained to very poorly drained predominant (U.S. Department of Agriculture, 1977).

City of South Weber

The City of South Weber is located in northern Davis County in north-central Utah. It is approximately 5 miles south of Ogden, Utah. The Great Salt Lake lies 15 miles to the west. Uintah is directly opposite South Weber, on the Weber River. The total population of South Weber is 6,051 (U.S. Department of Commerce, 2010).

The study area includes the Weber River flood plain, which is a sparsely developed, urbanizing lake plain, having extensive fertile arable lands left by the postglacial recession of Lake Bonneville. Tributary drainage originates in the high front range of the Wasatch Mountains immediately to the east.

The climate of the area is temperate and semiarid. Summers are warm and dry; winters are cold, but not severe. The primary soils at South Weber are of the Parleys-Timpanogos-Kidman Association, and are well drained to moderately well-drained (U.S. Department of Agriculture, 1968). The native vegetation consists of salt grass, wiregrass and other grasses on the low terraces, in addition to small bushes and shrubs such as sagebrush and brushy oak at higher terraces and on slopes up to 7,500 feet. At higher elevations, an alpine forest of aspen, fir, pine, and spruce is predominant.

Unincorporated Areas of Davis County

Davis County is located in north-central Utah directly north of Salt Lake City, the largest city in Utah. The county has an area of 167 square miles, however approximately 87 square miles consists of the Great Salt Lake.

The county is served by several major highways that provide access south to Salt Lake City and north to Ogden. They are Interstate Highway 15, U.S. Highways 89 and 91, and State Highway 106.

The population of Davis County in 1975 was 126,097. In 1980 the population was estimated at 156,000, an increase of approximately 24 percent since 1975. In 2000 the population of Davis County was 238,994, and in 2010 the population grew to 306,479 (U.S. Department of Commerce, 2010).

Land use has changed from agricultural to other uses with increasing urbanization. Over 500 acres per year are expected to be lost, primarily to residential and commercial development (Weber River Water Quality Planning Council, June 1977). With the exception of an area east of North Salt Lake, the unincorporated areas of Davis County do not have extensive development. Individual communities within the county generally annex adjacent land as it is developed.

The major employer is Hill Air Force Base, located in the northern part of the county, which had over 14,000 civilian employees in 1975. Overall, nearly one-half of the working population is employed by Federal, State or local governments (Weber River Water Quality Planning Council, June 1977).

Agriculture remains important even though the acreage farmed is steadily decreasing. The primary crops produced are orchard fruits, sugar beets, grain, and truck crops (U.S. Department of Agriculture, 1968).

Changes in topography are dramatic. High mountain peaks descend with steep slopes to low terraces and lake plains. Streams in the area generally begin in the mountain basins and flow westerly in steep canyons cut through the Front Range, toward the urbanized terrace arid lake plain. The native vegetation consists mainly of grasses (salt grass and wire grass) at the low terraces, and changes to small bushes and shrubs (sagebrush and bush oak) at the higher terraces. Above 7,500 feet, alpine forest of aspen, fir, pine, and spruce is predominant (U.S. Department of Agriculture, 1968; and U.S. Department of the Army, June 1974).

Soil types change significantly from the mountains in the east down to the lake shore. Below the rocky, sandy soils in the mountains is a band of alluvial soils running the length of the county along the high terrace. Below the high terrace, from North Salt Lake to north of Farmington, are darker, wetter flood plain soils of the Ironton-Logan-Draper Association. North of the Farmington area, from U.S. Highway 89 west to within 2 or 3 miles of the lake are fairly well-drained sandy and loamy soils of the Parleys-Timpanogos-Kidman Association. Bordering Great Salt Lake are poorly-drained saline and alkali soils of the lake plain (U.S. Department of Agriculture, 1968).

Average annual precipitation ranges from 12 to 20 inches per year in the valley and foothill areas, and up to 30 inches per year in the mountainous areas. The mean annual temperature measured at Farmington is 51.5°F. The warmest month is July, with a mean temperature of 76° F, and the coolest month is January, with a mean temperature of 29°F (U.S. Department of Commerce, August 1977).

Hooper Canyon Creek, above the developed area, flows through a canyon approximately 100 feet deep and has a slope of 800 feet per mile. Below the canyon mouth, in the residential development, the channel is undefined. Drainage areas are 1.4 and 1.0 square miles at Orchard Drive and the canyon mouth, respectively.

North Canyon Creek flows through the southern end of the City of Bountiful, then through a portion of unincorporated Davis County, enclosed on three sides by the communities of North Salt Lake and Bountiful. Near the Bountiful corporate limits, the channel is deep and well defined, with a slope of 400 feet per mile however, near the downstream study limit at Orchard Drive, the channel is much shallower and has a slope of 330 feet per mile. The drainage area at Orchard Drive is 3.1 square miles.

Davis Creek and Steed Creek flow westerly through the southern end of Farmington and drain into Great Salt Lake. Both creeks are steep and have defined channels. At the canyon mouth, Davis and Steed Creeks have drainage areas of 2.1 square miles and 3.3 square miles, respectively.

Farmington Creek flows southwesterly through the City of Farmington and empties into Farmington Bay approximately 2 miles west of the corporate limits. It is a perennial stream with a well-defined channel. The drainage area is 10.5 square miles at the canyon mouth and 13.5 square miles at Interstate Highway 15. Farmington Creek has an average slope of 290 feet per mile.

Elevations in the basin range from approximately 4,200 feet at Farmington Bay to 9,259 feet on Bountiful Peak.

Haight Creek begins in Fruit Heights and flows approximately 4 miles to the Great Salt Lake with an average slope of 130 feet per mile. The drainage area at Interstate Highway 15 is 0.8 square mile.

Baer Creek flows southwesterly through Fruit Heights, Kaysville, and unincorporated Davis County with an average slope of 200 feet per mile. At the canyon mouth, Baer Creek drains an area of 3.4 square miles, and has a total drainage area of 4.6 square miles at Interstate Highway 15.

Holmes Creek flows through unincorporated Davis County in the north Kaysville area. Holmes Creek has drainage areas of 3.6 square miles at Fairfield Road and 2.5 square miles at the canyon mouth. The average slopes of study reaches in the county are 300 feet per mile above U.S. Highway 89, 210 feet per mile above the reservoir, and 106 feet per mile above Fairfield Road.

North Fork Holmes Creek flows through parts of Layton, Kaysville, and unincorporated Davis County. Drainage areas at Interstate Highway 15 and at the canyon mouth are 5.8 and 2.3 square miles, respectively. The study reach in the county has a slope of 130 feet per mile.

Kays Creek flows in a steep, well-defined, and (in a few places) quite deep channel down to Interstate Highway 15. Below Interstate Highway 15, including the 1-mile-long study reach in the county, the channel remains well defined, with a slope of 54 feet per mile and flat overbank areas. The drainage area at Flint Street is approximately 13.3 square miles.

Snow Creek flows at an average slope of 202 feet per mile. At its canyon mouth, the drainage area is 1.1 square miles, and it drains a total area of 2.1 square miles at the downstream study limit.

Rudd Creek, an intermittent tributary of Farmington Creek, has a large, deep channel above the canyon mouth. The drainage area at the canyon mouth is approximately 0.9 mile.

Barton Creek flows westerly through the City of West Bountiful. The drainage area at 500 West is approximately 6.6 square miles.

City of West Bountiful

West Bountiful is located in the southeast portion of Davis County, in north-central Utah. It is approximately 5 miles north of Salt Lake City, and has a population of 5,265 (U.S. Department of Commerce, 2010).

The corporate limits of West Bountiful include an area of approximately 1,910 acres. The average annual temperature in West Bountiful is 51.5°F, and the annual precipitation totals 20 inches (U.S. Department of Commerce, August 1977).

West Bountiful has a temperate, semiarid climate with four well-defined seasons and has warm, dry summers and cold, but usually not severe, winters. The changes in topography in the area are often dramatic, with the high mountain peaks dropping abruptly to the low terraces and lake plains. Streams in the area generally begin in the mountain basins and flow west through steep canyons as they cut through the front range of peaks toward the urbanized lake plain. The native vegetation consists mainly of salt grass and wiregrass on the low terraces. Sagebrush and brushy

oak grow on the higher terraces to an elevation of approximately 7,500 feet. Above that, alpine forest of aspen, fir, pine, and spruce is predominant.

All four creeks in West Bountiful flow westward through the city. Deuel Creek flows at an average slope of 45 feet per mile. At the canyon mouth, it drains an area of 3.1 square miles. At Interstate Highway 15, Deuel Creek has a drainage area of 3.4 square miles. Stone Creek flows at an average slope of 39 feet per mile. At 750 East, it drains an area of 5.5 square miles, and has a drainage area of 6.6 square miles at 500 West. Mill Creek flows at an average slope of 79 feet per mile. It drains an area of 10.5 square miles at Orchard Drive, and at Interstate Highway 15, it has a drainage area of 12.0 square miles. Barton Creek flows at an average slope of 46 feet per mile. At 500 West, it drains an area of 6.6 square miles.

Most of the soils in West Bountiful are of the Ironton-Logan-Draper Association. They are moderately well drained to very poorly drained (U.S. Department of Agriculture, 1968).

2.3 Principal Flood Problems

City of Bountiful, City of Centerville, and City of Farmington

Flooding which caused damage had occurred frequently prior to 1939 on the streams studied for this report. Major mudflow or flood events occurred on some or all of the streams studied in 1862, 1878, 1901, 1903, 1912, 1923, 1926, 1929, 1930, 1932, 1936, 1947, and 1983. The most destructive floods were the large mudflows and mud floods which occurred in 1923 and 1930 on all the streams in Farmington (U.S. Department of the Army, June 1974; U.S. Department of Agriculture, June 1958; U.S. Department of the Interior, 1946; Ray E. Marsell, 1972; Department of the Interior, 1972).

In Centerville flooding which caused damage had occurred frequently prior to 1939 with the exception of Stone and Deuel Creeks. Stone and Deuel Creek have also flooded in the past, but the flooding has been less frequent and resulted in little damage. The most destructive of the floods in Centerville occurred in 1923, 1930, and 1983. Many of the recorded floods on the streams studied for this FIS were caused by or are associated with mudflows or mud floods.

Mudflows and mud floods can form in two different ways. In almost all flood events, floodwaters can scour significant amounts of material from the streambed, causing the floodwaters to be heavily laden with sediment and debris. If the sediment and debris load exceeds 20 percent solids by volume it is termed a mud flood; if the sediment and debris load exceeds 45 percent solids by volume it is termed a mudflow. Mudflows and mud floods also result directly from shallow landslides caused when the water content of the soil is increased sufficiently to permit flow. Below the canyon mouth, the velocities decrease and the material is deposited in a fan shape over the more gently inclined slopes. In some cases, as the mudflows proceed downstream, some of the heavier solids will fall out of suspension and the flow evolves from a mudflow to a mud flood and finally to a water flood.

Ricks Creek flooded several times between 1923 and 1934. Several homes and over 200 acres of farmland were destroyed or damaged, resulting in $280,000 in total damages (U.S. Department of Agriculture, June 1958). A house adjacent to Ricks Creek along State Highway 106 was filled to the window sills with mud and debris in both 1929 and 1930, according to the owners (U.S. Department of the Interior, 1983).

Barnard Creek flooded in 1923 and in 1930. Over 70 acres of land were covered by rocks and other flood debris (U.S. Department of Agriculture, June 1958).

A mudflow on July 10, 1930, on Parrish Creek destroyed several homes near the mouth of the canyon and caved in one side of the Centerville School. The "bouldery alluvium" of the mudflow covered an area of nearly 65 acres with an average thickness of 3 feet. Subsequent mudflows on August 11 and September 4, 1930, left State Highway 106 under 15 feet of mud and debris (U.S. Department of the Interior, 1983).

On Farmington Creek, floods with abundant debris have occurred in 1878, 1923, 1926, and 1930. Seven people died in the mudflow event of August 13, 1923. On that date a man driving a four-horse team up Farmington Canyon heard a tremendous roar up the canyon and rushed up the mountainside just in time to see a mass of mud and rocks carry away his team and wagon. Observers in the canyon reported the crest of the mudflow to be 75 to 100 feet high in that part of the canyon at a width of about 200 feet. The crest farther down the canyon was estimated at 30 feet high. At Lagoon resort, about 2 km downstream of the mouth of Farmington Canyon, people were rescued from trees, where they had fled to escape rapidly rising water. On August 10, 1947, a mudf1ow occurred in Halfway Canyon, a tributary of Farmington Canyon, estimated at 210,000 cubic yards in volume. That mudflow damaged an instrument house and knocked a bridge off its foundation. A mudf1ow of approximately 22,000 cubic yards occurred in spring of 1983 on Farmington Creek (U.S. Department of the Interior, 1983).

Excavation for sewer lines downstream of the Shepard Creek Canyon has uncovered evidence of large boulders which may have been deposited by mudflows. Several mudflows did reach the main channel during the spring of 1983 (U.S. Department of the Interior, 1983).

On Davis Creek a mudflow on August 13, 1923, deposited “bouldery alluvium” over 31 acres with an average thickness of 1.5 feet. Records show floods on Davis Creek in 1878, 1901, 1903, 1929, and 1930, some of which may have been mudflows (U.S. Department of the Interior, 1983).

On Steed Creek in 1923 a mudf1ow deposited "bouldery alluvium" over a area of 21.6 acres. Below the Steed Creek Canyon mouth there is an historic 6.5 feet thick mudf1ow which is underlain by an older mudflow deposit. A mudflow of approximately 13,000 cubic yards occurred in the spring of 1983 (U.S. Department of the Interior, 1983).

Following widespread flooding along the Wasatch Front in the 1930s, a special commission concluded that the mudflows and mud flooding were caused by a depletion of plant cover due to overgrazing and man-caused fires on headwater lands. As a result, re-vegetation and soil stabilization measures were instituted. The absence of large mudflows after the re-vegetation and soil stabilization measures seemed to indicate that there was no longer a significant mudflow hazard. However, in the spring of 1983, widespread landslides and mudflows caused an estimated $250 million in damage in the State of Utah. Along a 30-mile stretch of the Wasatch Front, 92 significant landslides sent mudflows down on residential areas. More than 1,000 landslides occurred along the Wasatch Plateau. The destruction was so extensive that 22 of Utah's 28 counties were declared national disaster areas (U.S. Department of the Interior, 1983).
Records show that flooding occurred in Bountiful in 1948, 1950, 1952, 1953, 1955, 1958, 1968, 1969, and 1983. The maximum floods of record for Mill and Stone Creeks occurred in April and May 1952. On April 28, 1952, a peak flood discharge of 182 cubic feet per second (cfs) was recorded on Mill Creek. On May 5, 1952, an estimated discharge of 82 cfs was recorded on Stone Creek.

There are no gage records on Barton Creek, but it is assumed that a large flood flow probably occurred in May of 1952. Some of these flood events probably could be classified as mudflows or

mud floods at different points in the basin. Except for the 1983 event, no specific information is available regarding mudflows or mud flooding in Bountiful (USACE, 1969).

There is evidence of a prehistoric debris flow that reached the mouth of the Ward Creek Canyon (Stone Creek) as did a debris flow in the Spring of 1983 (U.S. Department of the Interior, 1983). There is no historical evidence of debris flows or debris floods in Holbrook Canyon (Barton Creek); however, the presence of a large partly-detached landslide in the canyon points to a high potential for mudflows and mud flooding (U.S. Department of the Interior, 1983).

Young alluvial fan deposits identified beyond the canyon mouth on Mill Creek suggest a history of recurrent debris floods. Debris flows reached the main channel during the spring of 1983 without extending beyond the canyon mouth (U.S. Department of the Interior, 1983).

A series of mudflows occurred on Rudd Creek in the spring of 1983, which deposited approximately 90,000 cubic yards of mud and debris over 17.9 acres to depths up to 20 feet within the canyon and from 12 to 2 feet deep just downstream of the canyon mouth. The largest flow occurred on Memorial Day, May 30, 1983, at about 7:00 PM. That flow dumped mud and debris into a four-block area just downstream of the canyon, destroying five homes outright and damaging four others beyond repair. No one was killed in this catastrophic mudflow, probably because it occurred during the day.

City of Fruit Heights

Many floods have occurred on Baer, Haight, and Shepard Creeks in the Fruit Heights area.

The most destructive of these, according to information from Davis County officials and a 1946 technical paper, were the large mass debris flows in 1923 and 1930, caused by heavy cloudburst storms (U.S. Department of the Interior, 1946). The mass-debris flow, or mud-rock flood, is a mixture of runoff, soil, rocks, boulders, and other debris, such as trees and shrubs collected as the mass moves down the canyon. Below the canyon mouth, the flow depth and velocity decrease as it spreads in a fan shape over the more gently inclined slopes.

Following the 1930 floods, a special commission concluded that the mud-rock floods were caused by depletion of plant cover due to overgrazing livestock and man-caused fires on headwater lands (U.S. Department of the Interior, 1972). As a result, re-vegetation and soil stabilization measures were instituted.

Since 1939, only one major flood has occurred in the Fruit Heights area. On August 10, 1947, a cloudburst storm Over Baer Creek caused a mud-rock flood which closed traffic on U.S. Highway 89 (U.S. Department of the Interior, 1972). The majority of the runoff, however, was held in the established channel.

City of Kaysville

Flooding on the waterways through Kaysville would most likely result from cloudburst storms centered over the drainage basins. Such storms, which may last from several minutes to a few hours, characteristically produce mass debris flow, which is a viscous mixture of floodwater, soil, rock, boulders, washed-out trees and brush, and other flood debris. The most common time for these cloudburst storms to occur is between May 15 and September 15. Flooding from snowmelt is not as serious as the hazard of thunderstorm flooding because snowmelt floods do not have the high peak flows or high velocity of floods caused by cloudburst storms.

Kaysville has experienced many floods in its history, most of them the result of severe thunderstorms centered over the canyons above the city. Newspaper records show floods occurring in 1882, 1892, 1901, 1916, 1917, 1922, 1926, 1929, 1931, and 1936. There are few, if any, definitive data on local flooding besides newspaper articles and accounts by people in the area.

Most of the damage from these floods occurred at the canyon mouths where mass-debris flow has its highest transportive power. There has been severe flooding in the business section of Kaysville, but most flooding has occurred over the farmlands close to the canyon mouths, leaving the land severely damaged from the deposition of sand, silt, and debris (U.S. Department of the Army, June 1974).

No major floods have occurred in Kaysville since the 1930s. This is partly due to the re-vegetation and soil stabilization measures instituted in the Davis County areas in the 1930s (U.S. Department of the Army, June 1974).

City of Layton

Flooding on the creeks through Layton would most likely result from cloudburst storms centered over the drainage basins. Such storms, which may last from several minutes to a few hours, characteristically produce mass-debris flow, which is a viscous mixture of floodwater, soil, rock and boulders, washed-out trees and brush, and other flood debris. The most common time for these cloudburst storms to occur is between May 15 and September 15. Flooding from snowmelt is not as serious as the hazard of thunderstorm flooding because snowmelt floods do not have the high peak flows or high velocity of floods caused by cloudburst storms.

Layton has experienced many floods in the past, but little definitive data on specific floods are available. Flooding has been reported in 1862, 1865, 1882, 1896, 1901, 1912, 1913, 1917, 1922, 1923, 1930, and 1935, with Snow Creek flooding the most frequently. Most of the damage from these floods occurred at the canyon mouths, where the mass-debris flow has its highest velocity. In 1922, the Kaysville irrigation dam broke and flooded the business section of Layton. Usually most of the flooding occurs over farmlands, close to the canyon mouths, leaving the land severely damaged from the deposition of sand, silt, and debris (U.S. Department of the Army, June 1977).

No major floods have occurred in Layton since the 1930s. This is partly due to the re-vegetation and soil stabilization measures instituted in the Davis County area in the 1930s (U.S. Department of the Army, June 1977).

City of South Weber

Rapid snowmelt from late April to early July constitutes the most serious flood hazard in the study area. Snowmelt floods are characterized by large-volume runoff, moderately high peak flows, and marked diurnal fluctuation in flow. Convection-type cloudburst storms can be expected during the summer months, but runoff from such storms does not constitute a flood hazard along the study reach of the river. The area has no history of significant rain floods, but general rain may augment snowmelt flows.

The largest snowmelt floods of record on the Weber River occurred in 1893, 1896, 1907, 1909, 1920, 1922, and 1952. However, little definitive data other than recorded or estimated flow values are available. Most newspaper accounts are very brief and too old to relate significantly to existing conditions. It is known that floods have caused extensive damage to agricultural lands and to roads and highways, particularly in the area downstream from the mouth of Ogden River.

Flood damage has been less severe upstream from that point. Available peak-flow values for major floods follow:

Table 2. Peak Flow Values along the Weber River

Year of Flood	Flow (Cubic Feet Per Second)
1893	7300[1]
1896	8000[1]
1907	8900[1]
1909	9500[2]
1920	9000[1]
1922	6700[1]
1952	7600[1]
1975	3800[1]
1986	6160[1]
2011	5040[2]

[1] At the "Weber River at Gateway" Stream Gage
[2] At the "Weber River near Plain City" Stream Gage

The 1975 flood has an estimated recurrence interval of 15 years. Estimates for recurrence intervals on the other floods listed above are not possible because they occurred prior to completion of a retention project on the Weber River.

Unincorporated Areas of Davis County

With the exception of the Weber River, floods on streams in Davis County are caused by general rains, melting snow, or severe summer thunderstorms centered over the upper basins. Flooding from summer thunderstorms can occur from mid-April through September, but most frequently occurs during the hot summer months of July and August. Snowmelt floods may occur from April through June. Flooding from snowmelt lasts longer and has larger volume than flooding from thunderstorms, but it does not have the high peak flows characteristic of thunderstorm floods. Minor flooding from general rains can be expected at any time of the year.

Prior to 1939, flooding occurred with some regularity along the streams in Davis County; however, there are no records of specific data such as discharges and recurrence intervals of individual floods (U.S. Department of Agriculture, June 1958; U.S. Department of the Interior, 1946; Utah Geological Association, 1972; U.S. Department of the Interior, 1972; Utah Agricultural Experiment Station, 1931).

The most destructive of these floods were large mass-debris flows in 1923 and 1930 which occurred on most streams in the county. A mass-debris flow is a concrete-like mixture of water, soil, rocks, boulders, and other debris collected as the mass moves down the canyon. Below the canyon mouth, the flow depth and velocity decrease as the mixture spreads in a fan shape over the flatter slopes.

Floods of this type have been the cause of loss of life, destruction of crops, and damage to buildings, highways, irrigation systems, and railroads. Consequently, following the 1930 floods, a special commission was formed. It concluded that the mud-rock floods were caused by depletion of the plant cover on headwater lands, man-caused fires, and overgrazing by livestock (U.S. Department of the Army, July 1971).

Acting on the findings of the commission, re-vegetation and soil stabilization measures were instituted. With these measures in effect, there have been no major floods reported (U.S.

Department of the Interior, 1966; and U.S. Department of the Interior, 1964-1977). The principal flood problems have consisted of occasional water in the streets, some flooded basements, and ponding on agricultural lands east of Interstate Highway 15 and the railroad.

On Weber River, flooding from rapidly melting snow from late April to early July constitutes the most serious flood hazard. Convective type cloudburst storms can be expected during the summer months, but runoff from such storms does not create a flood hazard along the study reach of the river. The largest snowmelt floods of record on Weber River occurred in 1896, 1907, 1909, 1920, 1922, and 1952 (U.S. Department of the Interior, 1966; and U.S. Department of the Interior, 1964-1977). Available peak flows for these major floods are outlined in Table 2.

City of West Bountiful

Floods on Barton, Mill, Stone, and Deuel Creeks are caused by general rains, melting snow, or severe summer thunderstorms over the upper basins. Flooding from summer thunderstorms can occur from mid-April through September, but most frequently occurs during the hot summer months of July and August. Snowmelt floods may occur during the period of April through June. Flooding from snowmelt lasts longer and has larger volume than flooding from thunderstorms, but does not have the high peak flows characteristic of thunderstorm floods. Minor flooding from general rains can be expected at any time of the year.

Although West Bountiful is known to have a long history of flooding, little definitive data on specific floods are available. Sketchy accounts by early settlers, brief newspaper articles, and official records indicate that flooding occurred on Barton, Mill, Stone, and Deuel Creeks in 1862, 1896, 1922, 1923, 1930, 1936, 1938, 1950, 1952, 1953, 1958, 1962, and 1969. At street crossings, bridges and culverts were damaged or washed out and the inadequate capacities of channel and culvert openings caused flooding that damaged industrial installations and interrupted refinery operations in West Bountiful. Basements and the lower floors of dwellings were damaged. Gardens and lawns were covered with deposits of sand, gravel, and silt (U.S. Department of the Army, 1968). The maximum floods of record for Mill and Stone Creeks occurred during the flood of April and May 1952. On April 28, an estimated discharge of 140 cfs, with a recurrence interval of 20 years, was recorded for Mill Creek.

On May 5, an estimated discharge of 82 cfs, with a recurrence interval of 7 years, was recorded for Stone Creek (U.S. Department of Housing and Urban Development, March 1978).There are no records of historic flooding for Barton and Deuel Creeks in this study area.

2.4 Flood Protection Measures

Cities of Bountiful, Centerville, Farmington, Kaysville, Fruit Heights, and Layton

From 1933 to 1939, much of the land in the upper basins of the streams studied in detail for this study were contour trenched and seeded by the Civilian Conservation Corps. Approximately 1,300 acres of land in the headwater areas of several watersheds were contour-trenched and seeded.

The channels of all the streams studied for this report have been modified to some degree from their natural state, especially in developed areas. Most of these channel changes were designed to carry frequent flow and do not provide protection from the 1-percent-annual-chance flood. Haight and Baer Creeks in the downstream one-half of their study reaches have wide, deep channels which provide large conveyance and minimize flooding.

Debris basins have been constructed on all of the streams studied for this report. The debris basins have varying degrees of effectiveness depending on their designs.

A debris basin was not constructed for Lone Pine Creek. A rock quarry on Lone Pine Creek just downstream of the canyon mouth acts as an effective debris basin. The remaining constructed debris basins have varying degrees of effectiveness depending on their designs. A detention structure has also been constructed on Barnard Creek approximately 3,500 feet downstream of the canyon mouth. There is a structure downstream of the railroad to divert Deuel Creek flow south to Stone Creek. Stone Creek runs in an open concrete channel between the two railroads. These channel sand debris basins are periodically maintained by Davis County and the City of Centerville to permit the passage of smaller floods.

The debris basins on Farmington and Shepard Creeks, and floodwalls on Steed and Davis Creeks were built in the 1930s by the Civilian Conservation Corps. A debris basin was constructed at the canyon mouth of Rudd Creek, after the mudflow event of 1983.

There is one reservoir on Holmes Creek that serves as an irrigation reservoir with a storage capacity of 190 acre-feet. It will also serve as a flood-control reservoir by reducing the peak discharge during flood season. Same high embankments are found on Holmes Creek, Holmes Creek Tributary, and North Fork Holmes Creek, which also provide storage to reduce the flood peaks.

There are two reservoirs in the City of Layton used for irrigation purposes. They help to control flooding by reducing the peak flood flow. Their flood-control effect, however, is only significant in the areas immediately below the reservoirs.

City of South Weber

The Weber River Basin Project, completed in the mid-1960s, provides moderate flood protection to South Weber. The combined storage capacity of all the reservoirs of the project is approximately 320,000 acre-feet (U.S. Department of the Army, April 1976).

Unincorporated Areas of Davis County

Following the mass-debris floods in 1930, watershed management research was started in Davis County. From 1933 to 1939, several conservation and flood-control measures were undertaken. Approximately 1300 acres of land in the headwaters area of several watersheds were contour-trenched and seeded. In addition, debris basins were constructed to trap sediment below the canyon mouths on Farmington Creek, Davis Creek, and Steed Creek (U.S. Department of Agriculture, June 1958). These debris basins do not appreciably reduce the peak flood flows in the lower reaches of the streams because of the additional discharge produced by runoff from developed areas.

Reservoirs of the Weber River Basin Project (completed in the mid-1960s by the U.S. Bureau of Reclamation and operated by the Weber River Water Users Association) provide a combined flood control reservation of approximately 320,000 acre-feet and afford a moderate degree of flood protection to the study area (U.S. Department of the Army, July 1971; U.S. Department of the Army, April 1976; U.S. Department of the Interior, January 1951; and U.S. Department of the Army, February 1961).

City of West Bountiful

There is a structure downstream of the Union Pacific Railroad to divert Deuel Creek flow south to Stone Creek. Along 500 South, an 11-foot by 4-foot box culvert was installed to ease the flow

from Mill Creek. Along Stone Creek, there is a concrete open channel between the two railroads. U.S. Forest Service lands in the upper reaches of the streams have received watershed treatment to retard erosion and decrease runoff, thus reducing flood peaks in the lower reaches. Davis County and the communities involved periodically maintain the channels of Barton, Mill, Stone, and Deuel Creeks to improve flow characteristics and permit passage of the smaller flood flows (U.S. Department of Housing and Urban Development, March 1978).

3.0 ENGINEERING METHODS

For the flooding sources studied 1-percent-annual-chance flood in any 50-year period is approximately by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood-hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Coastal Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

Coastal flood-frequency information has been developed for the Great Salt Lake coastline adjacent to Davis County by the USACE, and is presented in the publication Flood Plain Management Services Study for Davis County, Utah, 100-Year Flood for the Great Salt Lake (USACE, May 1996). A study analysis was conducted to determine the magnitude of wind-induced wave action for the 1-percent-annual-chance lake elevation for several locations along the eastern shore of the Great Salt Lake within Davis County. The 1-percent-annual chance stillwater lake elevations used for the analysis are summarized in Table 3 below.

Table 3. Summary of Coastal Stillwater Elevations

	Elevation (Feet NAVD[1])			
Flooding Source and Location	10-Year	50-Year	100-Year	500-Year
West Point	--	--	4,215	--
Syracuse	--	--	4,215	--
Kaysville	--	--	4,215	--
Farmington	--	--	4,215	--
Woods Cross	--	--	4,215	--

[1] North American Vertical Datum of 1988

The analysis reported in this study reflects the stillwater elevations due to tidal and wind setup effects. The effects of wave action were also considered in the determination of flood hazard

areas. Lakefront areas that are located above Stillwater flood elevations can still be severely damaged by wave run-up, wave induced erosion, and wave-borne debris. The extent of wave run-up above stillwater elevations depends greatly on the wave conditions and local topography.

The extent of wave run-up and the height of the storm waves are dependent not only on the specific geometry of the shoreline at a particular site, but also on the potential exposure of the shoreline to storm winds. For Davis County, the records for observed wind data at the Salt Lake City International Airport were checked for the wind directions that can act against the shoreline. The years of record used were between 1964 and 1994. The maximum 1-minute wind speeds used were based on the observed data. The 60-minute wind speeds were estimated by dividing the 1-minute wind speeds by 1.24 based on a study correlating 1-minute and 60-minute wind speeds (USACE, May 1996).

3.2 Riverine Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

For the previously published FIS issued in 2007, the basic hydrology was taken directly from a hydrology report prepared for the Federal Insurance Administration in October 1979 (U.S. Department of Housing and Urban Development, October 1979). The discharge-frequency relationships for each stream were developed for the snowmelt flood events, as well as for the rainfall flood events. These two distributions were statistically combined to give a discharge-frequency curve for the combined snowmelt-rainfall event.

The runoff records of 16 gaging stations in the general vicinity of the study were searched for the yearly peak flows caused by snowmelt and the yearly peak flows caused by rainfall.

For each gaging station, the 10-, 2-, 1-, and 0.2-percent-annual-chance frequency discharges were developed for both snowmelt and rainfall events from U.S. Water Resources Council methods (U.S. Water Resources Council, June 1977).

The stepwise regression approach was used in developing a total of eight regression equations for all four frequencies and the two types of flood events. Drainage area was found to be the key independent variable in the regression equations.

The regression equations representing the snowmelt flood events resulted in a good correlation coefficient, but the regression equations for the rainfall flood events provided poor correlation and were unacceptable. It was necessary to use a watershed model to simulate rainfall flood events.

The Storm Water Management Model (SWMM) developed by the U.S. Environmental Protection Agency was used to simulate rainfall flood events (U.S. Environmental Protection Agency). A total of 16 streams were simulated by the SWMM model to yield hydrographs for 10-, 2-, 1-, and 0.2-percent-annual-chance frequency storms. Through the use of the stepwise regression approach, regression equations were developed to predict the 10-, 50-, and l00-year frequency discharges at two locations; for example, at the canyon mouth and at a location downstream of the developed area. The 500-year frequency discharge is obtained by extrapolation of the 10-, 2-, 1-, and 0.2-percent-annual-chance frequency discharges.

In summary, the discharge-frequency distribution curve for a stream for snowmelt events was determined from an analysis of the gaging station records of the related regression equations. The discharge-frequency distribution curve of the rainfall events was evaluated from the results of the

SWMM model simulation or the related regression equations. These two independent events were statistically combined to yield a discharge-frequency distribution for the combined event.

For the mudflow analysis for the cities of Bountiful, Centerville, and Farmington that were conducted specifically to identify the flood hazards associated with mudflow and mud flooding, the standard hydrologic and hydraulic study methods usually employed for Flood Insurance Studies do not adequately define the hazards associated with mudflows. A major portion of this study effort was expended on the development of a method to define mudf1ow hazards. The mudflow hazard identification method was developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Center at Davis, California, in conjunction with the University of Utah and the USACE Omaha District.

Therefore, for the mudflow/mud flooding analysis the resulting discharges from the October 1979 hydrology report (U.S. Department of Housing and Urban Development, October 1979) were used in this study with two modifications. The first modification was to include the available data from the 1983 flood event in the hydrologic analysis. A second modification was needed to simulate the effect of potential high sediment loads in the floodwaters. It was determined in this study that floodwaters in the streams studied could contain up to 45 percent solids, including sediment, rocks, and debris (USACE, 1985). To account for the potential for high sediment and debris load the discharges were increased by a "bulking factor." Flows were increased by multiplying the basic discharges by a "bulking factor" of 1.82.

As part of this study, a mudflow hydrograph was required to determine the extent of the mudflow hazard. A methodology for calculating a mudflow hydrograph was developed as part of this study by the Hydrologic Engineering Center in conjunction with the University of Utah. The mudflow hydrograph methodology uses observed mudflow volumes along the Wasatch Front to develop a total mudflow volume potential versus drainage area curve. Using the drainage area, a mudflow volume was determined for each stream. The mudflow volume was then used as input to a one-dimensional routing model with a dam break upstream boundary condition. The one-dimensional model provided a mudflow hydrograph for use in determining mudf1ow depths on boundaries.

The flood discharges were also routed through the debris basins on Stone, Barton, and Mill Creeks to determine the effects that the debris basins have on peak flood flows.

The storage routing effect of upstream reservoirs was considered and was based upon the published reports by the U.S. Bureau of Reclamation and the U.S. Army Corps of Engineers (U.S. Department of the Army, July 1971; U.S. Department of the Army, April 1976; U.S. Department of the Interior, January 1951; and U.S. Department of the Army, February 1961).

The detailed hydrologic analysis for Deuel Creek in the City of West Bountiful is included in a hydrology report prepared for the Federal Insurance Administration in October 1979 (U.S. Department of Housing and Urban Development, October 1979).

The hydrologic analysis of the Jordan River is documented in the Flood Insurance Study for Salt Lake County Utah, and Incorporated Areas, dated August 2, 2012 (FEMA, August 2, 2012).

Section 10.0 describes the restudies performed as part of the 2013 FIS update.

Peak discharge-drainage area relationships for the streams studied by detailed methods are shown in Table 4 - Summary of Discharges.

Table 4. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Baer Creek					
At Shepard Lane	6.89	71	238	418	--
At Interstate Highway 15	4.6	60	125	160	250
At Canyon Mouth	3.4	45	65	80	110
Barton Creek					
At 500 West	7.5	175	518	793	--
Barton Creek 500 South Split					
At Interstate Highway 15	--	--	--	459	--
Davis Creek					
At Interstate Highway 15	1.84	5	49	116	173
Davis Creek 55 West Split					
At Interstate Highway 15	--	--	--	51	--
Davis Creek I-15 Split					
At Interstate Highway 15	--	--	--	61	--
Deuel Creek					
At Interstate Highway 15	3.4	135	280	360	600
Dry Hollow #2					
At Orchard Drive	0.6	16	53	76	--
Farmington Creek					
At Interstate Highway 15	13.5	395	890	1,250	2,400
At 500 South	13.3	407	660	784	1,041
At Clark Lane	13.1	350	650	895	1,775
At Canyon Mouth	10.5	310	460	570	1,100
Haight Creek					
At Interstate Highway 15	0.8	15	55	85	200
At State Highway 273	0.4	34	111	158	239
Holmes Creek					
At Interstate Highway 15	4.6	120	210	255	370
Below Reservoir	3.6	35	50	55	80
Above Reservoir	3.6	95	255	395	800
At Canyon Mouth	2.5	40	65	90	270
Holmes Creek Diversion					
At Mouth	7.6	135	383	534	--

Table 4. Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
Hooper Canyon Creek					
At Orchard Drive	1.4	50	120	160	320
At Canyon Mouth	1.0	16	25	33	67
Jordan River					
At Rose Park Golf Course Bridge	140.3[1]	1,200	1,200	1,200	1,200
Kays Creek					
At Weaver Lane	16.6	464	1,301	1,858	2,748
At Denver And Rio Grande Western Rail Trail	15.6	311	872	1,246	1,842
At Union Pacific Railroad	10.6	297	833	1,189	1,759
Kays Creek I-15 Split					
At Interstate Highway 15	--	10	50	100	500
Kays Creek Railroad Split					
At Union Pacific Railroad	--	--	445	813	1,417
Kays Creek Bike Path Split					
At Stone Creek Lane	--	--	40	135	270
Middle Fork Kays Creek Lower					
At Kays Creek Drive	0.8	33	129	202	306
Middle Fork Kays Creek Upper					
At Fernwood Drive	1.7	6	62	141	211
Mill Creek					
At Interstate Highway 15	13.8	76	521	957	--
North Canyon Creek					
At Orchard Drive	2.6	5	49	129	--
North Canyon Creek Split					
At Orchard Drive	--	--	--	61	--

[1]Drainage area does not include tributary area upstream of the Surplus Canal Diversion.

Table 4. Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
North Fork Holmes Creek					
At Mouth (S Angel Street)	10.6	285	290	295	300
At Interstate Highway 15	8.3	365	965	1,370	2,008
At 0.2 Miles Downstream From Oakhills Drive	3.9	40	125	185	500
At Oakhills Drive (Downstream Side)	3.4	35	60	85	90
At Oakhills Drive (Upstream Side)	3.4	35	160	290	970
At Canyon Mouth	2.3	35	60	80	215
North Fork Holmes Creek I-15 Split					
At Interstate Highway 15	--	80	675	1,074	1,708
North Fork Holmes Creek Diversion					
At Fiddler Creek Road	2.9	11	77	169	--
North Fork Kays Creek					
At Mouth	3.4	45	211	330	509
At Reservoir (Upstream)	1.2	1	11	29	43
North Fork Stone Creek					
At 400 East	1.05	27	80	112	--
Ricks Creek					
At Interstate Highway 15	3.1	110	230	300	520
Rudd Creek					
At Canyon Mouth	0.9	14	20	28	45
Shepard Creek					
At State Highway 106	2.5	35	90	145	390
At Canyon Mouth	2.3	35	60	90	215
Snow Creek					
At Fairfield Road	2.2	34	79	105	152
At Canyon Mouth	1.1	15	30	35	80

Table 4. Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet Per Second) 10-Year	50-Year	100-Year	500-Year
South Fork Kays Creek					
At Mouth	5.4	125	423	737	1,085
At Confluence with Middle Fork Kays Creek	3.9	62	191	379	543
At Canyon Mouth	1.8	6	61	144	214
Steed Creek					
At Interstate Highway 15	3.5	55	140	215	590
At Canyon Mouth	3.3	50	90	140	300
Stone Creek					
At Pages Lane	6.4	182	432	660	--
At Stone Creek Split (1400	6.2	--	--	246	--
N)	4.8	82	194	305	--
At 400 East					
Stone Creek Split					
At 1400 North	--	--	--	414	--
Weber River					
At Uintah	1,640	3,600	5,300	7,000	12,000
Upstream of Confluence with Ogden River	1,610	3,600	5,300	7,000	12,000

3.3 Coastal Hydraulic Analyses

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding source studied, were carried out to provide estimates of the elevations of floods of the 1-percent-annual-chance flood along the shoreline. For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM. Users of the FIRM should also be aware that coastal flood elevations are provided in the Summary of Stillwater Elevations table in this report. If the elevation on the FIRM is higher than the elevation shown in this table, a wave height, wave run-up and/or wave setup component likely exists, in which case, the higher elevation should be used for construction and/or floodplain management purposes.

Areas of coastline subject to significant wave attack are referred to as coastal high-hazard zones. The USACE has established the 3-foot breaking wave as the criterion for identifying the limit of coastal high-hazard zones (USACE, 1975). The 3-foot wave has been determined as the minimum wave capable of causing major damage to conventional wood frame or brick veneer structures.

Individual site control locations were selected based on the conditions that create the maximum wave run-up possible at that site and not necessarily the worse conditions for the system as a whole. These five locations are shown in Figure 1. Comparing the maximum individual site exposure to the maximum expected system exposure resulted in slightly adjusted elevation levels. System exposure is based on the maximum Stillwater lake elevation and wave action for

those sites may be reduced. This data provides the basis for establishing the shoreline interest between lake and ground line for normally open exposed shallow sloped shorelines.

For this analysis the Stillwater elevations for the 1-percent-annual-chance flood were used as the starting elevations for the computation of wave action and wave run-up. Wave heights and run-up depths were computed to the nearest 0.1 foot. The location of the 3-foot breaking wave and the run-up depth for determining the terminus of the V Zone (are with velocity wave action) was computed at each location. Table 5 provides a listing of the study areas, starting Stillwater elevations, as well as maximum wave crest elevations.

Table 5. Transect Data

		Elevation (Feet NAVD[1])	
Transect	Location	1% Annual-Chance Stillwater	Maximum 1% Annual-Chance Wave Crest
1	City of West Point	4,215	4,218.6
2	City of Syracuse	4,215	4,218.7
3	City of Kaysville	4,215	4,219.1
4	City of Farmington	4,215	4,219.3
5	City of Woods Cross	4,215	4,219.3

[1] North American Vertical Datum of 1988

After analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic maps, aerial photography, and engineering judgment. Controlling features affecting the elevations were identified and considered in relation to their positions at a particular transect and their variations between transects.

The offshore lake elevation is the summation of the 1-percent-annual-chance Stillwater lake elevation, wind set, and half of the wave height (no run-up potential). Ponding areas are areas that are flooded but are protected by levees or other features. The flood elevations expected are the result of Stillwater lake elevation and wind set but do not include any wave action. These areas were evaluated and established by the engineers performing the study during the field assessment (USACE, May 1996).

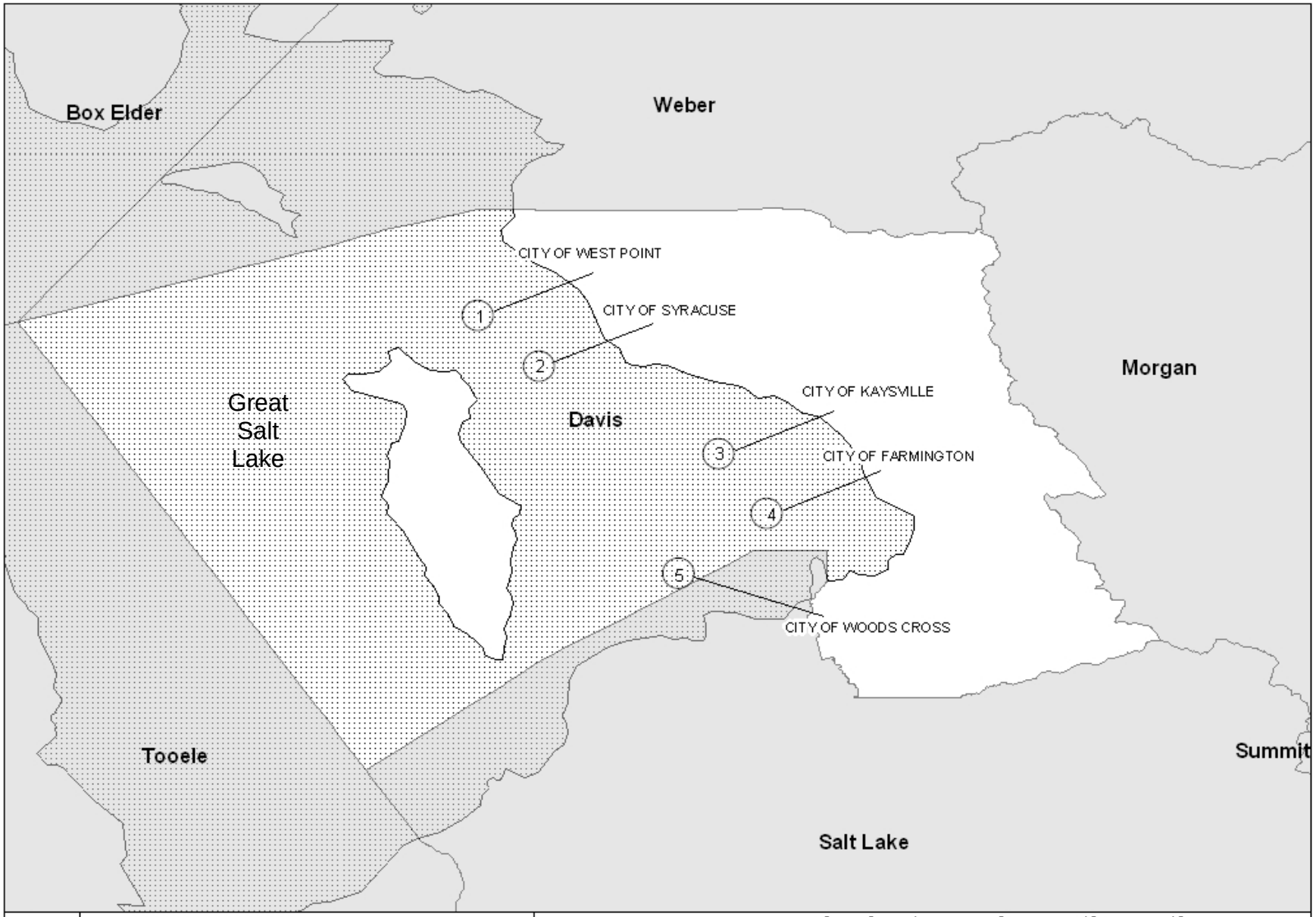


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

APPROXIMATE SCALE 0 2 4 8 12 16 Miles

TRANSECT MAP

3.4 Riverine Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data Table in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

Water-surface elevations of floods of the selected recurrence intervals were computed using the U.S. Army Corps of Engineers HEC-2 step-backwater computer program (U.S. Department of the Army, February 1977).

Cross section data for Baer, Barton, Height, Holmes Creek, Kays, Middle Fork Kays, Mill, North Fork Holmes, North Fork Kays, Shepard, Snow, South Fork Kays, Stone, and Deuel Creeks and Holmes Creek Tributary were obtained from topographic maps at a scale of 1:2400, with a contour interval of 2 feet (U.S. Department of Housing and Urban Development, 1979 [Aerial Photography Flown December 1978]).

Cross section data for Hooper Canyon Creek were taken from topographic maps and aerial photography (U.S. Department of the Interior, Photorevised 1969; U.S. Department of the Interior, Photorevised 1969 and 1975; and City of Bountiful and Davis County, April 1976).

Cross section data for Kays Creek within the unincorporated areas of Davis County were taken from topographic maps (U.S. Department of the Interior, Photorevised 1969 and 1975).

Cross section data for North Canyon Creek, Steed Creek, Farmington Creek, and Rudd Creek were taken from topographic maps (U.S. Department of Housing and Urban Development, 1979 [Aerial Photography Flown December 1978]; and City of Bountiful and Davis County, April 1976).

All bridges, dams, and culverts were measured to obtain elevation data and structural geometry.

Roughness coefficients (Manning's "n") for the flooding sources were estimated by field inspection at each cross section. The channel and overbank roughness value ranges for each stream are given in the following list. These values were estimated by field inspection at each cross section.

Table 6. Manning's "n" Values

Stream	Channel	Overbank
Baer Creek	0.030-0.035	0.040-0.100
Barton Creek	0.017-0.035	0.017-0.100
Davis Creek	0.030-0.040	0.030-0.100
Deuel Creek	0.020-0.050	0.050
Dry Hollow #2	0.035-0.080	0.160-0.080
Farmington Creek	0.030-0.040	0.030-0.040
Haight Creek	0.035	0.040-0.100
Holmes Creek	0.045-0.055	0.040-0.055
Holmes Creek Diversion	0.035	0.040
Holmes Creek Tributary	0.045-0.055	0.040

Table 6. Manning's "n" Values

Hooper Canyon Creek	0.050-0.80	0.060-0.080
Kays Creek	0.030-0.035	0.040-0.080
Mill Creek	0.017-0.035	0.028-0.100
Middle Fork Kays Creek	0.035	0.040-0.100
North Canyon Creek	0.035	0.030-0.100
North Fork Holmes Creek	0.035	0.030-0.080
North Fork Holmes Creek Diversion	0.035	0.040-0.100
North Fork Kays Creek	0.035	0.030-0.100
North Fork Stone Creek	0.035	0.026-0.100
Rudd Creek	0.060	0.070
Shepard Creek	0.020-0.050	0.020-0.080
South Fork Kays Creek	0.035	0.040-0.080
Snow Creek	0.035	0.040
Steed Creek	0.015-0.040	0.020-0.070
Stone Creek	0.017-0.035	0.050-0.060
Weber River	0.035	0.030-0.080

Starting water-surface elevations for Baer, Haight, and Holmes Creeks were taken from rating curves developed for their respective culverts at the railroad. Starting water-surface elevations for Holmes Creek Tributary were taken from a rating curve at 1st East Street. Starting water-surface elevations for North Fork Holmes Creek, Snow Creek, and Kays Creek were taken from a rating curve developed at the culvert of Interstate Highway 15, Fairfield Road, and Galbraith Lane, respectively. Starting water-surface elevations for Hooper Canyon, Davis, Steed, Farmington, and Rudd Creeks were taken from rating curves.

Starting water-surface elevations for Barton Creek, Mill, Shepard, and Stone Creeks were developed by the slope-area method.

Most of the flow from Stone and Deuel Creeks is contained in the channels and culverts. Flow not contained overtops the railroad and causes shallow flooding around Stone and Deuel Creeks.

Flood boundaries for Holmes Creek along U.S. Highway 89, Holmes Creek Tributary between Main Street and 1st East Street, and North Fork Holmes Creek between cross sections B and D, and cross sections AK and AM. Flooding along U.S. Highway 89 from Snow Creek was determined by shallow flooding techniques. Shallow flooding along Fairfield Road from Snow Creek flows into North Fork Holmes Creek. Flooding from Middle Fork Kays Creek above cross section G was determined by shallow flooding techniques. Flooding from Hooper Canyon, below the intersection of 300 West and 3350 South, was determined by shallow flooding techniques. No flood profiles are shown for this part of the study reach.

Depths for shallow flooding areas were determined from a formula based on Manning's roughness coefficients, topography, and topographic maps (U.S. Department of Housing and Urban Development, 1979 [Aerial Photography Flown December 1978]).

The mudflow hazard identification methodology developed for this study is comprised of two components. The first component employs a one-dimensional routing procedure to define the mudflow hydrograph. The mudflow hydrograph derived from the one-dimensional model is then used as a boundary condition in a two-dimensional finite element analysis to define the mudflow boundary and mud depths.

The mudflow depths and boundaries were calculated using a two-dimensional finite element computer model developed specifically for this study by the Hydrologic Engineering Center and the University of Utah (USACE, 1985). The basic inputs required for the two-dimensional model are: an inflow mudflow hydrograph; a finite element grid network; a representation of the ground topography of the alluvial fan; mudflow fluid properties; and initial mudflow depths and velocities. Topography for the two-dimensional model was taken from topographic mapping which was developed from aerial photographs flown in April 1982 (Davis County, Utah, April 1982). The mudflow fluid property values used for input into the two-dimensional model were selected using available data. The fluid properties required by the model included the plastic viscosity, the Bingham yield strength, and the unit weight. The values selected were 10 1b-sec/ft^2, 20 1b/ft^2, and 125 lb/ft^3 respectively. These selected fluid property values were of the same order of magnitude as those used for the one-dimensional mudflow modeling that was done on the North Fork of the Toutle River in Washington (USACE, January 1986). These values also agree with values measured by Thomas C. Pierson during a smaller Rudd Creek mudflow event which occurred about six days after the main event in 1983 (Pierson, Thomas C., 1983). The initial mudflow depths were calculated at normal depth using the resistance equation for mudflow from the one-dimensional model.

Within the Davis County study area little data were available with which the two-dimensional mudflow model could be calibrated. However, some data were available on the Rudd Creek 1983 mudf1ow events which included one main event followed by several smaller events. The data available on these events included:

1. An aerial photograph of the total inundation region.
2. A surveyed volume of the mudflow deposit of approximately 90,000 cubic yards. (This was the total mudflow volume for all of the 1983 events on Rudd Creek.)
3. A mudflow front speed on the alluvial fan of approximately the speed that a person could walk.
4. Observed mudflow depths that ranged from approximately 20 feet within the canyon and 12 feet at the apex of the alluvial fan (USACE, January 1986) to approximately 2 or 3 feet at the front.

Attempts were made to duplicate the Rudd Creek 1983 mudflow events using the two-dimensional mudflow model. The results of these attempts were checked against the available data on the Rudd Creek mudflow events and the duplication served as a rough calibration of the two-dimensional mudflow model.

The mudflow volumes used in this study represent the total average potential mud volumes available for the respective drainage areas in question. Because of a lack of historical data, it is difficult to assign a probability to a mudflow. Therefore, mudflow depths have not been shown. Additional information regarding the mudflow methodology used to develop the flood boundaries may be obtained from the USACE, Omaha District.

The Flood Insurance Study for The City of Farmington (FEMA, February 17, 1981) was revised on February 16, 1996, to incorporate the results of revised hydraulic analyses along Farmington and Steed Creeks. In addition, a Letter of Map Revision (LOMR) dated February 7, 1994, for Davis Creek has been incorporated into this revised study. The Flood Insurance Study for the unincorporated areas of Davis County (FEMA, March 1, 1982) was revised on November 2, 1995, to incorporate the February 7, 1994, LOMR. See Table 9 – Letters of Map Revision for the LOMRs that were incorporated in the 2013 study.

The hydraulic analysis for Farmington and Steed Creeks were performed by Perkins-Thurgood Consulting Engineers, Inc. The hydraulic analysis for Davis Creek was performed by the Davis County Department of Public Works.

As a result of more detailed topographic information along the Farmington and Steed Creek channels upstream of their respective debris basins, revised hydraulic analyses along these reaches indicated that flows much greater than the 1% annual chance discharges will be contained within these channels from the canyon mouths downstream to the debris basins. In addition, based on a study conducted by Davis County (Davis County Flood Control Department, November 1990 [rev. April 1992]), the Farmington and Steed Creek debris basins have the capacity to contain the debris flow expected to be generated by each flooding source. Downstream of the debris basins, revised hydraulic analyses were performed to reflect existing topographic conditions within the Farmington and Steed Creek floodplains. Because the debris basins will contain the entire expected 1-percent-annual-chance debris flow, the discharges used in the hydraulic analyses downstream were not adjusted to account for debris. Water-surface elevations downstream of the debris basins were calculated using the U.S. Department of the Army, Corps of Engineers, HEC-2 step-backwater computer program (U.S. Department of the Army, May 1991).

The starting water-surface elevations were taken from the Flood Profiles presented in the previous FIS for the City of Farmington (FEMA, February 17, 1981). Roughness coefficients (Manning's "n") were determined based on field observation and engineering judgment.

The revised hydraulic analysis for Davis Creek, based on more detailed topographic information, indicated that the expected 1-percent-annual-chance debris flow generated at the mouth of Davis Canyon will be contained within the channel from the canyon mouth to approximately 250 feet upstream of 200 East (Highway 106). From this location, the debris flow will travel in a southwesterly direction where it will overtop 200 East. Downstream of 200 East, the debris flow will be contained within levees located north and south of the Davis Creek channel to the Interstate Highway 15 Frontage Road, where the debris flow will pond behind the Interstate Highway 15 embankment. No base flood elevations were determined for Davis Creek, and the Special Flood Hazard Area is shown as an area of approximate flooding (Zone A) on the FIRM.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

For streams studied by approximate methods, the elevations of the l00-year flood were developed from normal-depth calculations.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the FIRM.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

3.5 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the completion of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are now prepared using NAVD88 as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the NGVD29 and NAVD88, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community.

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, and VE), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For each stream studied in detail, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000, with contour intervals of 20 and 40 feet (U.S. Department of the Interior, Photorevised 1969; and U.S. Department of the Interior, Photorevised 1969 and 1975), and at a scale of 1:2,400, with contour intervals of 2 and 5 feet (City of Bountiful and Davis County, April 1976; and USACE, 1985).

This FIS attempts to identify the entire area which may be subject to mudflows and mud flooding from those streams studied. Because of the effects of topography, floodplain development, and local obstructions, the path of mudflows and mud flooding on alluvial fans can vary from one flood event to another. In addition, areas which may appear "high" relative to adjacent areas may indeed be subject to flood hazards of the same degree, if a localized obstruction changes the course of the mudflow or mud flood such that it does not follow the lowest flow path through the area.

For the streams studied by approximate methods, the boundary of the 1-percent-annual-chance flood was developed from normal-depth calculations and the topographic maps referenced previously. For this study the approximate flood boundaries in some portions of the study area were taken from the Flood Hazard Boundary Maps for the Cities of Kaysville, South Weber, Fruit Heights, Layton, Bountiful, and the unincorporated areas of Davis County (U.S. Department of Housing and Urban Development, 1976, 1978, March 1977, March 1978, and September 1978).

The study contractor determined that some areas shown on the Flood Hazard Boundary Maps for the Cities of Kaysville, South Weber, Fruit Heights, Layton, Bountiful, and the unincorporated areas of Davis County (U.S. Department of Housing and Urban Development, 1976, 1978, March 1977, March 1978, and September 1978) are areas of minimal flooding; therefore, they were not delineated on the FIRM.

The floodplain boundaries for the Jordan River were taken from the Flood Insurance Rate Map for Salt Lake County, Utah, and Incorporated Areas dated August 2, 2012 (FEMA, August 2, 2012).

The floodplain boundaries for the Great Salt Lake were delineated using the flood elevation determined at each transect; between transects the boundaries were interpolated using topographic maps at a scale of 1:2,400 with a contour interval of 2 feet (USACE, May 1996).
For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood carrying capacity of the channel, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic

gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this FIS are presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

Floodways were computed for all or portions of the streams studied by detailed methods (see Table 1) and are shown on the FIRM where applicable. Floodway Data Tables are shown in Table 7.

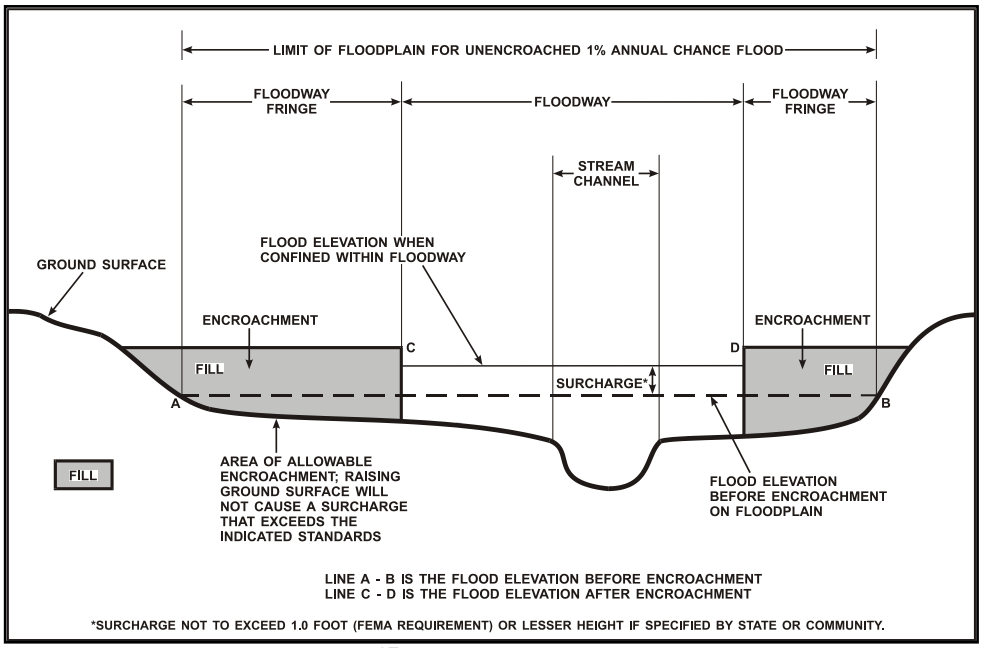
A floodway schematic is shown below explaining channel geometry in diagram form. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 7).

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage and heightens potential flood hazards by further increasing velocities. To reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplains will not cause more than a 1.0-foot increase in the BFEs at any point within the county.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water surface elevation of the 1-percent-annual-chance flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2 – Floodway Schematic.

Figure 2. Floodway Schematic



FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BAER CREEK								
A	65	204	1,182	0.2	4,283.2	4,283.2	4,283.2	0.0
B	475	110	615	0.3	4,283.2	4,283.2	4,283.2	0.0
C	1,290	41 [2]	115	1.5	4,296.2	4,296.2	4,296.2	0.0
D	1,935	27 [2]	28	5.7	4,297.6	4,297.6	4,297.6	0.0
E	2,270	41 [2]	48	3.3	4,301.1	4,301.1	4,301.1	0.0
F	2,830	27	29	6.1	4,305.9	4,305.9	4,305.9	0.0
G	3,355	39 [2]	43	3.7	4,314.0	4,314.0	4,314.0	0.0
H	3,900	39	32	5.1	4,325.4	4,325.4	4,325.4	0.0
I	4,705	47	50	3.7	4,335.7	4,335.7	4,335.7	0.0
J	5,080	47	34	4.9	4,340.9	4,340.9	4,340.9	0.0
K	5,785	50	45	2.5	4,350.3	4,350.3	4,350.3	0.0
L	6,435	62	40	4.9	4,357.2	4,357.2	4,357.2	0.0
M	6,920	30	36	4.6	4,361.9	4,361.9	4,361.9	0.0
N	7,470	20 [2]	22	5.9	4,372.7	4,372.7	4,372.7	0.0
O	7,725	296	2,225	0.1	4,396.2	4,396.2	4,396.2	0.0
P	8,155	120	453	0.3	4,396.2	4,396.2	4,396.2	0.0
Q	8,620	42	29	4.5	4,398.8	4,398.8	4,398.8	0.0
R	9,270	69	45	3.0	4,408.8	4,408.8	4,408.8	0.0
S	9,770	52	30	4.3	4,416.4	4,416.4	4,416.4	0.0
T	10,340	88	35	3.6	4,431.5	4,431.5	4,431.5	0.0
U	10,890	150	47	2.8	4,443.3	4,443.3	4,443.3	0.0
V	11,575	22	23	6.2	4,459.0	4,459.0	4,459.0	0.0
W	11,975	41	30	5.0	4,465.6	4,465.6	4,465.6	0.0
X	12,390	13	19	6.8	4,477.1	4,477.1	4,477.1	0.0
Y	12,975	32	26	5.1	4,494.1	4,494.1	4,494.1	0.0
Z	13,580	6 [2]	15	8.8	4,523.7	4,523.7	4,523.7	0.0

[1] Feet above Denver & Rio Grande Western Railroad
[2] Width contained in channel

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

BAER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BAER CREEK (CONTINUED)								
AA	13,840 [1]	6 [3]	15	8.8	4,535.7	4,535.7	4,535.7	0.0
AB	14,190 [1]	34	26	5.0	4,552.7	4,552.7	4,552.7	0.0
AC	14,900 [1]	23	21	5.6	4,596.3	4,596.3	4,596.3	0.0
AD	15,390 [1]	18	17	5.7	4,635.2	4,635.2	4,635.2	0.0
AE	15,740 [1]	19 [3]	18	5.5	4,665.1	4,665.1	4,665.1	0.0
AF	15,810 [1]	22 [3]	19	5.2	4,668.1	4,668.1	4,668.1	0.0
AG	15,825 [1]	24 [3]	19	5.2	4,680.2	4,680.2	4,680.2	0.0
AH	16,180 [1]	24 [3]	20	5.1	4,710.8	4,710.8	4,710.8	0.0
AI	16,575 [1]	8 [3]	13	7.8	4,756.6	4,756.6	4,756.6	0.0
AJ	17,070 [1]	14 [3]	16	6.2	4,825.5	4,825.5	4,825.5	0.0
BARTON CREEK LOWER REACH								
A	0 [2]	14 [3]	16	4.2	4,218.9	4,218.9	4,218.9	0.0
B	250 [2]	15 [3]	29	2.2	4,220.1	4,220.1	4,220.1	0.0
C	330 [2]	10	18	3.6	4,220.6	4,220.6	4,220.6	0.0
D	853 [2]	10	17	3.8	4,223.2	4,223.2	4,223.2	0.0
E	1298 [2]	14	21	3.1	4,225.1	4,225.1	4,225.4	0.3
F	1,740 [2]	20	27	2.4	4,226.7	4,226.7	4,227.0	0.3
G	2,174 [2]	10	16	4.1	4,227.8	4,227.8	4,227.8	0.0
H	2,400 [2]	8 [3]	21	3.2	4,229.1	4,229.1	4,229.1	0.0
I	2,570 [2]	12 [3]	26	0.2	4,230.1	4,230.1	4,230.1	0.0
J	2,820 [2]	9 [3]	10	6.3	4,230.4	4,230.4	4,230.4	0.0
K	3,142 [2]	8 [3]	13	2.7	4,232.9	4,232.9	4,232.9	0.0
L	3,420 [2]	8 [3]	13	2.8	4,234.0	4,234.0	4,234.0	0.0
M	3,900 [2]	9 [3]	18	2.0	4,235.2	4,235.2	4,235.2	0.0

[1] Feet above Denver & Rio Grande Western Railroad
[2] Feet above Limit of Detailed Study
[3] Width Contained in Channel

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

BAER CREEK - BARTON CREEK LOWER REACH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BARTON CREEK LOWER REACH (CONTINUED)								
N	4,375 [1]	25 [3]	27	1.4	4,235.8	4,235.8	4,235.8	0.0
O	4,900 [1]	5 [3]	6	6.1	4,243.4	4,243.4	4,243.4	0.0
P	5,355 [1]	18 [3]	21	1.8	4,246.9	4,246.9	4,246.9	0.0
Q	5,437 [1]	8 [3]	14	2.7	4,248.0	4,248.0	4,248.0	0.0
R	5,949 [1]	7 [3]	7	5.6	4,252.1	4,252.1	4,252.1	0.0
S	6,361 [1]	8 [3]	12	3.1	4,256.7	4,256.7	4,256.7	0.0
T	6,740 [1]	8 [3]	7	5.3	4,260.4	4,260.4	4,260.4	0.0
U	6,808 [1]	7 [3]	12	3.1	4,261.9	4,261.9	4,261.9	0.0
V	7,186 [1]	10 [3]	16	2.3	4,263.0	4,263.0	4,263.0	0.0
W	7,574 [1]	12 [3]	8	4.5	4,268.0	4,268.0	4,268.0	0.0
X	7,670 [1]	90	145	1.1	4,274.2	4,274.2	4,274.2	0.0
Y	7,910 [1]	54	59	2.6	4,274.3	4,274.3	4,274.3	0.0
DAVIS CREEK								
A	218 [2]	19	21	5.6	4,245.4	4,245.4	4,245.4	0.0
B	1,300 [2]	13	19	6.2	4,265.9	4,265.9	4,265.9	0.0
C	2,684 [2]	9	16	7.5	4,348.4	4,348.4	4,348.5	0.1
FARMINGTON CREEK								
A	793 [4]	270	343	2.3	4,231.7	4,231.7	4,232.5	0.8
B	2,006 [4]	270	510	1.5	4,235.5	4,235.5	4,236.4	0.8
C	2,821 [4]	67	115	6.8	4,239.5	4,239.5	4,239.8	0.3
D	4,250 [4]	91	184	4.3	4,247.3	4,247.3	4,248.3	1.0
E	5,409 [4]	38	228	3.4	4,258.2	4,258.2	4,258.2	0.0
F	5,693 [4]	29	114	7.9	4,258.3	4,258.3	4,258.8	0.5
G	6,303 [4]	35	144	6.2	4,262.0	4,262.0	4,262.1	0.1

[1] Feet above Limit of Detailed Study
[2] Feet above Interstate 15
[3] Width Contained in Channel
[4] Feet above 500 South

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

BARTON CREEK LOWER REACH - DAVIS CREEK - FARMINGTON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
FARMINGTON CREEK (CONTINUED)								
H	6,928	26	97	9.2	4,266.0	4,266.0	4,266.0	0.0
I	7,010	61	249	3.6	4,266.1	4,266.1	4,266.9	0.8
J	7,178	35	132	6.8	4,270.3	4,270.3	4,270.3	0.0
K	7,228	26	86	10.4	4,270.7	4,270.7	4,270.7	0.0
L	7,803	277	396	2.3	4,274.0	4,274.0	4,274.2	0.2
M	8,233	25	85	10.5	4,277.5	4,277.5	4,277.5	0.0
N	8,303	29	89	10.0	4,279.6	4,279.6	4,279.6	0.0
O	8,998	22	81	11.0	4,290.0	4,290.0	4,290.0	0.0
P	9,908	23	83	10.8	4,315.8	4,315.8	4,315.8	0.0
Q	9,968	27	87	10.2	4,319.4	4,319.4	4,319.4	0.0
R	10,223	24	62	9.1	4,328.3	4,328.3	4,328.3	0.0
S	10,263	23	69	8.2	4,329.1	4,329.1	4,329.1	0.0
T	10,623	26	64	8.9	4,341.2	4,341.2	4,341.2	0.0
U	10,713	50	80	7.2	4,368.1	4,368.1	4,368.1	0.0

[1]Feet above 500 South

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

FARMINGTON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HAIGHT CREEK								
A	70	114	258	0.2	4,258.4	4,258.4	4,258.4	0.0
B	485	21	21	1.6	4,258.4	4,258.4	4,258.4	0.0
C	580	142	622	0.1	4,266.2	4,266.2	4,266.2	0.0
D	1,095	119	336	0.2	4,266.2	4,266.2	4,266.2	0.0
E	1,290	86	191	0.3	4,268.2	4,268.2	4,268.2	0.0
F	1,770	18	13	4.8	4,268.5	4,268.5	4,268.5	0.0
G	1,880	111	288	0.3	4,281.2	4,281.2	4,281.2	0.0
H	2,205	98	407	0.2	4,281.2	4,281.2	4,281.2	0.0
I	2,700	124	175	0.5	4,283.6	4,283.6	4,283.6	0.0
J	3,265	22	17	5.0	4,289.4	4,289.4	4,289.4	0.0
K	3,710	62	50	1.8	4,292.5	4,292.5	4,292.5	0.0
L	3,975	32	19	4.4	4,296.2	4,296.2	4,296.2	0.0
M	4,065	84	606	0.1	4,304.9	4,304.9	4,304.9	0.0
N	4,230	83	433	0.2	4,304.9	4,304.9	4,304.9	0.0
O	4,310	33	124	0.7	4,304.9	4,304.9	4,304.9	0.0
P	4,500	71	281	0.3	4,304.9	4,304.9	4,304.9	0.0
Q	4,970	18	14	5.2	4,308.2	4,308.2	4,308.2	0.0
R	5,380	43	28	2.5	4,314.4	4,314.4	4,314.4	0.0
S	5,815	29	22	3.2	4,318.4	4,318.4	4,318.4	0.0
T	6,020	24	18	3.9	4,320.9	4,320.9	4,320.9	0.0
U	6,090	122	1,063	0.1	4,334.2	4,334.2	4,334.2	0.0
V	6,290	123	841	0.1	4,334.2	4,334.2	4,334.2	0.0
W	6,615	32	17	4.5	4,335.0	4,335.0	4,335.0	0.0
X	7,065	19 [2]	21	3.4	4,340.8	4,340.8	4,340.8	0.0
Y	7,700	26 [2]	16	4.4	4,354.6	4,354.6	4,354.6	0.0
Z	8,225	23 [2]	15	4.8	4,367.3	4,367.3	4,367.3	0.0

[1]Feet above Denver & Rio Grande Western Railroad
[2]Width Contained in Channel

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

HAIGHT CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HAIGHT CREEK (CONTINUED)								
AA	8708 [1]	10	50	3.1	4,388.9	4,388.9	4,388.9	0.0
AB	9691 [1]	7	20	7.9	4,403.9	4,403.9	4,404.2	0.3
AC	10894 [1]	13	21	7.4	4,433.3	4,433.3	4,433.3	0.0
AD	11917 [1]	14	151	1.1	4,471.8	4,471.8	4,471.8	0.0
AE	12880 [1]	13	22	7.5	4,499.0	4,499.0	4,499.2	0.2
AF	13755 [1]	31	29	5.5	4,536.5	4,536.5	4,536.5	0.0
AG	14862 [1]	55	34	4.6	4,590.3	4,590.3	4,590.4	0.1
HOLMES CREEK								
A	660 [2]	23	34	7.0	4,280.2	4,280.2	4,280.2	0.0
B	1,267 [2]	19	38	6.2	4,288.0	4,288.0	4,288.2	0.2
C	1,434 [2]	31	124	1.8	4,294.9	4,294.9	4,295.9	1.0
D	1,710 [2]	23	42	5.6	4,296.9	4,296.9	4,297.4	0.5
E	1,915 [2]	34	68	3.4	4,298.6	4,298.6	4,298.9	0.3
F	2,080 [2]	65	333	0.8	4,303.3	4,303.3	4,304.3	1.0
G	2,208 [2]	29	231	1.1	4,303.3	4,303.3	4,304.3	1.0
H	3,010 [2]	87	583	0.4	4,308.3	4,308.3	4,309.3	1.0
I	3,380 [2]	30	104	2.4	4,308.6	4,308.6	4,309.5	0.9
J	4,115 [2]	25	35	4.9	4,313.8	4,313.8	4,314.1	0.3
K	4,375 [2]	83	848	0.2	4,330.4	4,330.4	4,331.4	1.0
L	4,910 [2]	39	213	0.8	4,330.4	4,330.4	4,331.4	1.0
M	5,237 [2]	47	127	1.3	4,330.6	4,330.6	4,331.5	0.9
N	5,709 [2]	25	33	4.5	4,333.9	4,333.9	4,334.0	0.1
O	5,885 [2]	31	30	5.0	4,337.6	4,337.6	4,337.7	0.1
P	6,020 [2]	174	2,428	0.1	4,361.7	4,361.7	4,362.7	1.0
Q	6,450 [2]	133	1,492	0.1	4,361.7	4,361.7	4,362.7	1.0

[1] Feet above Denver & Rio Grande Western Railroad
[2] Feet above Limit of Detailed Study

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

HAIGHT CREEK - HOLMES CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HOLMES CREEK (CONTINUED)								
R	6,990	71	422	0.4	4,361.7	4,361.7	4,362.7	1.0
S	7,370	20	73	1.4	4,361.8	4,361.8	4,362.8	1.0
T	7,695	42	64	1.6	4,362.4	4,362.4	4,362.9	0.5
U	7,930	91	1,210	0.1	4,381.7	4,381.7	4,382.7	1.0
V	8,393	66	539	0.2	4,381.7	4,381.7	4,382.7	1.0
W	8,960	23	21	4.8	4,388.1	4,388.1	4,388.1	0.0
X	9,340	11 [2]	10	5.5	4,398.4	4,398.4	4,398.4	0.0
Y	9,682	14 [2]	11	5.0	4,410.9	4,410.9	4,410.9	0.0
Z	9,940	545	5,042	0.1	4,444.2	4,444.2	4,445.2	1.0
AA	10,960	32	60	5.8	4,450.3	4,450.3	4,450.4	0.1
AB	11,620	17	40	8.7	4,468.1	4,468.1	4,468.5	0.4
AC	11,730	82	223	1.6	4,473.0	4,473.0	4,474.0	1.0
AD	12,705	25	39	7.3	4,523.1	4,523.1	4,523.1	0.0
AE	13,375	15	34	8.5	4,593.3	4,593.3	4,593.6	0.3
AF	13,530	20	85	3.3	4,611.7	4,611.7	4,612.7	1.0
AG	14,225	20	31	7.1	4,644.0	4,644.0	4,644.0	0.0
AH	14,337	24	84	5.6	4,651.0	4,651.0	4,652.0	1.0
AI	14,515	15	28	7.9	4,658.9	4,658.9	4,658.9	0.0
AJ	14,650	45	306	0.7	4,676.2	4,676.2	4,677.2	1.0
AK	15,000	10	23	8.0	4,686.4	4,686.4	4,686.5	0.1
AL	15,242	33	96	1.9	4,699.4	4,699.4	4,700.4	1.0
AM	15,650	20	24	6.4	4,713.5	4,713.5	4,713.5	0.0
AN	16,105	9	16	7.7	4,740.0	4,740.0	4,740.0	0.0
AO	16,290	29	23	5.1	4,750.6	4,750.6	4,750.6	0.0
AP	16,438	10	16	7.1	4,757.9	4,757.9	4,757.9	0.0
AQ	16,530	19	60	1.8	4,761.9	4,761.9	4,762.9	1.0

[1]Feet Above Limit of Detailed Study
[2]Width Contained in Channel

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

HOLMES CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HOLMES CREEK (CONTINUED)								
AR	16785 [1]	16 [4]	18	5.9	4,778.2	4,778.2	4,778.2	0.0
AS	16,992 [1]	11 [4]	24	3.8	4,790.7	4,790.7	4,791.7	1.0
AT	17,760 [1]	19 [4]	17	5.4	4,863.0	4,863.0	4,863.0	0.0
AU	18,530 [1]	9 [4]	13	6.9	4,924.3	4,924.3	4,924.3	0.0
AV	19,332 [1]	13 [4]	15	6.1	5,018.5	5,018.5	5,018.5	0.0
AW	20,176 [1]	10 [4]	14	6.6	5,118.9	5,118.9	5,118.9	0.0
HOLMES CREEK TRIBUTARY								
A	-27 [2]	41	50	4.4	4,392.9	4,392.9	4,393.4	0.5
B	539 [2]	27	125	1.8	4,395.2	4,395.2	4,395.9	0.7
C	1,251 [2]	11	30	7.3	4,410.0	4,410.0	4,410.5	0.5
D	1,786 [2]	24	91	2.4	4,415.8	4,412.8	4,416.7	0.9
E	1,955 [2]	170	1,734	0.1	4,436.9	4,436.9	4,437.9	0.0
F	2,582 [2]	28	133	0.3	4,436.9	4,436.9	4,437.9	1.0
G	3,175 [2]	9 [4]	8	5.1	4,444.9	4,444.9	4,445.0	0.1
H	3,432 [2]	37	370	0.1	4,462.2	4,462.2	4,463.2	1.0
I	3,912 [2]	15	18	2.2	4,463.6	4,463.6	4,463.9	0.3
J	4,600 [2]	10	8	5.0	4,482.8	4,482.8	4,482.8	0.0
HOOPER CANYON CREEK								
A	0 [3]	40	31	5.1	4,647.8	4,647.8	4,647.8	0.0
B	150 [3]	20	38	4.2	4,650.6	4,650.6	4,650.7	0.1
C	300 [3]	17	23	6.9	4,656.0	4,656.0	4,656.0	0.0

[1]Feet Above Limit of Detailed Study
[2]Feet Above Point 75 Feet Above 1st East Street
[3]Feet Above 3350 South
[4]Width Contained in Channel

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

HOLMES CREEK - HOLMES CREEK TRIBUTARY
HOOPER CANYON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HOOPER CANYON CREEK (CONTINUED)								
D	645 [1]	17 [3]	23	6.9	4,681.0	4,681.0	4,681.0	0.0
E	975 [1]	23 [3]	27	6.0	4,705.5	4,705.5	4,705.5	0.0
F	1,343 [1]	20 [3]	21	4.8	4,730.2	4,730.2	4,730.2	0.0
G	1,658 [1]	18 [3]	26	3.8	4,741.1	4,741.1	4,741.2	0.1
H	2,135 [1]	17 [3]	17	5.8	4,780.3	4,780.3	4,780.3	0.0
I	2,643 [1]	13 [3]	16	6.3	4,830.6	4,830.6	4,830.7	0.1
J	2,868 [1]	27 [3]	20	5.1	4,861.7	4,861.7	4,861.7	0.0
K	3,238 [1]	17 [3]	11	4.6	4,929.5	4,929.5	4,929.5	0.0
L	3,645 [1]	10 [3]	9	5.5	4,980.1	4,980.1	4,980.1	0.0
M	4,033 [1]	13 [3]	10	5.1	5,054.7	5,054.7	5,054.7	0.0
N	4,393 [1]	28	13	3.9	5,114.1	5,114.1	5,114.1	0.0
O	4,753 [1]	30	13	3.8	5,161.7	5,161.7	5,161.7	0.0
P	5,033 [1]	20 [3]	12	2.8	5,194.0	5,194.0	5,194.1	0.1
Q	5,823 [1]	12 [3]	7	4.6	5,244.5	5,244.5	5,244.5	0.0
R	7,893 [1]	9 [3]	7	5.0	5,524.7	5,524.7	5,524.7	0.0
S	8,370 [1]	8 [3]	6	5.2	5,604.8	5,604.8	5,604.9	0.1
T	8,910 [1]	9 [3]	7	4.9	5,684.7	5,684.7	5,684.7	0.0
U	9,820 [1]	8 [3]	6	5.1	5,804.8	5,804.8	5,804.8	0.0
V	10,700 [1]	10 [3]	7	4.8	5,949.6	5,949.6	5,949.6	0.0
JORDAN RIVER								
A	2,060 [2]	91 / 67 [4]	510	2.4	4,218.0 [5]	4,215.0	4,215.0	0.0
B	4,210 [2]	93 / 38 [4]	554	2.2	4,218.0 [5]	4,215.5	4,215.5	0.0
C	4,310 [2]	77 / 52 [4]	619	2.0	4,218.0 [5]	4,215.5	4,215.5	0.0
D	4,440 [2]	77 / 68 [4]	619	2.0	4217.0 [5]	4,215.5	4,215.5	0.0

[1]Feet above 3350 South
[2]Feet above Cudahy Lane
[3]Width Contained in Channel
[4]Width / Width Within Davis County
[5]Flooding due to Great Salt Lake

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

HOOPER CANYON CREEK - JORDAN RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
JORDAN RIVER (CONTINUED)								
E	4,490 [1]	87 / 81 [3]	645	1.9	4217.0 [4]	4,215.5	4,215.5	0.0
F	8,515 [1]	73 / 68 [3]	391	3.2	4217.0 [4]	4,216.3	4,216.3	0.0
KAYS CREEK								
A	532 [2]	120	450	4.1	4,235.0	4,235.0	4,235.9	0.9
B	1,597 [2]	23	207	9.0	4,242.6	4,242.6	4,242.9	0.3
C	2,550 [2]	37	227	8.0	4,246.6	4,246.6	4,246.9	0.3
D	3,661 [2]	48	210	9.0	4,254.9	4,254.9	4,254.9	0.0
E	4,800 [2]	37	263	7.0	4,269.2	4,269.2	4,269.3	0.1
F	6,430 [2]	44	171	11.0	4,283.9	4,283.9	4,283.9	0.0
G	7,420 [2]	59	190	10.0	4,295.8	4,295.8	4,295.8	0.0
H	7,911 [2]	40	199	9.0	4,299.5	4,299.5	4,299.7	0.2
I	8,824 [2]	53	367	3.0	4,308.7	4,308.7	4,309.7	1.0
J	10,057 [2]	46	152	8.0	4,311.6	4,311.6	4,311.6	0.0
K	10,959 [2]	48	200	6.0	4,323.2	4,323.2	4,323.8	0.6
L	11,891 [2]	32	114	11.0	4,330.8	4,330.8	4,330.8	0.0
M	13,011 [2]	149	704	2.0	4,349.9	4,349.9	4,350.5	0.6
N	13,790 [2]	74	433	3.0	4,353.0	4,353.0	4,353.2	0.2
O	14,959 [2]	47	327	4.0	4,365.4	4,365.4	4,366.2	0.8
P	15,933 [2]	105	630	2.0	4,374.7	4,374.7	4,375.5	0.8
Q	16,850 [2]	66	145	8.0	4,376.3	4,376.3	4,376.3	0.0
R	17,946 [2]	79	233	5.0	4,386.8	4,386.8	4,386.8	0.0
S	18,991 [2]	58	884	1.0	4,404.9	4,404.9	4,404.9	0.0
T	19,828 [2]	34	361	3.0	4,404.9	4,404.9	4,405.0	0.1
U	20,983 [2]	115	4,004	0.0	4,452.8	4,452.8	4,453.6	0.8
V	22,214 [2]	100	1,872	1.0	4,452.8	4,452.8	4,453.6	0.8

[1]Feet above Cudahy Lane
[2]Feet above 1750 West
[3]Width / Width Within Davis County
[4]Flooding due to Great Salt Lake

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

JORDAN RIVER - KAYS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
KAYS CREEK (CONTINUED)								
W	23,055 [1]	53	750	2.0	4,452.8	4,452.8	4,453.6	0.8
X	24,224 [1]	62	2,846	0.0	4,500.5	4,500.5	4,500.9	0.4
Y	24,991 [1]	85	2,517	0.5	4,500.5	4,500.5	4,501.0	0.5
MIDDLE FORK KAYS CREEK LOWER REACH								
A	527 [2]	16	108	1.9	4,610.0	4,610.0	4,610.7	0.7
B	1,474 [2]	8	95	2.1	4,642.8	4,642.8	4,642.8	0.0
C	2,495 [2]	8	83	2.5	4,670.0	4,670.0	4,670.6	0.6
MIDDLE FORK KAYS CREEK UPPER REACH								
A	462 [2]	6	15	9.1	4,965.4	4,965.4	4,965.5	0.1
B	1,413 [2]	5	15	9.6	5,066.3	5,066.3	5,066.4	0.1
C	2,547 [2]	24	25	5.7	5,232.2	5,232.2	5,232.2	0.0
MILL CREEK								
A	0 [3]	14	39	4.8	4,237.4	4,237.4	4,237.4	0.0
B	305 [3]	15	38	4.9	4,239.2	4,239.2	4,239.2	0.0
C	580 [3]	15	49	3.8	4,240.5	4,240.5	4,240.5	0.0
D	650 [3]	15	54	3.5	4,241.0	4,241.0	4,241.0	0.0
E	1,003 [3]	53	45	4.2	4,243.2	4,243.2	4,243.5	0.3
F	1,400 [3]	36	87	2.2	4,243.3	4,243.3	4,243.9	0.6
G	1,755 [3]	12	23	8.0	4,245.0	4,245.0	4,245.0	0.0
H-AD[4]								

[1]Feet above 1750 West
[2]Feet above confluence with South Fork Kays Creek
[3]Feet above a point 625 feet downstream of 1100 West
[4]Floodway not computed

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

KAYS CREEK - MIDDLE FORK KAYS CREEK UPPER AND LOWER REACH - MILL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
NORTH CANYON CREEK								
A	423 [1]	4	13	10.0	4,598.5	4,598.5	4,598.5	0.0
B	1,229 [1]	12	28	4.6	4,646.6	4,646.6	4,647.0	0.4
C	2,170 [1]	6	14	8.9	4,713.0	4,713.0	4,713.1	0.1
D	3,283 [1]	4	13	10.1	4,798.8	4,798.8	4,798.8	0.0
E-O[2]								
NORTH FORK HOLMES CREEK								
A-I[2]								
J	9,418 [3]	348	1,943	0.7	4,320.1	4,320.1	4,320.2	0.1
K	10,396 [3]	113	604	2.3	4,325.4	4,325.4	4,326.2	0.8
L	11,678 [3]	116	197	7.0	4,334.0	4,334.0	4,334.0	0.0
M	12,378 [3]	81	277	5.0	4,344.9	4,344.9	4,345.4	0.5
N	13,475 [3]	55	148	9.2	4,356.2	4,356.2	4,356.2	0.0
O	14,394 [3]	124	316	4.3	4,372.3	4,372.3	4,372.8	0.5
P	15,209 [3]	50	244	5.6	4,381.3	4,381.3	4,382.2	0.9
Q	16,503 [3]	74	439	3.1	4,415.8	4,415.8	4,416.4	0.6
R	17,429 [3]	33	123	11.2	4,430.5	4,430.5	4,430.5	0.0
S	18,773 [3]	20	21	4.0	4,469.5	4,469.5	4,469.5	0.0
T	19,136 [3]	20	17	5.1	4,477.0	4,477.0	4,477.0	0.0
U	19,426 [3]	457	5,800	0.0	4,492.4	4,492.4	4,493.4	1.0
V	19,855 [3]	233	2,085	0.1	4,492.4	4,492.4	4,493.4	1.0
W	20,296 [3]	35	45	6.5	4,493.8	4,493.8	4,494.1	0.3
X	20,388 [3]	84	648	0.4	4,503.1	4,503.1	4,504.1	1.0
Y	20,806 [3]	36	46	6.3	4,505.5	4,505.5	4,505.5	0.0
Z	21,387 [3]	22	38	7.5	4,519.1	4,519.1	4,519.4	0.3
AA	22,087 [3]	22	39	7.4	4,534.0	4,534.0	4,534.3	0.3

[1]Feet above Orchard Drive
[2]Floodway not computed
[3]Feet above confluence with Holmes Creek

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

NORTH CANYON CREEK - NORTH FORK HOLMES CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
NORTH FORK HOLMES CREEK (CONTINUED)								
AB	22,852 [1]	31	47	6.1	4,554.1	4,554.1	4,554.4	0.3
AC	23,027 [1]	21	38	7.7	4,561.0	4,561.0	4,561.2	0.2
AD	23,626 [1]	30	47	6.1	4,581.2	4,581.2	4,581.3	0.1
AE	24,370 [1]	26	44	6.6	4,604.8	4,604.8	4,605.4	0.6
AF	24,896 [1]	17	34	6.9	4,623.4	4,623.4	4,623.6	0.2
AG	25,768 [1]	18	32	7.5	4,678.5	4,678.5	4,678.5	0.0
AH	26,417 [1]	24	35	6.9	4,717.8	4,717.8	4,717.8	0.0
AI	26,789 [1]	26	29	6.1	4,742.8	4,742.8	4,742.8	0.0
NORTH FORK KAYS CREEK[4]								
Z	26,224 [2]	34	375	0.9	4,501.6	4,501.6	4,502.0	0.4
AA	27,132 [2]	10	67	4.9	4,516.8	4,516.8	4,517.3	0.5
AB	28,034 [2]	25	45	7.4	4,534.4	4,534.4	4,534.5	0.1
AC	29,085 [2]	22	142	2.3	4,558.0	4,558.0	4,558.9	0.9
AD	30,023 [2]	13	35	9.5	4,565.5	4,565.5	4,565.7	0.2
AE	31,056 [2]	35	56	5.9	4,579.9	4,579.9	4,580.3	0.4
AF	31,956 [2]	13	36	9.1	4,594.4	4,594.4	4,595.2	0.8
AG	33,211 [2]	15	38	8.7	4,614.1	4,614.1	4,615.0	0.9
AH	34,099 [2]	19	40	8.2	4,623.5	4,623.5	4,623.6	0.1
AI	35,076 [2]	15	37	8.8	4,635.4	4,635.4	4,635.4	0.0
AJ-AK[3]								
AL	38,723 [2]	28	186	0.2	4,724.6	4,724.6	4,725.6	1.0
AM	39,679 [2]	5	5	5.6	4,771.2	4,771.2	4,771.2	0.0
AN	40,988 [2]	5	5	5.8	4,920.6	4,920.6	4,920.6	0.1

[1]Feet above confluence with Holmes Creek
[2]Feet above 1750 West
[3]Floodway not computed
[4]Preceeding XS are part of Kays Creek

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

NORTH FORK HOLMES CREEK - NORTH FORK KAYS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
RICKS CREEK								
A	4,320 [1]	60	165	1.8	4,251.1	4,251.1	4,251.8	0.7
B	4,555 [1]	15	31	8.3	4,262.4	4,262.4	4,262.4	0.0
C	4,860 [1]	17	52	5.0	4,265.5	4,265.5	4,265.5	0.0
D	5,150 [1]	17	47	5.5	4,266.9	4,266.9	4,266.9	0.0
E	5,225 [1]	185	837	0.3	4,271.6	4,271.6	4,271.6	0.0
F	5,415 [1]	66	315	0.8	4,271.6	4,271.6	4,271.6	0.0
G	5,490 [1]	21	69	3.8	4,273.4	4,273.4	4,274.1	0.7
H	5,690 [1]	7	25	10.4	4,281.4	4,281.4	4,281.4	0.0
I	6,000 [1]	12	29	8.9	4,291.1	4,291.1	4,291.1	0.0
J	6,270 [1]	14	31	8.4	4,305.5	4,305.5	4,305.5	0.0
K	6,480 [1]	9	33	8.0	4,308.7	4,308.7	4,308.8	0.1
L	6,565 [1]	25	119	1.7	4,319.2	4,319.2	4,319.9	0.7
M	6,595 [1]	9	23	8.9	4,328.2	4,328.2	4,328.2	0.0
N	6,635 [1]	50	96	2.1	4,329.1	4,329.1	4,329.6	0.5
O	6,770 [1]	27	32	6.2	4,334.8	4,334.8	4,334.8	0.0
RUDD CREEK								
A	1,810 [2]	7	6	5.3	4,764.1	4,764.1	4,764.1	0.0
SNOW CREEK								
A	2,785 [3]	25	206	1.6	4,420.3	4,420.3	4,421.2	0.9
B	3,702 [3]	26	78	1.4	4,431.4	4,431.4	4,432.4	1.0
C	4,775 [3]	21	163	0.6	4,457.2	4,457.2	4,457.2	0.0
D	5,809 [3]	14	28	3.8	4,473.8	4,473.8	4,474.0	0.2
E	7,298 [3]	28	182	0.6	4,518.7	4,518.7	4,519.6	0.9
F	7,589 [3]	730	9,462		4,559.6	4,559.6	4,559.6	0.0

[1] Feet above Denver & Rio Grande Western Railroad
[2] Feet above Skyline Drive
[3] Feet above confluence with North Fork Holmes Creek

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

RICKS CREEK - RUDD CREEK - SNOW CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SNOW CREEK (CONTINUED)								
G	7,911	893	11,575	0.0	4,559.6	4,559.6	4,559.6	0.0
H	8,575	1,013	13,148	0.0	4,559.6	4,559.6	4,559.6	0.0
I	9,242	431	2,161	0.0	4,559.6	4,559.6	4,559.6	0.0
J	9,972	17	9	4.1	4,569.5	4,569.5	4,569.5	0.0
K	10,976	57	21	1.7	4,599.8	4,599.8	4,599.8	0.0
L	11,836	24	9	3.8	4,633.0	4,633.0	4,633.0	0.0
M	12,501	39	14	2.5	4,666.8	4,666.8	4,666.8	0.0
N	13,067	11	9	4.0	4,686.6	4,686.6	4,686.6	0.0
O	13,850	39	13	2.7	4,719.2	4,719.2	4,719.2	0.0
P	14,216	25	12	2.9	4,735.0	4,735.0	4,735.0	0.0
Q	14,448	19	9	4.1	4,749.1	4,749.1	4,749.1	0.0
R	14,811	47	21	1.7	4,762.1	4,762.1	4,762.1	0.0
S	15,178	47	12	2.9	4,780.7	4,780.7	4,780.7	0.0

[1]Feet above confluence with North Fork Holmes Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SOUTH FORK KAYS CREEK								
A	990 [1]	45	698	1.1	4,500.5 [3]	4,500.5 [3]	4,501.0	0.5
B	1,777 [1]	26	86	8.7	4,501.4	4,501.4	4,501.8	0.4
C	2,683 [1]	14	63	11.9	4,517.2	4,517.2	4,517.3	0.1
D	3,703 [1]	47	521	1.4	4,540.2	4,540.2	4,541.2	1.0
E	4,519 [1]	84	109	6.8	4,543.2	4,543.2	4,543.2	0.0
F	5,668 [1]	25	78	9.6	4,563.1	4,563.1	4,563.2	0.1
G	6,776 [1]	30	53	7.2	4,596.6	4,596.6	4,596.6	0.0
H	7,702 [1]	14	42	8.9	4,625.8	4,625.8	4,625.9	0.1
I	8,814 [1]	26	53	7.1	4,658.8	4,658.8	4,658.9	0.1
J	9,808 [1]	17	45	8.5	4,693.5	4,693.5	4,693.5	0.0
K	10,867 [1]	34	61	6.2	4,750.5	4,750.5	4,750.6	0.1
L	11,800 [1]	29	56	6.7	4,808.5	4,808.5	4,808.5	0.0
M	12,938 [1]	26	49	7.7	4,890.4	4,890.4	4,890.4	0.0
N	13,910 [1]	36	23	6.1	4,957.1	4,957.1	4,957.1	0.0
O	15,012 [1]	23	25	5.8	5,067.7	5,067.7	5,067.7	0.0
STEED CREEK								
A	75 [2]	102	157	1.4	4,255.3	4,255.3	4,255.8	0.5
B	625 [2]	38	52	6.5	4,256.9	4,256.9	4,257.3	0.4
C	1,255 [2]	8	22	9.7	4,261.6	4,261.6	4,261.6	0.0
D	1,730 [2]	8	21	9.4	4,267.3	4,267.3	4,267.3	0.0
E	2,010 [2]	19	56	3.6	4,268.9	4,268.9	4,269.1	0.2
F	2,610 [2]	40	36	5.5	4,279.1	4,279.1	4,279.1	0.0
G	2,895 [2]	22	30	6.7	4,287.0	4,287.0	4,287.0	0.0
H	3,020 [2]	20	36	6.0	4,288.1	4,288.1	4,288.1	0.0
I	3,221 [2]	71	55	3.9	4,290.7	4,290.7	4,290.7	0.0
J	3,439 [2]	45	40	5.4	4,295.5	4,295.5	4,295.5	0.0

[1] Feet above confluence with Kays Creek
[2] Feet Above Interstate Highway 15 Frontage Road
[3] Backwater effects from confluence with Kays Creek

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

SOUTH FORK KAYS CREEK - STEED CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
STEED CREEK (CONTINUED)								
K	3,778 [1]	87	49	4.4	4,312.1	4,312.1	4,312.1	0.0
L	3,959 [1]	16	30	6.3	4,314.4	4,314.4	4,314.7	0.3
M	4,352 [1]	15	26	7.4	4,349.0	4,349.0	4,349.0	0.0
N	4,390 [1]	16	26	7.3	4,352.5	4,352.5	4,352.5	0.0
O	4,490 [1]	7	30	6.3	4,363.6	4,363.6	4,363.6	0.0
P	4,556 [1]	28	31	6.0	4,372.0	4,372.0	4,372.0	0.0
Q	4,664 [1]	21	28	6.7	4,380.2	4,380.2	4,380.2	0.0
R	4,754 [1]	40	28	6.7	4,385.9	4,385.9	4,385.9	0.0
S	4,859 [1]	14	25	7.5	4,399.0	4,399.0	4,399.0	0.0
T	4,883 [1]	31	90	2.1	4,400.0	4,400.0	4,400.0	0.0
U	5,288 [1]	16	26	7.2	4,417.9	4,417.9	4,417.9	0.0
V	5,385 [1]	41	32	5.2	4,428.1	4,428.1	4,428.1	0.0
STONE CREEK								
A	0 [2]	19 [3]	47	8.8	4,222.9	4,222.9	4,222.9	0.0
B	563 [2]	18 [3]	28	14.6	4,223.3	4,223.3	4,223.3	0.0
C	635 [2]	18 [3]	33	12.6	4,225.1	4,225.1	4,225.1	0.0
D	1,055 [2]	14 [3]	41	10.1	4,228.2	4,228.2	4,228.2	0.0
E	1,580 [2]	13 [3]	38	11.0	4,229.9	4,229.9	4,229.9	0.0
F	2,097 [2]	14 [3]	42	9.9	4,232.2	4,232.2	4,232.2	0.0
G	3,819 [2]	80	186	3.4	4,254.1	4,254.1	4,254.1	0.0
H	4,305 [2]	83	242	2.6	4,255.8	4,255.8	4,255.8	0.0
I	4,823 [2]	69	201	3.1	4,257.1	4,257.1	4,257.1	0.0
J-W [4]								

[1] Feet Above Interstate Highway 15 Frontage Road
[2] Feet above Denver and Rio Grande Western Railroad
[3] Floodway contained in channel
[4] Floodway not computed

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY
DAVIS COUNTY, UT
AND INCORPORATED AREAS

FLOODWAY DATA

STEED CREEK - STONE CREEK

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (1-percent-annual-chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone VE

Zone VE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and shows selected whole foot BFEs or average depths in the 1-percent annual chance floodplains that were studied by detailed methods. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map uses tints, screens, and symbols to show the 1-percent and 0.2-percent annual chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Utah County. Previously, separate FIRMs were prepared for each identified flood-prone incorporated community and for the unincorporated areas of the county. Historical data relating to the maps prepared for each community, up to and including this countywide FIS are presented in Table 8, "Community Map History".

Community Name	Initial Identification	Flood Hazard Boundary Map Revision Date(s)	Flood Insurance Rate Map Effective Date(s)	Flood Insurance Rate Map Revision Date(s)
Bountiful, City of	October 26, 1973	--	September 29, 1978	March 2, 1982 September 27, 1991
Centerville, City of	June 28, 1974	March 19, 1976	March 1, 1982	February 19, 1992
Clearfield, City of	August 2, 1974	October 1, 1976	February 20, 1979	--
*Clinton, City of	August 8, 1974	--	June 18, 2007	--
Farmington, City of	June 28, 1974	October 31, 1975	August 17, 1981	December 15, 1992 February 16, 1996
Fruit Heights, City of	June 28, 1974	--	August 17, 1981	--
Kaysville, City of	June 28, 1974	September 3, 1976	March 1, 1982	--
Layton, City of	August 9, 1974	May 14, 1976	December 1, 1982	--
North Salt Lake, City of	June 28, 1974	August 13, 1976	August 29, 1978	December 22, 1981
South Weber, City of	July 26, 1974	April 2, 1976	September 12, 1978	May 19, 1981
Sunset, City of	June 28, 1974	February 13, 1976	November 21, 1978	--
*Syracuse, City of	July 30, 1976	--	June 18, 2007	--
Unincorporated Areas (Davis County)	February 7, 1978	--	March 1, 1982	November 2, 1995
West Bountiful, City of	December 28, 1973	November 5, 1976	August 3, 1981	--
West Point, City of	June 18, 2007	--	June 18, 2007	--
Woods Cross, City of	December 28, 1973	April 23, 1976	August 29, 1978	--

* No Special Flood Hazard Areas Identified

Table 8	FEDERAL EMERGENCY MANAGEMENT AGENCY DAVIS COUNTY, UT AND INCORPORATED AREAS	COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

Barton, Mill, and Stone Creeks were included in the USACE Flood Plain Information report for Bountiful, West Bountiful, and Woods Cross, Utah dated December, 1969 (USACE, 1969).

A Flood Insurance Study was prepared in 1981 for the City of Centerville (FEMA, September 1, 1981). The results of this revised study supersede the 1981 study.

Farmington and Steed Creeks were included in the USACE Flood Plain Information Report for Farmington Bay Tributaries, Farmington-Centerville, Utah (U.S. Department of the Army, June 1974).

The U.S. Army Corps of Engineers published a Flood Information report in 1976 (U.S. Department of the Army, April 1976). This Flood Insurance Study and the USACE report are compatible.

A Flood Plain Information report done by the U.S. Army Corps of Engineers includes Barton, Mill, and Stone Creeks through the City of West Bountiful (U.S. Department of the Army, 1968). The hydrologic information used in that report has been updated as provided in the FIS for the City of Bountiful (U.S. Department of Housing and Urban Development, March 1978).

This FIS report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

This is a multiple-volume FIS. Each volume may be revised separately, in which case it supersedes the previous printed volume. User should refer to the Table of Contents in Volume 1 for the current effective date of each volume; volumes bearing these dates contain the most up-to-date flood hazard data.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region VIII, Denver Federal Center, Building 710, Box 25267, Denver, Colorado 80225-0267.

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10.0 REVISIONS DESCRIPTION

This section has been added to provide information regarding significant revisions made since the previous FIS report and FIRM were printed. Future revisions may be made that do not result in the republishing of the FIS report. All users are advised to contact the Community Map Repository to obtain the most up-to-date flood hazard data.

10.1 Physical Map Revision (2013)

All minor revisions to this Flood Insurance Study that occurred before the creation of the first digital Countywide FIS in 2007 are described in the relevant sections of this document.

For this countywide PMR and FIS update, an initial Community Coordination Officer's (CCO) meeting was held on June 22, 2010, and was attended by representatives of the community, the study contractor, the State of Utah, and FEMA. The final CCO meeting was held on _____, and was attended by representatives of the community, the study contractor, the State of Utah, and FEMA.

For this PMR and FIS update, URS Corporation, prime engineering contractor for the Utah Division of Emergency Management Cooperative Technical Partner (CTP) conducted 19.7 miles of detailed study along Davis Creek and Farmington Creek in Farmington, Haight Creek in Fruit Heights, North Canyon Creek in Bountiful, and North Fork Holmes Creek in Kaysville, and Kays Creek, Middle Fork Kays Creek, North Fork Holmes Creek, North Fork Holmes Creek Diversion, North Fork Kays Creek, South Fork Kays Creek and Snow Creek in Layton; 20.4 miles of limited detail study along Barton Creek, Dry Hollow #2, Mill Creek, North Canyon Creek, North Fork Stone Creek and Stone Creek in Bountiful, and Holmes Creek Diversion, North Fork Holmes Creek and North Fork Holmes Creek Diversion in Kaysville; and 1.2 miles of approximate study along Baer Creek in Kaysville. Additionally a portion of the Great Salt Lake shoreline in Farmington, Centerville, and West Bountiful was refined using updated topography. This work was completed in September 2013 under Contract No: EMD-2010-GR-1080.

The updated flood hazard information for the Weber River reflects the study conducted for the Weber County and Incorporated Areas FIS that was updated in October 2011 (FEMA, 2011) under Contract No: EMD-2009-GR-0980.

Detailed descriptions of the streams studied as part of this revision are listed in Table 1 – Summary of Streams Studied.

This restudy affected 31 FIRM panels. Base map information used for this project was derived from multiple sources. This information was compiled from the U.S. Geological Survey, 1989 and 2010, National Geodetic Survey, 2013, Bureau of Land Management, 2010, Utah Automated Geographic Reference Center (AGRC), 2013, Davis County Information Systems Center, 2011, FEMA existing DFIRM data, 2007, and the USDA and Farm Service Agency Aerial Photography Field Office, 2011.

The projection used in the preparation of this Flood Insurance Rate Map (FIRM) is Universal Transverse Mercator (UTM) Zone 12 N with a NAD83 horizontal datum, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

The hydrologic analyses for the streams that were studied during this update were performed using the available peak annual runoff data from USGS, and a Log Pearson Type III analysis (LPIII) using methodology outlined in the Davis County PMR Study Hydrology Report (URS, 2011). A detailed hydrologic analysis was completed using the Hydraulic Engineering Center's Hydrologic Modeling System (HEC-HMS) Version 3.5 developed by the U.S. Army Corps of Engineers using the SCS Curve Number Method. Four HEC-HMS basin models were used to develop the final flows for the Davis County update. The models combined watershed characteristics such as area, ground cover, and land use with a meteorological model and hydrologic/hydraulic routing techniques, to generate the peak flow data.

A Log Pearson III gage analysis of the Farmington Creek gage was used to develop an appropriate range of CN values, storm duration and storm depth for the 1-percent-annual-chance storm event. Once this was created the results for the remaining watersheds used the same rainfall loss and meteorological inputs. The Farmington Creek gage was used because it is the most representative gage for the county.

Weighted curve numbers (CN) values were computed for each subbasin delineated in the HMS model based on National Resource Conservation Service (NRCS) (formerly SCS) methodologies. The CN value defines how much of the total storm depth will infiltrate into the ground, will be lost in surface storage, or evaporate (initial abstraction) versus how much of the precipitation will collect and runoff downstream. CN values are based on weighted averages of ground cover, land use and hydrologic soil classification. Ground cover was determined from 2009 USDA aerial topography obtained from the AGRC and was combined with soil types obtained from the AGRC to determine a range of CN values covering all the studied watersheds.

An SCS 12-hour Type II storm distribution was used to distribute a rainfall depth throughout each watershed. This shorter duration storm event coincided best with the 1-percent-annual-chance gage data on Farmington Creek.

Adams Reservoir and Hobbs Reservoir are both maintained as flood control facilities by Davis County. Adams Reservoir divides Snow Creek into an upper and lower basin. The reservoir was designed in 1914 and contains one primary outlet with a secondary emergency spillway. Since its original construction, the emergency spillway was modified in 1993 and the primary outlet was replaced in 1997. Hobbs Reservoir is located at the junction of North Fork of Kays Creek Upper Basin and North Fork Kays Creek Lower Basin. The reservoir was designed in 1924 and contains one primary outlet with a secondary emergency spillway. The emergency spillway was modified in 1985 and the primary outlet was replaced in 2009. These reservoirs were incorporated into the hydrologic model using as-built drawings received from the Utah Division of Water Rights in collaboration with Layton City, Utah.

Based on the calibration results using the Farmington Gage data and the NOAA Atlas 14 rainfall depth with the HMS model, the Davis County PMR Study Hydrology Report (URS, 2011) flows were incorporated into Table 4 – Summary of Peak Discharges.

The hydrologic analysis of the Weber River was taken from the Flood Insurance Study for Weber County Utah, and Incorporated Areas, dated Preliminary October 27, 2011 (FEMA, Preliminary October 27, 2011).

The topographic surface used for Stone Creek, Mill Creek and Barton Creek was acquired through LiDAR methodology by the Utah AGRC flown in 2006, with some areas supplemented by Bountiful City LiDAR flown in 2010.

The topographic surface used for Kays Creek and North Fork Holmes Creek within Layton City was derived from two-foot contours provided by Layton City from an aerial survey flown in 2003.

The topographic surface used for Kays Creek, North Fork Holmes Creek and Holmes Creek Diversion in Fruit Heights and Kaysville cities was derived from community-provided LiDAR that was flown in 2010.

All of the topographic surfaces used in this study were supplemented with a field survey, performed during late 2010 and early 2011, to collect bridge geometry and ground truth channel cross section data provided by the LiDAR flight. All data used in these analyses were supplemented with site visits and investigation of aerial photography to identify flow paths, culvert and bridge locations and to estimate friction values to use with the modeling.

The Army Corps of Engineers Hydraulic Engineering Center's River Analysis Program (HEC-RAS) v4.1 (USACE, 2010) was selected to analyze channel hydraulic capacity and to determine the water surface profiles along with HEC-GeoRAS, an ArcGIS based pre- and post-processor for HEC-RAS (USACE, 2010).

For limited detailed studies and approximate studies, only the 1-percent-annual-chance flow is analyzed, mapped and reported. The detailed study areas include the 10-, 2-, 1-, and 0.2-percent-annual-chance flows and includes a floodway analysis. Both the detailed and limited detailed study reaches had a detailed survey performed of all encountered structures.

Roughness coefficients (Manning's "n" values) used in the hydraulic computations are shown in Table 6, "Manning's "n" values", and were based on field inspection of stream channels and overbank areas, and adjusted based upon land use and ground cover determined from aerial photography.

Hydraulic model results are reported for a subcritical flow regime except for Mill, Barton, and Stone Creeks. The downstream boundary conditions are based on normal depth at the channel slope as determined by the last two modeled cross section inverts. The downstream boundary conditions for North Fork Kays Creek are the known water surface elevations from Hobbs Reservoir (URS, 2011).

Contraction and expansion coefficients of 0.1 and 0.3, respectively, were used for cross sections with no structures, while cross sections influenced by flow contraction and expansion caused by bridges or other conveyance structures were assigned a contraction coefficient of 0.3 and an expansion coefficient of 0.5.

The hydraulic analyses for this study is based on unobstructed flow, and calculated flood elevations that are only valid if hydraulic structures remain unobstructed, are operated properly, and do not fail. Along these lines, all piers were modeled as unobstructed, passing clear water flow, with no floating debris using the measured geometries.

Ineffective flow areas are typically set at bridges and culverts. Occasionally ineffective flow areas are not used at structures due to model instability causing crossing profiles. When ineffective areas were removed to stabilize the model a note was added to the cross section description.

The floodway calculations reflect the minimum width allowed by encroachment of the 1-percent-annual-chance floodplain on either overbank, until a maximum floodplain elevation surcharge of one foot was created. In several of the HEC-RAS models, the encroachments are set outside of the

floodplain. This was done to produce surcharges within the 1 foot limit. The floodway is cut to match the floodplain in these instances. Minor negative surcharges (less than 0.1 foot) in the model were caused by subcritical flow instability through sections of narrow floodplains and are reported as 0 with the exception of Farmington Creek.

Split flow analyses were performed for Barton Creek, Davis Creek, Kays Creek, North Canyon Creek, North Fork Holmes Creek, and Stone Creek. Results are described in detail in the North and South Davis County Hydraulic Reports (URS, 2013).

Holmes Creek Diversion begins as a piped lateral through the bank of Holmes Creek, and subsequently joins a wash under Angel Street that generates the majority of the 1-percent-annual-chance flow. The HEC-RAS model extends upstream of a diversion structure into the tributary wash area. The Angel Street crossing backs the 1-percent-annual-chance flood up to the diversion from Holmes Creek.

There are three split flows along Kays Creek. The first split flow is located upstream of I-15. The culvert does not pass 100 cfs for the 1-percent-annual-chance storm event. This flow is routed along the upstream side of the I-15 embankment creating the I-15 split. The second split flow is located upstream of railroad track crossing. The culvert does not pass 1813 cfs for the 1-percent-annual-chance storm event. This flow is routed east creating the Railroad split.

The third split flow is located upstream of 1150 Stone Creek Lane bike path and is modeled in HEC-RAS as a lateral structure. The HEC-RAS model results show the weir flow over the lateral structure is 135 cfs for the 1-percent-annual-chance flood event.

There is one split flow along North Fork Holmes Creek which is located at I-15. The culvert under I-15 has the capacity to pass 295 cfs for the 1-percent chance storm. The plan named SPLITCALC was used to determine the capacity of the culvert. The floodplain plan reduces the flow in North Fork Holmes Creek to 295 cfs from I-15 to the downstream limit of study.

The Snow Creek model study limits is the North Fork Holmes Creek. A structure begins at Fairfield Road at the outlet to Layton City's Adamswood Pond and ends at North Fork of Holmes Creek, a total of approximately 2,800 feet. The HEC-RAS model showed the structure as not contained. Instead of creating a split flow at Fairfield Road the Adamswood Pond was modeled in HEC-HMS and it was determined to have adequate capacity to detain the 1-percent-annual-chance storm event.

In the City of Bountiful, three reaches have been improved with concrete lined channels. Barton Creek, Mill Creek and Stone Creek are all modeled using a mixed flow regime to allow for supercritical flow regimes in the appropriate reaches of the creeks. This modeling approach better represents the hydraulic conditions that are experienced through the concrete sections.

These three models require upstream boundary conditions. The upstream boundary conditions are based on normal depth at the channel slope, as determined by the first two modeled cross section inverts. If the first two cross sections resulted in a negative slope the next cross section that did not result in a negative slope was used.

There is one split flow along Barton Creek at 500 South. Modeling results for the 500 South culvert show that water is not contained in the culvert and is spilling onto the road during the 1-percent-annual-chance storm event. The model results show the culvert can pass 333.8 cfs and the weir flow is 458.9 cfs. The split flow leaves the main channel and does not return to Barton Creek downstream.

There are two split flows along Davis Creek. The first split flow is located upstream of the frontage road to I-15 at approximately 55 West and is modeled as a lateral structure. The model results show the weir flow over the lateral structure is 50.6 cfs for the 1-percent-annual-chance flood event. The second split flow occurs at the I-15 culvert. The culvert does not pass 61.27 cfs for the 1-percent-annual-chance storm event. This flow is routed along the upstream side of the I-15 embankment creating the I-15 split.

A split flow occurs along the North Canyon Creek culvert. Modeling results for this bridge show that water is not contained under the bridge and is spilling onto North Canyon Road with the bridge passing 67.68 cfs and an overtopping weir flow of 61.12 cfs for the 1-percent-annual-chance flood.

Modeling results for a bridge show the 1-percent-annual-chance flow overtopping and traveling north of Viewmont football field. The culvert passes 246.09 cfs while the weir flow results redirect 414.31 cfs behind the football field towards 175 West.

The hydraulic analysis of the Weber River was taken from the Flood Insurance Study for Weber County Utah, and Incorporated Areas, dated Preliminary October 27, 2011 (FEMA, Preliminary October 27, 2011).

Table 7 – Floodway Data, and Exhibit 1 – Flood Profiles, were revised to reflect changes as a result of this restudy.

Table 9 lists the Letters of Map Revision (LOMRs) that were incorporated in this study.

Table 9. Letters of Map Revision

Case Number	Community	Flooding Source(s)/ Project Identifier	Date Issued	Type
07-08-0754P	City of Centerville	Barnard Creek	5/12/2009	LOMR
08-08-0164P	City of Kaysville	Holmes Creek	4/18/2008	LOMR
08-08-0369P	City of Kaysville	Holmes Creek	12/26/2008	LOMR
09-08-0509P	City of Bountiful	Dry Hollow No. 1/Dry Hollow No. 1 South Channel	8/20/2009	LOMR
09-08-0502P	City of Kaysville	Holmes Creek	9/30/2009	LOMR
11-08-0022P	City of Kaysville	Holmes Creek Tributary	6/4/2012	LOMR
11-08-0827P	City of Centerville & Davis County (Unincorporated Areas)	Deuel Creek	8/23/2011	LOMR
13-08-0218P	City of Kaysville	Holmes Creek Tributary	8/2/2013	LOMR