

# 8. Urban Areas

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## 8.1. Overview

An “urban area” is defined as a developed area in which there are 10,000 residents or more, and an “urbanizing area” is defined as a developed area or an area outside of a developed area that is planned or anticipated to have 10,000 residents or more within the next 10 years. The City of Chico is the only area within the Mid and Upper Sacramento RFMP regions that is characterized as ‘urban’ or ‘urbanizing’. Therefore, this Chapter focuses on the identification of flood related problems and solutions for the City of Chico.

## 8.2. Legislative Background

California voters passed the Disaster Preparedness and Flood Prevention Bond Act (Proposition 1E) and the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act (Proposition 84) in November 2006, authorizing the sale of nearly \$5 billion in State bonds for flood management improvements throughout the state with \$4.275 billion of this amount specifically earmarked for the repair and improvements to State and federal flood projects within the Central Valley.

In the latter part of 2007, the California Legislature passed and the Governor signed five interrelated bills (2007 California Flood Legislation) aimed at addressing the problems of flood protection and liability and helping direct use of the Proposition 1E bond funds. These included Senate Bills (SB) 5 and 17, and Assembly Bills (AB) 5, 70, and 156. A sixth bill passed in 2007, AB 162, required additional consideration of flood risk in local land use planning throughout California.

These bills, effective January 1, 2008, collectively added or amended sections in the California Government Code, Health and Safety Code, Public Resources Code, and Water Code. Together, these bills outline a comprehensive approach to improving flood management at the State and local levels, with elements to address both the chance of flooding (e.g., improvements to reduce the probability that floods will occur) and the consequences when flooding does occur.

Of the six bills in the 2007 California Flood Legislation, SB 5 contains the provisions most relevant to urban areas within the Central Valley. It mandates that new development within urban and urbanizing areas have an “urban level of flood protection” which is defined as the “level of protection that is necessary to withstand flooding that has a 1-in-200 chance of occurring in any given year using criteria consistent with, or developed by, the California Department of Water Resources.” SB 5 requires all cities and counties within the Sacramento-San Joaquin Valley to make ‘findings’ related to an urban level of flood protection before making a variety of land use decisions.

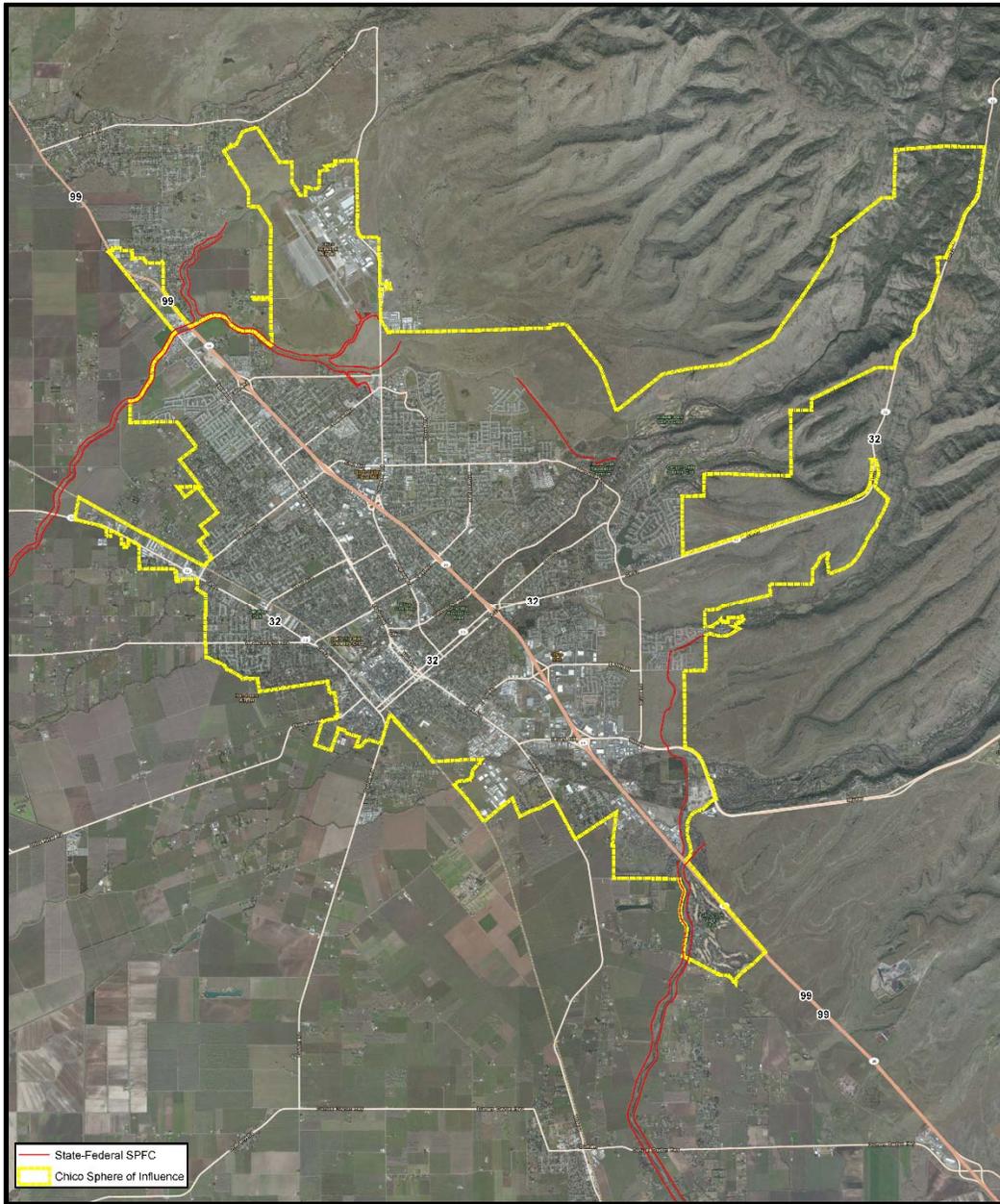
1 Since 2007, there have been several legislative amendments to SB 5 regarding urban level of  
2 flood protection. SB 1278 (2012) and AB 1965 (2012) are the most recent amendments. These  
3 amendments extended the original compliance schedule for cities and counties to amend their  
4 General Plans and Zoning Ordinances, which in turn starts the timeline for implementing the  
5 urban level of flood protection provisions. General Plans must be amended by no later than July  
6 2, 2015, and Zoning Ordinances must be amended within 12 months after completion of the  
7 General Plans amendments. The urban level of flood protection requirements apply once the  
8 General Plan and Zoning Ordinance amendments become effective, but no later than July 2,  
9 2016.

## 10 **8.3. Chico Urban Area**

### 11 **8.3.1. *Boundary***

12 Senate Bill 5 mandated that new development within urban and urbanizing areas have an urban  
13 (200-Year) level of flood protection. As mentioned previously, SB 5 defines an "urban area" as  
14 a developed area in which there are 10,000 residents or more, and an "urbanizing area" as a  
15 developed area or an area outside a developed area that is planned or anticipated to have 10,000  
16 residents or more within the next 10 years. The only area within the MUSR RFPM planning area  
17 that meets these definitions is the Chico area. SB5 allows some discretion to local land use  
18 agencies in determining the boundaries and extents of urban and urbanizing areas. For the  
19 purpose this report, the Chico Urban Area has been assumed to be the City of Chico sphere of  
20 influence together with directly adjacent developed unincorporated areas.

1 **Figure 8-1. Chico Urban Area Boundary**



3 **8.3.2. Levee System Description**

4 The Big Chico Diversion and the Sycamore and Mud Creek levee systems are located north of  
5 Chico, CA and were designed by the United States Army Corps of Engineers (USACE) in the  
6 1960's to protect Chico from flooding during major storm events. The levees are maintained by  
7 the Butte County Department of Public Works, and the channels and diversion structures are  
8 maintained by DWR.

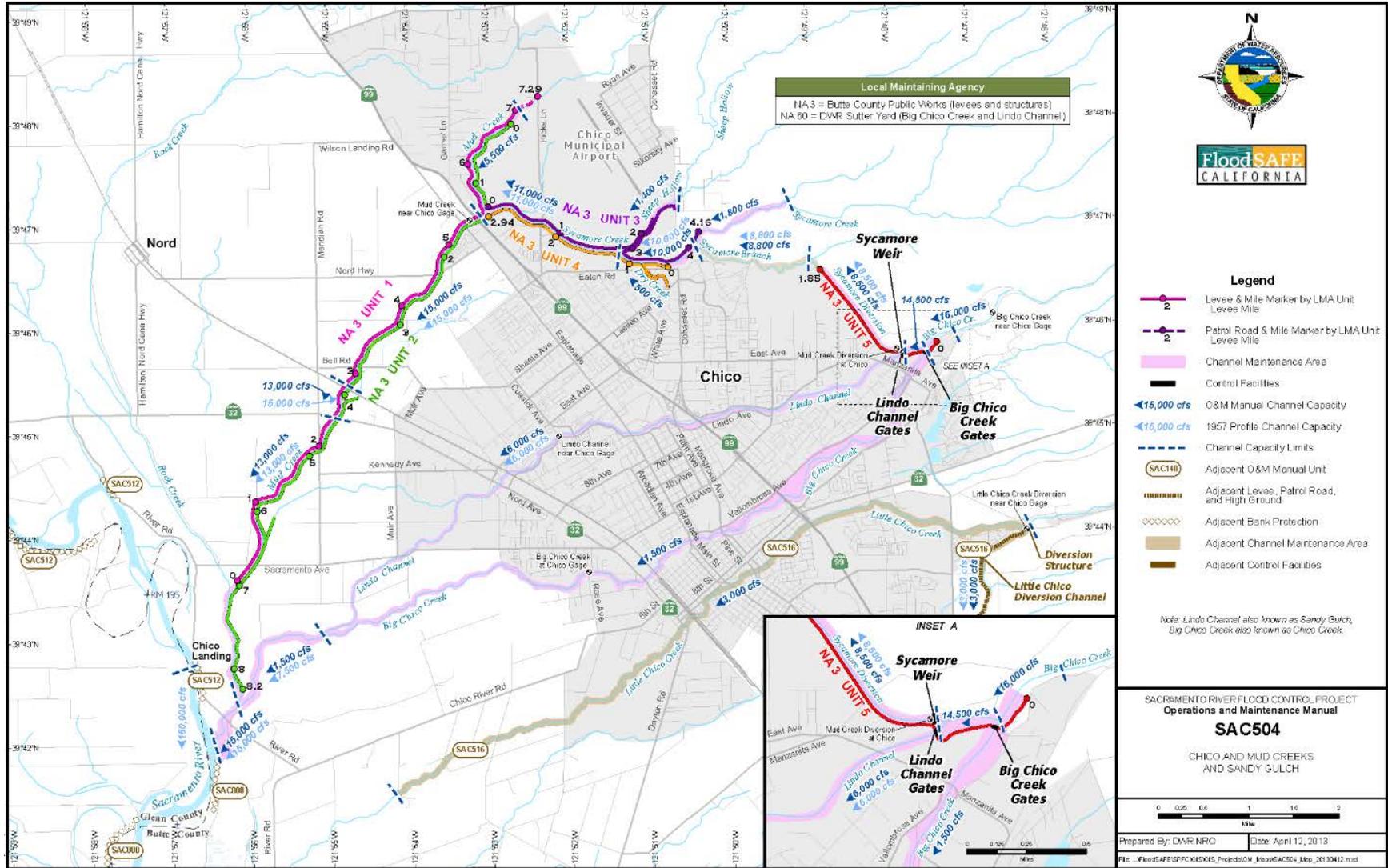
9 Big Chico Creek originates in the foothills and flows through the City of Chico. The Big Chico  
10 Creek diversion structure is located just upstream of the City and diverts high water flows from

1 Big Chico Creek through a Diversion Channel and into the Sycamore-Mud Creek leveed system.  
2 This Sycamore-Mud Creek levee system routes flood flows around the City to the north and east.  
3 Lindo Channel and Mud Creek. Failure of these structures could flood portions of the City of  
4 Chico.

5 Floodwaters from Little Chico Creek to the south are also diverted away from the City of Chico  
6 into Butte Creek by a diversion structure. While these streams rise rapidly and generally flow  
7 high for a limited duration, a prolonged storm event could potentially create an extended flow  
8 situation which would greatly increase the flood threat on this system. Figure 8-2 shows an  
9 overview of the Big Chico Creek system, and Figure 8-3 shows an overview of the Little Chico  
10 Creek System.

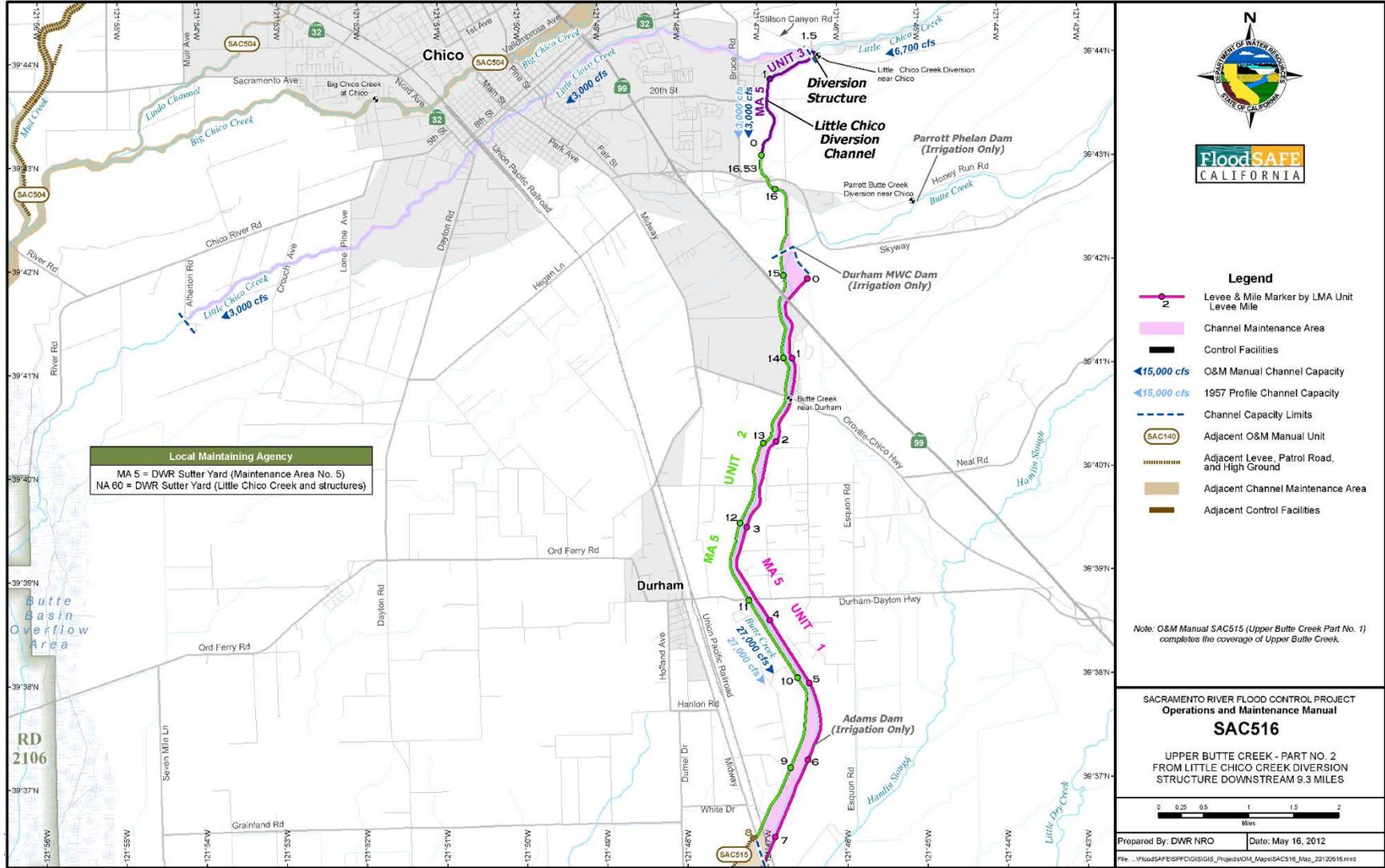
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1 **Figure 8-2. Overview of the Big Chico Creek Levee System**



2

1 **Figure 8-3. Overview of the Little Chico Creek Levee System**



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## 1           **8.4.       Levee Standards, Urban Criteria, and Ongoing Evaluations**

2   Standards for the design, construction, and management of levees have evolved over time, often  
3   in response to structural failures during floods. SPFC levees have been constructed through the  
4   individual and combined efforts of local, State, and federal agencies. The facilities were  
5   constructed with materials at hand over many decades, to meet evolving design standards and  
6   using construction techniques. As a result, these facilities provide varying levels of protection,  
7   depending on when and how they were constructed and upgraded.

### 8                   **8.4.1.       USACE Levee Standards**

9   In 2005, Hurricane Katrina caused widespread flooding and devastation along the Gulf Coast,  
10   most notably the flooding of much of New Orleans. As a result, USACE launched a multi-  
11   pronged effort to improve levee management nationwide, including the creation of a national  
12   levee database, risk notification procedures, and more stringent enforcement of its levee  
13   standards. USACE has also stepped up enforcement of other standards for various aspects of  
14   levee integrity, including encroachments, penetrations, erosion protection, patrol roads, and  
15   structural cross sections.

16   Levees that are deemed noncompliant with current USACE standards risk being classified as  
17   inactive in the federal Rehabilitation and Inspection Program (RIP), which would make the  
18   levees ineligible for PL 84-99 rehabilitation assistance in the event of damage or failure during a  
19   flood. In addition, in many cases FEMA has based its National Flood Insurance Rate Maps  
20   (FIRM) hazard classification upon USACE determinations or certifications of levee integrity and  
21   channel capacity. When USACE downgrades levee structural ratings within its evolving  
22   standards, re-mapping by FEMA is a likely outcome.

### 23                   **8.4.2.       FEMA Standards and Accreditation**

24   When FEMA's National Flood Insurance Program (NFIP) was first established in 1968, areas  
25   protected by USACE levees were presumed to meet 100-year criteria. As a result, most of the  
26   floodplains in the Chico Urban Area protected by the levees of the State Plan of Flood Control  
27   were mapped with 100-year ratings on FEMA's Flood Insurance Rate Maps (FIRMs). In 2005,  
28   FEMA issued Procedure Memorandum 34 (PM 34), which fundamentally reversed the historic  
29   presumption regarding USACE levee systems by requiring the agencies responsible for levees to  
30   demonstrate and document the integrity of their levee systems.

31   Recognizing that in many cases responsible agencies would need to conduct extensive field  
32   work, hydraulic and hydrologic studies, and geotechnical and engineering analyses in order to  
33   demonstrate that their levees met FEMA's certification criteria, FEMA issued PM 43 in 2007.  
34   Procedure Memorandum 43 permits FEMA to issue preliminary and effective FIRMs with  
35   Provisionally Accredited Levees (PALs) if the responsible agencies believe that their systems  
36   meet 100-year criteria, but cannot provide adequate supporting documentation. The PAL

1 designation provides the responsible agencies 24 months to gather and provide the necessary  
2 documentation.

3 The City of Chico and Butte County recently utilized the PAL process to recertify the following  
4 levees as meeting FEMA criteria. The FEMA accreditation package was submitted in January of  
5 2011 and approved in May of 2011. The accredited levees include:

- 6 • Diversion Channel and Sycamore Creek east of Cohasset Road
- 7 • Sycamore Creek West of Cohasset Road to its confluence with Mud Creek
- 8 • Mud Creek from high ground downstream to State Highway 32

### 9 **8.4.3. State Levee Standards and Urban Levee Design Criteria**

10 Prior to 2008, the State primarily relied on USACE levee design, construction, operation, and  
11 management standards. Its historic role in the region included cost sharing in the construction of  
12 Project levees, providing Lands, Easements, Real Estate, Relocations (LERRDs), borrow  
13 materials, and disposal sites, and certifying that the State, through the CVFPB, would take  
14 responsibility for Operation, Maintenance, Repair, and Rehabilitation (OMRR).

15 With the enactment of the 2007 California Flood Legislation however, the State's role in  
16 establishing levee standards was expanded. DWR led the development of the new levee standards  
17 for urban areas called the Urban Levee Design Criteria (ULDC, May 2012), which describes the  
18 levee and floodwall design criteria which flood control facilities protecting urban levees must  
19 now meet.

20 The ULDC provides engineering criteria and guidance for the design, evaluation, operation and  
21 maintenance of levees and floodwalls that provide an urban level of flood protection, as well as  
22 determining design water surface elevations along leveed and unleveed streams. Other topics are  
23 presented to provide reasonable assurance that once a levee or floodwall is found to provide an  
24 urban level of flood protection, it will continue to do so. The ULDC is very comprehensive and  
25 more stringent than current practice for levee design and accreditation. Some of the key features  
26 are as follows:

- 27 • Periodic review by a civil engineer at least every 5 years of the urban level of flood  
28 protection
- 29 • For frequently loaded levees, more stringent requirements that include seepage control and  
30 crack-stopping features like those commonly included in earthen dams of similar height;  
31 and seismic stability sufficient to maintain the integrity of the levee and its internal  
32 structures without significant deformation.
- 33 • For intermittently loaded levees, post-earthquake remediation plan must address 200-year  
34 return period ground motions at a minimum. The plan must address the amount and  
35 extent of damage and the general magnitude of earth and other materials that would be  
36 required to restore flood protection against the 10-year flood within 8 weeks.
- 37 • Expanding the fee title/easement area beyond the levee landside toe from 10 to 20 feet.
- 38 • Additional right-of-way for a future needs area that has a width equal to four times the  
39 levee height or 50 feet, whichever is greater, on the landside of the 20-foot clear zone.

- 1 • Cities and counties should adopt aggressive setback criteria that keep permanent  
2 structures 70 to 400 feet beyond the future needs area, depending on the height of the  
3 levees, future plans for the levee system, and other site-specific conditions.
- 4 • Cities and counties should adopt restrictions on excavations within 400 feet of levees  
5 greater than 15 feet in height and within 200 feet for levees less than 15 feet in height.
- 6 • Civil engineer needs to assess existing encroachments and penetrations and render an  
7 opinion as to their impact on the reliable performance of the levee/floodwall.
- 8 • At minimum of 5-year intervals, the interiors of all pipe and culvert penetrations need to  
9 be visually inspected and/or pressure tested.
- 10 • An engineering inspection and evaluation shall be conducted to identify trees and other  
11 woody vegetation on the levee and within 15 feet of the levee toe.
- 12 • A security plan is required to protect urban and urbanizing area levee systems from acts  
13 of terrorism and other malicious or negligent acts.

14 The ULDC was developed through a collaborative stakeholder involvement process with  
15 representatives from cities, counties, flood agencies, and State and Federal agencies. The Chico  
16 Urban Area levee systems have not yet been evaluated to determine if they meet the ULDC.

#### 17 **8.4.4. Urban Level of Protection Criteria**

18 As discussed earlier, cities and counties (local agencies) located within the Sacramento-San  
19 Joaquin Valley are subject to additional requirements as a result of the 2007 California Flood  
20 Legislation. In October 2013, DWR published criteria called the “Urban Level of Flood  
21 Protection Criteria” (ULOP), for cities and counties to follow when making findings regarding  
22 200-Year level of flood protection for new development as required by the 2007 law. Specific  
23 sections of that law require local agencies to complete the following two planning actions:

##### 24 Planning Action 1:

25 Amend the General Plan by July 1, 2015 to include data and analysis contained within the  
26 Central Valley Flood Protection Plan (CVFPP). The amendment should include the  
27 locations of facilities of the State Plan of Flood Control, and other flood management  
28 facilities, locations of real property protected by those facilities, and the locations of  
29 flood hazard zones.

##### 30 Planning Action 2:

31 Amend the Zoning Ordinance by July 1, 2016 so that it is consistent with the General  
32 Plan, as amended.

33 Once these planning actions are taken, SB5 limits the authority of local agencies to grant the  
34 following three entitlements unless certain conditions are met:

##### 35 Limit 1:

36 Cannot enter into a development agreement for any property; or

1           Limit 2:  
2           Cannot approve any discretionary permit or other discretionary entitlement (for  
3           residential, commercial or industrial property) or any ministerial permit that would result  
4           in construction of a new residence; or

5           Limit 3:  
6           Cannot approve any tentative map, or a parcel map for which a tentative map was not  
7           required, or any subdivision that is located within a flood hazard zone.

8           If the local agency wishes to take any of these three actions, it must first make, based on  
9           substantial evidence in the record, one of the following findings:

10           Finding 1:  
11           The facilities of the State Plan of Flood Control or other flood management facilities  
12           protect the property, project, or subdivision to the ULOP 200-year flood protection; or

13           Finding 2:  
14           The local agency has imposed conditions on the development agreement, permit or  
15           discretionary entitlement, or subdivision, whichever is applicable, that will provide  
16           protect the property, project, or subdivision with ULOP 200-year flood protection; or

17           Finding 3:  
18           The local flood management/levee maintaining agency has made adequate progress on  
19           the construction of a flood protection system which will result in flood protection equal to  
20           or greater than the ULOP 200-year flood protection for property, project or subdivision  
21           located within a flood hazard zone, intended to be protected by the system. The ULOP  
22           200-year flood protection shall be achieved by 2025.

23           Finding 1 requires that the area has already achieved ULOP 200-year flood protection. Finding 2  
24           allows approvals, but not construction of structures; not a practical solution for most urban areas  
25           since development construction quickly follows land use approvals. Finding 3, which measures  
26           adequate progress toward construction and ultimate completion of ULOP 200-year flood  
27           protection, will therefore be relevant to most urban areas as few have 200-Year levels of  
28           protection already in place.

29           According to SB5, adequate progress means all of the following:

30           Progress 1:  
31           The total project scope, schedule and cost of the completed flood protection system have  
32           been developed to meet the appropriate standard of protection, and

33           Progress 2A:  
34           Revenues that are sufficient to fund each year of the project schedule developed in  
35           Progress 1 have been identified and, in any given year and consistent with that schedule,  
36           at least 90 percent of the revenues scheduled to have been received by that year have  
37           been appropriated and are currently expended, and

1           Progress 2B:

2           Notwithstanding Progress 2A, for any year in which State funding is not appropriated  
3           consistent with an agreement between a state agency and a local flood management  
4           agency, the Central Valley Flood Protection Board may find that the local flood  
5           management agency is making adequate progress in working toward the completion of  
6           the flood protection system, and

7           Progress 3:

8           Critical features of the flood protection system are under construction, and each critical  
9           feature is progressing as indicated by the actual expenditure of the construction budget  
10          funds, and

11          Progress 4:

12          The local agency has not been responsible for a significant delay in the completion of the  
13          system, and

14          Progress 5:

15          The local flood management agency provides the Department of Water Resources and the  
16          Central Valley Flood Protection Board with the information specified in this subdivision  
17          sufficient to determine substantial completion of the required flood protection. The local  
18          flood management agency annually reports to the Central Valley Flood Protection Board  
19          on the efforts in working toward completion of the flood protection system.

20                   **8.4.5.        DWR's Urban Levee Evaluation Program**

21          As part of the Urban Levee Evaluation (ULE) program, DWR is conducting geotechnical  
22          exploration, testing, and analysis of state and federal levees that protect the highly populated  
23          urban areas. Technical specialists are also reviewing existing levee historical data; mapping  
24          near-surface geology; conducting field explorations; performing engineering, stability and  
25          seepage analyses; and preparing preliminary design and construction estimates for repairing and  
26          upgrading the levees, where needed.

27          For the Chico urban area, the ULE program is evaluating 5.5 miles of levees, which are directly  
28          adjacent to the City of Chico (the Diversion Canal, Mud, Sycamore and Dry Creeks). The ULE  
29          program will be releasing a draft Geotechnical Evaluation Report (GER) in 2014 that will  
30          present the results of the geotechnical analyses for existing conditions for freeboard, erosion,  
31          seepage, stability, rapid drawdown, and seismic vulnerability. The GER will also further  
32          evaluate the segments identified as not meeting Urban Levee Design Criteria. Two remedial  
33          alternatives will be selected and analyzed in order to better define the repairs and costs which are  
34          needed to bring the deficient segments in compliance ULDC criteria. Appendix B summarizes  
35          the ULE information that has been developed for levee segments protecting the Chico Urban  
36          area.

37          <<Note to Reviewer: Additional ULE information will be incorporated into future drafts as it  
38          becomes available in order to help develop potential system enhancements for the Chico  
39          system.>>

#### 1                    **8.4.6.        *DWR's 200-Year Floodplain Mapping***

2    In 2012, SB 1278 amended the 2007 California Flood Legislation to require DWR to provide  
3    urban areas with 200-Year floodplain maps. DWR provided what they termed “informational  
4    maps” in July 2013 for the City of Chico depicting the resultant 200-Year floodplain from failure  
5    of SPFC levees. The maps were developed using DWR hydraulic models developed as part of  
6    the Central Valley Floodplain Evaluation and Delineation Program (CVFED) and levee  
7    geotechnical information derived in part from the Urban Levee Evaluation program. The maps  
8    were ‘clipped’ to depict the extent of flooding within the sphere of influence only, and only  
9    account for sources of flooding associated with SPFC levees protecting the urban area.

10   The SB 1278 200-year maps do not:

- 11        • Provide all of the information needed for the Chico Urban Area to make ULOP findings.
- 12        • Represent the most likely floodplain
- 13        • Relate to FEMA NFIP regulatory maps or the FEMA levee accreditation process
- 14        • Account for other sources of flooding (non-SPFC levees or local/interior drainage)

15   Therefore, the maps may need to be substantially refined for use in making ULOP findings for  
16   the Chico Urban Area.

### 17                    **8.5.        Issues**

18   <<Note to Reviewer: Conducting detailed hydrologic and hydraulic analyses to identify and  
19   analyze system deficiencies is beyond the scope of the MUSR RFPM. However, DWR is  
20   currently performing analyses which are expected to help better understand the hydraulic  
21   limitations of the Big Chico Creek flood control system. DWR Northern Region Office is  
22   developing updated hydraulic models to be used to assess maintenance needs and priorities for  
23   the Chico system, including analyses for the 100-Year and 200-Year flood events using updated  
24   system hydrology and hydraulics. This information was not available for inclusion in this  
25   Working Draft version of the MUSR RFMP but will be incorporated into future drafts as it  
26   becomes available>>.

#### 27                    **8.5.1.        *Big Chico Creek Diversion Structure***

28   The Big Chico Creek Diversion Structure was originally constructed in 1965. Since  
29   construction, sedimentation and gravel deposits have consistently been an issue. Historically,  
30   these deposits were regularly removed after high water events through agreements with local  
31   contractors. However, these efforts have not occurred for quite some time and deposits have  
32   accumulated to the point where the diversion weir is no visible. The O&M Manual even makes  
33   reference to a ‘notch in the weir’, which is no longer visible.

34   Gravel and sediment deposits at the diversion pose a serious threat to the City of Chico. The  
35   deposits limit the volume of water which gets diverted into the diversion channel, which in turn  
36   forces more water through the Big Chico Creek gates and down through the heart of the City.

1 Downstream of the gates, Big Chico runs adjacent to residential neighborhoods, downtown, and  
2 the University.

3 **8.5.2. Capacity Deficiencies**

4 << Under Development >>

5 **8.5.3. Lindo Channel**

6 << Under Development >>

7 **8.5.4. Sycamore and Mud Creek**

8 Mud Creek suffers from both sediment and vegetation buildup. In recent years, significant  
9 erosion has occurred on the bed and bank on the lower reaches of Sycamore Creek, both directly  
10 at and just below its confluence with the Diversion Channel from Big Chico Creek. The channel,  
11 before the addition of floodwaters, was a relatively small stream with no significant scour holes  
12 or erosion in the underlying geologic structure. Scour and erosion is evident in an originally  
13 buried sewer pipe being exposed and scour at several bridges downstream of Cohasset Road. All  
14 such erosion is taking place in the areas of Mud Creek and its tributary Sycamore Creek. With  
15 the relatively narrow levees along Mud Creek, sediment carried by the stream has no place to go  
16 besides settle in the bottom of the flood control channel.

17 **8.5.5. Little Chico Creek**

18 The Little Chico Creek Diversion Channel was not designed to provide an urban level of  
19 protection. The channel primarily suffers from the buildup of unwanted (non-native) vegetation.  
20 It is believed that sedimentation is not a major issue.

21 **8.6. Potential Enhancements**

22 **8.6.1. ULOP 200-year Strategic Plan**

23 << Under Development >>

24 **8.6.2. Sediment Removal at Big Chico Creek Diversion**

25 << Under Development >>

1           **8.6.3.     *Lindo Channel Improvements***

2   << Under Development >>

3           **8.6.4.     *Enhanced Channel Maintenance Program***

4   << Under Development >>

5           **8.6.5.     *Sycamore Creek Grade Control Structures***

6   << Under Development >>

7           **8.6.6.     *Sheep Hollow Off-Stream Storage Area***

8   << Under Development >>

9           **8.6.7.     *Dry Creek Detention Facility***

10   << Under Development >>

11           **8.6.8.     *Mud Creek UPRR Bridge Crossing Improvements***

12   << Under Development >>