APPENDIX F

Economic Study

Salinas River Stream Maintenance Program

Economic Study

Project No. 30206011

Cardno ENTRIX

Shaping the Future

Document Information

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Acronyms

ACS	American Community Survey
ALMIS	America's Labor Market Information System
BEA	Bureau of Economic Analysis
CBP	County Business Patterns
CMP	Channel Maintenance Plan
CSVR	Content-to-Structure Value Ratio
EDD	Employment Development Department
EIR	Environmental Impact Report
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HEC-Geo RAS	Hydrologic Engineering Center River Analysis System
I-O	Input-Output
IMPLAN	Impact Analysis for Planning
LGMA	Leafy Green Marketing Agreement
MCWRA	Monterey County Water Resources Agency
NASS	USDA National Agricultural Statistics Service
NOAA	National Oceanic and Atmospheric Administration
QCEW	Quarterly Census of Employment and Wages
RGP	Regional General Permit
RPC	Regional Purchase Coefficients
SMP	Salinas River Stream Maintenance Program
TNC	The Nature Conservancy
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture

Executive Summary

The Monterey County Flood Control and Water Conservation District was established in 1947 and was renamed the Monterey County Water Resources Agency (MCWRA) in 1991. MCWRA manages water resources in the Salinas River Watershed and is responsible for administering the proposed Stream Maintenance Program (SMP). MCWRA has developed a stream maintenance program that is programmatic in nature and could be refined as needed over time to provide for more comprehensive and integrated mitigation planning. The proposed SMP would be implemented like the earlier Salinas River Channel Maintenance Plan (CMP) was prior to 2008, on a voluntary basis by individual property owners, growers, and municipalities (participants) along the Salinas River mainstem. MCWRA would also implement the SMP on three tributaries to the Salinas River (San Lorenzo Creek, Bryant Canyon Channel, and Gonzales Slough).

Monterey County is home to some of the most valuable and sophisticated farming operations in the United States. According to the latest Census of Agriculture publication (2007), there are approximately 1,200 farms in the county spanning approximately 1.3 million acres. A significant portion of the farmland is located along the Salinas River Valley, in the heart of Monterey County. At approximately 1,100 acres, farming operations in Monterey County are over two times larger than the national average. The market value of farmland and buildings averages $5.1 million per farm, compared with $0.8 million nationwide.

Monterey County is a national leader in agricultural production. In 2010, Monterey County generated $4.0 billion in agricultural products, ranking it fourth among California counties. The Salinas River Valley is one of the top vegetable and fruit producing areas in the US and supplies 80 percent of the nation's lettuce and nearly the same proportion of the nation's artichokes. It is commonly referred to as the "Salad Bowl of the World". Monterey County leads all other counties in the U.S. by value of vegetable crop production.

Agriculture is a major component of the Monterey County economy. In addition to the direct value of agricultural products, production agriculture supports a broad cross section of industries in Monterey County which supply and are supplied by agriculture. Farmers purchase chemicals, seed, feed, fertilizer, equipment and other supplies as well as the services of hired labor, financial institutions and custom operators, termed "backward linkages." In addition, crops are transported, packed, shipped, brokered, processed, frozen, and otherwise handled before reaching final consumers. This web of businesses is termed "forward linkages." A recent study commissioned by the Monterey County Agricultural Commissioner finds that agricultural production contributes $8.2 billion annually to the Monterey County economy and supports approximately 70,000 jobs.

This Economic Impact Study assesses the economic impacts of alternative Salinas River Stream Maintenance Programs. An Input-Output (I-O) model is developed to estimate the economic value of lost industry output (a component of which is labor income) and the total number of jobs that are lost when crops planted in the Salinas River Valley are destroyed during simulated flood events under alternative flood channel capacities. The model is implemented using IMPLAN (Impact Analysis for Planning) software and associated data, along with data published by the Monterey County Agricultural Commissioner's Office and U.S. Bureau of Economic Analysis, among others. Additionally, an estimate of the cost to restore inundated structures and their contents to pre-flood conditions is developed with parcel data maintained by the Monterey County Assessor, data on depth of inundation, and appropriate damage depth curves published by the U.S. Army Corp of Engineers.

In this study, impacts are evaluated for two flood events along the Salinas River, a two and ten-year flow. Results and methodology are presented and explained assuming the flood event occurs during the month of February. For each flood event, resulting economic impacts are estimated for two alternative Salinas

River channel capacities; a) actual capacity in the absence of active stream maintenance ("existing conditions"), and b) expected capacity after implementation of the activities prescribed in Stream Maintenance Program. A measure of the SMP's economic value is derived as the reduction in economic impacts of a flood event with the SMP in place relative to economic impacts of the same flood under existing conditions.

The Economic Impact Study begins by analyzing results of the Salinas River Stream Maintenance Program Flood Study (Flood Study) presented in Appendix E to identify the inundated crop acreage and number of structures for each flood event and stream maintenance alternative. Along with data presented in the Flood Study, primary data for this analysis includes cropping and land use pattern data published by the USDA National Agricultural Statistics Service (NASS) and The Nature Conservancy (TNC). Following is a summary of the findings.

> The two-year flood event is expected to inundate 369 acres of crops under existing and 323 acres under maintained stream conditions; a reduction of 12 percent. These acreages reflect less than one percent of the harvested cropland in Monterey County.

> The two-year flood event is not expected to inundate any structures under either stream maintenance alternative.

> The ten-year flood event is expected to inundate approximately 25,000 acres of crops under existing and approximately 23,000 acres under maintained stream conditions; a reduction of 8 percent. These acreages reflect approximately ten percent of the harvested cropland in Monterey County.

> The ten-year flood event is expected to inundate 1,069 structures under existing and 801 under maintained stream conditions. Approximately 90 percent of the structures are classified as single-family residences.

Table ES-1 presents estimates of regional economic impact resulting from crop loss and forgone value-added food processing based on the I-O model developed in this study.

> For the two-year flood flow, results indicate that implementing the SMP would avoid $0.6 million in lost output and save 3 jobs. Approximately $0.3 million of avoided output losses is comprised of income. In percentage terms, lost output is reduced by approximately 11 percent under maintained conditions relative to existing conditions.

> For the ten-year flood flow, results indicate that implementing the SMP would avoid $27.9 million in lost output and save 163 jobs. Approximately $10.9 million of avoided output losses is comprised of income. In percentage terms, lost output is reduced by approximately 6 percent under maintained conditions relative to existing conditions.

Table ES-1: Estimated of Regional Economic Impacts from Crop Loss Resulting from a February Flood Event on the Salinas River

Flood Event and Stream Maintenance Alternative	Total Output (Millions)	Total Income (Millions)	Total Employment (jobs)
2-Year Flow: Existing Conditions	$5.8	$2.3	33
2-Year Flow: Maintained Conditions	$5.2	$2.0	30
Difference: (Existing – Maintained)	**$0.6**	**$0.3**	**3**
10-Year Flow: Existing Conditions	$478.9	$190.8	2,911
10-Year Flow: Maintained Conditions	$451.0	$179.9	2,748
Difference: (Existing – Maintained)	**$27.9**	**$10.9**	**163**

Notes:
Values are reported in 2011 dollars.

Totals may not sum due to rounding.

When interpreting the estimates presented in Table ES-1, it is important to keep in mind uncertainties and key modeling assumptions forming the base scenario in the I-O model that, when shocked, can result in changes to estimates of economic impact. These and other assumptions and uncertainties are discussed in Chapter 5.

> These estimates provided an annual snapshot for a single crop-year. In any given crop year there is a 50% chance that a two-year flood event will occur. Therefore, it is important to realize that the SMP will provide long-term benefit to Salinas River growers and the Monterey County economy.

> Vegetable production is intensive, and growers in the area harvest multiple crops per year from the same field. The base scenario for the I-O model assumes that crop loss is limited to the first crop and that subsequent plantings can be harvested as usual. Based on survey data and discussions with local industry participants, it is assumed that growers can comply with food safety protocols following flood inundation (which may require waiting up to 60 days before replanting the acreage) and replant the subsequent crop(s) in sufficient time to bring the crop to market. Similarly, it is assumed that any topsoil erosion is sufficiently minimal to allow for repair and replacement in time to replant the subsequent crop(s). Relaxing this assumption will increase economic impacts of flooding with and without stream maintenance activities.

> Acreage that is adjacent to inundated areas but is itself free of inundation is assumed to be harvested and managed without additional costs to growers. Relaxing this assumption will increase economic impacts of flooding with and without stream maintenance activities.

Table ES-2 presents estimates of costs to restore inundated structures and their contents to pre-flood conditions for each flood event and alternative stream maintenance scenario. When interpreting these figures, it is important to understand these estimates are based on data reporting assessed value of buildings and improvements and thus overestimate the actual replacement cost.

> No structures are expected to be inundated for a two-year flood event under either stream maintenance alternative.

> For the ten-year flood flow, results indicate that implementing the SMP would reduce potential property damage (to both structures and their contents), by $23.9 million. In percentage terms, this equates to a 21 percent reduction in property damages relative to the same flood under existing conditions.

Table ES-2: Value of Damage to Structures and Contents from a Flood Event on the Salinas River ($ Millions)

Flood Event and Stream Maintenance Alternative	Office	Multi-Family Residences	Single-Family Residences	Condominiums-Single Family Residences	Undefined Structures	Total
2-Year Flow: Existing Conditions	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
2-Year Flow: Maintained Conditions	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Difference: (Existing – Maintained)	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**
10-Year Flow: Existing Conditions	$0.0	$1.7	$66.7	$0.7	$42.5	$111.6
10-Year Flow: Maintained Conditions	$0.0	$1.2	$47.5	$0.0	$39.0	$87.7
Difference: (Existing – Maintained)	**$0.0**	**$0.5**	**$19.2**	**$0.7**	**$3.5**	**$23.9**

Notes:
Values are reported in 2012 dollars.

Table ES-2: Value of Damage to Structures and Contents from a Flood Event on the Salinas River ($ Millions)

Flood Event and Stream Maintenance Alternative	Office	Multi-Family Residences	Single-Family Residences	Condominiums-Single Family Residences	Undefined Structures	Total

Totals may not sum due to rounding.

When interpreting the estimates presented in Table ES-2, it is important to keep in mind data limitations that work to overstate the true cost of restoring inundated structures and contents to pre-flood conditions.

> Data provided by the Monterey County Tax Assessor reports the assessed value of buildings and improvements on parcels in Monterey County. Assessed values are closer to the market value of the property and its improvements. Replacing a property will typically cost less than its market value. In this study, the market value is a proxy for the replacement cost, which more closely resembles insurance payments.

> The tax assessor data reports the assessed value of land and improvements. However, improvements are not broken down into categories. As a result, the value of improvements which may be unaffected by inundation (e.g., cement irrigation canals, stand pipes) are included in the estimate of damage.

It is also important to note that the Flood Study was prepared by to evaluate the effects of proposed maintenance activities on channel flood capacity along 100 miles of river. The model approach and results are not intended to be sufficiently refined to evaluate site-specific effects of maintenance on channel capacity for a specific landowner or property, including residential structures. While the model is a reasonable predictor of the general effects of the SMP on Salinas River floodflow stages, and is adequate for purposes of supporting an EIR assessment, the model would need to be refined locally in order to use it for purposes of assessing the specific effects and potential economic benefits for particular maintenance projects planned by a given landowner under the SMP. The model lacks the specificity necessary to meet FEMA standards and homes that are currently shown in the 10-year inundation area may actually be elevated or otherwise not subject flood damages from a 10-year event.

1 Introduction

The Salinas River Stream Maintenance Program (SMP) Economic Study (Study) was prepared by Cardno ENTRIX for the Monterey County Water Resources Agency (MCWRA) to measure the economic value of proposed maintenance activities on channel flood capacity along 94 miles of river. An Input-Output model was constructed using the IMPLAN software and data package to determine the impacts to the Monterey County economy based on a simulated flood event with existing flood capacities and to determine changes in economic impacts with proposed stream maintenance activities. Additionally, estimates of property damages to inundated structures after a simulated flood under existing conditions were developed and compared to property damages after the same flood with proposed stream maintenance activities.

1.1 Overview

Monterey County, located in central California, encompasses 3,322 square miles and has a population of 415,000. The geographic center of the county is the 170-mile long Salinas River Valley, which lies within the southern Coast Ranges between the San Joaquin Valley and the Pacific Ocean. Monterey County has a Mediterranean climate. With mild summers and cool winters that are moderated by the Pacific Ocean, it is well-suited for growing fruits and vegetables.

In 2010, Monterey County ranked fourth among all counties in California by value of agricultural production, with a total value of $4.0 billion of crop and livestock output. Crops are grown primarily in the Salinas River Valley. Fruits and vegetables are the major crops by value of production, and are grown in the northern two-thirds of the valley. Less land is cultivated south of King City, where grains and wine grapes are the major crops.[1]

Monterey County is a national leader in agricultural production.[2] The Salinas River Valley is one of the top vegetable and fruit producing areas in the US and supplies 80 percent of the nation's lettuce and nearly the same proportion of the nation's artichokes.[3] It is commonly referred to as the "Salad Bowl of the World". When compared to all counties in the nation in 2007 (the latest year for which data for all counties is available), Monterey County ranked fifth by value of agricultural production and first by value of vegetable crop production.[4]

The latest Census of Agriculture publication (2007) reported 1,199 farms and ranches across 1.3 million acres in Monterey County.[5] Farms in Monterey County average 1,108 acres, compared to the national average of 418 acres.[6] Average market values are $4,645 per acre ($5.1 million per farm), compared to

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1 Monterey County Groundwater Plan: Chapter 1, May 2006, Website (http://www.calwater.com/your_district/uwmp/kc/Appendix_H_-_GWMP.pdf) accessed November 21, 2012.

2 Monterey County, Overview of Monterey County, Website (http://www.mcbusiness.org/page/montereycounty/index.v3page) accessed November 8, 2012.

3 Salinas Valley Chamber of Commerce, Agriculture Industry, Website (http://www.salinaschamber.com/ag_industry.asp) accessed November 6, 2012.

4 USDA, NASS, 2007 Census of Agriculture: County Profile, Monterey County - California, Website (http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/California/cp06053.pdf)

5 USDA NASS, 2007 Census of Agriculture, State and County Profiles. (http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/California/)

6 USDA NASS, 2007 Census of Agriculture, State and County Profiles. (http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/California/)

the national average of $1,892 per acre ($0.8 million per farm).[7] Monterey County farms average nearly $500,000 in net cash income annually, compared with the national average of approximately $34,000 per operation.[8]

Despite production of high value agricultural products on highly valuable farmland, the Salinas River Valley is prone to flooding and has experienced a number of notable floods over time.[9] For example, the highest flow event ever measured at the Spreckels River Gauge occurred on March 12, 1995 when the river peaked at 30.3 feet.[10] Other major Salinas River flood events, as measured by the Spreckels River Gauge, occurred in 1938, 1969, 1978, and 1983.[11]

1.2 Proposed Stream Maintenance Program

MCWRA is currently assessing the flood capacity changes associated with a proposed stream maintenance program that would be voluntarily implemented by local landowners, growers, and municipalities, with property adjacent to the Salinas River. The stream maintenance program area is defined as the Salinas River mainstem and select tributaries and in total covers approximately 94 miles.[12] However, not all 94 miles will be subject to maintenance. MCWRA has developed projections for reasonably anticipated locations and extent of maintenance work expected to occur within the 94 miles of river channel over the next 10 years. The estimated projections identify the potential maintenance activities that could occur. Actual stream maintenance activities and locations will vary from year-to-year, depending on land-owner interest, weather, hydrologic conditions, frequency and extent of past maintenance activities, and funding. Future maintenance needs may occur, consistent with overall MCWRA projections, but may vary from the specific location originally projected.

There is a long history of channel maintenance activities on the Salinas River. The most recent SMP was conducted between 2003-2008, under a USACE 404 Regional General Permit (RGP) which authorized MCWRA to oversee voluntary, annual channel maintenance activities by participating landowners along the lower 92 miles of the Salinas River mainstem. The currently proposed stream maintenance program is a voluntary program similar to the 2003-2008 Channel Maintenance Program (CMP), and includes the following activities:

> Mechanical removal of vegetation below the channel bank slopes near the channel bottom

> Provision for a 10-foot wide riparian buffer zone on each side of the low-flow channel

> No removal of native vegetation from the low-flow channel

> Scalping of sediment from sandbars greater than 3 feet in height above the channel thalweg

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7 USDA NASS, 2007 Census of Agriculture, Volume 1, Chapter 2: County Level Data, **Table 8.** Farms, Land in Farms, Value of Land and Buildings, and Land Use: 2007 and 2002 (http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/California/)

8 USDA, NASS, 2007 Census of Agriculture, Volume 1, Chapter 2: County Level Data, **Table 4.** Net Cash Farm Income of Operations and Operators: 2007 and 2002 (http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/California/).

USDA, NASS, 2007 Census Volume 1, Chapter 1: U.S. National Level Data, **Table 5.** Net Cash Farm Income of Operations and Operators: 2007 and 2002

9 MCWRA, Historical Flooding, Website (http://www.mcwra.co.monterey.ca.us/Floodplain%20Management/Historical%20Flooding.htm) accessed November 6, 2012.

10 NOAA, National Weather Service: Salinas River-Spreckels, Website (http://www.cnrfc.noaa.gov/graphicalRVF.php?id=SPRC1) accessed November 7, 2012.

11 NOAA, National Weather Service: Salinas River-Spreckels, Website (http://www.cnrfc.noaa.gov/graphicalRVF.php?id=SPRC1) accessed November 7, 2012.

12 From the Highway 1 Bridge, (RM 2), upstream to RM 94, and also includes portions of the tributaries along Gonzales Slough (at RM 31.6), Bryant Canyon Channel (at RM 47.1), and San Lorenzo Creek (at RM 69.0), totaling approximately 94 miles

> Removal of non-native vegetation, primarily Arundo donax

The three primary maintenance activities consist of vegetation management, sediment management, and bank stabilization. None of the proposed maintenance actions allow for work in the low-flow channel. These core maintenance activities will occur along reaches within the Salinas River mainstem from RM 2 to RM 94. The SMP also includes the transport and disposal of collected sediment and vegetation outside the channel. However, it is assumed that the materials would be primarily deposited in other upland areas of the property.

Stream maintenance activities for the tributaries, specifically sediment removal and native and non-native vegetation management, will be performed by MCWRA on the lower portions of Gonzales Slough, Bryant Canyon Channel, and San Lorenzo Creek. Pre- and post-project cross-sections will be performed to ensure that the grading activities are consistent with the goal of restoring the channel elevations to original plans or specifications.

The proposed SMP includes annual limits on the amount of vegetation and sediment removal. The limit on native vegetation removal is 175 acres/year in the constrained reach and 670 acres/year in the unconstrained reach. Under the proposed SMP, it is anticipated that 100 acres of non-native Arundo would be removed annually. However under the proposed SMP, there would be no annual limits regarding the removal of non-native vegetation. Sandbar scalping is limited to 100,000 cubic yards/year in the constrained reach and 455,000 cubic yards/year in the unconstrained reach.

The specifics of the Stream Maintenance Program are detailed in Chapter 2 of the Draft EIR and Appendix E. For the Economic Study, the key piece of information about the program is data on the number of acres expected to be inundated during the same flood events with and without proposed stream maintenance activities in place. These data are developed by the hydrologic model presented in the Flood Study (Appendix E).

1.3 Study Area

The study area for the Economic Study is Monterey County. All of the acreage expected to be inundated by flooding of the Salinas River is located along the Salinas River valley within Monterey County. Crop production is the primary economic activity conducted within the inundated area and businesses linked closely to Salinas Valley agriculture (such as local agricultural suppliers and processors of Salinas Valley agricultural production) are located within the county. Figures 1.1, 1.2, and 1.3 depict the Salinas River Valley and identify major cropping patterns relative to the footprint of flood inundation areas expected for two and ten-year flows under existing flood capacity along the Salinas River channel.

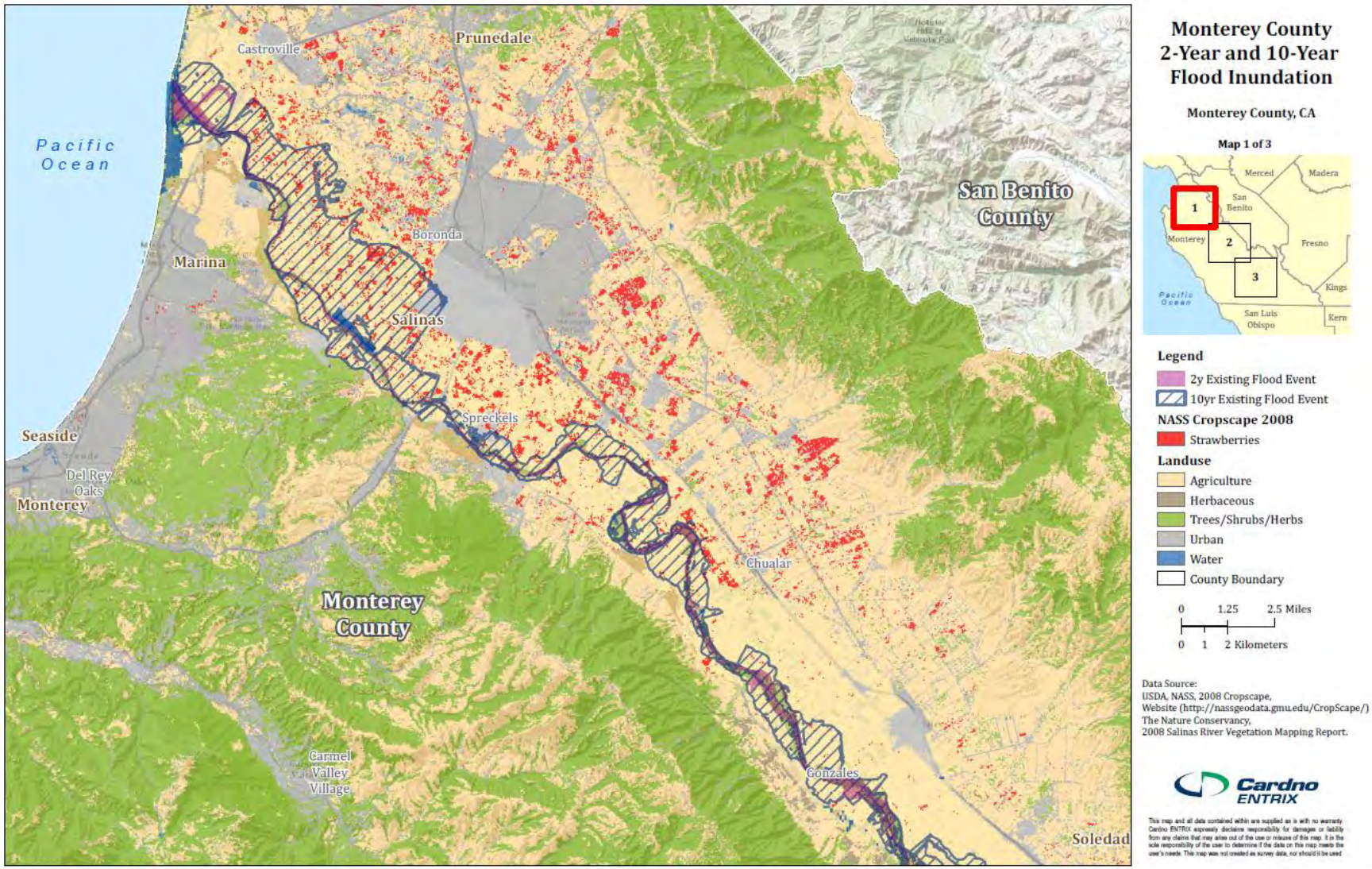

Figure 1.1: Salinas River Valley, Northern Third: Cropping Patterns and Expected Flood Inundation Areas Under Existing Channel Flood Capacity

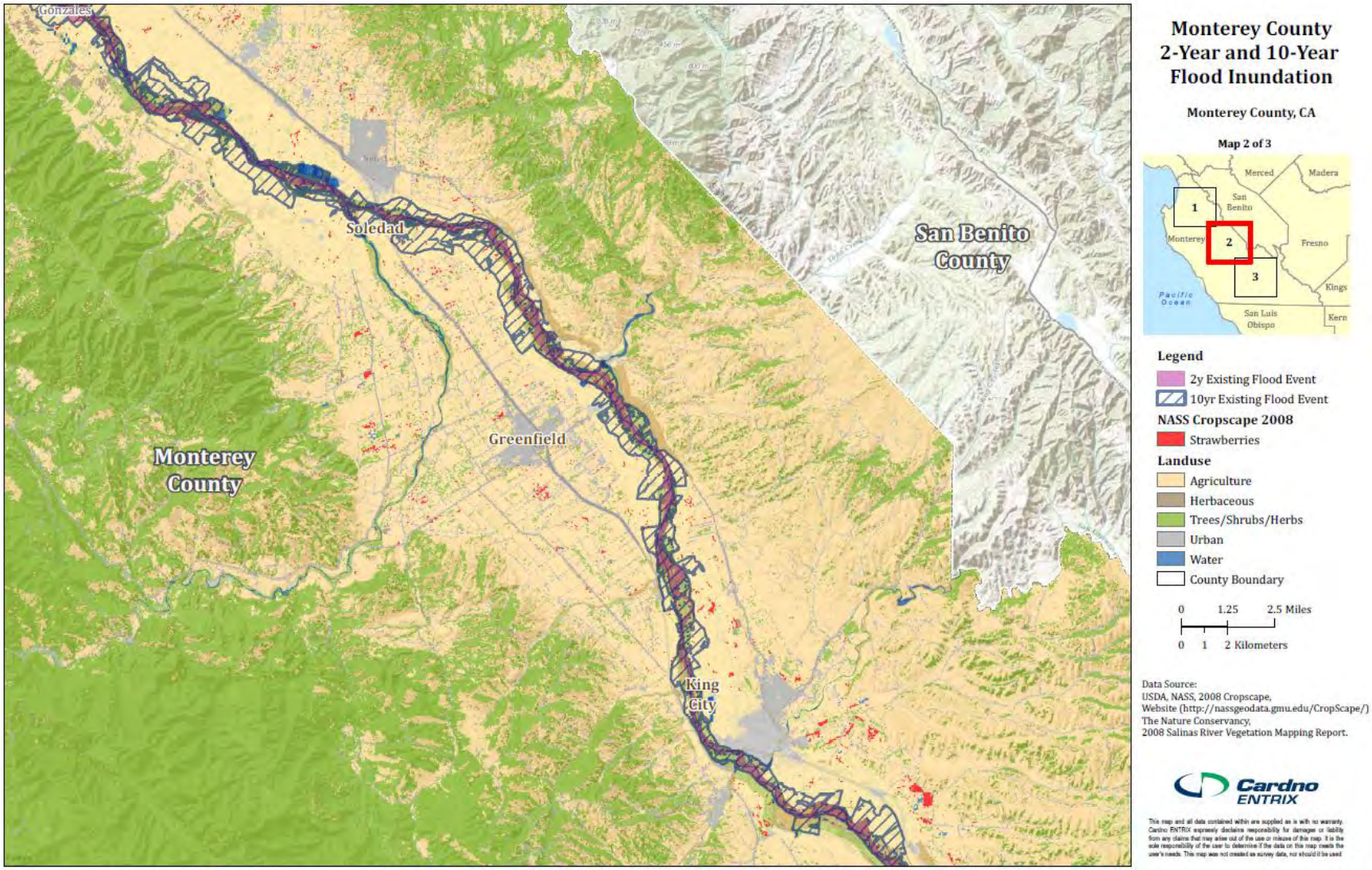

Figure 1.2: Salinas River Valley, Central Third: Cropping Patterns and Expected Flood Inundation Areas Under Existing Channel Flood Capacity

Figure 1.3: Salinas River Valley, Southern Third: Cropping Patterns and Expected Flood Inundation Areas Under Existing Channel Flood Capacity

1.4 Study Objectives

The objective of the Economic Study is to provide measures of the value associated with implementing the proposed SMP. Specific study objectives included:

> Quantify the economic impacts of lost agricultural crop production and value-added processing, declines in purchases by those sectors from related businesses, and declines in household spending in the greater Monterey County area resulting from the same Salinas River flood event under existing and maintained river channel conditions.

> Provide estimates of property damages to structures located within the inundation area of the same Salinas River flood event under existing and maintained river channel conditions.

> Use economic impact estimates to provide measures of economic value associated with the SMP.

The measure of economic value presented in the study is the economic impacts avoided by increasing channel capacity through the maintenance activities described in the SMP. Avoided impacts are computed as the difference between economic impacts resulting from a flood under maintained channel conditions and those resulting from the same flood under existing flood capacity.

1.5 Scope

The scope of the Economic Study is summarized as follows:

> This study evaluates two flood events, a two and ten-year flow. For each flood event, resulting economic impacts are estimated for two alternative Salinas River channel capacities; a) actual capacity in the absence of active stream maintenance ("existing conditions"), and b) expected capacity after implementation of the stream maintenance activities prescribed in the SMP.

> An Input-Output (I-O) model is developed to estimate forgone output and jobs resulting directly from lost crop production and value added processing during one crop-year. Additionally, the study examines the "ripple" effects the crop production and value-added processing sectors have upon the greater Monterey County economy as lost expenditures on goods and services, reduced household income and spending, and lost jobs.

> Property damage estimates reflecting the cost of restoring each structure and its contents to pre-flood condition. Estimates for individual structures are then totaled for the entire inundated area.

Issues not addressed in the Economic Study include:

> Costs incurred by individual growers to implement stream maintenance activities coordinated by MCWRA. This data is specific to individual landowners and are not available for this study. Also, the number and intensity of participants in the SMP remains uncertain, as the activities and their scope may vary from year to year. Further, in the context of regional economics spending on maintenance would stimulate business and individuals supplying goods and services necessary for conducting maintenance.

> Implications of crop insurance benefits paid to growers in the event of flooding. Depending on the type of insurance, growers may be paid benefits to cover production expenses or revenue. Data on individual landowners was not available for this study. Additionally, insurance benefits may not fully compensate business and individuals supplying growers with productive inputs.

> Flood disaster aid, and any economic stimulus it may create, was not addressed in this study.

> Any long-term property value diminution to agricultural land resulting of more intense flooding in the absence of the SMP. Investigating this issue requires detailed case studies of individual parcels and farming operations and assumptions or data on the degree of degradation to individual parcels with and without stream maintenance activities.

- Any long-term impacts to growers stemming from difficulty obtaining production or marketing contracts due to reductions in supply reliability of their crop. Investigating this issue requires knowledge of which growers are impacted by flooding under existing conditions but not with stream maintenance activities in place as well as details of their marketing arrangements and requirements.
- Whether and to what degree flood damage would result in sufficient short-term supply shortages to increase commodity prices and afford windfalls to growers without crop loss.
- Whether and to what degree flood damage would result in sufficient short-term supply shortages to reduce consumer welfare, either through increase prices or unavailability of product.
- Ripple effects through the regional economy associated with property damage. This requires a host of assumptions to incorporate into to identify the industries stimulated by spending on repairs and replacement and to what extent the expenditures occur within Monterey County.
- Resulting change, if any, in property tax revenue accruing to Monterey County in light of property damage. The study assumes structures are immediately restored to pre-flood conditions.
- The value of recreation or habitat associated with the stream maintenance alternatives.

1.6 Organization

This report contains six additional chapters and three Appendices. Chapter 2 provides summarizes the socioeconomic characteristics of the study area. Chapter 3 describes the characteristics of agriculture within the county, with a focus on the Salinas River Valley. Chapter 4 describes the methodological approach for the regional economic impact model. Chapter 5 describes the estimation of property damages. Chapter 6 presents the results of the economic analysis. Chapter 7 lists the studies and data referenced in this study. Each of the appendices provides additional detail on the data or methodology used in this study.

2 Population and Economic Conditions

This chapter provides an overview of the demographic and economic conditions in Monterey County, with data also presented for the State of California and the Nation for comparison.[22] Data presented are published by a variety of state and federal sources such as the U.S. Bureau of the Census, U.S. Bureau of Economic Analysis, California State Employment Development Department, and California State Department of Finance Demographic Research Unit, and U.S. Bureau of Labor Statistics.[23]

Monterey County is comprised of twelve cities and a number of other smaller population centers.[24] Located in the northern third of the Salinas River Valley, Salinas is Monterey County's major population center. With approximately 150,000 residents, Salinas' population is approximately five times greater than that of the second and third most populous cities; Seaside (33,000 residents) and Monterey (28,000 residents). Monterey County's population increased 3.3 percent between 2000 and 2010; one-third of the percentage increase in population experienced by California and the Nation. A similar trend is expected in the future.

Key economic indicators show that on average, the Monterey County population is as well off as California and the Nation as a whole. Per capita incomes of Monterey County residents are highly comparable with those in California and the Nation. Poverty rates area nearly equivalent, suggesting that the Monterey County, California and National populations are distributed similarly by income. However, unemployment in Monterey County was consistently higher than California and the Nation between 2001 and 2011, although the gap has declined since the economic downturn in 2009.

Agriculture is the major component of Monterey County's economy, and accounts for a disproportionate share of income and employment relative to California and the Nation. In 2010, earnings generated by farming and agricultural support activities (a component of "Fishing, forestry, and related activities") accounted for 19 percent of total earnings in Monterey County, compared to two percent in California and one percent in the nationwide. These industries employed 20 percent of the Monterey County population compared to two percent in California and the Nation.[25]

2.1 Population Trends

As indicated in Table 1, in 2010 Monterey County had a population of 415,000, an increase of 3.3 percent from the 2000 population of 402,000. The population of the county is approximately one percent of the 2010 California population of 37.3 million. The 2000-2010 population growth of 3.3 percent for Monterey

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[22] When interpreting data in this section, it is important to understand that Monterey County has not been removed from the data presented for California and the United States in any of the following tables or figures.

[23] Detailed demographic data are taken primarily from the 2010 Census of Population and Housing and 2006-2010 American Community Survey (ACS) 5-year estimates. While both of these data sources are compiled by the U.S. Census Bureau, there are fundamental differences between the two datasets. The 2010 Census has a much smaller margin of error, as it is a survey of 100 percent of the population. Conversely, ACS data are based on a sample of the population. The ACS was developed to obtain the same information previously collected on the long-form questionnaire of the 2000 Census of Population and Housing, but more frequently than every 10 years. In contrast to previous census reports, the 2010 Census did not collect income and poverty information. It follows that the most recent data for these socioeconomic indicators is from the ACS for 2006-2010. All ACS estimates should be interpreted as average values over the defined period. *See U.S. Census Bureau. 2009. A Compass for Understanding and Using American Community Survey Data: What Researchers Need to Know, May 2009. Website (http://www.census.gov/acs/www/Downloads/handbooks/ACSResearch.pdf)*

[24] In order from largest to smallest population as of 2010: Salinas (150,441), Seaside (33,025), Monterey (27,810), Soledad (25,738), Marina (19,718), Greenfield (16,330), Pacific Grove (15,041), King City (12,874), Gonzales (8,187), Carmel-by-the-Sea (3,722), Del Rey Oaks (1,624), and Sand City (334). Source: Census Bureau, Factfinder, Website (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml) accessed January 6, 2013.

[25] Bureau of Economic Analysis, U.S. Economic Accounts, Website (http://www.bea.gov/) accessed July 20, 2012.

County is much lower than those for California and the United States, 10.0 percent and 9.7 percent, respectively. The population density for Monterey County (125.2 people per square mile) is lower than California (239.1 people per square mile), but higher than population density for the U.S. (87.4 people per square mile).

Table 1: Population Growth and Density, 2000-2010

Area	Population 2000	Population 2010	Population Growth 2000 - 2010	Population Density 2010
Monterey County	402,000	415,000	3.31%	125.2
California State	33,872,000	37,254,000	9.99%	239.1
United States	281,422,000	308,746,000	9.71%	87.4

Source: Census Bureau, Factfinder, Website (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml) accessed July 20, 2012.

Population projections through 2050 for Monterey County, California, and the United States are provided in Table 2. The population in Monterey County is projected to increase by 23 percent over the period 2010–2050 compared to projects of 37 and 42 percent for California and the United States, respectively.

Table 2: Population Projections, 2010 to 2050

Area	2010	2020	2030	2040	2050	2010-2050 Percent Change
Monterey County	415,000	435,000	459,000	483,000	511,000	23%
California State	37,254,000	40,754,000	44,505,000	47,908,000	50,934,000	37%
United States	308,746,000	339,751,000	371,714,000	403,711,000	436,906,000	42%

Source: Census Bureau, Population Division, August 14, 2008, Table 1. Projections of the Population and Components of Change for the United States: 2010 to 2050 (NP2008-T1). Website (http://www.census.gov/population/www/projections/summarytables.html)

California Department of Finance, May 2012, Population Projections, Website (http://www.dof.ca.gov/research/demographic/reports/projections/interim/view.php)

2.2 Economic Base

This section describes the economic conditions in the study area, including employment by sector, income, unemployment, and tax revenues.

2.2.1 Employment

Table 3 presents employment by industry in 2010 for Monterey County, the state, and the nation. Data show there were 222,244 jobs in Monterey County. Approximately seven percent of employment was sourced with farming, which is a much higher proportion than for California (one percent) and the U.S. (two percent). In addition to higher on-farm employment, Monterey County has significantly more employment in the "forestry, fishing, and related activities" sector than the other regions, with 13 percent of total employment in this sector. This sector includes agricultural support activities performed for farms on a contract or fee basis, including soil preparation, planting, harvesting, fruit packing, and management. The vegetable packaging and processing industry is included in this data.

Table 3: Employment by Industry, 2010

Description	Monterey County		California		United States	
	Employment	Percent of Total	Employment	Percent of Total	Employment	Percent of Total
Total employment	222,244	100%	19,770,765	100%	173,767,400	100%
Farm employment	15,956	7%	237,402	1%	2,665,000	2%
Nonfarm employment	206,288	93%	19,533,363	99%	171,102,400	98%
Private nonfarm employment	168,948	76%	16,843,736	85%	146,422,400	84%
Forestry, fishing, and related activities	29,598	13%	209,538	1%	835,800	0%
Mining	536	0%	55,847	0%	1,185,500	1%
Utilities	507	0%	59,191	0%	579,000	0%
Construction	7,526	3%	875,114	4%	8,914,200	5%
Manufacturing	6,338	3%	1,340,071	7%	12,206,900	7%
Wholesale trade	6,192	3%	727,357	4%	6,045,400	3%
Retail trade	19,634	9%	1,904,951	10%	17,762,800	10%
Transportation and warehousing	4,132	2%	571,194	3%	5,504,400	3%
Information	2,222	1%	506,653	3%	3,210,700	2%
Finance and insurance	6,595	3%	1,021,198	5%	9,651,300	6%
Real estate and rental and leasing	8,523	4%	1,008,113	5%	7,459,200	4%
Professional, scientific, and technical services	11,182	5%	1,696,916	9%	11,727,700	7%
Management of companies and enterprises	1,612	1%	210,087	1%	2,038,000	1%
Administrative and waste management services	8,865	4%	1,251,993	6%	10,478,800	6%
Educational services	3,739	2%	438,070	2%	4,076,600	2%
Health care and social assistance	15,575	7%	1,864,359	9%	19,062,300	11%
Arts, entertainment, and recreation	4,532	2%	535,239	3%	3,777,100	2%
Accommodation and food services	19,755	9%	1,380,029	7%	12,048,000	7%
Other services, except public administration	11,885	5%	1,187,816	6%	9,858,700	6%
Government and government enterprises	37,340	17%	2,689,627	14%	24,680,000	14%

Source: Bureau of Economic Analysis, U.S. Economic Accounts, Website (http://www.bea.gov/) accessed July 20, 2012.

2.2.2 Income by Industry

Farm income is significantly more important in the study area than elsewhere in California and the U.S.; it accounts for 10 percent of total income in Monterey County and one percent in California and the U.S. Additionally, Monterey County has significantly more income from in the "forestry, fishing, and related activities" sector than the other regions, with 9 percent of total earnings coming from this sector.

Table 4: Income by Industry, 2010 (Billion dollars)

	Monterey		California		United States	
Description	Income	Percent of Earnings by Place of Work	Income	Percent of Earnings by Place of Work	Income	Percent of Earnings by Place of Work
Personal income[a]	$16.97	NA	$1,587.4	NA	$12,353.6	NA
Earnings by place of work	$11.79	100%	$1,158.6	100%	$8,986.2	100%
Farm earnings	$1.23	10%	$13.6	1%	$77.2	1%
Nonfarm earnings	$10.56	90%	$1,145.0	99%	$8,909.0	99%
Private nonfarm earnings	$7.39	63%	$939.3	81%	$7,266.3	81%
Forestry, fishing, and related activities	$1.07	9%	$6.1	1%	$22.5	0%
Mining	$0.03	0%	$4.2	0%	$83.1	1%
Utilities	$0.07	1%	$8.7	1%	$73.3	1%
Construction	$0.44	4%	$56.3	5%	$479.5	5%
Manufacturing	$0.40	3%	$119.0	10%	$891.6	10%
Wholesale trade	$0.62	5%	$54.8	5%	$456.2	5%
Retail trade	$0.69	6%	$69.9	6%	$553.5	6%
Transportation and warehousing	$0.25	2%	$32.0	3%	$295.4	3%
Information	$0.15	1%	$62.2	5%	$294.3	3%
Finance and insurance	$0.30	3%	$69.2	6%	$647.7	7%
Real estate and rental and leasing	$0.11	1%	$21.1	2%	$148.1	2%
Professional, scientific, and technical services	$0.60	5%	$139.8	12%	$886.7	10%
Management of companies and enterprises	$0.15	1%	$22.7	2%	$223.6	2%
Administrative and waste management services	$0.27	2%	$46.4	4%	$353.6	4%
Educational services	$0.12	1%	$17.4	2%	$146.7	2%
Health care and social assistance	$0.89	8%	$111.4	10%	$1,000.3	11%
Arts, entertainment, and recreation	$0.21	2%	$19.6	2%	$101.0	1%
Accommodation and food services	$0.60	5%	$35.6	3%	$278.8	3%
Other services, except public administration	$0.42	4%	$42.8	4%	$330.4	4%
Government and government enterprises	$3.17	27%	$205.7	18%	$1,642.7	18%

Source: Bureau of Economic Analysis, REIS data, Tables CA05N, Website (http://www.bea.gov/regional/reis/action.cfm,) accessed July 20, 2012.
Notes:
BEA defines Local Area Personal Income as "income that is received by, or on behalf of, all persons who live in the local area. It is calculated as the sum of wage and salary disbursements, supplements to wages and salaries, proprietors' income with inventory valuation adjustment (IVA) and capital consumption adjustment (CCAdj), rental income of persons with CCAdj, personal dividend income, personal interest income, and personal current transfer receipts, less contributions for government social insurance. Estimates of local area personal income are presented by the place of residence of the income recipients. All estimates of local area personal income are in current dollars (not adjusted for inflation)."

2.2.3 Major Employers

Table 5 lists the top employers for Monterey County.[26] These employers range in size from between 500 and 999 to between 1,000 and 4,999 employees. Eight entities are in the agricultural industries; seven of which are involved in fruit and vegetable crop production, marketing, food processing or all three activities. Of note is that collectively the individual farmers and ranchers within Monterey County, not listed here, constitute a major employer.

Table 5: Major Employers in Monterey County, CA

Employer	Location	Industry
1,000 to 4,999 Employees		
Azcona Harvesting	*Greenfield*	*Harvesting-Contract*
Breast Care Ctr	Monterey	Diagnostic Imaging Centers
Bud of California	*Soledad*	*Fruits & Vegetables-Growers & Shippers*
D'Arrigo Brothers Co	*Salinas*	*Marketing Programs & Services*
HSBC Card Svc Inc	Salinas	Credit Card & Other Credit Plans
Naval Postgraduate School	Monterey	Schools-Universities & Colleges Academic
Pebble Beach Resorts	Pebble Beach	Resorts
Salinas Valley Meml Healthcare	Salinas	Hospitals
Taylor Farms California Inc	*Salinas*	*Fruits & Vegetables-Growers & Shippers*
500 to 999 Employees		
CTB MC GRAW-HILL LLC	Monterey	Educational Consultants
Dole Fresh Vegetables	*Soledad*	*Food Products & Manufacturers*
Mann Packing Co	*Salinas*	*Fruits & Vegetables-Growers & Shippers*
Mc Graw-Hill Co	Monterey	Publishers-Book (Mfrs)
Misionero Vegetables	*Gonzales*	*Fruits & Vegetables-Growers & Shippers*
Monterey Cnty Social Svc Cmmtt	Salinas	County Government-Social/Human Resources
Monterey County Social Svc	Salinas	County Government-Social/Human Resources
Monterey Mushrooms Inc	*Royal Oaks*	*Mushrooms*
Monterey Peninsula Collect	Monterey	Schools-Universities & Colleges Academic
Natividad Medical Ctr	Salinas	Hospitals
Social Services Dept	Salinas	Senior Citizens Service Organizations
Special Education School Div	Salinas	Schools
US Defense Dept	Seaside	Federal Government-National Security
US Defense Manpower Data Ctr	Seaside	Government Offices-Us

Source: California Employment Development Department (EDD), Website (http://www.labormarketinfo.edd.ca.gov/majorer/countymajorer.asp?CountyCode=000053) accessed January 6, 2013. This list of major employers was extracted from the America's Labor Market Information System (ALMIS) Employer Database, 2013 1st Edition.

Merfield, Susan, HR Executive, Pebble Beach Co., Personal communication with Lee Elder, Cardno ENTRIX, February 22, 2013.

[26] The list of major employers is published by California EDD on its website. The source page states that the original data were extracted from America's Labor Market Information System (ALMIS) database.

2.3 Key Economic Indicators

2.3.1 Income

Table 6 highlights the annual per capita income, poverty rates and average household size for Monterey County, California, and the Nation. In 2010, per capita income in Monterey County was $40,883, relative to $42,610 for California and $40,012 for the U.S. The poverty rate in Monterey County was slightly greater than comparable rates for California and the U.S.

Table 6: Per Capita Income, Poverty and Household Size, 2010

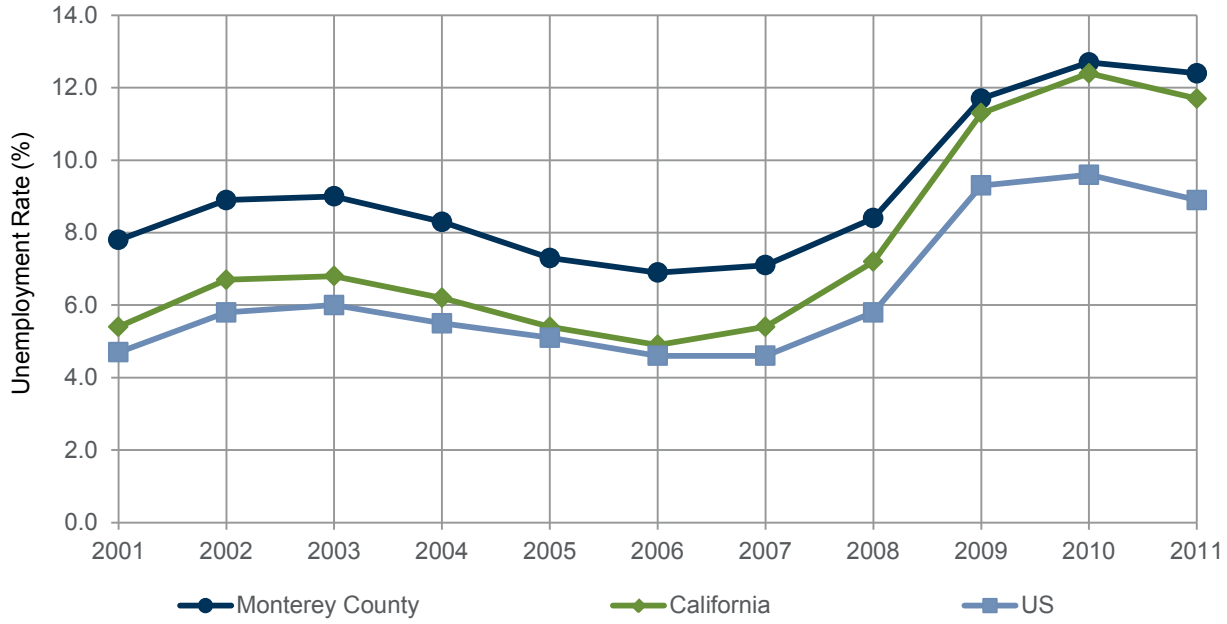
Area	Per Capita Income	Poverty Rate	Average Household Size
Monterey County	$40,883	13.9%	3.2
California	$42,610	13.7%	2.9
US	$40,012	13.8%	2.6

Source: Census Bureau, American Community Survey, Selected Economic Characteristics, Table DP03, Website (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml)
Census Bureau, Factfinder, Website (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml) accessed July 23, 2012.

2.3.2 Unemployment

The unemployment rate provides insight into the economic health of a region. High unemployment is a sign of an unhealthy economy, which can lead to reduced spending, a decreased tax base, and further unemployment. Unemployment rates increased nationwide starting in 2009 with the onset of the great recession. In 2010 Monterey County's unemployment rate reached 12.7 percent, which was 0.3 percentage points higher than the California average and 3.5 percentage points higher than the national average. As Figure 2 illustrates, unemployment in Monterey County was consistently above the national average during 2001 to 2011, and to a consistent degree.[27]

[27] Bureau of Labor Statistics, Local Area Unemployment Statistics, Website (http://www.bls.gov/lau/#tables)



Source: Bureau of Labor Statistics, Local Area Unemployment Statistics, Website (http://www.bls.gov/lau/#tables)

Figure 2: Unemployment Rate, 2001-2011

3 Monterey County Agriculture

This chapter summarizes production agriculture in Monterey County. In 2010, Monterey County agricultural output ranked fourth among all counties in California with a total crop and livestock farm gate value of $4.0 billion (see Table 7). Based on the latest Census of Agriculture publication (2007), Monterey County ranks fifth among counties in the U.S. by value of agricultural production.[28]

Table 7: Gross Value of Crop and Livestock Production by Top Ranking California Counties, 2010 (Billion dollars)

Statewide Rank	County	Total Agriculture Value	Livestock Value	Crop Value	Highest Value Commodity
1	Fresno	$5.94	$1.21	$4.73	Almonds ($0.58)
2	Tulare	$4.86	$2.18	$2.68	Milk ($1.60)
3	Kern	$4.76	$0.84	$3.92	Almonds ($0.60)
4	Monterey	$4.01	$0.05	$3.96	All Lettuce ($1.23)
5	Merced	$2.73	$1.53	$1.20	Milk ($0.74)
6	Stanislaus	$2.57	$1.19	$1.38	Milk ($0.51)
7	San Joaquin	$1.96	$0.46	$1.50	Milk ($0.31)
8	Ventura	$1.86	$0.01	$1.85	Berries ($0.49)
9	Kings	$1.72	$0.73	$0.99	Milk ($0.55)
10	San Diego	$1.65	$0.11	$1.55	Nursery ($0.42)

Source:

California Department of Food and Agriculture, California Agricultural Statistics Review 2011-2012, Website (http://www.cdfa.ca.gov/) accessed July 23, 2012.

County of Fresno, Fresno County 2010 Annual Crop and Livestock Report, Website (http://www.co.fresno.ca.us/Departments.aspx?id=114) accessed July 23, 2012.

County of Tulare, 2010 County of Tulare Agricultural Crop and Livestock Report, Website (http://agcomm.co.tulare.ca.us/default/index.cfm/linkservid/04B2D467-C0A5-EDE8-56F8AEF67D99F922/showMeta/0/) accessed July 23, 2012.

County of Kern, 2010 Kern County Agricultural Crop Report, Website (http://agcomm.co.tulare.ca.us/default/index.cfm/linkservid/04B2D467-C0A5-EDE8-56F8AEF67D99F922/showMeta/0/) accessed July 23, 2012.

Monterey County, 2011 Monterey County Crop Report, Website (http://ag.co.monterey.ca.us/news/2011-crop-report-monterey-county-agriculture-maintains-economic-clout) accessed July 23, 2012.

Merced County, 2010 report on Agriculture, Website (http://ag.co.monterey.ca.us/news/2011-crop-report-monterey-county-agriculture-maintains-economic-clout) accessed July 23, 2012.

Stanislaus County, Stanislaus County Agricultural Crop Report 2010, Website (http://www.stanag.org/ag/croprpts/croppdf/2010-crop-report.pdf) accessed July 23, 2012.

San Joaquin County, 2010 Agricultural Report San Joaquin County, Website (http://www.co.san-joaquin.ca.us/agcomm/annualrpts.aspx) accessed July 23, 2012.

Ventura County, 2010 Annual Crop Report, Website (http://www.co.san-joaquin.ca.us/agcomm/annualrpts.aspx) accessed July 23, 2012.

Kings County, 2010 Agricultural Crop Report, Website (http://www.countyofkings.com/ag%20commissioner/Crop%20Reports/Report%202010.pdf) accessed July 23, 2012.

County of San Diego, 2010 Crop Statistics and Annual Report, Website (http://www.sdcounty.ca.gov/awm/crop_statistics.html) accessed July 23, 2012.

[28] USDA, NASS, 2007 Census of Agriculture: County Profile, Monterey County - California, Website (http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/California/cp06053.pdf)

Vegetables are the highest value commodity in Monterey County, with $2.6 billion in vegetable production during 2011 (see Table 8). This is slightly more than double the value of fruit and nut crops and about two-thirds the value of all agricultural products. Lettuce was the highest value crop, with production valued at $1.2 billion. Lettuce alone accounted for nearly one-third the value of all agricultural products. Strawberries follow lettuce as the second most valuable crop, accounting for approximately 78 percent of total fruit and nut production value and nearly 20 percent of total agricultural production value.

Table 8: Value of Agricultural Production in Monterey County, 2007–2011 ($ Millions)

Crop	2006	2007	2008	2009	2010	2011
Vegetables Total	$2,386.8	$2,516.4	$2,530.9	$2,631.8	$2,677.1	$2,596.7
Broccoli	$234.4	$260.4	$276.1	$280.2	$297.1	$297.3
Cauliflower	$95.1	$103.4	$101.5	$112.0	$110.6	$105.0
Celery	$108.9	$117.3	$121.3	$172.2	$175.6	$182.3
Lettuce	$1,074.3	$1,121.9	$1,112.1	$1,172.5	$1,236.5	$1,231.7
Misc. Vegetables	$116.4	$117.7	$123.6	$130.1	$127.6	$125.5
Spinach	$111.3	$128.5	$131.0	$132.0	$127.5	$88.9
Spring Mix	$169.6	$175.3	$172.4	$166.4	$143.1	$100.8
Fruit and Nut Total	$699.3	$900.6	$906.7	$1,042.7	$987.7	$914.7
Strawberries	$439.8	$604.9	$619.3	$756.1	$751.1	$713.9
Grapes	$218.0	$251.6	$238.4	$238.1	$172.9	$141.0
Field Crop Total	$16.9	$14.4	$14.5	$15.0	$15.2	$16.8
Seed Production	$9.6	$7.3	$8.4	$9.3	$10.0	$9.4
Apiary Production	$0.0	$0.0	$0.0	$0.0	$0.2	$0.2
Nursery Products	$339.2	$342.1	$326.1	$294.6	$266.1	$260.7
Livestock, Poultry and Products	$38.3	$42.4	$40.2	$40.4	$49.9	$54.5
Total Production Value	**$3,490.1**	**$3,823.3**	**$3,926.8**	**$4,033.7**	**$4,006.2**	**$3,853.0**

Source: Monterey County 2011 Crop Report, Website (http://ag.co.monterey.ca.us/assets/resources/assets/252/cropreport_2011.pdf?1340401640) accessed July 23, 2012.

Monterey County, 2009 Crop Report, Website (http://ag.co.monterey.ca.us/assets/resources/assets/18/CropReport2009.pdf?1296154928) accessed July 23, 2012.

Monterey County, 2007 Crop Report, Website (http://ag.co.monterey.ca.us/assets/resources/assets/72/crop_report_2007.pdf?1295564865) accessed July 23, 2012.

Notes:

Values are reported in 2011 dollars.

3.1 Crop Production Characteristics

This section provides additional detail regarding production characteristics for the major crops produced in the Salinas River Valley. Information is presented on such characteristics as growing season, irrigation requirements, planting practices, and harvesting procedures. The major crops discussed include lettuce, strawberries, broccoli, cauliflower, celery, spinach, spring mix, and artichokes. Together these crops accounted for close to 20 percent of the acreage in production within Monterey County during 2011. By contrast, these crops accounted for 70 percent of total agricultural production value.

3.1.1 Lettuce

In 2011, of the 269,000 acres of lettuce planted in the U.S., approximately half was located in Monterey County.[29] This production accounted for nearly 53 percent of the total national value of lettuce production. The major types of lettuce include head and leaf. The time from planting to harvest of head lettuce is 70 to 80 days for mid-summer planting and up to 130 days for late-fall or winter plantings.[30] Temperatures in the central coast are uniform year-round. Lettuce is planted from late December to mid-August and harvested from early April to November. However, lettuce cannot be planted during the December 7 – December 21 period in order to break pest cycles and decrease the occurrence of Lettuce Mosaic Virus.[31]

Typically, up to two vegetable crops per year can be produced on each field in the central coast region.[32] Depending on soil type and terrain, fields may be irrigated with hand-move, linear-move, or permanently buried sprinkler systems.[33] Surface placed drip systems have become a major lettuce irrigation technology within the central coast region, with an estimated 30 percent of producers using the technique. Typically a central coast lettuce crop requires between 1 acre foot and 2.5 acre feet of water per acre depending on the irrigation system used.

Iceberg lettuce is field packed into cartons, and approximately 60 percent of lettuce is harvested by ground packing rather than wrapped. Ground packing is the process by which crews of 20 to 30 people are split into units that consist of two cutters and a packer. The lettuce is cut, trimmed, and packed 24 per carton. A carton has a minimum gross weight of 50 pounds.

Approximately 40 percent of lettuce is wrapped at harvest. Cut and trimmed heads are stacked on a table and then wrapped with a film of plastic or a bag. These are then packed either 24 or 30 heads per carton. Lettuce in cartons is vacuum cooled prior to storage in a cold room. Vacuum cooling removes field heat in about 15 minutes.[34]

Some companies contract, grow, and handle lettuce as their primary product.[35] At harvest, all wrapper leaves are removed in the field and the heads are packed in bins 1 cubic yard in size for pre-cooling, and are then transported to a processing plant. The entire processing plant is maintained at 35 to 40 degrees.

3.1.2 Strawberries

Monterey County had 10,992 acres of strawberries in production in 2011, accounting for the second-highest total value ($713.9 million) of crops produced in the county.[36] Strawberries are typically grown on an annual basis and rotated every other year with vegetables. The plants are grown first in greenhouses and then transplanted to 48-inch beds with two rows per bed and 12 inches between plants for a density

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29 USDA, NASS, January 2012, Vegetables 2011 Summary, Website (http://usda01.library.cornell.edu/usda/nass/VegeSumm//2010s/2012/VegeSumm-01-26-2012.pdf) accessed August 1, 2012.

30 University of California, Iceberg Lettuce Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7215.pdf)

31 Tourte, Laura and Richard Smith, 2010, Sample Production Costs for Wrapped Iceberg Lettuce Sprinkler Irrigated – 40 inch Beds, University of California Cooperative Extension Report LT-CC-10, Website (http://coststudies.ucdavis.edu/files/2010Lettuce_Wrap_CC.pdf)

32 Smith, Richard F., Klonsky, Karen M., and Richard L. De Moura, 2009, Sample Costs to Produce Romaine Hearts: Leaf Lettuce, University of California Cooperative Extension Report LT-CC-09-1, Website (http://coststudies.ucdavis.edu/files/lettuceromcc09.pdf)

33 University of California, Iceberg Lettuce Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7215.pdf)

34 University of California, Iceberg Lettuce Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7215.pdf)

35 University of California, Iceberg Lettuce Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7215.pdf)

36 Monterey County, 2011, Monterey County Crop Report, Website (http://ag.co.monterey.ca.us/assets/resources/assets/252/cropreport_2011.pdf)

of 21,780 plants per acre.[37] Strawberries are transplanted during the summer or fall and harvested during the following winter, spring, summer, and fall. The plants produce berries for approximately six months.[38]

After strawberry plants are transplanted in the summer or fall, growers irrigate the crop with sprinklers and then switch to drip irrigation during March through September. A total of approximately 3 acre-feet of water are applied for each acre of strawberries.. The harvest period is April through early October, with the peak harvest occurring June and July. Field workers pick the strawberries by hand and place them in containers/trays. The trays are stacked on a truck and then delivered to a cooler.[39] The strawberries are then shipped to market in refrigerated trucks. Strawberries produced in California are consumed in domestic and export markets. Key export markets include Canada, Japan, and Mexico.[40]

3.1.3 Broccoli

Monterey County typically accounts for about 40 percent of all California broccoli acreage and production, more than any other county in the state. Broccoli can be grown year-round in Monterey County. Broccoli thrives in cool temperatures, with an optimal temperature range of between 60 degrees and 65 degrees Fahrenheit. Commercial growers produce hybrids of the Italian green type of broccoli, which takes from 75 to 140 days from the date of planting to reach marketable maturity.

Broccoli is typically directly seeded in Monterey County and grown in double rows on raised beds between 38 and 42 inches wide. The plants require adequate soil moisture but succumb to root diseases, hollow stems, or loose heads when overwatered. The majority of the acreage grown on the central coast is irrigated with overhead sprinklers, requiring approximately 1.5 to 2.5 acre-feet of water per acre during the summer.[41] Fields are irrigated once a week over a ten-week period until harvest.[42]

Broccoli is sold in both fresh and processed food markets. Broccoli for fresh markets is hand-harvested and field packed into cartons containing between 34 and 38 crowns. Broccoli harvested for processing is also harvested by hand by field workers and hauled to a processor. The demand for Monterey County broccoli includes both domestic and export markets, the latter including Canada, Japan, and Taiwan.[43]

3.1.4 Cauliflower

Like broccoli, cauliflower is a cool-season crop that is grown and harvested year-round in Monterey County. The optimal temperature range for cauliflower is between 65 and 68 degrees Fahrenheit. The main varieties grown in the central coast region are Ravella and Rushmore (transplanted during the fall and winter for a spring harvest) and Apex, Casper, and Cortez (main-season varieties). These varieties are grown in greenhouses and transplanted to single rows on beds 40 inches wide and spaced 12 inches

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[37] Bolda, Mark P., Laura Tourte, Karen M. Klonsky, and Richard L. De Moura. 2010. http://coststudies.ucdavis.edu/files/StrawberryCC2010.pdf

[38] California Strawberry Commission, October 1999, Crop Profile for Strawberries in California, Website (http://ucce.ucdavis.edu/files/datastore/391-501.pdf)

[39] Bolda, Mark P., Laura Tourte, Karen M. Klonsky, and Richard L. De Moura, 2010, http://coststudies.ucdavis.edu/files/StrawberryCC2010.pdf

[40] California Strawberry Commission, October 1999, Crop Profile for Strawberries in California, Website (http://ucce.ucdavis.edu/files/datastore/391-501.pdf)

[41] University of California, Broccoli Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7211.pdf)

[42] Dara, Surenda K., Karen M Klonsky, and Kabir P. Tumber, 2012, Sample Costs to Produce Fresh Market Broccoli: Central Coast Region – San Luis Obispo County, University of California Cooperative Extension report, Website (http://coststudies.ucdavis.edu/files/Broccoli_CC2012.pdf)

[43] University of California, Broccoli Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7211.pdf)

apart. The majority of the acreage grown on the central coast is irrigated with overhead sprinklers, requiring approximately 2 to 3 acre-feet of water per acre during the summer.[44]

Cauliflower is hand-harvested in the field. The heads are trimmed of excess wrapper leaves, placed on a harvesting platform, covered with plastic wrap, and packed according to size. Depending on the size of the cauliflower, packed cartons contain 9, 12, 16, or 20 heads, 12 most preferred by the market. Cauliflower may also be cut into florets produced for food-service outlets. The vegetable must be stored for only short amounts of time to avoid perishing and requires a storage temperature of 32 degrees Fahrenheit with high relative humidity. Similar to broccoli, the demand for Monterey County cauliflower extends to both domestic and export markets, the latter especially Canada, Japan, and Taiwan.[45]

3.1.5 Celery

In Monterey County, celery is transplanted from March to September and harvested from late June to late December.[46] The vegetable requires cool weather and has an optimal temperature range of between 60 degrees and 65 degrees Fahrenheit. Celery is grown in greenhouses and transplanted to the field where is it grown in double rows on 36 to 40 inch beds. Due to its shallow root system, celery must be irrigated frequently. A sprinkler system is used to irrigate the crop prior to transplanting and during root establishment; afterwards, growers may continue to irrigate with sprinklers or may choose a combination of sprinklers and a furrow irrigation system. [47,48] The per-acre water requirements for celery using a combination of sprinklers and furrow irrigation are 2.5 to 3.5 acre-feet of water.[49]

During harvest, the crop is hand-harvested and field-packed in cartons that contain 24, 30, 36 or 48 heads. The cartons are hauled to distribution centers where they are cooled by forced air or hydrocooling and kept in cold storage (32 to 35 degrees Fahrenheit) until they are ready to be shipped. The crop is primarily used fresh, and Monterey County celery serves both domestic and export markets, the latter especially Canada and Taiwan.[50]

3.1.6 Spinach

Monterey County accounts for nearly half of the total California spinach acreage and production. A cool season vegetable with an optimal temperature range of 60 to 65 degrees Fahrenheit, spinach is grown and harvested year-round in Monterey County, although planting and harvesting decline during December and January.

Spinach produced in California is predominantly sold clipped and bagged for the fresh market. Depending on the desired size of the leaf (“baby” or “teenage”) and the season during which it is grown, spinach requires between 21 and 50 days from direct seeding to harvest. For these short-cycle crops, solid-set sprinklers are used to provide frequent, short irrigation to account for spinach’s shallow root system. Depending on crop type (clipped, fresh market bunch, or processed), weather conditions, and irrigation technology, applied water rates can range from 0.33 to 2 acre-feet per acre between seeding and harvest.

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[44] University of California, Cauliflower Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7219.pdf)

[45] University of California, Cauliflower Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7219.pdf)

[46] University of California, Celery Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7220.pdf)

[47] Takele, Etaferahu. Celery Production: Sample Costs and Profitability Analysis. University of California, Agriculture and Natural Resources Publication 8028.

[48] University of California, Celery Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7220.pdf)

[49] University of California, Celery Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7220.pdf)

[50] University of California, Celery Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7220.pdf)

Spinach sold for clipped and bagged salad mixes is typically mechanically harvested using a machine with a front cutter bar. The leaves are transported on a conveyor belt to bins on trailers and then hauled to a processing plant to be sorted, washed, dried, and packaged. It is stored at 32 degrees Fahrenheit with high relative humidity. Spinach grown in California is primarily sold in the domestic market, but about eight percent is exported to Canada.[51]

3.1.7 Spring Mix

Monterey County is the largest producer of spring mix in the nation, with 10,746 acres producing 74,100 tons in 2011.[52] [53] Spring mix may include greens from the following plants: cress, dandelion, endigia, romaine, chard, arugula, frisée, and radicchio, among others. These plants are planted from January through October and harvested from February through November.[54] The plants are irrigated with sprinkler irrigation.[55] Spring mix is mechanically harvested and trucked to a processing facility to be washed, dried, mixed, packaged, and shipped in refrigerated trucks to distributors, producer wholesalers, grocery chains, and foodservice operations.[56]

3.1.8 Artichokes

A cool-season crop thriving in warm days and cool nights, artichokes are grown year-round as perennials in Monterey County, with peak production occurring from March through April. More than half the artichokes produced in California are of the perennial variety Green Globe. The crowns of perennial artichokes are divided, rooted, and hand-planted in trenches that create a grid system in the field. After harvest the plants are cut back to stimulate new growth. Overhead sprinklers initially provide irrigation beginning approximately one month after the artichokes are cut back, after which growers typically switch to drip irrigation.

Artichoke fields are harvested by field workers once or twice a week. The artichoke buds are hand-cut, placed into cloth bags, and packed on mobile packing frames. The buds are sorted into cartons according to the diameter of the buds and then cooled by forced air. The buds are then stored and shipped around 33 degrees Fahrenheit at 90 to 95 percent humidity. Artichokes are consumed in the domestic market as well as in export markets (Canada, Mexico, Japan, and Europe).[57]

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51 University of California, Spinach Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7212.pdf)

52 Hardesty, Shermain D., June 2010, "Spring Mix Case Studies in the Sacramento Area", in *Comparing the Structure, Size, and Performance of Local and Mainstream Food Supply Chains* by Robert P. King, Michael S. Hand, Gigi DiGiacomo, Kate Clancy, Miguel I. Gomez, Sherman D. Hardesty, Larry Lev, and Edward W. McLaughlin, United State Department of Agriculture Economic Research Report No. ERR-99, Website (http://foodindustrycenter.umn.edu/prod/groups/cfans/@pub/@cfans/@tfic/documents/asset/cfans_asset_250529.pdf)

53 Monterey County, 2011, Monterey County Crop Report, Website (http://ag.co.monterey.ca.us/assets/resources/assets/252/cropreport_2011.pdf)

54 Hardesty, Shermain D., June 2010, "Spring Mix Case Studies in the Sacramento Area", in *Comparing the Structure, Size, and Performance of Local and Mainstream Food Supply Chains* by Robert P. King, Michael S. Hand, Gigi DiGiacomo, Kate Clancy, Miguel I. Gomez, Sherman D. Hardesty, Larry Lev, and Edward W. McLaughlin, United State Department of Agriculture Economic Research Report No. ERR-99, Website (http://foodindustrycenter.umn.edu/prod/groups/cfans/@pub/@cfans/@tfic/documents/asset/cfans_asset_250529.pdf)

55 Belinda Patts, No date, "Lettuce Production Patterns and Practices: California and Arizona", Dole Fresh Vegetables.

56 Hardesty, Shermain D., June 2010, "Spring Mix Case Studies in the Sacramento Area", in *Comparing the Structure, Size, and Performance of Local and Mainstream Food Supply Chains* by Robert P. King, Michael S. Hand, Gigi DiGiacomo, Kate Clancy, Miguel I. Gomez, Sherman D. Hardesty, Larry Lev, and Edward W. McLaughlin, United State Department of Agriculture Economic Research Report No. ERR-99, Website (http://foodindustrycenter.umn.edu/prod/groups/cfans/@pub/@cfans/@tfic/documents/asset/cfans_asset_250529.pdf)

57 University of California, Artichoke Production in California, Website (http://anrcatalog.ucdavis.edu/pdf/7221.pdf)

3.2 Characteristics of Farms and Ranches

The latest Census of Agriculture publication (2007) reported 1,199 farms and ranches across 1.3 million acres in Monterey County.[58] Monterey County farms are large scale operations producing high value crops on highly valuable farmland. Farming is the primary source of income to a majority of principal operators of Monterey county farms. Additionally, Monterey County farming operations employ substantial numbers of workers. Following is a summary of Monterey County farming operations. Data are presented for California and the nation for comparison.[59]

> Farms in Monterey County average 1,108 acres, compared with 313 and 418 acres in California and the U.S., respectively.[60]

> Market value of total agricultural products sold by Monterey County farms average $1.8 million per farm, compared to $0.4 and 0.1 million in California and the U.S., respectively.

> Average market values of farmland and buildings are $4,645 per acre ($5.1 million per farm) in Monterey County, compared to the national average of $1,892 per acre ($0.8 million per farm), and to the state average of $6,408 per acre (2.0 million per farm).[61]

> Monterey County farms average nearly $500,000 in net cash income annually, compared with the national average of approximately $34,000 per operation, and a state average of approximately $100,000.[62]

> A high percentage of principal farm operators in Monterey County, 64 percent, consider farming as their primary. This is compared with 50 and 45 percent in California and U.S., respectively.

> Approximately 8 percent of Monterey County farms receive government payments. This is compared to 38 percent nationwide and 9 percent in California. Even so, the average government payment to Monterey County operations receiving them is less than half of the average payment received by all farms in California.

> A substantially higher percentage of farms in Monterey County hire on-farm laborers (48 percent), relative to California (37 percent) and the U.S. (22 percent). When considering the farms hiring labor, Monterey County operations average 46 hired workers, compared with 15 and 5 workers per farm in California and the U.S.

3.3 Agriculture within the Regional Economy

To understand how an economy is affected by a business or industry, such as agricultural production, it is important to recognize the extent to which different industries in the economy are linked to each other. Changes that occur at the farm production level set in motion a series of “ripple effects” throughout the

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58 USDA NASS, 2007 Census of Agriculture, State and County Profiles. (http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/California/)

59 When interpreting data in this section, it is important to understand that Monterey County has not been removed from the data presented for California and the United States in any of the following tables or figures.

60 USDA NASS, 2007 Census of Agriculture, State and County Profiles. (http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/California/)

61 USDA NASS, 2007 Census of Agriculture, Volume 1, Chapter 2: County Level Data, Table 8. Farms, Land in Farms, Value of Land and Buildings, and Land Use: 2007 and 2002 (http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/California/)

62 USDA, NASS, 2007 Census of Agriculture, Volume 1, Chapter 2: County Level Data, Table 4. Net Cash Farm Income of Operations and Operators: 2007 and 2002 (http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/California/).

USDA, NASS, 2007 Census Volume 1, Chapter 1: U.S. National Level Data, Table 5. Net Cash Farm Income of Operations and Operators: 2007 and 2002

local economy based on inter-industry linkages, which collectively affect local and regional output, employment, and income levels.

Agriculture is a major component of the Monterey County economy. In addition to the direct value of agricultural products, production agriculture supports a broad cross section of industries in Monterey County which supply and are supplied by agriculture. Farmers purchase chemicals, seed, feed, fertilizer, packing services, equipment and other supplies as well as the services of hired labor, financial institutions and custom operators, termed "backward linkages." In addition, crops are transported, shipped, brokered, processed, frozen, and otherwise handled before reaching final consumers. This web of businesses is termed "forward linkages." A recent study commissioned by the Monterey County Agricultural Commissioner finds that agricultural production contributes $8.2 billion annually to the Monterey County economy and supports approximately 70,000 jobs.[63]

The ripple effects reflected in backward linkages are frequently expressed as "multipliers." The size of those multipliers is a function of the relative proportions of the ripple effect spending that ultimately stay within or leave the region. Purchases made from outside the local economy are considered "imports," while items produced within and sold outside the local area are considered "exports." The size of the multiplier effect represents the extent to which "new" money from exports of an industry such as agriculture recirculate and is re-spent in the local economy. Some of the money received by the industry is spent to procure local supplies from backward-linked industries, and these local suppliers make other purchases with those funds. If there are many other local suppliers from which local businesses can purchase goods and services, less of this money leaves the local economy to buy imports. Thus, the size of the multiplier depends on how local businesses are linked together and the extent to which funds "leak" as purchases of goods and services produced in outside areas. If the economy has numerous sectors that are linked, multipliers will be higher than if there are few linkages among sectors.

[63] Langholz, Jeff. Depaolis, Fernando. 2011. Economic Contributions of Monterey County Agriculture. Published by the Monterey County Agricultural Commissioner's Office.

4 Regional Economic Impact Methodology

This Chapter describes the Input-Output (I-O) methodology, data, and assumptions forming the model for estimating regional economic impacts resulting from crop loss and forgone food processing.

4.1 Input-Output (I-O) Models and Metrics

The regional economic impacts of the Salinas River stream maintenance alternatives were estimated using IMPLAN (IMpact Analysis for PLANning), a commonly used economic input-output (I-O) modeling software package. I-O models are constructed based on the concept that all industries within an economy are linked together in multiple sell-purchase transactions, where the output of one industry becomes the input of another industry until all final goods and services are produced. I-O models can be used to analyze the structure of a regional economy at the existing equilibrium supply and demand of final goods and services or to estimate the total economic impact of projects or policies expected to result in a change to that equilibrium. With respect to the latter, a change in the equilibrium supply and demand is derived from a change in the value of goods and services produced or purchases made which results from the project or policy alternative in question.

IMPLAN I-O models provide three basic metrics that describe the economy: ***output***, ***income***, and ***employment***. Output is the total value of the goods and services produced by businesses in a study area. Income (labor income) is the sum of employee compensation (including all payroll and benefits), proprietor income (income for self-employed work), and other property income (payments for rents, royalties, and dividends). Employment represents the annual average number of employees, whether full or part-time, of the businesses producing output. Income and employment represent the net economic benefits that accrue to the region as a result of increased economic output.

Total economic effects reflected by of any of these three metrics can be decomposed into three types: ***direct***, ***indirect***, and ***induced*** effects. Direct effects are attributed to the activity being analyzed. Indirect and induced effects result from money circulating throughout the economy in the form of expenditures among linked sectors. For example, because farming operations within a local economy are linked together through the purchase and sale patterns of goods and services produced in the local area, an action that has a direct impact on one or more local industries is likely to have an indirect impact on many other businesses in the region such as chemical dealers, labor contractors, and banks. Those firms would increase or reduce their industry outputs depending on the underlying changes in demand from farming. These additional effects are known as the indirect economic impacts. As household income is affected by the changes in regional economic activity, additional impacts occur. The additional effects generated by changes in household spending are known as induced economic impacts.

4.1.1 Limitations of Input-Output (I-O) Models

Assumptions underlying the I-O methodology employed by IMPLAN are subject to certain limitations. Following is a list of some of the key limitations.

> ***Fixed Proportions.*** For any good or service, all productive inputs are combined in fixed proportions that are constant regardless of the level of output. Hence, there is no substitution among production inputs and no economies of scale are possible. This is known as a Leontief production function.

> ***Fixed Technology*****.** Each production function incorporates fixed technology; thus, for example, the same proportions of labor and capital are used. If an industry is undergoing rapid technological change, this rigidity may under or overestimate impacts for any industry. Monterey County agriculture has, at times undergone rapid technological change and the producers (particularly grower-shippers) in the area are on the leading edge of crop production technology.

- ***Constant Prices.*** Regardless of the level of production, it is assumed that price and returns per unit of production are constant. An investigator wishing to analyze price impacts must do so outside of the I-O framework.
- ***Fixed Employment of Resources.*** I-O assumes that resources that become unemployed or employed due to a change in final demand have no alternative employment.
- ***Aggregation of Economic Activities.*** I-O models are organized by industry sector. The IMPLAN database contains 440 economic sectors nationwide. While this is a large number of sectors, some sectors contain a wide range of products or services and the production functions reflect the average or aggregate production technology for the goods or services produced. There are 10 crop production sectors in IMPLAN. Each sector includes an average production function for the crops included in that sector.
- ***No Accounting of Forward-Linkages.*** IMPLAN software is designed to measure the total multiplier effects of a change in output (final demand) in the industry under study, in this case production agriculture, from a change in demand for labor and goods and services it utilizes as *inputs* (backward linkages). IMPLAN software is not designed to measure multiplier effects of the same change in output on industries purchasing agricultural *output* (crops), such as food processing industries. Resulting changes in final demand in the forward linked industries must be computed outside of IMPLAN and then re-input as a direct change in output (final demand) of the forward-linked industry.

4.2 IMPLAN Model Setup

Setting up an IMPLAN model to analyze impacts of a policy or project requires one to calculate the change in the value of output generated directly by the affected industry (or industries). The initial change in the value of production is referred to in IMPLAN as a change in final demand since in equilibrium production (supply) must equal demand. Estimating the change in final demand is a critical step in an impacts analysis.

The industry sectors studied in the Monterey County IMPLAN are:

- Vegetable and melon farming (IMPLAN Sector 3) “Vegetables”
- Fruit farming (IMPLAN Sector 4) “Strawberries”
- Frozen food manufacturing (IMPLAN Sector 53)
- Canning, pickling and drying (IMPLAN Sector 54)
- Fresh food processing (IMPLAN Sector 69)

Vegetable and strawberry crop production is studied because much of the inundated acreage is in strawberry or some type of vegetable production. Total direct output in these sectors is valued as the gross production value per acre that will be lost at the time of the flood event multiplied by the total number of inundated acreage. In this model, the unit value (per acre) of forgone direct output is derived separately for the component parts of total industry output (known as a “by parts” approach). This approach was taken in order to make adjustments for and take account of spending patterns on crop production throughout the growing season relative to the timing of the flood event.

The food processing industries (sectors 53, 54 and 59) were studied because these industries purchase raw fruit and vegetable product from farmers in the Salinas River Valley (and others in Monterey County). Computing the total direct change in output within these processing industry sectors is more involved than for the crop production sectors. First, the unit value of lost agricultural products from Sectors 3 and 4 must be converted into the unit value of forgone processed output. Second, Sectors 3 and 4 are backward-linked from Sectors 53, 54 and 69. As a result, care must be taken to avoid double-counting, as IMPLAN does not have a built-in procedure for sorting these forward-linkages. This involves making

adjustments to the Regional Purchase Coefficients (RPC) of the processing sectors that are associated with Sectors 3 and 4.[64]

Steps in implementing the Monterey Count IMPLAN model developed for this study are detailed within the remainder of this section. The basic steps are:

1. Validate IMPLAN data for the crop production and food processing sectors where the change in final demand will occur as a result of flooding
2. Classify inundated acreage in terms of cropland and other uses
3. Determine the average value of an acre of inundated crop land
4. Compute the change in final demand within the crop production sectors
5. Compute the change in final demand within the food processing sectors
6. Use IMPLAN to calculate multiplier effects from changes in final demand with vegetable crop production, strawberry crop production, and local processing industry sectors and estimate impacts to the Monterey County economy.

The IMPLAN model methodology described in this chapter and the results presented in Chapter 6 assume that the simulated flood event occurs during February. Previous research conducted for the Pajaro River, which borders northern Monterey County, indicated if a flood was to occur in any given year, there would be a 39 percent probability that it would occur in February.[65] Appendix A to this study reports changes in final demand for Sectors 3 and 4 separately for December, January, February, March and April, which taken together, form a 94 percent likelihood of a flood event relative to other seven months in the year. Additionally, Appendix B to this study reports estimates of regional economic impacts separately for IMPLAN model runs assuming the flood event occurs in each of these months.

4.2.1 Data

The key data sources used in estimating the I-O model were the 2010 IMPLAN database (the most recent available), cropping pattern data for Monterey County published in the USDA National Agricultural Statistics Service's (NASS) "Cropscape" database, cropping pattern data for the Salinas River Valley published by the Nature Conservancy, and crop reports published by the Monterey County, Office of the Agricultural Commissioner. Other, supplemental data sources include County Business Patterns (CBP) database and the Quarterly Census of Employment and Wages (QCEW).

4.2.2 IMPLAN Data Validation

IMPLAN data for the vegetable and fruit crop production sectors were compared to the 2011 Crop Report published by the Monterey County Agricultural Commissioner. The value of production reported in the Monterey County crop reports was substantially higher than the value of output reported in the IMPLAN data. This study considered the Monterey County Agricultural Commissioner's office to be the most reliable data source reporting production value of Monterey County agricultural. As a result the crop report data were substituted in place of the IMPLAN data. Vegetable and melon farming (Sector 3) output was increased from $1.7 billion to $2.7 billion, fruit farming (Sector 4) output was increased from $628.3 million to $987.7 million.

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[64] A Regional Purchase Coefficient (RPC) is the proportion of the total demand for a commodity by all users in the Study Area that is supplied by producers located within the Study Area. For example, if the RPC for the commodity ''fish'' is 0.8, then 80% of the demand by local fish processors, fish wholesalers, and other fish consumers are met by local fish producers. Conversely, 20% (1.0-RPC) of the demand for fish is satisfied by imports

[65] Bierman, Mark D., August, 24, 2010, Pajaro River Flood Risk Management-Summary Report: Agricultural Damages from Flooding-Strawberries.

The IMPLAN model for each of the three food processing sectors analyzed was validated using the Census Bureau's County Business Patterns (CBP) database and the Quarterly Census of Employment and Wages (QCEW).[66] [67] It was found that the data for the other food manufacturing sector in IMPLAN (IMPLAN sector 69) and the fruit canning, pickling, and drying sector (IMPLAN sector 54) were significantly different from the CBP data. Therefore these sectors were updated within the IMPLAN model to reflect CBP data. IMPLAN employment in the other food manufacturing sector was updated from 1,530 to 2,102, which subsequently increased the output for this sector within the model from $499.9 million to $686.4 million. Similarly, the CBP employment income data for the fruit canning, pickling, and drying sector was 387 percent higher than the IMPLAN employee compensation for fruit and vegetable canning, pickling and drying. Therefore, employment and all components of output (value added and intermediate demands) were increased to reflect this update. CBP does not disclose the number of employees or income for the frozen food sector, and it is assumed that IMPLAN provides an appropriate estimate of this industry's size.

4.2.3 Classifying Inundated Crop Acreage

Information provided by the hydrologic model developed in Appendix E was used in conjunction with 2008 USDA Cropscape GIS data to determine the proportions of inundated agricultural acres that are planted to strawberries or vegetable crops.[68] [69] Personal communication with a USDA representative indicated that the 2008 Cropscape data for California would be a better representation of actual crop data for the county given that a major ground-truthing effort occurred that same year.[70] Furthermore, comparison of 2007-2011 Cropscape GIS data for Monterey County to the Monterey County Agriculture Commissioner report indicates that 2008 Cropscape data is the most representative and therefore was used in this analysis.

The data indicate that a 2-year flood event in the Salinas River Valley, assuming the existing condition, would inundate a total of 7,458 acres (see Table 9). Agricultural lands comprise 369 acres of the total inundated acreage, including 360 acres of vegetables and 9 acres of strawberries. Conversely, under maintained channel conditions, the 2-year flood would inundate a total of 6,965 acres, of which agricultural lands comprise 323 acres: 314 in vegetables and 9 in strawberries. Thus, the SMP is expected to result in the inundation of 46 fewer crop acres under the two-year flood event.

Under 10-year flow conditions, flooding is anticipated to cover a total of 43,615 acres. Agricultural lands would comprise 24,848 acres, including 23,490 acres of vegetables and 1,358 acres of strawberries. Under maintained channel conditions, the 10-year flow would inundate a total of 41,327 acres, including 23,200 acres of agricultural land Agricultural lands are comprised of by 21,899 vegetable acres and 1,301 strawberry acres. Thus, the SMP is expected to result in the inundation of 1,648 fewer vegetable acres and 57 strawberry acres than the existing condition for a 10-year flood.

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66 Census Bureau, County Business Patterns, Website (http://www.census.gov/econ/cbp/)

67 State of California, Quarterly Census of Employment and Wages, Employment Development Department, Website (http://www.labormarketinfo.edd.ca.gov/qcew/cew-select.asp).

68 USDA, NASS, 2008 Cropscape, Website (http://nassgeodata.gmu.edu/CropScape/) accessed November 13, 2012.

69 The Nature Conservancy, 2008 Salinas River Vegetation Mapping Report.

70 Zakzeski, Audra, USDA, NASS Cropscape Team, Personal communication with Lee Elder, Cardno ENTRIX, October 31, 2012.

Table 9: Salinas River Valley Inundated Acreage for Channel Conditions and Flow Events (Acres)

Flood Event and Channel Condition	Total	Crop Land			Other		
		Strawberry	Other Crops	Sub-Total	Developed	Undeveloped	Sub-Total
2-Year Flows Under Existing Conditions	7,458	9	360	369	12	7,077	7,089
2-Year Flows Under Maintained Conditions	6,965	9	314	323	10	6,632	6,642
10-Year Flows Under Existing Conditions	43,615	1,358	23,490	24,848	782	17,985	18,767
10-Year Flows Under Maintained Conditions	41,327	1,301	21,899	23,200	637	17,489	18,126

Source: USDA, NASS, 2008 Cropscape, Website (http://nassgeodata.gmu.edu/CropScape/) accessed November 13, 2012.
The Nature Conservancy, 2008 Salinas River Vegetation Mapping Report.

4.2.4 Crop Value

Agricultural land within in the study area is intensively cropped, much of it in high-value crops such as lettuce, broccoli, cauliflower, and strawberries. Generally, two vegetable crops can be produced on the same field each year; whereas, one crop of strawberries can be produced per year.[71] This analysis evaluates flood impacts separately for strawberry and vegetable crops. Gross strawberry value per acre was derived using total Monterey County strawberry acreage and the gross value of this production for each year from 2007-2011 from the annual crop reports of the Monterey County Agricultural Commissioner Reports. The same information was collected for those vegetable crops most likely to be grown in the Salinas River Valley. Based upon personal communication with regional crop experts, it was determined that lettuce, broccoli, cauliflower, spinach, spring mix, artichokes, and other miscellaneous vegetables would be most likely to be produced in the area. Therefore, the total crop acreage and gross crop value for each of these crops over the 2007-2011period were used to calculate a weighted average value per acre for a representative vegetable acre. As shown in Table 10, average vegetable gross value per acres is estimated at $9,426, while strawberries are estimated at $79,670.

Table 10: Gross Value per Acre, Vegetable Crops and Strawberries

Crop	Harvested Acreage		Gross Value	
	Annual Average	Total	Annual Average	Total
Broccoli	54,737	273,685	$344,770,385	$1,723,851,924
Cauliflower	17,929	89,644	$130,672,667	$653,363,336
Celery	11,376	56,881	$187,290,634	$936,453,169
Lettuce	143,948	719,741	$1,436,557,742	$7,182,788,711
Misc. Vegetables	24,912	124,561	$152,997,291	$764,986,453
Spinach	11,916	59,582	$150,796,786	$753,983,932

[71] University of California Cooperative Extension, 2009, Sample Costs to Produce Romaine Hearts-Leaf Lettuce: Central Coast Region, Website (http://coststudies.ucdavis.edu/files/lettuceromcc09.pdf)

Table 10: Gross Value per Acre, Vegetable Crops and Strawberries

Crop	Harvested Acreage		Gross Value	
	Annual Average	Total	Annual Average	Total
Spring Mix	12,096	60,479	$188,557,807	$942,789,033
Artichokes	5,503	27,513	$70,345,060	$351,725,300
Strawberries	10,596	52,982	$844,211,003	$4,221,055,016
			Vegetables Value per Acre	**$9,426**
			Strawberry Value per Acre	**$79,670**

Source: Monterey County Agricultural Commissioner Crop Reports, 2007-2011.

Notes: A single acre is counted as many times as it is harvested per crop year.

The production of output of any industry includes two components, intermediate goods/services and value added. Intermediate goods and services are required as inputs into production, which for crops would include items such as pesticide, fertilizer, and seed. The value added component of the total industry output includes employee compensation, proprietor income, other property income, and indirect business taxes.

In this study, the value of agricultural production activities affected by a flood event excludes those expenditures for materials, services and labor that have occurred prior to the flood event. Expenditures are made at different points throughout the crop cycle. As a result, some portion of the sectors' expenditures on goods and services from the backward-linked sectors are already made prior to the flood. The proportion expended varies by crop and the timing of the flood event. The remaining crop production costs and value added that would have occurred after the flood is the appropriate unit value for deriving the total change in final demand (direct output) of crop production sectors.

Table 10 reports per acre production value for vegetables and strawberries at $9,426 and $79,670, respectively. The proportion of crop production expenses that are expected to be expended prior to a February flood are removed from these estimates using the expenditure profiles documented in University of California Cooperative Extension Service's "crop budgets". The timing of vegetable crop flood effects was modeled using the *Sample Costs to Produce Romaine Hearts-Leaf Lettuce: Central Coast Region*, whereas the timing of strawberry production expenditures was ascertained from the *Sample Costs to Produce Second Year Strawberries: Central Coast Region*.[72] [73]

Table 11 reports per acre vegetable crop output (total commodity demand plus value added) that occurs prior to flood anticipated to occur in February. By the end of February, approximately 20 percent of the value of an acre of vegetable production has been realized within Monterey County. The $1,874 in total crop-related expenditure before a February flood has already been realized by the Monterey County economy, while $7,552 has not. The $7,552 in total output serves as the per acre value of foregone economic activity associated with vegetable crop production destroyed during a February flood event.

[72] University of California Cooperative Extension, 2009, Sample Costs to Produce Romaine Hearts-Leaf Lettuce: Central Coast Region, Website (http://coststudies.ucdavis.edu/files/lettuceromcc09.pdf)

[73] University of California Cooperative Extension, 2011, Sample Costs to Produce Strawberries: Central Coast Region, Website (http://coststudies.ucdavis.edu/files/Strawberry2ndYrCC2011.pdf)

Table 11: Direct Vegetable Crop Production Effects by Component, February Flood

Measure of Economic Activity	Description	IMPLAN Proportion	Crop Value	Pre-Flood Direct Economic Activity (%)	Pre-Flood Direct Economic Activity ($)	Post Flood Direct Economic Activity
Total Output	Value of crop produced	100%	$9,426	20%	$1,874	$7,552
Total Commodity Demand	Amount spent on materials	58%	$5,503	30%	$1,677	$3,826
Value Added	Primarily income	42%	$3,923	19%	$197	$3,726
Employee Compensation	Worker income	11%	$1,029	19%	$197	$832
Proprietor Income	Farmer income	24%	$2,271	0%	$0	$2,271
Other Property Income	Land owner income	6%	$539	0%	$0	$539
Indirect Business Tax	Payments to local government	1%	$85	0%	$0	$85

Notes:

Totals may not sum due to rounding.

Allocation of total commodity demand, value added and its components are derived from the IMPLAN 2010 model for the vegetable production sector in Monterey County.

Table 12 illustrates that by the end of February, approximately four percent of the value of an acre of strawberry production has been realized within Monterey County and the remaining 96 percent has yet to be expended. The $3,000 in total output crop-related expenditures made prior to a February flood have already been realized by the Monterey County economy, while $76,670 has not. The $76,670 in total output is the per acre measure of foregone economic activity associated with strawberry production destroyed during a February flood event.

Table 12: Direct Strawberry Crop Production Effects by Component, February Flood

Measure of Economic Activity	Description	IMPLAN Value	Crop Value	Pre-Flood Direct Economic Activity (%)	Pre-Flood Direct Economic Activity ($)	Post Flood Direct Economic Activity
Total Output	Value of crop produced	100%	$79,670	4%	$3,000	$76,670
Total Commodity Demand	Amount spent on materials	47%	$37,792	6%	$2,271	$35,521
Value Added	Primarily income	53%	$41,878	6%	$729	$41,149
Employee Compensation	Worker income	15%	$12,211	6%	$729	$11,482
Proprietor Income	Farmer income	32%	$25,666	0%	$0	$25,666
Other Property Income	Land owner income	3%	$2,220	0%	$0	$2,220

Table 12: Direct Strawberry Crop Production Effects by Component, February Flood

Measure of Economic Activity	Description	IMPLAN Value	Crop Value	Pre-Flood Direct Economic Activity (%)	Pre-Flood Direct Economic Activity ($)	Post Flood Direct Economic Activity
Indirect Business Tax	Payments to local government	2%	$1,781	0%	$0	$1,781

Notes:

Totals may not sum due to rounding.

Allocation of total commodity demand, value added and its components are derived from the IMPLAN 2010 model for the vegetable production sector in Monterey County.

4.2.5 Change in Final Demand within the Crop Production Sectors

The total direct output effect within the vegetable and strawberry crop production sectors for each flow and stream maintenance alternative is computed by applying the respective adjusted gross value per acre reported in Tables 11 and 12 to the respective inundated acreages. Table 13 presents the resulting change in final demand by crop and as a total for both sectors, for each flood flow and stream maintenance alternative. In keeping with the by-parts approach, Table 13 reports changes in final demand for each component of direct output.

Table 13 Change in Final Demand within Crop Production Sectors, After February Flood Event ($ Millions)

Component of Sector Output	2-Year Flow			10-Year Flow		
	Vegetables Sector	Strawberries (Fruit) Sector	Total	Vegetables Sector	Strawberries (Fruit) Sector	Total
Existing Conditions						
Commodity Demand	-$1.38	-$0.32	-$1.70	-$89.87	-$48.24	-$138.11
Employee Income	-$0.30	-$0.10	-$0.40	-$19.54	-$15.59	-$35.14
Proprietor & Other Property Income	-$1.01	-$0.25	-$1.26	-$65.99	-$37.87	-$103.86
Indirect business Taxes	-$0.03	-$0.02	-$0.05	-$1.99	-$2.42	-$4.41
Total	**-$2.72**	**-$0.69**	**-$3.41**	**-$177.40**	**-$104.12**	**-$281.52**
Maintained Conditions						
Spending Pattern	-$1.20	-$0.32	-$1.52	-$83.79	-$46.21	-$130.00
Employee Income	-$0.26	-$0.10	-$0.36	-$18.22	-$14.94	-$33.16
Proprietor & Other Property Income	-$0.88	-$0.25	-$1.13	-$61.52	-$36.28	-$97.80
Indirect business Taxes	-$0.03	-$0.02	-$0.04	-$1.86	-$2.32	-$4.17
Total	**-$2.37**	**-$0.69**	**-$3.06**	**-$165.38**	**-$99.75**	**-$265.13**
Difference Between Existing and Maintained	$0.35	$0.00	$0.35	$12.02	$4.37	$16.39

4.2.6 Change in Final Demand within Food Processing Sectors

If all vegetable and strawberry crops were exported or consumed as raw, bulk agricultural products or there existed little to no forward linkages to processing industries, the value of lost agricultural production would be the total direct output value to consider for the IMPLAN model. However, strawberry and vegetable crops are inputs to three forward-linked industries, fresh food manufacturing, frozen food processing, and vegetable/fruit canning and drying.

Food processing industries in Monterey County purchase strawberries and vegetable crops from local farmers. Without local strawberry and vegetable production, local food processing industries would produce less output and are thus dependent on Salinas River Valley production. To measure the full impact of flood events on agriculture, it is necessary to estimate the final demand values in these forward-linked industries that are generated by the inundated Salinas River Valley crop acreage. The following discussion summarizes the methods used to convert changes in strawberry and vegetable farming output into changes in final demands in the crop sectors and in the forward-linked processing sectors.

Proportion of Crop Production Value Retained in Monterey County Processing Sectors

This step is illustrated using data for the 10-year flow and existing channel conditions reported in Table 13. As provided in Table 13, $281.5 million is the total value of direct crop losses. This step is to estimate the proportion of the crop that is used locally in forward-linked industries. Only those industries that are dependent on Salinas River Valley crop production, and would likely not substitute Salinas River Valley crop production with imports from other regions, are evaluated.

For this analysis, it was assumed that three forward-linked food processing sectors are dependent on local crop production: “frozen food manufacturing,” “other food manufacturing,” and “fruit and vegetable canning and drying.” IMPLAN data indicates that the other food manufacturing sector requires 0.95 percent of local raw agriculture output or approximately $1.0 million of strawberries and $2.1 million of vegetables from the inundated area. [74] The local fruit and vegetable canning and drying sector require 0.014 percent of local raw agriculture output or $15,000 of strawberry production and $31,000 of vegetable production. The local frozen fruit manufacturing sector requires 0.013 percent of local agriculture production or $14,000 in strawberry production and $30,000 in vegetable production.

The remaining output value of the inundated strawberry and vegetable acreage is exported, consumed locally, or used in industries that may not be as dependent on local agricultural production. The remaining values of fruits not processed locally are entered into IMPLAN as a change in final demand in the fruit farming sector.

Converting Crop Production to Processed Food Output

The analysis also requires estimation of the total output value of Salinas River Valley crop production used by the forward-linked industries. In the other food manufacturing industry, agriculture products account for 18 percent of total production value.[75] Therefore, every dollar of agricultural product input purchased the value of output in the other food manufacturing industry increases by $5.65. Consequently, starting from the $1.0 million of strawberries that, in the absence of a flood, would otherwise be purchased by the other food manufacturing industry from inundated Salinas River acreage, it is possible for the industry to produce output valued at $5.8 million.

A similar process for vegetables purchased by the other food manufacturing industry ($2.1 million in raw vegetable purchases) supports output of $11.9 million in the other food manufacturing industry. This $17.7 million ($5.8 million plus $11.9 million) is the final demand value that is entered into IMPLAN for the

[74] This data is from the IMPLAN commodity balance sheets for the other food manufacturing sector.

[75] Ibid.

local other food manufacturing industry. This process is repeated for the fruit canning and drying sector and for frozen food manufacturing to derive the final demand values of $600,000 and $320,000, respectively. The final demand values used in IMPLAN assuming a 2-year and 10-year flow for the existing and maintained conditions are highlighted in Table 14 below.

Table 14 Change in Final Demand within Food Processing Sectors after Flood Event ($ Millions)

Industry Sector	2-Year Flow		10-Year Flow	
	Existing Conditions	Maintained Conditions	Existing Conditions	Maintained Conditions
Fresh Strawberry Processing	-$0.04	-$0.04	-$5.81	-$5.57
Fresh Vegetable Processing	-$0.18	-$0.16	-$11.90	-$11.09
Sub-Total Fresh Food Processing	**-$0.22**	**-$0.20**	**-$17.71**	**-$16.66**
Frozen Strawberry Processing	$0.00	$0.00	-$0.11	-$0.10
Frozen Vegetable Processing	$0.00	$0.00	-$0.22	-$0.20
Sub-Total Frozen Food Processing	**$0.00**	**$0.00**	**-$0.32**	**-$0.31**
Strawberry Canning and Drying	$0.00	$0.00	-$0.20	-$0.19
Vegetable Canning and Drying	-$0.01	-$0.01	-$0.40	-$0.38
Sub-Total Canning and Drying	**-$0.01**	**-$0.01**	**-$0.60**	**-$0.57**
Total Food Processing	**-$0.23**	**-$0.21**	**-$18.6**	**-$17.5**

Notes:
Totals may not sum due to rounding

Since these local processing sectors purchase crop inputs from the local area, it is necessary to modify the IMPLAN model prior to analyzing the final demand for the processing sectors to avoid calculating the economic implications of crop production through these food processing industries. In order to prevent double counting of Monterey County Crop production through the processing sectors backward linkages it was necessary to modify the regional purchase coefficients (RPCs) for each of these processing sectors to be zero. This RPC modification prevents the food processing sectors from purchasing local crop production and therefore does not double count the effects for crop production when evaluating the forward linkage impacts in conjunction with the crop production impacts.

4.3 Key Modeling Assumptions and Caveats

4.3.1 Impact on Adjacent Acreage

Acreage that is adjacent to inundated areas but is itself free of inundation is assumed to be harvested and managed without additional costs to growers. A survey of area growers was conducted by the Monterey County Agricultural Commissioner following flood events on the Salinas River during March 2011. The study revealed that growers were prevented from harvest crops on 0.08 adjacent acres for every inundated acre.[76] Relaxing this assumption will increase economic impacts of flooding with and without stream maintenance activities.

[76] County of Monterey, Agricultural Commissioner's Office. 2011. Salinas River Watershed March 2011 Storm and Flood Damage & Losses Survey Response Summary.

4.3.2 Crop Loss Assumptions: Food Safety Measures and Soil Erosion

Vegetable production in Monterey County is complex in that there are often multiple plantings of vegetable crops on the same acre during the year. Personal communication with knowledgeable regional crop production experts reveals that Monterey County vegetable producers can produce two or three vegetable crops per acre throughout the year.[77] [78] Strawberries are not typically double-cropped, and the model maintains the assumption of one crop per year.

Given these facts, it was necessary to consider the likelihood that subsequent vegetable plantings during the year would be lost following a spring flood. Two important factors about the post-flood landscape were evaluated in forming this assumption:

> Voluntary but uniformly accepted food safety measures in the Leafy Green Marketing Association's *Commodity Specific Food Safety Guidelines for the Production and Harvest of Lettuce and Leafy Greens*, and

> Potential for degradation and erosion of topsoil and the need to recondition the field before replanting.

The question is whether or not growers are able to replant the acreage following the flood with sufficient time to bring the subsequent crop to market within the season. Ultimately, it was assumed that crop loss on vegetable acreage is limited to the first crop of the season. Relaxing this assumption will increase economic impacts of flooding with and without stream maintenance activities. In relaxing this assumption, it is important to understand that the economic value of the SMP only increase relative to no stream maintenance if flood conditions under existing conditions increase the likelihood and prevalence of losing the entire crop year. This study does not evaluate that question.

Food Safety

Signatories of the Leafy Green Marketing Agreement (LGMA) must conform to basic standards following a flood event. All LGMA members are subject to mandatory government audits that certify that member companies are implementing food safety practices. In 2007, California farmers formed the LGMA, and with over 100 members it represents approximately 99 percent of California's leafy green production.[79] The basic standards following a flood event under the LGMA include the following provisions:[80]

> Identify, buffer, and do not harvest any product within a minimum of 30 feet of the visible flooded leading edge. This allows enough space for equipment to turn around and to avoid cross-contamination of non-flooded areas.

> The need for a non-harvest, non-traffic area greater than 30 feet must be based upon a risk analysis conducted by a qualified food safety professional.

> Documentation must be archived over a period of two years following the flood event.

> Flooded ground may be planted or re-planted following a plant-back interval of 60 days, provided that the soil has had sufficient time to dry out. Additional soil testing can be conducted to shorten this period to 30 days.

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[77] Roach, Bob, Monterey County Assistant Agriculture Commissioner, Personal communication with Lee Elder, Cardno ENTRIX, December 10, 2010.

[78] Smith, Richard, Monterey County Extension Service/Farm Advisor, Personal communication with Lee Elder, Cardno ENTRIX, December 10, 2010.

[79] LGMA, About Us, Website (http://www.caleafygreens.ca.gov/about-us) accessed August 10, 2012.

[80] LGMA, January 20, 2012, Commodity Specific Food Safety Guidelines for the Production and Harvest of Lettuce and Leafy Greens, Website (http://www.caleafygreens.ca.gov/sites/default/files/01.20.12%20CALGMA%20GAPs%20-%20metrics.pdf)

In the event of an April flood, the latest month evaluated in this study, and assuming the producer would have to wait for 60 days to replant and a summer growing season of 70 to 80 days,[81] September is the latest the second crop produced on that flooded acreage would be harvested. For this analysis, it is assumed that under most circumstances following a flood event, flooded acreage should be re-worked and planted within 60 days.[82] Actual survey data reported by the Monterey County Agricultural Commissioner's Office shows that an average grower faced a 67-day waiting period to replant their fields after a March 2011 flood event along the Salinas River.[83]

Topsoil Erosion

It is assumed that any topsoil erosion is sufficiently minimal to allow for repair and replacement in time to replant the subsequent crop(s). Relaxing this assumption will increase economic impacts of flooding with and without stream maintenance activities.

4.3.3 Substitution by the Processing Sectors

In computing the change in final demand of processed food products resulting from crop loss, the study assumes that local processors are unable to replace lost raw agricultural product supply with imports from outside of the Monterey County region or even from unaffected growers within Monterey County. Regional economic impacts decline to the extent processors are able to substitute and recover lost input supplies of raw agricultural product.

4.3.4 Annual Variation in Crop Value

Gross production value per acre of vegetables and strawberries is a key data point for measuring the change in final demand within those crop production sectors. A 5-year weighted average gross value per acre was computed in part to offset the effect of annual variability in commodity prices, yields, and acreage of each commodity in production. Based on Monterey County crop reports, the annual per acre vegetable production value varied by 10 percent of its 5-year average over 2007 to 2011, while annual per acre strawberry production valued varied by 14 percent of its 5-year average.

4.3.5 Costs Incurred by Affected Landowners

This study does not account or quantify certain direct costs that may be incurred by individual landowners and growers in the Salinas River Valley, including:

> costs incurred to conduct the maintenance activities prescribed in the SMP, and

> costs incurred to clean-up or restore inundated acreage.

The SMP is a voluntary program and costs of implementation may vary annually depending on participation, intensity, and mix of maintenance activities. Aside from making necessary assumptions about these determining factors, quantifying the cost of maintenance activities was outside the scope of this study and data on historically costs incurred under the Channel Maintenance Program (CMP) are not available for this study.

Landowners of parcels actually inundated by flood waters may bear a variety of direct costs associated with clean-up, following voluntary food safety protocols (creating a buffer zone, testing, replacing soil), replacing top soil, among other activities. Factors determining these costs will vary substantially by

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[81] UC Davis, Iceberg Lettuce Production in California, Publication 7215, Website (http://anrcatalog.ucdavis.edu/pdf/7215.pdf) accessed October 10, 2012.

[82] Suslow, Trevor, University of California Davis, Personal communication with Lee Elder, Cardno ENTRIX, September 21, 2012.

[83] County of Monterey, Agricultural Commissioner's Office. 2011. Salinas River Watershed March 2011 Storm and Flood Damage & Losses Survey Response Summary.

individual parcel and farming operation. Following the March 2011 flood events, survey data report that clean-up and restoration costs average $800 per acre, or $45,000 per farming operation.[84] Putting these figures in context, $800 per acre is approximately 8 percent of the per acre production value of vegetable acreage computed in this study. Following flooding in 1995, central coast farmers who were interviewed stated ranges of $500 and $3,000 per acre.[85]

While these costs are significant to the individual growers, it is important to understand that in the context of the regional economic model developed in this study these direct costs reflect spending on goods and services. These purchases represent an income transfer from land owners to other business and sectors of the economy, assuming that requisite labor, machines, supplies and equipment are purchased within Monterey County.

4.3.6 Grower Price Effects

The regional economic model developed in this study does not quantify the regional economic impact of short-run supply shortages due to crop loss resulting from the flooding. As explained in Section 4.1.1, IMPLAN assumes prices are constant, and do not adjust after a reduction in supply (change in final demand). However, economic theory tells as that commodity prices will increase in the short-run until supply from other regions, or in this case unaffected Monterey County growers, satisfies the excess demand and returns the market to equilibrium. During this period, unaffected growers with the ability to access spot markets will be able to sell at higher prices than in the absence of the flood. It should be noted that forward-price contracts and certain production contracts may prevent growers from accessing the increased market prices. Additionally, local processors will face higher input prices and gains to the regional economy by increased farmer income may be offset to a degree.

[84] County of Monterey, Agricultural Commissioner's Office. 2011. Salinas River Watershed March 2011 Storm and Flood Damage & Losses Survey Response Summary.

[85] Bierman, Mark D., August, 24, 2010, Pajaro River Flood Risk Management-Summary Report: Agricultural Damages from Flooding-Strawberries.

5 Estimation of Property Damages

This chapter describes methods, data, assumptions and formulae for estimating the value of damage to inundated structures and their contents. Property damages result from flood events when land, structures, and their contents are inundated by flood waters. The severity of physical damage is determined by the depth of inundation, duration of inundation, and the baseline structural condition, among other factors. The financial impact of flood damage is a function of the extent of physical damage and the cost restoring the structure to pre-flood condition. Costs can vary based on type of structure, age of structure, and other factors.

This study estimates damages to structures and their contents resulting from each flood event and stream maintenance condition. The first step is to determine the location of inundated structures. Next, the cost to restore each structure and its contents to pre-flood conditions is estimated. Total structure and content property damages are calculated by totaling replacement cost estimates for the entire inundated area.

5.1 Data

GIS hydrologic HEC-Geo RAS flood event data presented in The Salinas River Stream Maintenance Program Flood Study (Flood Study), Appendix E of the EIR, identifies boundaries inundated by under each simulated flood event along with the depth of inundation. Parcel data provided by the Monterey County Assessor's Office provided detailed information on each parcel, including age of structure and assessed value of improvements (i.e., excluding the value of land). Additional data for the calculation were sourced with tables and formulas published in studies referencing or directly from the U.S. Army Corps of Engineers.

5.2 Inundated Structures

A GIS overlay of the hydrologic model output forming the inundated zones and the parcel data revealed that the inundated structures would include a commercial office, multi-family residences, single-family residences, condominiums, and a number of undefined structures. The data show that approximately 90 percent of the inundated structures are single-family residences. These structures are located on both agricultural parcels and on small urban residential properties in Salinas. The results of the simulated ten-year flood are presented in Chapter 6.

It should be noted that the Flood Study was prepared by to evaluate the effects of proposed maintenance activities on channel flood capacity along 100 miles of river. A hydraulic model of the Salinas River was constructed using the U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center River Analysis System (HEC-Geo RAS) version 4.3.93 computer program in order to simulate existing flood capacity and to determine changes in flood capacity with proposed stream maintenance activities. The model approach and results are not intended to be sufficiently refined to evaluate site-specific effects of maintenance on channel capacity for a specific landowner or property, including residential structures.

As determined by a third party review of the modeling, while the model is a reasonable predictor of the general effects of the SMP on Salinas River floodflow stages, and is adequate for purposes of supporting an EIR assessment, the model would need to be refined locally in order to use it for purposes of assessing the specific effects and potential economic benefits for particular maintenance projects planned by a given landowner under the SMP. The model lacks the specificity necessary to meet FEMA standards and homes that are currently shown in the 10-year inundation area may actually be elevated or otherwise not subject flood damages from a 10-year event.

5.3 Property Damage Computation

Following industry practice, the flood damages are estimated based on the depreciated replacement value of the damaged structure and its contents.[86] Due to the nature of the available data, this analysis uses assessed property values to proxy for the cost of replacing or restoring damaged structures.[87] The assessed value of improvements on each inundated parcel is adjusted using a depreciation factor calculated by applying the ratio of the structure's effective age to its functional life expectancy. The extent of content damages is determined by applying the appropriate content-to-structure value ratios based on the literature. The costs of structural and content damages on each parcel are computed by multiplying the depreciated replacement value by a factor reflecting the extent of structural damage that is determined by depth of inundation and standard damage depth curves. Appendix C to this study presents the calculation in steps within a diagram.

5.3.1 Functional Life Expectancies of Inundated Structures

In this study, functional life expectancies for single-family residences and multi-family homes were assumed to be representative of an average quality stick frame structure.[88] Table 15 reports the functional life expectancies for an average quality single-family stick frame residence and multi-family residence as 55 years and 50 years, respectively.

Table 15: Functional Life Expectancy for Structures

	Single-Family Residence		Low-Rise Multiples, Town Houses, and Duplexes	
Quality	Frame	Masonry	Frame	Masonry
Low	45	50	-	-
Fair	50	55	45	50
Average	55	60	50	55
Good	55	60	50	55
Very Good	60	60	55	60
Excellent	60	65	55	60

Source: Metzler, Sharon M., 2011, Land Use Interpretation in Flood Damage Estimation, San Jose State University, Website (http://scholarworks.sjsu.edu/etd_theses) accessed November 14, 2012.

5.3.2 Structural Condition Ratings

The effective age for each structure reflects the structure's actual age as well as the property's general condition rating. For this analysis, each structure was considered to be of average condition (normal) and to be located in a stable area. Table 16 reports the general condition rating for well maintained structures in a stable area is 0.40.

[86] USACE, Estimating Structure Value, Website (http://www.corpsnedmanuals.us/flooddamagereduction/FDRID020EstStrucValue.asp?ID=20) accessed November 15, 2012.

[87] Assessed property values are recognized as an acceptable proxy when data on the replacement costs are not available. See U.S. Army Corps of Engineers. 1987. National Economic Development Procedures Manual – Agricultural Flood Damage. IWR Report 87-R-10.

[88] Metzler, Sharon M., 2011, Land Use Interpretation in Flood Damage Estimation, San Jose State University, Website (http://scholarworks.sjsu.edu/etd_theses) accessed November 14, 2012.

Table 16: Structural General Condition Ratings

Property Condition	High Demand/Appreciating	Stable Area/Some Updating	Declining Area/Basic Maintenance
Newer Properties/Total Remodel	0.05	0.10	0.15
Above Average/Well Maintained	0.15	0.25	0.35
Average Condition/Normal	0.25	0.40	0.55
Below Average	0.40	0.60	0.80

Source: Metzler, Sharon M., 2011, Land Use Interpretation in Flood Damage Estimation, San Jose State University, Website (http://scholarworks.sjsu.edu/etd_theses) accessed November 14, 2012.

5.3.3 Content-to-Structure Value Ratios

The traditional approach used to quantify damages to structural contents relies upon the structural value, the content-to-structure value ratio (CSVR), and content depth-damage relationship.[89] Table 17 provides the CSVRs used in this analysis.

Table 17: Content-to-Structure Value Ratios

Structure	Content-to-Structure Value Ratio
Single-Family Residences	100%
Professional Businesses	44%
Public and Semi-Public[2]	79%
Multi-Family Residences[2]	27%

Source: USACE, Economic Guidance Memorandum (EGM) 04-01, October 10, 2003, Website (http://planning.usace.army.mil/toolbox/library/EGMs/egm04-01.pdf) accessed November 15, 2012.

USACE, Final Report, Depth-Damage Relationships for Structures, Content, and Vehicles and Content-To-Structure Value Ratios (CSVR) in Support of the Donaldsonville to the Gulf, Louisiana, Feasibility Study. Website (http://www.mvn.usace.army.mil/pd/COMPLETE_REPORT_Donaldsv-Gulf.pdf) accessed November 15, 2012.

5.3.4 Damage Depth Curves

Table 18 details the structure and content damage depth curves used in this analysis. Water depth and the associated damage are relative to first floor of the structure. A value of zero indicates that water has reached the first floor. It was assumed that each structure foundation was one foot above the ground.[90] Flood depth, as provided by in the hydrology analysis, was therefore reduced one foot in order to take into account the foundation for each structure.

[89] USACE, Economic Guidance Memorandum (EGM) 04-01, October 10, 2003, Website (http://planning.usace.army.mil/toolbox/library/EGMs/egm04-01.pdf) accessed November 15, 2012.

[90] Metzler, Sharon M., 2011, Land Use Interpretation in Flood Damage Estimation, San Jose State University, Website (http://scholarworks.sjsu.edu/etd_theses) accessed November 14, 2012.

Table 18: Structural and Content Damage Depth Curves for Property Types

Water Depth (feet)	Structural Damage Depth Curve			Content Damage Depth Curve		
	Single-Family Residence	Multi-Family Residence	Commercial	Single-Family Residence	Multi-Family Residence	Commercial
-1	2.5%	5.0%	0.0%	2.4%	0%	0%
-0.5			0.0%		0%	0%
0	13.4%	6.0%	3.9%	8.1%	0%	0%
0.5			15.2%		15%	11%
1	23.3%	17.0%	17.3%	13.3%	20%	15%
1.5			19.0%		22%	19%
2	32.1%	18.0%	22.1%	17.9%	28%	23%
3	40.1%	20.0%	24.4%	22.0%	45%	68%
4	47.1%	22.0%	31.2%	25.7%	49%	87%
5	53.2%	23.0%	31.9%	28.8%	49%	87%
6	58.6%	25.0%	32.2%	31.5%	49%	99%
7	63.2%	27.0%	32.6%	33.8%	49%	99%
8	67.2%		42.5%	35.7%	49%	99%
9	70.5%	30.0%	44.6%	37.2%	49%	99%
10	73.2%	32.0%	45.8%	38.4%	64%	99%
11	75.4%		46.6%	39.2%	71%	99%
12	77.2%		46.9%	39.7%	93%	99%
13	78.5%		46.9%	40.0%	98%	99%
14	79.5%		47.3%	40.0%	98%	99%
15	80.2%		47.3%	40.0%	98%	99%

Source:

USACE, Economic Guidance Memorandum (EGM) 04-01, October 10, 2003, Website (http://planning.usace.army.mil/toolbox/library/EGMs/egm04-01.pdf) accessed November 15, 2012.

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6 Results

This chapter presents measures of the economic value associated with the SMP. Estimates of economic impacts of a two-year and ten-year flood event on the Salinas River Valley are presented for existing and maintained stream channel conditions. A measure of SMP's economic value is derived as the reduction in economic impacts with the SMP in place relative to economic impacts of the same flood under existing conditions. Measures of the SMP's economic value presented in this section are:

> Reductions in impacts from lost agricultural production and crop processing in terms industry output, jobs (employment) and annual income supported within Monterey County, and

> Reductions in property damage to inundated structures located within the flood inundation zone.

6.1 Regional Economic Impact Estimates

Results for the regional economic impact model are presented in this section. Estimates of regional economic impacts are presented for the alternative simulated flood flows and stream maintenance conditions. Results presented in this section assume the flood event occurs in the month of February, the most probable of any single month during the crop season.[91] A measure of the SMP's economic value is derived as the reduction in economic impacts of a flood event with the SMP in place relative to economic impacts of the same flood under existing conditions. Dollar values presented in this section are shown at 2011 price levels.

> For the two-year flood flow, results indicate that implementing the SMP would avoid $0.6 million in lost output and save 3 jobs. Approximately $0.3 million of avoided output losses is comprised of income. In percentage terms, lost output is reduced by approximately 11 percent under maintained conditions relative to existing conditions.

> For the ten-year flood flow, results indicate that implementing the SMP would avoid $27.9 million in lost output and save 163 jobs. Approximately $10.9 million of avoided output losses is comprised of income. In percentage terms, lost output is reduced by approximately 6 percent under maintained conditions relative to existing conditions.

Table 19 Estimated of Regional Economic Impacts from Crop Loss Resulting from a February Flood Event on the Salinas River

Flood Event and Stream Maintenance Alternative	Total Output (Millions)	Total Income (Millions)	Total Employment (jobs)
2-Year Flow: Existing Conditions	$5.8	$2.3	33
2-Year Flow: Maintained Conditions	$5.2	$2.0	30
Difference: (Existing – Maintained)	**$0.6**	**$0.3**	**3**
10-Year Flow: Existing Conditions	$478.9	$190.8	2,911
10-Year Flow: Maintained Conditions	$451.0	$179.9	2,748
Difference: (Existing – Maintained)	**$27.9**	**$10.9**	**163**

[91] Appendix B to this study reports the same estimates tables separately for December, January, March, and April flood events.

The remainder of this Chapter presents detailed estimates of regional economic impacts for the two-year and ten-year flood events under both existing and maintained stream conditions. Three different sets of two tables present more detail on about the impact estimates summarized in Table 19.

> Tables 20.1 and 20.2 report output, income and employment (jobs) impacts broken down type of impact; direct, indirect, or induced, and by industry in which a change in final demand results from the two-year flood. In these tables, vegetable and strawberry crop production industry sub-sectors are totaled as "Crop Production" and all six local food processing industry sectors analyzed are totaled as "Local Processing". Table 20.1 reports impacts under existing conditions, whereas table 20.2 reports impacts under maintained conditions. Analogous tables considering the ten-year flood event are labeled 23.1 and 23.2.

> Tables 21.1 and 21.2 report output, income and employment impacts (jobs) resulting from a two-year flood broken down by the two crop production industry sub-sectors analyzed; vegetable and strawberry crop production. Additionally, impacts are reported as the total of all six local food processing industry sectors analyzed ("Local Processing"). Additionally, these tables break out the direct output effect, which is interpreted as the value of industry production that is lost due to the flooding. Table 21.1 reports impacts under existing conditions, whereas table 21.2 reports impacts under maintained conditions. Analogous tables considering the ten-year flood event are labeled 24.1 and 24.2.

> Tables 22.1 and 22.2 report output, income, and employment (jobs) impacts of lost crop production and food processing output (manufacturing) accruing to each aggregate industry sector. Table 22.1 reports impacts under existing conditions, whereas table 22.2 reports impacts under maintained conditions. Analogous tables considering the ten-year flood event are labeled 25.1 and 25.2.

6.1.1 Two-Year Flood Flow

Measures of Impact by Type of Effect and Sub-Sector

Table 20.1: Crop Production and Food Processing Impacts for Monterey County for a February 2-year Flow under Existing Channel Conditions

Type of Effect	Output	Income	Employment (Jobs)
Crop Production (Millions $)			
Direct	$3.4	$1.5	14
Indirect	$0.9	$0.3	9
Induced	$1.2	$0.4	10
Sub-Total	**$5.5**	$2.2	**32**
Local Processing			
Direct	$0.2	$0.04	1
Indirect	$0.1	$0.02	0
Induced	$0.0	$0.01	0
Sub-Total	**$0.3**	**$0.06**	**1**
Total Local Economic Impacts (Millions $)			
Direct	$3.6	$1.5	14
Indirect	$0.9	$0.3	9
Induced	$1.2	$0.4	10

Table 20.1: Crop Production and Food Processing Impacts for Monterey County for a February 2-year Flow under Existing Channel Conditions

Type of Effect	Output	Income	Employment (Jobs)
Total	**$5.8**	**$2.3**	**33**

Notes:

Totals may not sum due to rounding.

Note that impacts in forward linked industries (processing) are actually an indirect impact of crop farming. However, as impacts to forward-linked industries must be analyzed in IMPLAN as direct impacts in order to be captured, results are presented to show the total economic impacts resulting from this direct impact to the processing sector.

Table 20.2: Crop Production and Food Processing Impacts for Monterey County for a February 2-year Flow under Maintained Channel Conditions

Type of Effect	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$3.1	$1.3	12
Indirect	$0.8	$0.3	8
Induced	$1.1	$0.4	9
Sub-Total	**$4.9**	**$2.0**	**29**
Local Processing			
Direct	$0.2	$0.03	1
Indirect	$0.0	$0.02	0
Induced	$0.0	$0.01	0
Sub-Total	**$0.3**	**$0.06**	**1**
Total Local Economic Impacts			
Direct	$3.3	$1.4	13
Indirect	$0.8	$0.3	8
Induced	$1.1	$0.4	9
Total	**$5.2**	**$2.0**	**30**

Notes:

Totals may not sum due to rounding.

Note that impacts in forward linked industries (processing) are actually an indirect impact of crop farming. However, as impacts to forward-linked industries must be analyzed in IMPLAN as direct impacts in order to be captured, results are presented to show the total economic impacts resulting from this direct impact to the processing sector.

Measures of Impact from Type Crop Production and Local Processing

Table 21.1: Estimated Crop Production Value and Associated Total Economic Impacts of a February 2-year Flow under Existing Channel Conditions: Monterey County

Industry	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.7	$1.1	$0.5	8
Vegetable farming	$2.7	$4.4	$1.7	23
Local Processing	$0.2	$0.3	$0.1	1

Table 21.1: Estimated Crop Production Value and Associated Total Economic Impacts of a February 2-year Flow under Existing Channel Conditions: Monterey County

Industry	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Total	**$3.6**	**$5.8**	**$2.3**	**33**

Notes:
Totals may not sum due to rounding.

Table 21.2: Estimated Crop Production Value and Associated Total Economic Impacts of a February 2-year Flow under Maintained Channel Conditions: Monterey County

Industry	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.7	$1.1	$0.5	8
Vegetable farming	$2.4	$3.8	$1.5	20
Local Processing	$0.2	$0.3	$0.1	1
Total	**$3.3**	**$5.2**	**$2.0**	**30**

Notes:
Totals may not sum due to rounding.

Measures of Impact to Aggregate Industry Sector

Table 22.1: Total Economic Impacts by Sector of a February 2-year Flow under Existing Channel Conditions

Sector	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$3.6	$1.6	19
Mining	$0.0	$0.0	0
Construction	$0.0	$0.0	0
Manufacturing	$0.3	$0.0	1
TIPU	$0.1	$0.0	1
Trade	$0.2	$0.1	2
Service	$1.4	$0.4	10
Government	$0.1	$0.0	0
Total	**$5.8**	**$2.3**	**33**

Notes:
Totals may not sum due to rounding.

Table 22.2: Total Economic Impacts by Sector of a February 2-year Flow under Maintained Channel Conditions

Sector	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$3.3	$1.5	17
Mining	$0.0	$0.0	0

Table 22.2: Total Economic Impacts by Sector of a February 2-year Flow under Maintained Channel Conditions

Sector	Output (millions)	Income (millions)	Employment (jobs)
Construction	$0.0	$0.0	0
Manufacturing	$0.3	$0.0	1
TIPU	$0.1	$0.0	0
Trade	$0.2	$0.1	2
Service	$1.2	$0.3	9
Government	$0.1	$0.0	0
Total	**$5.2**	**$2.0**	**30**

Notes:
Totals may not sum due to rounding.

6.1.2 10-Year Flow Results

Measures of Impact by Type of Effect and Sub-Sector

Table 23.1: Crop Production and Food Processing Impacts for Monterey County for a February 10-year Flow under Existing Channel Conditions

Type of Effect	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$281.5	$124.8	1,266
Indirect	$72.5	$27.6	733
Induced	$99.2	$33.2	810
Sub-Total	**$453.3**	**$185.7**	**2,808**
Local Processing			
Direct	$18.6	$2.82	55
Indirect	$4.4	$1.48	27
Induced	$2.6	$0.86	21
Sub-Total	**$25.6**	**$5.16**	**103**
Total Local Economic Impacts			
Direct	$300.1	$127.6	1,320
Indirect	$77.0	$29.1	760
Induced	$101.8	$34.1	830
Total	**$478.9**	**$190.8**	**2,911**

Notes:
Totals may not sum due to rounding.Note that impacts in forward linked industries (processing) are actually an indirect impact of crop farming. However, as impacts to forward-linked industries must be analyzed in IMPLAN as direct impacts in order to be captured, results are presented to show the total economic impacts resulting from this direct impact to the processing sector.

Table 23.2: Crop Production and Food Processing Impacts for Monterey County for a February 10-year Flow under Maintained Channel Conditions

Type of Effect	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$265.1	$117.7	1,197
Indirect	$68.3	$26.0	691
Induced	$93.5	$31.3	763
Sub-Total	**$426.9**	**$175.0**	**2,651**
Local Processing			
Direct	$17.5	$2.65	52
Indirect	$4.2	$1.39	26
Induced	$2.4	$0.81	20
Sub-Total	**$24.1**	**$4.85**	**97**
Total Local Economic Impacts			
Direct	$282.7	$120.3	1,249
Indirect	$72.4	$27.4	716
Induced	$95.9	$32.1	782
Total	**$451.0**	**$179.9**	**2,748**

Notes:

Totals may not sum due to rounding.

Note that impacts in forward linked industries (processing) are actually an indirect impact of crop farming. However, as impacts to forward-linked industries must be analyzed in IMPLAN as direct impacts in order to be captured, results are presented to show the total economic impacts resulting from this direct impact to the processing sector.

Measures of Impact from Type Crop Production and Local Processing

Table 24.1: Estimated Crop Production Value and Associated Total Economic Impacts of a February 10-year Flow under Existing Channel Conditions

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$104.1	$167.8	$74.9	1,279
Vegetable farming	$177.4	$285.5	$110.8	1,529
Local Processing	$18.6	$25.6	$5.2	103
Total	**$300.1**	**$478.9**	**$190.8**	**2,911**

Notes:
Totals may not sum due to rounding

Table 24.2: Estimated Crop Production Value and Associated Total Economic Impacts of a February 10-year Flow and Maintained Channel Conditions: Monterey County

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$99.7	$160.7	$71.7	1,226
Vegetable farming	$165.4	$266.2	$103.3	1,425
Local Processing	$17.5	$24.1	$4.9	97
Total	**$282.7**	**$451.0**	**$179.9**	**2,748**

Notes:
Totals may not sum due to rounding.

Measures of Impact to Aggregate Industry Sector

Table 25.1: Total Economic Impacts by Sector of a February 10-year Flow under Existing Channel Conditions

Sector	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$300.1	$138.8	1,711
Mining	$0.5	$0.2	0
Construction	$3.2	$1.4	16
Manufacturing	$26.1	$3.9	71
TIPU	$8.4	$3.6	46
Trade	$17.7	$8.5	204
Service	$112.5	$31.0	820
Government	$10.2	$3.6	43
Total	**$478.9**	**$190.8**	**2,911**

Notes:
Totals may not sum due to rounding.

Table 25.2: Total Economic Impacts by Sector of a February 10-year Flow under Maintained Channel Conditions

Sector	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$282.6	$130.8	1,617
Mining	$0.5	$0.2	0
Construction	$3.1	$1.3	16
Manufacturing	$24.6	$3.7	66
TIPU	$7.9	$3.4	43
Trade	$16.7	$8.0	193
Service	$106.0	$29.2	772
Government	$9.6	$3.4	41
Total	**$451.0**	**$179.9**	**2,748**

Notes:
Totals may not sum due to rounding.

6.2 Property Damage Estimates

This section presents estimates of property damages to inundated structures and contents. Estimates presented here were derived by the methodology described in Chapter 5. Dollar values presented in this section are shown at 2012 price levels.

Table 26 shows the numbers of structures, by type, that would be damaged by 2-year and 10-year flood events under the existing and the maintained channel conditions. No structures are expected to be affected by 2-year flows under either the existing condition or the maintained condition. However, it is expected that a total of 1,069 structures will be affected by 10-year flows under existing channel conditions and 801 structures under maintained conditions, thus 268 fewer structures under the maintained than under the existing condition.

Table 26: Number of Inundated Structures

Flood Event	Offices	Multi-Family Residences	Single-Family Residences	Condominiums-Single Family Residences	Undefined Structures	Total Structures
2yr Existing	0	0	0	0	0	0
2yr Maintained	0	0	0	0	0	0
Difference	**0**	**0**	**0**	**0**	**0**	**0**
10yr Existing	1	35	950	24	59	1,069
10yr Maintained	1	17	729	0	54	801
Difference	**0**	**17**	**221**	**24**	**5**	**267**

Table 27 presents estimates of property damages to structures and contents assuming various flood flow and channel maintenance conditions. A 10-year flow under existing conditions results in $111.6 million in structural and content damage. Most of these damages will accrue to single-family residences ($66.7 million) followed by undefined structures ($42.5 million). Under maintained conditions, structure and content damages are estimated at $87.7 million. Most of these damages will also be for single-family residences ($47.5 million) followed by undefined structures ($39.0 million). Total structural and content damages under the 10-year maintained conditions are thus anticipated to be $23.9 million lower than under existing conditions.

Table 27: Value of Structure and Content Damage

Flood Event	Offices	Multi-Family Residences	Single-Family Residences	Condominiums -Single Family Residences	Undefined Structures	Total Contents Damages
2yr Existing	$0	$0	$0	$0	$0	$0
2yr Maintained	$0	$0	$0	$0	$0	$0
Difference	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
10yr Existing	$3,000	$1,695,000	$66,721,000	$663,000	$42,530,000	$111,612,000
10yr Maintained	$0	$1,164,000	$47,548,000	$0	$38,988,000	$87,700,000
Difference	$3,000	**$532,000**	$19,172,000	**$663,000**	**$3,542,000**	$23,912,000

Notes:
Totals may not sum due to rounding.

Tables 28 and 29 detail property damages estimates reported in Table 27 by component of damage, structural or content. Table 28 shows that a 10-year flow under existing conditions results in structural damage of $72.0 million. The majority of these damages will be for single-family residences ($43.1 million), followed by undefined structures ($27.3 million). It is expected that a 10-year flow under maintained conditions would cause structural damages of $56.4 million. The majority of these damages will also be for single-family residences ($30.7 million) followed by undefined structures ($24.9 million). Thus, structural damages under the 10-year maintained conditions are anticipated to be $15.6 million lower than under existing conditions.

Table 28: Value of Structural Damage

Flood Event	Offices	Multi-Family Residences	Single-Family Residences	Condominiums-Single Family Residences	Undefined Structures	Total Structures Damages
2yr Existing	$0	$0	$0	$0	$0	$0
2yr Maintained	$0	$0	$0	$0	$0	$0
Difference	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
10yr Existing	$3,000	$1,128,000	$43,088,000	$535,000	$27,260,000	$72,013,000
10yr Maintained	$0	$763,000	$30,690,000	$0	$24,939,000	$56,393,000
Difference	$3,000	**$364,000**	$12,397,000	**$535,000**	**$2,320,000**	$15,620,000

Notes:
Totals may not sum due to rounding.

Table 29 shows that a 10-year flood under existing conditions results in content damage of $39.6 million. Most of these damages will be for single-family residences ($23.6 million) followed by undefined structures ($15.3 million). A 10-year flow under maintained conditions would cause content damages of $31.3 million. Most of these damages will also be for single-family residences ($16.8 million) followed by undefined structures ($14.0 million). Thus, structural damages under the 10-year maintained conditions are anticipated to be $8.3 million lower than under existing conditions.

Table 29: Value of Damage to Contents

Flood Event	Offices	Multi-Family Residences	Single-Family Residences	Condominiums-Single Family Residences	Undefined Structures	Total Contents Damages
2yr Existing	$0	$0	$0	$0	$0	$0
2yr Maintained	$0	$0	$0	$0	$0	$0
Difference	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
10yr Existing	$0	$568,000	$23,633,000	$128,000	$15,270,000	$39,599,000
10yr Maintained	$0	$400,000	$16,858,000	$0	$14,049,000	$31,307,000
Difference	$0	**$167,000**	$6,775,000	**$128,000**	**$1,221,000**	$8,292,000

Notes:
Totals may not sum due to rounding.

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Appendix

A

IMPLAN MODEL INPUT

Appendix A IMPLAN Model Inputs

Table A-1 Crop Production and Food Processing Final Demand Changes for IMPLAN Model for 2-year Flow under Existing Channel Conditions

IMPLAN Sector	Final Demand Change				
	December	January	February	March	April
Salinas River Valley Crop Production					
Vegetable Farming Spending Pattern	$1,792,000	$1,487,000	$1,377,000	$1,336,000	$9,000
Vegetable Farming Employee Income	$354,000	$347,000	$300,000	$262,000	$0
Proprietor Income	$1,011,000	$1,011,000	$1,011,000	$1,011,000	$1,011,000
Indirect business taxes	$31,000	$31,000	$31,000	$31,000	$31,000
Sub-Total Vegetable Farming	$3,188,000	$2,876,000	$2,719,000	$2,640,000	$1,051,000
Strawberry Farming Spending Pattern	$335,000	$324,000	$320,000	$295,000	$254,000
Vegetable Farming Employee Income	$108,000	$105,000	$103,000	$97,000	$83,000
Proprietor Income	$251,000	$251,000	$251,000	$251,000	$251,000
Indirect business taxes	$16,000	$16,000	$16,000	$16,000	$16,000
Sub-Total Strawberry Farming	$710,000	$696,000	$690,000	$659,000	$604,000
Total Crop Production	$3,898,000	$3,572,000	$3,409,000	$3,299,000	$1,655,000
Forward Linked Sectors					
Frozen Strawberry Processing	$1,000	$1,000	$1,000	$1,000	$1,000
Frozen Vegetable Processing	$3,000	$3,000	$3,000	$3,000	$3,000
Strawberry Canning and Drying	$1,000	$1,000	$1,000	$1,000	$1,000
Vegetable Canning and Drying	$6,000	$6,000	$6,000	$6,000	$6,000
Fresh Strawberry Processing	$39,000	$39,000	$39,000	$39,000	$39,000
Fresh Vegetable Processing	$182,000	$182,000	$182,000	$182,000	$182,000
Total Forward Linked Sectors	$232,000	$232,000	$232,000	$232,000	$232,000

Table A-2 Crop Production and Food Processing Final Demand Changes for IMPLAN Model for 2-year Flow under Maintained Channel Conditions

IMPLAN Sector	Final Demand Change				
	December	January	February	March	April
Salinas River Valley Crop Production					
Vegetable Farming Spending Pattern	$1,563,000	$1,297,000	$1,201,000	$1,166,000	$8,000
Vegetable Farming Employee Income	$309,000	$303,000	$261,000	$228,000	$0
Proprietor Income	$882,000	$882,000	$882,000	$882,000	$882,000
Indirect business taxes	$27,000	$27,000	$27,000	$27,000	$27,000
Sub-Total Vegetable Farming	$2,780,000	$2,509,000	$2,371,000	$2,302,000	$917,000

IMPLAN Sector	Final Demand Change				
	December	January	February	March	April
Strawberry Farming Spending Pattern	$335,000	$324,000	$320,000	$295,000	$254,000
Vegetable Farming Employee Income	$108,000	$105,000	$103,000	$97,000	$83,000
Proprietor Income	$251,000	$251,000	$251,000	$251,000	$251,000
Indirect business taxes	$16,000	$16,000	$16,000	$16,000	$16,000
Sub-Total Strawberry Farming	$710,000	$696,000	$690,000	$659,000	$604,000
Total Crop Production	$3,491,000	$3,204,000	$3,061,000	$2,962,000	$1,521,000
Forward Linked Sectors					
Frozen Strawberry Processing	$1,000	$1,000	$1,000	$1,000	$1,000
Frozen Vegetable Processing	$3,000	$3,000	$3,000	$3,000	$3,000
Strawberry Canning and Drying	$1,000	$1,000	$1,000	$1,000	$1,000
Vegetable Canning and Drying	$5,000	$5,000	$5,000	$5,000	$5,000
Fresh Strawberry Processing	$39,000	$39,000	$39,000	$39,000	$39,000
Fresh Vegetable Processing	$159,000	$159,000	$159,000	$159,000	$159,000
Total Forward Linked Sectors	$208,000	$208,000	$208,000	$208,000	$208,000

Table A-3 Crop Production and Food Processing Final Demand Changes for IMPLAN Model for 10-year Flow under Existing Channel Conditions

IMPLAN Sector	Final Demand Change				
	December	January	February	March	April
Salinas River Valley Crop Production					
Vegetable Farming Spending Pattern	$116,934,000	$97,038,000	$89,873,000	$87,197,000	$615,000
Vegetable Farming Employee Income	$23,089,000	$22,650,000	$19,543,000	$17,066,000	$0
Proprietor Income	$65,991,000	$65,991,000	$65,991,000	$65,991,000	$65,991,000
Indirect business taxes	$1,990,000	$1,990,000	$1,990,000	$1,990,000	$1,990,000
Sub-Total Vegetable Farming	$208,005,000	$187,670,000	$177,398,000	$172,246,000	$68,597,000
Strawberry Farming Spending Pattern	$50,533,000	$48,908,000	$48,237,000	$44,546,000	$38,266,000
Vegetable Farming Employee Income	$16,342,000	$15,787,000	$15,593,000	$14,666,000	$12,589,000
Proprietor Income	$37,870,000	$37,870,000	$37,870,000	$37,870,000	$37,870,000
Indirect business taxes	$2,418,000	$2,418,000	$2,418,000	$2,418,000	$2,418,000
Sub-Total Strawberry Farming	$107,163,000	$104,983,000	$104,118,000	$99,500,000	$91,143,000
Total Crop Production	$315,168,000	$292,653,000	$281,516,000	$271,745,000	$159,740,000
Forward Linked Sectors					
Frozen Strawberry Processing	$106,000	$106,000	$106,000	$106,000	$106,000
Frozen Vegetable Processing	$217,000	$217,000	$217,000	$217,000	$217,000
Strawberry Canning and	$197,000	$197,000	$197,000	$197,000	$197,000

IMPLAN Sector	Final Demand Change				
	December	January	February	March	April
Drying					
Vegetable Canning and Drying	$404,000	$404,000	$404,000	$404,000	$404,000
Fresh Strawberry Processing	$5,812,000	$5,812,000	$5,812,000	$5,812,000	$5,812,000
Fresh Vegetable Processing	$11,895,000	$11,895,000	$11,895,000	$11,895,000	$11,895,000
Total Forward Linked Sectors	$18,632,000	$18,632,000	$18,632,000	$18,632,000	$18,632,000

Table A-4 Crop Production and Food Processing Final Demand Changes for IMPLAN Model for 10-year Flow under Maintained Channel Conditions

IMPLAN Sector	Final Demand Change				
	December	January	February	March	April
Salinas River Valley Crop Production					
Vegetable Farming Spending Pattern	$109,014,000	$90,465,000	$83,786,000	$81,291,000	$573,000
Vegetable Farming Employee Income	$21,525,000	$21,116,000	$18,219,000	$15,910,000	$0
Proprietor Income	$61,522,000	$61,522,000	$61,522,000	$61,522,000	$61,522,000
Indirect business taxes	$1,856,000	$1,856,000	$1,856,000	$1,856,000	$1,856,000
Sub-Total Vegetable Farming	$193,916,000	$174,959,000	$165,382,000	$160,579,000	$63,951,000
Strawberry Farming Spending Pattern	$48,412,000	$46,856,000	$46,212,000	$42,676,000	$36,659,000
Vegetable Farming Employee Income	$15,656,000	$15,124,000	$14,938,000	$14,050,000	$12,061,000
Proprietor Income	$36,281,000	$36,281,000	$36,281,000	$36,281,000	$36,281,000
Indirect business taxes	$2,317,000	$2,317,000	$2,317,000	$2,317,000	$2,317,000
Sub-Total Strawberry Farming	$102,665,000	$100,577,000	$99,748,000	$95,323,000	$87,317,000
Total Crop Production	$296,581,000	$275,536,000	$265,130,000	$255,902,000	$151,268,000
Forward Linked Sectors					
Frozen Strawberry Processing	$102,000	$102,000	$102,000	$102,000	$102,000
Frozen Vegetable Processing	$203,000	$203,000	$203,000	$203,000	$203,000
Strawberry Canning and Drying	$189,000	$189,000	$189,000	$189,000	$189,000
Vegetable Canning and Drying	$377,000	$377,000	$377,000	$377,000	$377,000
Fresh Strawberry Processing	$5,568,000	$5,568,000	$5,568,000	$5,568,000	$5,568,000
Fresh Vegetable Processing	$11,089,000	$11,089,000	$11,089,000	$11,089,000	$11,089,000
Total Forward Linked Sectors	$17,528,000	$17,528,000	$17,528,000	$17,528,000	$17,528,000

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Appendix

B

IMPLAN MODEL RESULTS

Appendix B IMPLAN Model Results

Table B-1 Crop Production and Food Processing Impacts for Monterey County for a December 2-year Flow under Existing Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$3.9	$1.5	15
Indirect	$1.1	$0.4	11
Induced	$1.3	$0.4	10
Total	$6.3	$2.4	37
Local Processing			
Direct	$0.2	$0.0	1
Indirect	$0.1	$0.0	0
Induced	$0.0	$0.0	0
Total	$0.3	$0.1	1
Total Local Economic Impacts			
Direct	$4.13	$1.56	16
Indirect	$1.17	$0.43	11
Induced	$1.30	$0.44	11
Total	$6.60	$2.43	38

Table B-2 Crop Production and Food Processing Impacts for Monterey County for a January 2-year Flow under Existing Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$3.6	$1.5	15
Indirect	$1.0	$0.4	9
Induced	$1.2	$0.4	10
Total	$5.8	$2.3	34
Local Processing			
Direct	$0.2	$0.0	1
Indirect	$0.1	$0.0	0
Induced	$0.0	$0.0	0
Total	$0.3	$0.1	1
Total Local Economic Impacts			
Direct	$3.8	$1.6	16
Indirect	$1.0	$0.4	10
Induced	$1.3	$0.4	10
Total	$6.1	$2.3	36

Table B-3 Crop Production and Food Processing Impacts for Monterey County for a February 2-year Flow under Existing Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$3.4	$1.5	13
Indirect	$0.9	$0.3	9
Induced	$1.2	$0.4	10
Total	$5.5	$2.2	32
Local Processing			
Direct	$0.2	$0.04	1
Indirect	$0.1	$0.02	0
Induced	$0.0	$0.01	0
Total	$0.3	$0.06	1
Total Local Economic Impacts			
Direct	$3.6	$1.5	14
Indirect	$0.9	$0.3	9
Induced	$1.2	$0.4	10
Total	$5.8	$2.3	33

Table B-4 Crop Production and Food Processing Impacts for Monterey County for a March 2-year Flow under Existing Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$3.3	$1.4	12
Indirect	$0.9	$0.3	8
Induced	$1.2	$0.4	9
Total	$5.3	$2.1	30
Local Processing			
Direct	$0.2	$0.0	1
Indirect	$0.1	$0.0	0
Induced	$0.0	$0.0	0
Total	$0.3	$0.1	1
Total Local Economic Impacts			
Direct	$3.5	$1.5	13
Indirect	$0.9	$0.3	9
Induced	$1.2	$0.4	10
Total	$5.6	$2.2	31

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Table B-5 Crop Production and Food Processing Impacts for Monterey County for an April 2-year Flow under Existing Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$1.7	$1.1	4
Indirect	$0.2	$0.1	2
Induced	$0.8	$0.3	7
Total	$2.6	$1.5	12
Local Processing			
Direct	$0.2	$0.0	1
Indirect	$0.1	$0.0	0
Induced	$0.0	$0.0	0
Total	$0.3	$0.1	1
Total Local Economic Impacts			
Direct	$1.9	$1.2	4
Indirect	$0.2	$0.1	2
Induced	$0.9	$0.3	7
Total	$3.0	$1.6	14

Table B-6 Estimated Crop Production and Processing Value and Total Economic Impacts for Monterey County of a December 2-year Flow under Existing Channel Conditions

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.7	$1.1	$0.5	9
Vegetable farming	$3.2	$5.1	$1.9	28
Local Processing	$0.2	$0.3	$0.1	1
Total Farming	**$4.1**	**$6.6**	**$2.4**	**38**

Table B-7 Estimated Crop Production and Processing Value and Total Economic Impacts for Monterey County of a January 2-year Flow under Existing Channel Conditions

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.7	$1.1	$0.5	9
Vegetable farming	$2.9	$4.6	$1.8	26
Local Processing	$0.2	$0.3	$0.1	1
Total Farming	**$3.8**	**$6.1**	**$2.3**	**36**

Table B-8 Estimated Crop Production and Processing Value and Total Economic Impacts for Monterey County of a February 2-year Flow under Existing Channel Conditions

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.7	$1.1	$0.5	8
Vegetable farming	$2.7	$4.4	$1.7	23
Local Processing	$0.2	$0.3	$0.1	1
Total Farming	**$3.6**	**$5.8**	**$2.3**	**33**

Table B-9 Estimated Crop Production and Processing Value and Total Economic Impacts for Monterey County of a March 2-year Flow under Existing Channel Conditions

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.7	$1.1	$0.5	8
Vegetable farming	$2.6	$4.2	$1.6	22
Local Processing	$0.2	$0.3	$0.1	1
Total Farming	**$3.5**	**$5.6**	**$2.2**	**31**

Table B-10 Estimated Crop Production and Processing Value and Total Economic Impacts for Monterey County of an April 2-year Flow under Existing Channel Conditions

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.6	$1.0	$0.5	7
Vegetable farming	$1.1	$1.7	$1.0	5
Local Processing	$0.2	$0.3	$0.1	1
Total Farming	**$1.9**	**$3.0**	**$1.6**	**14**

Table B-11 Total Economic Impacts on Monterey County, by Sector, of a December 2-year Flow under Existing Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$4.2	$1.7	22
Mining	$0.0	$0.0	0
Construction	$0.0	$0.0	0
Manufacturing	$0.3	$0.1	1
TIPU	$0.1	$0.1	1
Trade	$0.2	$0.1	3
Service	$1.5	$0.4	11
Government	$0.1	$0.0	1
Total	$6.6	$2.4	38

Table B-12 Total Economic Impacts on Monterey County, by Sector, of a January 2-year Flow under Existing Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$3.8	$1.7	20
Mining	$0.0	$0.0	0
Construction	$0.0	$0.0	0
Manufacturing	$0.3	$0.0	1
TIPU	$0.1	$0.0	1
Trade	$0.2	$0.1	3
Service	$1.4	$0.4	10
Government	$0.1	$0.0	1
Total	$6.1	$2.3	36

Table B-13 Total Economic Impacts on Monterey County, by Sector, of a February 2-year Flow under Existing Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$3.6	$1.6	19
Mining	$0.0	$0.0	0
Construction	$0.0	$0.0	0
Manufacturing	$0.3	$0.0	1
TIPU	$0.1	$0.0	1
Trade	$0.2	$0.1	2
Service	$1.4	$0.4	10
Government	$0.1	$0.0	0
Total	$5.8	$2.3	33

Table B-14 Total Economic Impacts on Monterey County, by Sector, of a March 2-year Flow under Existing Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$3.5	$1.6	17
Mining	$0.0	$0.0	0
Construction	$0.0	$0.0	0
Manufacturing	$0.3	$0.0	1
TIPU	$0.1	$0.0	1
Trade	$0.2	$0.1	2
Service	$1.3	$0.4	10
Government	$0.1	$0.0	0
Total	$5.6	$2.2	31

Table B-15 Total Economic Impacts on Monterey County, by Sector, of an April 2-year Flow under Existing Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$1.7	$1.2	5
Mining	$0.0	$0.0	0
Construction	$0.0	$0.0	0
Manufacturing	$0.3	$0.0	1
TIPU	$0.0	$0.0	0
Trade	$0.1	$0.1	2
Service	$0.8	$0.2	6
Government	$0.1	$0.0	0
Total	$3.0	$1.6	14

Table B-16 Crop Production and Food Processing Impacts for Monterey County for a December 2-year Flow under Maintained Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$3.5	$1.4	14
Indirect	$1.0	$0.4	10
Induced	$1.1	$0.4	9
Total	$5.6	$2.1	33
Local Processing			
Direct	$0.2	$0.0	1
Indirect	$0.0	$0.0	0
Induced	$0.0	$0.0	0
Total	$0.3	$0.1	1
Total Local Economic Impacts			
Direct	$3.70	$1.41	15
Indirect	$1.04	$0.38	10
Induced	$1.17	$0.39	10
Total	$5.91	$2.18	34

Table B-17 Crop Production and Food Processing Impacts for Monterey County for a January 2-year Flow under Maintained Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$3.2	$1.4	14
Indirect	$0.9	$0.3	8
Induced	$1.1	$0.4	9
Total	$5.2	$2.1	31
Local Processing			
Direct	$0.2	$0.0	1
Indirect	$0.0	$0.0	0
Induced	$0.0	$0.0	0
Total	$0.3	$0.1	1
Total Local Economic Impacts			
Direct	$3.4	$1.4	14
Indirect	$0.9	$0.3	9
Induced	$1.1	$0.4	9
Total	$5.4	$2.1	32

Table B-18 Crop Production and Food Processing Impacts for Monterey County for a February 2-year Flow under Maintained Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$3.1	$1.3	12
Indirect	$0.8	$0.3	8
Induced	$1.1	$0.4	9
Total	$4.9	$2.0	29
Local Processing			
Direct	$0.2	$0.03	1
Indirect	$0.0	$0.02	0
Induced	$0.0	$0.01	0
Total	$0.3	$0.06	1
Total Local Economic Impacts			
Direct	$3.3	$1.4	13
Indirect	$0.8	$0.3	8
Induced	$1.1	$0.4	9
Total	$5.2	$2.0	30

Table B-19 Crop Production and Food Processing Impacts for Monterey County for a March 2-year Flow under Maintained Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$3.0	$1.3	11
Indirect	$0.8	$0.3	8
Induced	$1.0	$0.3	8
Total	$4.8	$1.9	27
Local Processing			
Direct	$0.2	$0.0	1
Indirect	$0.0	$0.0	0
Induced	$0.0	$0.0	0
Total	$0.3	$0.1	1
Total Local Economic Impacts			
Direct	$3.2	$1.3	12
Indirect	$0.8	$0.3	8
Induced	$1.1	$0.4	9
Total	$5.1	$2.0	28

Table B-20 Crop Production and Food Processing Impacts for Monterey County for an April 2-year Flow under Maintained Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$1.5	$1.0	4
Indirect	$0.2	$0.1	2
Induced	$0.8	$0.3	6
Total	$2.4	$1.4	12
Local Processing			
Direct	$0.2	$0.0	1
Indirect	$0.0	$0.0	0
Induced	$0.0	$0.0	0
Total	$0.3	$0.1	1
Total Local Economic Impacts			
Direct	$1.7	$1.1	4
Indirect	$0.2	$0.1	2
Induced	$0.8	$0.3	6
Total	$2.7	$1.4	13

Table B-21 Estimated Crop Production and Processing Value and Total Economic Impacts of a December 2-year Flow under Maintained Channel Conditions: Monterey County

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.7	$1.1	$0.5	9
Vegetable farming	$2.8	$4.5	$1.6	24
Local Processing	$0.2	$0.3	$0.1	1
Total Farming	**$3.7**	**$5.9**	**$2.2**	**34**

Table B-22 Estimated Crop Production and Processing Value and Total Economic Impacts of a January 2-year Flow under Maintained Channel Conditions: Monterey County

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.7	$1.1	$0.5	9
Vegetable farming	$2.5	$4.0	$1.6	22
Local Processing	$0.2	$0.3	$0.1	1
Total Farming	**$3.4**	**$5.4**	**$2.1**	**32**

Table B-23 Estimated Crop Production and Processing Value and Total Economic Impacts of a February 2-year Flow under Maintained Channel Conditions: Monterey County

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.7	$1.1	$0.5	8
Vegetable farming	$2.4	$3.8	$1.5	20
Local Processing	$0.2	$0.3	$0.1	1
Total Farming	**$3.3**	**$5.2**	**$2.0**	**30**

Table B-24 Estimated Crop Production and Processing Value and Total Economic Impacts of a March 2-year Flow under Maintained Channel Conditions: Monterey County

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.7	$1.1	$0.5	8
Vegetable farming	$2.3	$3.7	$1.4	19
Local Processing	$0.2	$0.3	$0.1	1
Total Farming	**$3.2**	**$5.1**	**$2.0**	**28**

Table B-25 Estimated Crop Production and Processing Value and Total Economic Impacts of an April 2-year Flow under Maintained Channel Conditions: Monterey County

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$0.6	$1.0	$0.5	7
Vegetable farming	$0.9	$1.5	$0.9	5
Local Processing	$0.2	$0.3	$0.1	1
Total Farming	**$1.7**	**$2.7**	**$1.4**	**13**

Table B-26 Total Economic Impacts on Monterey County, by Sector, of a December 2-year Flow under Maintained Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$3.7	$1.6	20
Mining	$0.0	$0.0	0
Construction	$0.0	$0.0	0
Manufacturing	$0.3	$0.0	1

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
TIPU	$0.1	$0.0	1
Trade	$0.2	$0.1	2
Service	$1.4	$0.4	10
Government	$0.1	$0.0	0
Total	$5.9	$2.2	34

Table B-27 Total Economic Impacts on Monterey County, by Sector, of a January 2-year Flow under Maintained Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$3.4	$1.5	19
Mining	$0.0	$0.0	0
Construction	$0.0	$0.0	0
Manufacturing	$0.3	$0.0	1
TIPU	$0.1	$0.0	1
Trade	$0.2	$0.1	2
Service	$1.3	$0.3	9
Government	$0.1	$0.0	0
Total	$5.4	$2.1	32

Table B-28 Total Economic Impacts on Monterey County, by Sector of a February 2-year Flow under Maintained Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$3.3	$1.5	17
Mining	$0.0	$0.0	0
Construction	$0.0	$0.0	0
Manufacturing	$0.3	$0.0	1
TIPU	$0.1	$0.0	0
Trade	$0.2	$0.1	2
Service	$1.2	$0.3	9
Government	$0.1	$0.0	0
Total	$5.2	$2.0	30

Table B-29 Total Economic Impacts on Monterey County, by Sector, of a March 2-year Flow under Maintained Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$3.2	$1.4	16
Mining	$0.0	$0.0	0
Construction	$0.0	$0.0	0
Manufacturing	$0.3	$0.0	1
TIPU	$0.1	$0.0	0
Trade	$0.2	$0.1	2
Service	$1.2	$0.3	9
Government	$0.1	$0.0	0
Total	$5.1	$2.0	28

Table B-30 Total Economic Impacts on Monterey County, by Sector, of an April 2-year Flow under Maintained Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$1.5	$1.1	5
Mining	$0.0	$0.0	0
Construction	$0.0	$0.0	0
Manufacturing	$0.2	$0.0	1
TIPU	$0.0	$0.0	0
Trade	$0.1	$0.1	2
Service	$0.7	$0.2	5
Government	$0.1	$0.0	0
Total	$2.7	$1.4	13

Table B-31 Crop Production and Food Processing Impacts for Monterey County for a December 10-year Flow under Existing Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$315.2	$129.1	1,403
Indirect	$87.7	$33.1	879
Induced	$105.1	$35.2	857
Total	$507.9	$197.4	3,139
Local Processing			
Direct	$18.6	$2.8	55
Indirect	$4.4	$1.5	27
Induced	$2.6	$0.9	21

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Total	$25.6	$5.2	103
Total Local Economic Impacts			
Direct	$333.80	$131.91	1,458
Indirect	$92.09	$34.61	906
Induced	$107.61	$36.05	878
Total	$533.50	$202.57	3,242

Table B-32 Crop Production and Food Processing Impacts for Monterey County for a January 10-year Flow under Existing Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$292.7	$128.1	1,366
Indirect	$76.6	$29.1	772
Induced	$102.1	$34.2	833
Total	$471.3	$191.4	2,971
Local Processing			
Direct	$18.6	$2.8	55
Indirect	$4.4	$1.5	27
Induced	$2.6	$0.9	21
Total	$25.6	$5.2	103
Total Local Economic Impacts			
Direct	$311.3	$130.9	1,421
Indirect	$81.0	$30.6	799
Induced	$104.6	$35.1	854
Total	$496.9	$196.6	3,074

Table B-33 Crop Production and Food Processing Impacts for Monterey County for a February 10-year Flow under Existing Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$281.5	$124.8	1,266
Indirect	$72.5	$27.6	733
Induced	$99.2	$33.2	810
Total	$453.3	$185.7	2,808
Local Processing			
Direct	$18.6	$2.82	55
Indirect	$4.4	$1.48	27
Induced	$2.6	$0.86	21
Total	$25.6	$5.16	103

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Total Local Economic Impacts			
Direct	$300.1	$127.6	1,320
Indirect	$77.0	$29.1	760
Induced	$101.8	$34.1	830
Total	$478.9	$190.8	2,911

Table B-34 Crop Production and Food Processing Impacts for Monterey County for a March 10-year Flow under Existing Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$271.7	$121.4	1,152
Indirect	$69.3	$26.4	698
Induced	$96.4	$32.3	787
Total	$437.5	$180.0	2,637
Local Processing			
Direct	$18.6	$2.8	55
Indirect	$4.4	$1.5	27
Induced	$2.6	$0.9	21
Total	$25.6	$5.2	103
Total Local Economic Impacts			
Direct	$290.4	$124.2	1,207
Indirect	$73.7	$27.8	726
Induced	$99.0	$33.2	808
Total	$463.1	$185.2	2,741

Table B-35 Crop Production and Food Processing Impacts for Monterey County for an April 10-year Flow under Existing Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$159.7	$102.2	558
Indirect	$21.4	$9.0	238
Induced	$74.6	$25.0	609
Total	$255.8	$136.3	1,404
Local Processing			
Direct	$18.6	$2.8	55
Indirect	$4.4	$1.5	27
Induced	$2.6	$0.9	21
Total	$25.6	$5.2	103

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Total Local Economic Impacts			
Direct	$178.4	$105.1	613
Indirect	$25.9	$10.5	265
Induced	$77.2	$25.9	630
Total	$281.4	$141.4	1,507

Table B-36 Estimated Crop Production and Processing Value and Total Economic Impacts of a December 10-year Flow under Existing Channel Conditions: Monterey County

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$107.2	$172.7	$76.4	1,331
Vegetable farming	$208.0	$335.2	$121.0	1,808
Local Processing	$18.6	$25.6	$5.2	103
Total Farming	**$333.8**	**$533.5**	**$202.6**	**3,242**

Table B-37 Estimated Crop Production and Processing Value and Total Economic Impacts of a January 10-year Flow under Existing Channel Conditions: Monterey County

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$105.0	$169.2	$75.3	1,293
Vegetable farming	$187.7	$302.1	$116.1	1,677
Local Processing	$18.6	$25.6	$5.2	103
Total Farming	**$311.3**	**$496.9**	**$196.6**	**3,074**

Table B-38 Estimated Crop Production and Processing Value and Total Economic Impacts of a February 10-year Flow under Existing Channel Conditions: Monterey County

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$104.1	$167.8	$74.9	1,279
Vegetable farming	$177.4	$285.5	$110.8	1,529
Local Processing	$18.6	$25.6	$5.2	103
Total Farming	**$300.1**	**$478.9**	**$190.8**	**2,911**

Table B-39 Estimated Crop Production and Processing Value and Total Economic Impacts of a March 10-year Flow under Existing Channel Conditions: Monterey County

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$99.5	$160.3	$72.8	1,210
Vegetable farming	$172.2	$277.2	$107.2	1,428
Local Processing	$18.6	$25.6	$5.2	103
Total Farming	**$290.4**	**$463.1**	**$185.2**	**2,741**

Table B-40 Estimated Crop Production and Processing Value and Total Economic Impacts of an April 10-year Flow under Existing Channel Conditions: Monterey County

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$91.1	$146.7	$68.7	1,067
Vegetable farming	$68.6	$109.1	$67.6	337
Local Processing	$18.6	$25.6	$5.2	103
Total Farming	**$178.4**	**$281.4**	**$141.4**	**1,507**

Table B-41 Total Economic Impacts by Sector of a December 10-year Flow under Existing Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$338.1	$146.0	1,936
Mining	$0.6	$0.2	0
Construction	$3.7	$1.6	19
Manufacturing	$27.4	$4.1	74
TIPU	$9.7	$4.1	52
Trade	$19.0	$9.1	218
Service	$123.9	$33.6	896
Government	$11.0	$3.9	47
Total	$533.5	$202.6	3,242

Table B-42 Total Economic Impacts by Sector of a January 10-year Flow under Existing Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$312.4	$142.9	1,835
Mining	$0.6	$0.2	0
Construction	$3.4	$1.4	17
Manufacturing	$26.5	$3.9	71
TIPU	$8.8	$3.8	48
Trade	$18.3	$8.7	210
Service	$116.6	$32.0	848
Government	$10.5	$3.7	44
Total	$496.9	$196.6	3,074

Table B-43 Total Economic Impacts by Sector of a February 10-year Flow under Existing Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$300.1	$138.8	1,711
Mining	$0.5	$0.2	0
Construction	$3.2	$1.4	16
Manufacturing	$26.1	$3.9	71
TIPU	$8.4	$3.6	46
Trade	$17.7	$8.5	204
Service	$112.5	$31.0	820
Government	$10.2	$3.6	43
Total	$478.9	$190.8	2,911

Table B-44 Total Economic Impacts by Sector of a March 10-year Flow under Existing Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$289.2	$134.6	1,575
Mining	$0.5	$0.2	0
Construction	$3.1	$1.3	16
Manufacturing	$25.8	$3.8	70
TIPU	$8.1	$3.5	44
Trade	$17.2	$8.2	199
Service	$109.1	$30.0	795

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Government	$10.0	$3.5	42
Total	$463.1	$185.2	2,741

Table B-45 Total Economic Impacts by Sector of an April 10-year Flow under Existing Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$163.3	$106.2	703
Mining	$0.2	$0.1	0
Construction	$1.6	$0.7	7
Manufacturing	$21.7	$3.3	61
TIPU	$4.0	$1.7	24
Trade	$12.7	$6.0	150
Service	$70.5	$20.8	532
Government	$7.5	$2.6	31
Total	$281.4	$141.4	1,507

Table B-46 Crop Production and Food Processing Impacts for Monterey County for a December 10-year Flow under Maintained Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$296.6	$121.7	1,326
Indirect	$82.4	$31.2	827
Induced	$98.9	$33.1	807
Total	$477.9	$186.0	2,961
Local Processing			
Direct	$17.5	$2.7	52
Indirect	$4.2	$1.4	26
Induced	$2.4	$0.8	20
Total	$24.1	$4.9	97
Total Local Economic Impacts			
Direct	$314.11	$124.34	1,378
Indirect	$86.57	$32.57	853
Induced	$101.35	$33.96	827
Total	$502.03	$190.87	3,057

Table B-47 Crop Production and Food Processing Impacts for Monterey County for a January 10-year Flow under Maintained Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$275.5	$120.7	1,291
Indirect	$72.0	$27.4	727
Induced	$96.1	$32.2	784
Total	$443.7	$180.4	2,803
Local Processing			
Direct	$17.5	$2.7	52
Indirect	$4.2	$1.4	26
Induced	$2.4	$0.8	20
Total	$24.1	$4.9	97
Total Local Economic Impacts			
Direct	$293.1	$123.4	1,343
Indirect	$76.2	$28.8	753
Induced	$98.5	$33.0	804
Total	$467.8	$185.2	2,900

Table B-48 Crop Production and Food Processing Impacts for Monterey County for a February 10-year Flow under Maintained Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$265.1	$117.7	1,197
Indirect	$68.3	$26.0	691
Induced	$93.5	$31.3	763
Total	$426.9	$175.0	2,651
Local Processing			
Direct	$17.5	$2.65	52
Indirect	$4.2	$1.39	26
Induced	$2.4	$0.81	20
Total	$24.1	$4.85	97
Total Local Economic Impacts			
Direct	$282.7	$120.3	1,249
Indirect	$72.4	$27.4	716
Induced	$95.9	$32.1	782
Total	$451.0	$179.9	2,748

Table B-49 Crop Production and Food Processing Impacts for Monterey County for a March 10-year Flow under Maintained Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$255.9	$114.5	1,091
Indirect	$65.2	$24.8	658
Induced	$90.8	$30.4	741
Total	$412.0	$169.7	2,490
Local Processing			
Direct	$17.5	$2.7	52
Indirect	$4.2	$1.4	26
Induced	$2.4	$0.8	20
Total	$24.1	$4.9	97
Total Local Economic Impacts			
Direct	$273.4	$117.1	1,142
Indirect	$69.4	$26.2	684
Induced	$93.2	$31.2	761
Total	$436.1	$174.6	2,587

Table B-50 Crop Production and Food Processing Impacts for Monterey County for an April 10-year Flow under Maintained Channel Conditions

Impact Type	Output (Millions $)	Income (Millions $)	Employment (Jobs)
Crop Production			
Direct	$151.3	$96.6	534
Indirect	$20.5	$8.6	228
Induced	$70.5	$23.6	575
Total	$242.3	$128.8	1,337
Local Processing			
Direct	$17.5	$2.7	52
Indirect	$4.2	$1.4	26
Induced	$2.4	$0.8	20
Total	$24.1	$4.9	97
Total Local Economic Impacts			
Direct	$168.8	$99.2	586
Indirect	$24.7	$10.0	253
Induced	$72.9	$24.4	594
Total	$266.4	$133.7	1,434

Table B-51 Estimated Crop Production and Processing Value and Total Economic Impacts for Monterey County of a December 10-year Flow under Maintained Channel Conditions

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$102.7	$165.4	$73.2	1,275
Vegetable farming	$193.9	$312.5	$112.8	1,685
Local Processing	$17.5	$24.1	$4.9	97
Total Farming	**$314.1**	**$502.0**	**$190.9**	**3,057**

Table B-52 Estimated Crop Production and Processing Value and Total Economic Impacts for Monterey County of a January 10-year Flow under Maintained Channel Conditions

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$100.6	$162.1	$72.1	1,239
Vegetable farming	$175.0	$281.7	$108.2	1,564
Local Processing	$17.5	$24.1	$4.9	97
Total Farming	**$293.1**	**$467.8**	**$185.2**	**2,900**

Table B-53 Estimated Crop Production and Processing Value and Total Economic Impacts for Monterey County of a February 10-year Flow under Maintained Channel Conditions

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$99.7	$160.7	$71.7	1,226
Vegetable farming	$165.4	$266.2	$103.3	1,425
Local Processing	$17.5	$24.1	$4.9	97
Total Farming	**$282.7**	**$451.0**	**$179.9**	**2,748**

Table B-54 Estimated Crop Production and Processing Value and Total Economic Impacts for Monterey County of a March 10-year Flow under Maintained Channel Conditions

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$95.3	$153.5	$69.8	1,159
Vegetable farming	$160.6	$258.4	$100.0	1,331
Local Processing	$17.5	$24.1	$4.9	97
Total Farming	**$273.4**	**$436.1**	**$174.6**	**2,587**

Table B-55 Estimated Crop Production and Processing Value and Total Economic Impacts for Monterey County of an April 10-year Flow under Maintained Channel Conditions

Impact Type	Direct Output (Millions $)	Total Output (Millions $)	Total Income (Millions $)	Total Employment (Jobs)
Strawberry farming	$87.3	$140.5	$65.8	1,022
Vegetable farming	$64.0	$101.7	$63.0	314
Local Processing	$17.5	$24.1	$4.9	97
Total Farming	**$168.8**	**$266.4**	**$133.7**	**1,434**

Table B-56 Total Economic Impacts on Monterey County, by Sector, of a December 10-year Flow under Maintained Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$318.2	$137.6	1,828
Mining	$0.6	$0.2	0
Construction	$3.5	$1.5	18
Manufacturing	$25.8	$3.8	69
TIPU	$9.1	$3.9	49
Trade	$17.9	$8.5	205
Service	$116.6	$31.7	843
Government	$10.4	$3.7	44
Total	$502.0	$190.9	3,057

Table B-57 Total Economic Impacts on Monterey County, by Sector, of a January 10-year Flow under Maintained Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$294.1	$134.7	1,733
Mining	$0.5	$0.2	0
Construction	$3.2	$1.3	16
Manufacturing	$24.9	$3.7	67
TIPU	$8.2	$3.5	45
Trade	$17.2	$8.2	198
Service	$109.7	$30.1	798
Government	$9.9	$3.5	42
Total	$467.8	$185.2	2,900

Table B-58 Total Economic Impacts on Monterey County, by Sector, of a February 10-year Flow under Maintained Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$282.6	$130.8	1,617
Mining	$0.5	$0.2	0
Construction	$3.1	$1.3	16
Manufacturing	$24.6	$3.7	66
TIPU	$7.9	$3.4	43
Trade	$16.7	$8.0	193
Service	$106.0	$29.2	772
Government	$9.6	$3.4	41
Total	$451.0	$179.9	2,748

Table B-59 Total Economic Impacts on Monterey County, by Sector, of a March 10-year Flow under Maintained Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$272.3	$126.9	1,489
Mining	$0.5	$0.1	0
Construction	$2.9	$1.2	15
Manufacturing	$24.3	$3.6	66
TIPU	$7.6	$3.3	41
Trade	$16.2	$7.7	187
Service	$102.7	$28.3	748

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Government	$9.4	$3.3	40
Total	$436.1	$174.6	2,587

Table B-60 Total Economic Impacts on Monterey County, by Sector, of an April 10-year Flow under Maintained Channel Conditions

Sector Name	Output (millions)	Income (millions)	Employment (jobs)
Agriculture	$154.7	$100.4	674
Mining	$0.2	$0.1	0
Construction	$1.5	$0.7	6
Manufacturing	$20.4	$3.1	57
TIPU	$3.8	$1.6	22
Trade	$12.0	$5.7	142
Service	$66.6	$19.6	503
Government	$7.1	$2.5	29
Total	$266.4	$133.7	1,434

Salinas River Stream
Maintenance Economic Analysis

APPENDIX C

PROPERTY DAMAGE FORMULA

Appendix C Property Damage Formula

Figure C1 provides the steps necessary to calculate structural and content flood damages for a single-family residence with one foot of flood water above the structures floor. It is also assumed that this property is in average condition in a stable area.

Depreciated Replacement Value of Structures	
Formula Description	**Calculation Example**
Replacement Value of Structure	
Replacement Value of Structure = Market Value of Structure	$400,000
Effective Age of Structure	
((Current Year) - (Year Built)) x General Condition Factor	(2012 - 1985) x 0.40 = 10.8 years
Depreciation Factor	
(1 year/Functional Life Expectancy) x Effective Age	(1 year/55 years) x 10.8 = 0.1964
Depreciated Replacement Value of Structure	
Replacement Value - (Replacement Value x Depreciation Factor)	$400,000 - ($400,000 x 0.1964) = $321,455
Structural Flood Damages	
Depth to Damage Factor for Structures x Replacement Value	23.3% x $321,455 = $74,899
Content Value for Structures	
Estimated Value of Structure Contents	
Contents-to-Structure Value Ratio (CSVR) x Depreciated Replacement Value	100%* x $321,455 = $321,455
Contents Depth Damage Factor x Estimated Value of Contents	13.3% x $321,455 = $42,753

Figure C-1 Structural and Content Flood Damage Calculation Example

Source: Metzler, Sharon M., 2011, Land Use Interpretation in Flood Damage Estimation, San Jose State University, Website (http://scholarworks.sjsu.edu/etd_theses) accessed November 14, 2012.

Notes:

In this instance, the CSVR is equal to 100% because the content depth damage function used in this analysis for single-family residences is calculated based upon the relationship between content damage and structural value rather than content damage based upon structural content value as is the case for multi-family residences. See Table X for CSVR for various properties evaluated in this analysis.

APPENDIX G

Salinas River Stream Maintenance Program Guidelines

Salinas River
Stream Maintenance Program

Guidelines

Monterey County Water Resources Agency
893 Blanco Circle
Salinas, CA 93901

June 2014

Salinas River
Stream Maintenance Program

Guidelines

Prepared by
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June 2014

Table of Contents

1 Introduction and Program Summary

1.1 Program Background

After a severe flood devastated much of the industry in Monterey County in March of 1995, a group of concerned landowners and growers formed the Salinas River Channel Coalition to help the disaster from repeating itself. The Agriculture Industry took a large hit economically with major business losses and loss of land that would affect future business. The Salinas Valley and the Monterey Peninsula experienced major interruptions in travel when many bridges and roads were flooded or washed away. Cities had flooding interrupt the functionality of their infrastructure. The flooding impacted all those who lived and worked in Monterey County one way or another.

Voluntary efforts to manage sediment accumulations and vegetation overgrowth in the Salinas River were reinstituted. Previous work was similarly done through many decades of the 20th century. The 1995 flood event renewed the interest and urgency to do work again. This was the major impetus for the inception of the Salinas River Channel Maintenance Program (Program). The Program was established in 1997 and has evolved since then into the current Stream Maintenance Program (SMP or Program). This Program takes into account the changing environment we live in, including regulatory requirements, needs of the agricultural industry, operations of the dams and flows into the Salinas River, vegetation communities, among other things.

1.2 Program Purpose

The purpose of the Stream Maintenance Program is to provide a uniform approach to maintenance activities on the Salinas River from River Mile 2 to 94. Select tributaries also fall under this Program but have unique criteria for eligibility. Those include the Gonzales Slough, Bryant Canyon Channel and San Lorenzo Creek. The maintenance activities include Sediment Management, Native and Non-Native Vegetation Management for all eligible areas within the Program Area.

The goals of the Program are to improve flood protection in the Program Area and minimize flood damages to lands and infrastructure adjacent to the water bodies, with a focus on the 10-year flood event, while making informed decisions to avoid removing beneficial habitats. The Program needs to be implemented so that maintenance activities can happen on a regular basis the same time every year. Slight modifications may need to be made throughout the life of the Program. As such, these Guidelines would be updated as necessary.

1.3 Program Activities

There are two types of work that are included under this Program: vegetation management and sediment management. Together these methods will help improve the functionality of the river which in turn should provide benefits to wildlife and aquifer recharge. Each method is discussed below in detail.

1.3.1 Vegetation Management

In 2009, The Nature Conservancy mapped the vegetation in the Salinas River corridor, located within Monterey County, which totaled approximately 15,000 acres. Vegetation management is designed to maintain hydraulic capacity of the river and streams within the Program Area while improving the ecosystem. The goal of the SMP site specific designs is to achieve the desired flood capacity outcome while balancing environmental and economic considerations. This is achieved by selectively removing vegetation typically using heavy equipment or herbicide application. Hand removal methods are also allowed but are typically not the primary method used for removal.

Non-native invasive species have been spreading pervasively in the Salinas River Watershed. There are little if any benefits to allowing these invasive plants to exist. The Salinas River Watershed has the second largest infestation of *Arundo donax* (giant reed) in the State of California. Unlike native riparian plants, *Arundo* provides little shading to the in-stream habitat, leading to increased water temperatures and reduced habitat quality for aquatic wildlife. Once established, *Arundo* has the ability to out-compete and completely suppress native vegetation. *Arundo* is known to draw over three times as much water from the aquifer as native vegetation (RCD Monterey: CEQA Initial Study, Invasive Non-native Plant Control and Restoration Program, 2011). The removal of non-native vegetation is unlimited but all Best Management Practices and mitigation measures that apply to the Program, must be followed.

The location and amount of native vegetation clearing allowed under this Program is based on the flow capacity of the channel for that area. If an area cannot pass the 10-year flow, with one-foot of freeboard, then the site is eligible for native vegetation removal and/or sediment removal. The site specific design as to where and how much native vegetation is removed, is developed during the Technical and Design Team process.

1.3.1.1 Non-Native Vegetation Removal Techniques

WHEN These activities may occur between August and February to avoid bird nesting season although August and September should be prioritized for best efficacy of herbicide application.

WHERE The activities will occur in the following areas:

- channel bottom
- sandbars
- buffer zones along the channel
- upper bench area

Areas where vegetation removal is not allowed are:

- low-flow channel
- river banks steeper than 20%

HOW Proper techniques must be adhered to so that the removal is effective. Mechanized removal techniques include using a fixed tooth or hammer flail mowing attachment mounted on a tractor. The mowing attachment mulches the dead (or live) *Arundo* cane into a layer about 4-inches thick.

The herbicide treatment cycle would involve application of an U.S. Environmental Protection Agency (USEPA) approved aquatic herbicide formulation of glyphosate (AquaMaster®). There are two approved methods for use:

- Cut Stump - The *Arundo* would be cut approximately 1-foot from the ground and the biomass removed from the area. The stumps would then be cut to ground level and ½ to full strength AquaMaster® would be applied to each stump just after cutting. Dye would also be added to the herbicide to mark treated stumps and ensure full coverage.
- Prep-and-spray - Patches of *Arundo* treated with the prep-and-spray method would be "prepped" before spraying by bending the stalks (without breaking) down to the ground or into the center of the clump to concentrate the biomass and ease the spray application. Bending to the ground provides easy spraying and the least amount of overspray by alternating layers with spray treatments to ensure adequate herbicide coverage of each layer of canes.

HOW MUCH Non-native vegetation removal is a benefit to the watershed and does not have an annual limit. Due to the high cost of treatment, removal is anticipated to be up to a few hundred acres a year. As of 2010, there were just over 2000 acres of *Arundo* mapped in the Program Area.

1.3.1.2 Native Vegetation Removal Techniques

WHEN This activity includes selectively removing native vegetation from October 15th through November 30th (may continue sooner and/or later with regulatory agency approval).

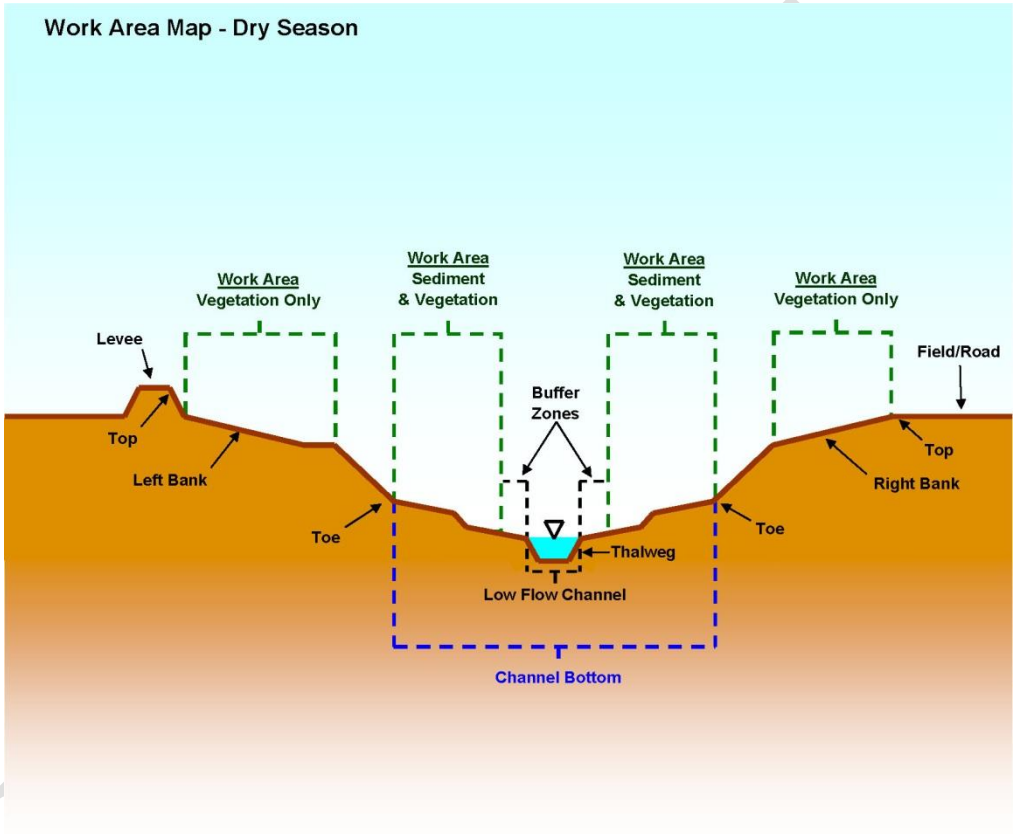
WHERE The activities will occur in the following areas:

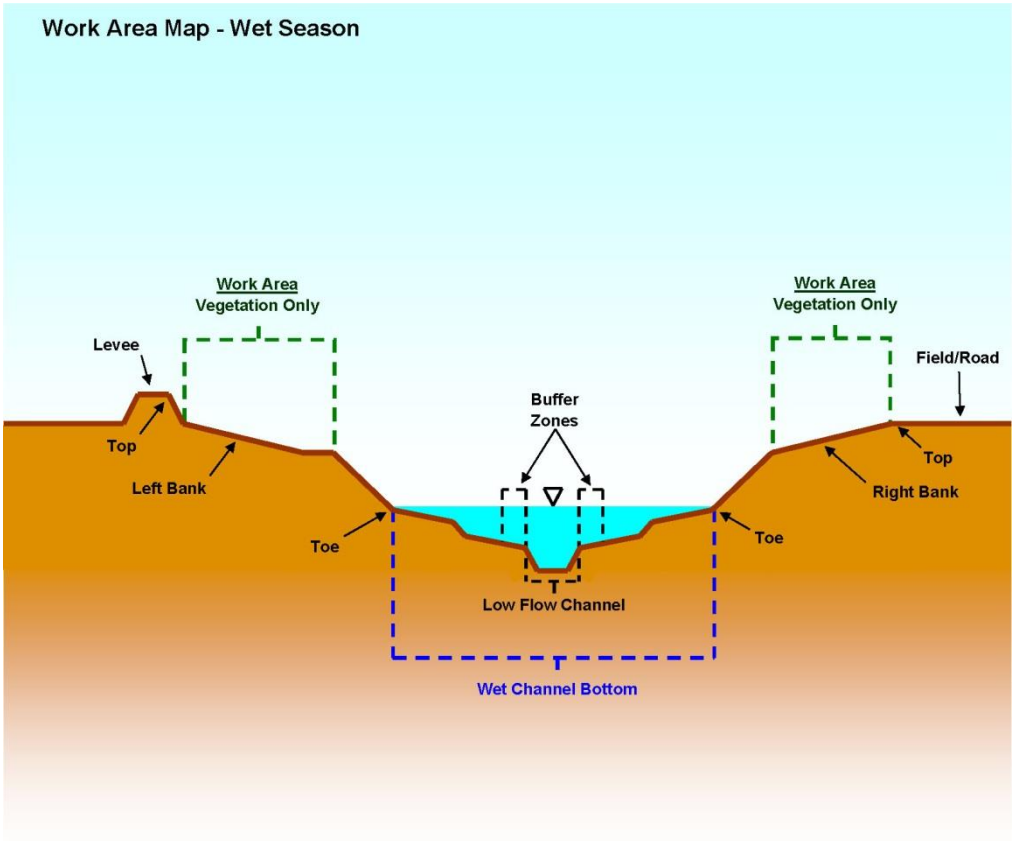
- channel bottom
- sandbars
- Between the right and left riverbanks

Areas where vegetation removal is not allowed are:

- low-flow channel
- buffer zones along the channel (5-10 feet wide, depending on the situation)
- river banks steeper than 20%

Annual conditions in the basin will vary such as precipitation, temperature, groundwater levels, reservoir releases, and irrigation demand. This results in different flows in the Salinas River during the Program implementation period. Therefore, not all work areas will be accessible year-to-year nor will all of the areas be appropriate for stream maintenance activities. Potential areas for river work are shown below for both wet and dry season conditions.





HOW Techniques include using a scraper, mower, bulldozer, excavator, truck or similar equipment to remove the vegetation above the ground. Roots will be left intact as much as possible.

HOW MUCH The total annual limit for removal within the Program Area is 875 acres. It is broken down by area as follows:

Annual Limits of vegetation removal

Area	Native Vegetation Removal (acres)	Non-Native Vegetation Removal
Salinas River Miles 2-21	175	No Limit
Salinas River Miles 21-94	670	No Limit
Gonzales Slough	10	No Limit
Bryant Canyon Channel	10	No Limit
San Lorenzo Creek	10	No Limit

1.3.2 Sediment Management

WHEN This activity includes selectively removing sediment from the river channel from October 15th through November 30th.

WHERE The activities will occur below the toe of the river bank, including:

- dry channel bottom or sandbar
- area more than 9-inches above any standing water

Areas where sediment removal is not allowed are:

- low-flow channel
- buffer zones along the channel (5-10 feet wide, depending on the situation)
- river banks steeper than 20%

HOW Techniques include using heavy equipment such as a bulldozer or excavator. Sediment removed from the river channel would be moved outside the stream channel and either relocated on the property or hauled off-site using 10- or 20-cubic yard dump trucks.

HOW MUCH The total annual limit for sediment removal within the Program Area is 554,420 cubic yards. It is broken down by area as follows:

Annual Limits of sediment removal

Area	Quantity (cubic yards)
Salinas River Miles 2-21	100,000
Salinas River Miles 21-94	454,000
Gonzales Slough	20
Bryant Canyon Channel	200
San Lorenzo Creek	200

1.4 Permitting

1.4.1 Regulatory Framework

The SMP applies to all activities related to vegetation and sediment management within the Program Area that has been designed for carrying capacity and ecological function. It may be necessary to obtain additional permits or authorizations for work within the Program Area that is not covered by the SMP.

Regulatory agencies with jurisdictional authority in the Program Area and from which permits will be obtained include the U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration National Marine Fisheries Service, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, and the Regional Water Quality Control Board. The following is a description of each regulatory agency and their jurisdiction within the SMP.

1.4.1.1 U.S. Army Corps of Engineers (USACE)

Section 404 of the Clean Water Act regulates the discharge of dredged, excavated, or fill material in wetlands, streams, rivers, and other U.S. waters. The USACE is the federal agency authorized to issue Section 404 Permits for certain activities conducted in wetlands or other U.S. waters. Depending on the scope of the project and method of construction, certain farming activities may require this permit. Examples include ponds, embankments, and stream channelization.

1.4.1.2 U.S. Environmental Protection Agency (USEPA)

The USEPA is the administering agency for the Clean Water Act (CWA), but under a Memorandum of Agreement has delegated responsibilities for administering CWA Section 404 to the USACE. The USEPA retains the authority to enforce compliance with Section 404 and maintains the power to overrule USACE decisions on the issuance or denial of permits. If there is a dispute about whether an area can be regulated, the USEPA has the ultimate authority to determine the actual geographic scope of waters of the United States subject to jurisdiction under all sections of the CWA, including the Section 404 regulatory program.

1.4.1.3 National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries)

The Endangered Species Act (ESA) provides for the designation and protection of invertebrates, wildlife, fish, and plant species that are in danger of becoming extinct and conserves the ecosystems on which such species depend. NOAA Fisheries deals with actions affecting marine species. Section 7 of the ESA requires that federal agencies consult with NOAA Fisheries to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or adversely modify or destroy designated critical habitat. Following consultation under Section 7, a biological opinion is issued.

1.4.1.4 U.S. Fish and Wildlife Service (USFWS)

The ESA provides for the designation and protection of invertebrates, wildlife, fish, and plant species that are in danger of becoming extinct and conserves the ecosystems on which such species depend. ESA Section 7 requires that federal agencies consult with USFWS to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or adversely modify or destroy designated critical habitat. Following consultation under Section 7, a biological opinion is issued.

1.4.1.5 California Department of Fish and Wildlife (CDFW)

Lake and Streambed Alteration Program

The CDFW is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. To meet this responsibility, the Fish and Wildlife Code (Section 1602) requires an entity to notify CDFW of any proposed activity that may substantially modify a river, stream, or lake.

California Endangered Species Act

The California Endangered Species Act (CESA) allows CDFW to authorize project proponents to take state-listed threatened, endangered, or candidate species if certain conditions are met. CDFW administers the incidental take provisions of CESA to ensure regulatory compliance and statewide consistency.

1.4.1.6 Regional Water Quality Control Board (RWQCB)

The Water Board is a State agency with regional jurisdiction over the bed and banks of stream channels, their riparian corridors and the beneficial uses. Monterey County is under the jurisdiction of the Central Coast Region. The RWQCB's purpose is to protect and improve the quality of the natural water resources in the region. Protecting water quality is achieved by regulating discharges to the waters and by requiring cleanup of illegal or unplanned discharges. This is done through the CWA Section 401.

1.4.2 MCWRA Responsibilities

The Primary Permits obtained by the MCWRA are as follows:

- U.S. Army Corps of Engineers (USACE) Section 404 Permit: Regulates placement of dredged or fill material into waters of the U.S.
- Regional Water Quality Control Board Central Coast (CCRWQCB) Section 401: Issues water quality certification; certification required for Section 404 permits

1.4.3 Applicant Responsibilities

The Primary Permits obtained by the Applicant are as follows:

- California Department of Fish and Wildlife (CDFW) Sections 1600-1616 Streambed Alteration Agreement: Regulates activities that will alter a river, stream or lake.

1.5 Program Timelines

The list below includes the annual steps that are taken in order to participate in the SMP. They are discussed in more detail in Section 2.

- Notification of interest to participate in SMP to MCWRA by March 1st
- Screen for eligibility, within program limits, and covered activities
- Consult with Technical & Design Committee or Permitting Committee as necessary
- Annual Work Plan developed
- Permit Approval Notifications given to participants by September 15th
- Permit Notification Letter signed by participants prior to Site Preparation
- Site Preparation completed prior to Biological Survey
- Pre-maintenance biological surveys conducted within 60 days of commencing SMP activities
- Participant training prior to commencing SMP activities
- Authorization to begin work issued
- Non-Native Vegetation removal August through February
- Native Vegetation Removal & Sediment Removal October 15-November 30
- Program Reporting by Applicants: January 15th

- Program Reporting by MCWRA: March 15th
- Program Review by May 30th

2 Pre-Maintenance Planning Approach and Impact Avoidance

2.1 Introduction

This chapter describes the planning steps taken prior to conducting maintenance work to ensure that the work is effective and also avoids and minimizes potential environmental impacts. These planning steps occur prior to the actual maintenance work to ensure that the work is targeted, effective, and avoids foreseeable environmental impacts. The process begins with a broad level activity planning and focuses down to the details informing maintenance at a specific site. Although this will occur annually over a five-year period, it is anticipated that the majority of the sites and approaches will be addressed prior to issuance of the 404 permit.

2.2 River Management Unit Process

A series of River Management Units (RMUs) will be identified as geographic units for organizing adjacent willing landowners along several miles of river to coordinate management along reaches of the river with similar conditions. This method offers opportunities to maximize the multiple benefits listed above as well as a more efficient means of achieving and documenting regulatory compliance. Potential RMUs include MCWRA short-term SMP Priority 1 and 2 areas for constricted flow capacity. RMUs will be the geographic and operational framework for the SMP. Once RMUs are developed, they will be maintained or modified throughout the life of the permit.

The flood management design concepts for an RMU are based on opportunities for enhancement, avoidance, minimization and on-site mitigation to the extent that each RMU has the capacity to accommodate these conditions. Avoidance is defined as areas and activities that will not be part of the maintenance in order to not disturb habitats, stream conditions or native vegetation. These areas will become part of the RMU design plan. Minimization is defined as activities that will be part of the maintenance but that will be conducted according to a defined set of protocols or parameters that are intended to keep the activity from exceeding the impact threshold. These protocols and parameters will become part of the RMU design plan. On-site mitigation will be identified for the RMU based on existing conditions including probable restoration sites, habitat conditions, and removal of Arundo from riparian areas. On-site mitigation will also be part of the RMU design plan.

2.3 Notification Process

The MCWRA will prepare an annual outreach program so that people that may want to participate in the Program are given the eligibility criteria, levels of participation as well as the instructions on how to apply. The outreach information will be provided both electronically and in print format to reach a wider audience. MCWRA may perform additional outreach activities for the most critical areas, in order to increase participation.

Each year MCWRA will send information and notification instructions to all potential applicants within the Program Area. Annual notifications must be submitted to MCWRA by March 1st and are subject to the requirements in these Guidelines. The RMU notification will trigger the participation in the Technical and Design Committee and Permitting Committee process for any new activities or areas of work. Annual work within existing RMUs may trigger Committee review if there are proposed changes. Otherwise they will be included in the Annual Work Plan.

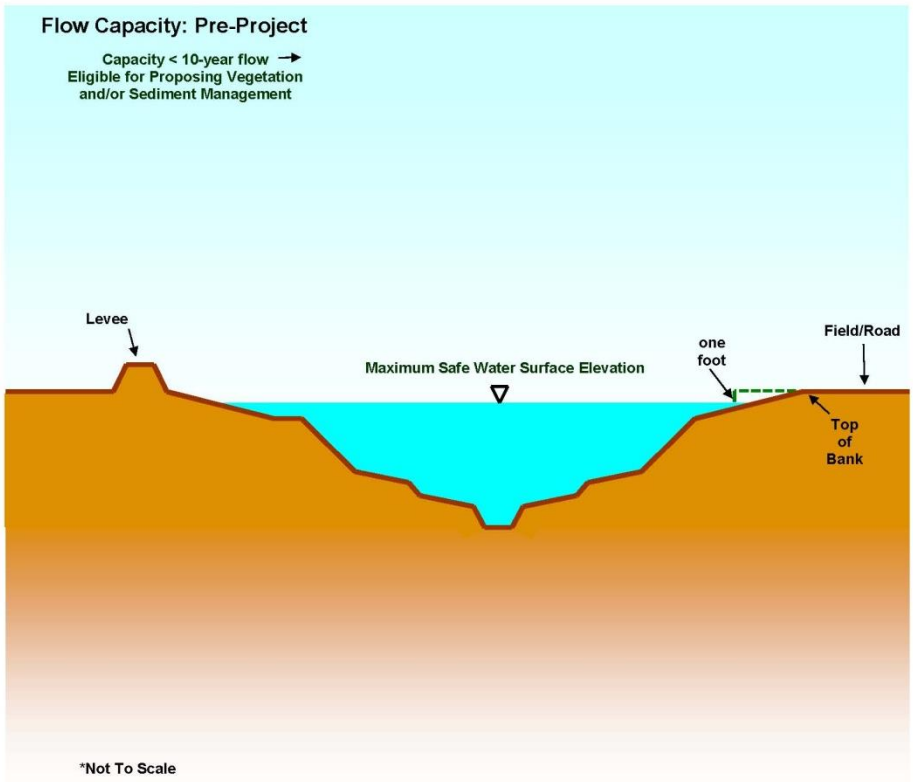
SMP Notification Package Requirements

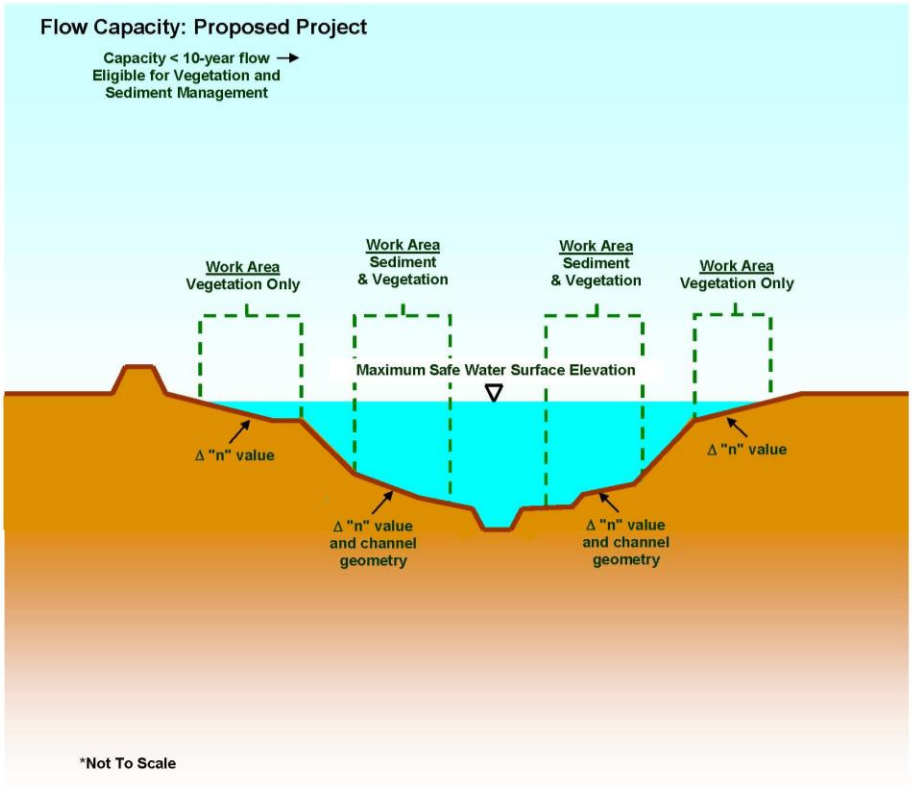
A completed SMP Notification Package must be submitted to MCWRA by March 1st, which includes:

- Site Work Notification including a conceptual scope of work
- Photo Sheets of existing conditions
- River Management Area Location plotted on Eligibility Maps

2.4 Flood Eligibility Requirements

Each site must first go through the site screening process to determine its eligibility to perform work. Sites are eligible if they cannot pass the 10-year flood flow of approximately 39,000 cfs, with one-foot of freeboard. The following schematics are provided to demonstrate an eligible project.





There are two approved approaches to determine site eligibility:

- HEC RAS Flood Model utilizing LiDAR data
- ground survey of transects of the work site and apply the Mannings Equation to determine Discharge using the provided Excel Spreadsheet

The requirements listed below are applicable to both of these approved approaches.

Data Collection

- Each transect must have a station and elevation for each point surveyed or extracted from the LiDAR data.
- A minimum of three transects must be used for each site, no more than 1000 feet apart.
- The Left Bank Station (looking downstream) is the starting point (zero) and each station is the cumulative distance to the nearest foot.
- Elevations are on a known and reproducible datum and recorded to the nearest tenth of a foot.
- In locations that are impassable due to dense riparian forests, elevations should be determined at each edge of the forest and a constant slope will be applied through the forest.
- Ground transects should be performed when flows in the river are at the lowest. If the water is too deep to perform the survey then data should be acquired from both banks and the channel bottom will be assumed to be flat between the points.
- All major slope breaks should be recorded.
- Both edges of the low-flow channel or wetted channel should be noted.

- Both the beginning and end coordinates of each transect should be referenced to State Plane coordinates (NAD 83, Zone 4, US Survey Feet).

Additional detailed information and definitions are located with the Site Work Qualification Evaluation Form in the back of these Guidelines.

2.4.1 Priority Sites

All 92 miles (RM 2 to RM 94) of the Salinas River mainstem are within the SMP and may be eligible for maintenance activities during the life of the program. However, a preliminary ranking of sites was undertaken to identify those reaches that would have highest priority at this time based on: 1) whether or not they currently pass the 10-yr flow; and 2) the likelihood of existing access and therefore a reduced level of ground disturbance to environmentally sensitive areas.

Based on the Salinas River Stream Maintenance Program Flood Study (see the Appendix E of the EIR), sites were given priority rankings:

- Priority 1: 36 river miles of the Salinas mainstem area are currently eligible for maintenance based on minimum flood flow capacity and assumed existing access.
- Priority 2: 36 river miles of the Salinas mainstem area are currently eligible for maintenance based on minimum flood flow capacity but not previously maintained and may require new access.
- Priority 3: 20 river miles along the Salinas mainstem area would require additional information/surveys to determine eligibility.

2.4.2 Eligibility Maps

Eligibility Maps have been created utilizing the HEC RAS Flood Model and LiDAR data as described in Appendix E of the Program's EIR. They have the entire project area categorized as Priority 1, 2, or 3. These maps may be used during the notification process. Additional data may be necessary during the Technical and Design Committee phase to understand the hydraulics of a particular reach.

2.4.3 Technical and Design Committee

Once the notifications are reviewed and compiled by the MCWRA, a Technical and Design Committee will be convened for a 3-6 month period to define the cause of flooding in the Salinas River based on scientific analysis and assessment, including use of a 2-dimensional (2-D) hydraulic model, and to develop RMUs. The goal of the committee is to refer and review appropriate analytical methods and to integrate hydrological and biological science into the RMU design. Committee members will include landowners and growers and/or their representatives, technical experts (hydrologists, biologists, etc.), MCWRA staff and a facilitator.

The Technical and Design Committee will be convened immediately upon finalizing a list of potential participants within the RMU that will work cooperatively on design. Public outreach will be performed as necessary to encourage landowners within a potential RMU to participate even if they did not submit a notification package by March 1st. The Technical and Design Committee will meet with the hydrologists and biologists to initiate the analysis on the reaches for existing and future conditions. Once a set of design conditions have been identified and agreed to, the Technical and Design Committee will present the work to the Permitting Committee for final design confirmation and permit development.

Having a multi-disciplinary team that understands integrated planning will allow for a streamlined and consistent analysis of maintenance approaches as they are put forth based on site conditions and landowner interest. As such, it is critical to have a biological or ecological team that can both develop ecological goals for each RMU based on current local conditions and conduct field reconnaissance surveys that are cost-effective and acceptable to the permit agencies. The reconnaissance survey work is essential to identifying high priority avoidance areas (e.g. wetlands, areas with mid successional riparian habitat and/or presence of less common riparian trees) within each RMU or property and working with growers and landowners to field fit each maintenance concept to refine avoidance and minimization efforts upfront and to ensure that maintenance actions could be implemented in a timely and cost-effective manner. While an integrated multi-disciplinary team is critical for developing RMUs and the appropriate strategies for each RMU, the team should also provide on-going support for the annual review of monitoring data, potential adaptive management needs due to changes in river conditions, and maintaining confidence in the on-going evolution of the program.

RMU Evaluation Process

The SMP seeks to address maintenance through an evaluation process that includes collaborative science-based flood risk reduction analysis, assessment and mapping of SMP RMUs, and subsequent monitoring and reporting. Key steps include:

- Perform 2D model analysis of existing conditions tied to appropriate and current data from the proposed maintenance area.
- Conduct database searches for Special Status Species information based on existing data from CDFW databases (CNDDB) or other studies in the area.
- Map vegetation types and wetlands data within the RMU utilizing existing maps and publically available recent aerial photos.
- Develop maintenance activity options to balance flood benefit with ecological enhancement
- Utilize 2D model and sensitive species information to quantify effect
- A qualified biologist will conduct a field reconnaissance to identify areas of sensitive habitat, including low flow channel buffers or other features, existing wetlands, and native riparian trees that will be avoided, to the greatest extent practicable, for project activities.
- A qualified professional will prepare a map showing maintenance options for each RMU and describe the extent of the proposed maintenance activity (i.e., length, width, depth, etc.).

2.4.4 Permitting Committee

The Permitting Committee will convene to review the design options developed by the Technical and Design Committee for the likelihood of success for permitting. Committee members will include members of the Technical and Design Committee and regulatory agency staff, as appropriate to the RMU. It is intended that this committee would initiate pre-application consultations, engaging regulatory agencies early in the design process and prior to permit application submittal.

The Permitting Committee will be tasked with finalizing the design negotiated by the Technical and Design Committee and will include additional site-specific design aspects such as access, mechanical techniques, best management practices, seasonal restrictions, monitoring and mapping and other details pertinent to permit application development. This may include visits to potential RMU sites to have a better understanding of existing conditions and proposed design. Any final changes to the RMU design will be done cooperatively between the Permitting Committee and the Technical and Design Committee and with the input of regulatory agencies.
Once the programmatic permit has been secured, additional activities or changes will need to be re-assessed to ensure compliance with the permit terms. The team should also provide ongoing support, through the life of the permit for the annual review of monitoring data, potential adaptive management needs due to changes in river conditions, and maintaining confidence in the on-going evolution of the program.

2.5 Annual Work Plan

It is anticipated that most RMUs will be defined prior to the development of the initial permit applications for the overall program. However, each year MCWRA will be responsible for reviewing the site work notifications for either new RMU proposals, changed conditions in existing RMUs, or for follow-up work in existing RMUs, applications and developing an annual stream maintenance work plan.

MCWRA will develop a preliminary list of project sites and proposed activities developed during the Notification and/or Permitting Committee process based on approved RMU applications. This data will be further reviewed and prioritized to develop an annual work plan. The review will include what work is feasible for the year, based on hydrologic conditions, available resources, severity of need for maintenance in a particular reach, past/recent flooding conditions, management goals for the Program, and Program limits. This work plan will be submitted to all appropriate regulatory agencies for their record and /or review.

MCWRA will contact all applicants and inform them if they were approved to perform any or all activities in a given year and they will issue a list of action items that are required for each site. This will include which, if any biological or cultural surveys that must be performed.

2.6 Tributary Work Plan

The MCWRA, as a Program Participant, will conduct maintenance activities in the following flood control zones. The annual activities will also be included in the Annual Work Plan in a separate section from the mainstem RMUs.

Gonzales Slough

Flow within Gonzales Slough is a direct result of stormwater runoff from the Gabilan Mountains and foothills to the east of the City of Gonzales. Vegetation removal will be performed below the pump discharge pipe so that the flap gate to the stormwater retention basin can operate properly.

MCWRA will use a 1% concentration of AquaMaster® to remove the vegetation in the area of the discharge pipe. Minimal grading will also occur in the area of the discharge pipe, about 70 feet, due to the limit of the long-reach excavator and staging area. A small channel from the outlet into the Salinas River bench area will also be maintained and kept free of debris using a bulldozer or excavator. If sediment is to be hauled out of the area, then a 5 cy dump truck will be used to move sediment outside of the floodplain elsewhere on the ranch, amounting to less than 20 cy. Access to the Slough will be via well-established private farm roads.

Bryant Canyon Channel

MCWRA is the agency responsible for maintaining Bryant Canyon Channel which is located northeast of the city of Soledad. The original construction of the channel included a 44-foot wide channel with 2:1 side slopes, a 12-foot bottom width, and a channel slope of 0.08%. As part of the proposed short-term SMP, the last 800 feet will be restored to the original construction (from the channel bend to the Salinas River).

Maintenance will involve some vegetation removal and sediment removal of the bottom of the channel (approximately 1-3 feet). MCWRA anticipates driving a backhoe along the channel and removing debris and sand, and placing it in a dump truck on the roadway above the channel. MCWRA will use 1% concentration of AquaMaster® to spray the side slopes of the channel using a spray rig (e.g., F-450) from the top of the channel depending on the amount of vegetation growth. They should typically perform one treatment in the spring or early summer and then a few touch-up applications in the fall.

San Lorenzo Creek

The San Lorenzo Creek watershed extends easterly from the Salinas River at King City up into the western slopes of the Diablo Range. Sediment maintenance will occur to restore the channel size and capacity to the FEMA Flood Insurance Rate Maps and Flood Insurance Study (FIS, 2009). As modeled in the FIS, the channel appeared to contain the 10% chance peak discharge (10-year storm event), which is equivalent to 7,090 cfs at the First Street Bridge; the upstream most extent of the work area under the proposed short-term SMP.

MCWRA staff will use heavy equipment (i.e., bulldozer and excavator) to remove sediment from the channel from First Street Bridge to Highway 101. Sediment removal

is estimated to be up to 200 cy annually and will be stockpiled off-site. A 5 cy dump truck will be used to move the sediment out of the floodplain and onto County-owned land. Vegetation maintenance will also occur. MCWRA uses 1% concentration of AquaMaster® to spray from the top of bank to the toe of the channel (side slopes only) using a spray rig (e.g., F-450).

2.7 Work Authorization

MCWRA will send permit approval notifications to all applicants within an approved RMU by September 15th of the year they are proposing maintenance activities. This letter includes the permit conditions and commits the participant to adhering to the Program Guidelines including the BMPs and Mitigation Measures. The short-term SMP permit will be initiated upon receipt of a signed permit notification letter, which certifies the applicant will perform stream maintenance within the allowable scope of work, and the general terms and conditions.

Ultimately a work authorization will be issued for each RMU that has passed the previous steps.

3 Site Preparation

3.1 Introduction

All sites should be prepared at least one day prior to the scheduled surveys (i.e. biological, cultural, etc.) and no more than 60 days prior to commencement of SMP activities. This ensures that sites are all prepared within an RMU and any modifications can be made prior to commencing the SMP activities. MCWRA staff may inspect any of the sites in the Program.

3.2 Buffer Zone Demarcation

In order to ensure that any work that is proposed adjacent to the low flow channel, does not impact the low flow channel a Buffer Zone must be established. It is anticipated that most potential work areas are not within fifty feet of the low flow channel, but located up on a higher bench.

3.2.1 Applicability

There are two buffer widths allowed for Native Vegetation and Sediment Management work within the Program. Any modifications to this would need to be outlined in the approved Permit.

- The primary buffer zone is the 10-foot one to mark the edge of a flowing channel towards the bank.
- The less frequently used buffer zone is a 5-foot buffer zone to mark the edge of a non-flowing (stagnant or dry) channel towards the bank.

There are three unique situations that are further detailed below:

- If the low-flow channel is adjacent to a steep bank with overhanging vegetation, then the opposite side of the channel would be buffered but not the side adjacent to the bank.
- Where the low-flow channel splits around a well-vegetated island or mid-channel bar (forming a braided channel), the dominant channel would be selected and a 10-foot wide buffer would be staked on each side of the dominant channel. The dominant channel for a specific work area would be photo-documented and described in the Technical and Design Committee Process prior to approval.
- When working more than 50-feet outside of the low-flow channel a buffer zone does not need to be staked.

3.2.2 Preparation

Prior to initiating work, the applicant or contractor would clearly mark the buffer zone area using 4-foot lath stakes and blue flagging in the proposed work areas.. MCWRA may review each of the sites to ensure accurate demarcation of the 5-foot or 10-foot buffer zone areas prior to the onset of maintenance activities each year.

3.3 New Site Access

Participants will use existing access ramps and roads, to the extent feasible. For any site that requires a new access road from a disturbed area to the river channel it shall be constructed in a manner that minimizes impacts according to the following guidelines:

- Access points will be constructed as close to the work area as possible to minimize equipment transport
- When considering channel access routes, slopes of greater than 20 percent will be avoided, if possible
- If possible, avoid large mature trees, native vegetation, or other significant habitat features
- To limit disturbance to the riparian vegetation along the banks, up to eight access ways are allowed for every river mile within an entire work area.

Prior to grading or vegetation removal, the participant or contractor shall clearly mark the farm-side (or non-river side) entrance to the access way with 4-foot lath and yellow ribbon. The entrance shall be no more than 16-feet wide. Additional lath stakes shall be placed every 30 feet towards the river channel.

3.4 River Crossings – Dry Channel

One river crossing is allowed per work site (during either wet or dry conditions). This crossing will enable the participant to move from sandbar to sandbar due to the terrain or restricted access from the other side of the river, when the river channel is dry. The location of the crossing will be determined during the development of the RMU and may need to be revisited annually as conditions change.

3.4.1 Preparation

Prior to work, each crossing shall be clearly marked by a 4-foot lath with yellow flagging for the equipment operator.

3.5 River Crossings – Wet Channel

One access crossing the river is allowed per work site (during either wet or dry conditions). This crossing will enable the participant to move from sandbar to sandbar due to the terrain or restricted access from the other side of the river, when the river channel is wet. The location of the crossing will be determined during the development of the RMU and may need to be revisited annually as conditions change.

3.5.1 Description

A temporary steam crossing is used to provide a safe, stable way for construction vehicle traffic to cross a watercourse. Temporary stream crossings provide streambank stabilization, reduce the risk of damage to the streambed or channel, and minimize

sediment loading from construction traffic. The crossing might be a bridge, a culvert, or a ford.

3.5.2 Applicability

Temporary stream crossings are appropriate where heavy construction equipment must be moved from one side of a stream channel to the other. They can also be used where lighter construction vehicles will cross the stream repeatedly during construction.

A bridge or culvert is the best choice for most temporary stream crossings because each can support heavy loads. The materials used to construct most bridges and culverts can be salvaged after they are removed. A ford is a shallow area in a stream that can be crossed safely. Fords are appropriate in steep areas where flash flooding might occur and where normal flow is shallow or intermittent across a wide channel. Fords should be used only where stream crossings are expected to be infrequent.

3.5.3 Preparation

Prior to work, each crossing shall be clearly marked by a 4-foot lath with pink flagging for inspection. Once approved, a temporary Stream Crossing shall be installed by the participant or contractor in accordance with the Sediment and Erosion Control BMPs prepared by the State Regional Water Quality Control Board.

3.6 Sediment Management

3.6.1 Preparation

Prior to grading, the participant or contractor shall drive a 4-foot lath at one-foot depth in the highest point of elevation downstream of the sandbar to be graded. Then moving upstream from that point, lath stakes would be placed every 30 feet in the river channel lateral to the top of the sandbar to be graded. This methodology would ensure that post-graded bar heights are at least 3 feet above the thalweg.

Alternatively, where the high point of elevation cannot be identified due to standing and/or flowing water, 4-foot laths buried 1-foot deep would be placed at the edge of the standing and/or flowing water lateral to the top of the sandbar. These laths will serve as an elevation reference mark to ensure that post-graded bar heights are at least 3 feet above the thalweg.

4 Implementation Procedures

4.1 General Requirements

After each RMU has had all appropriate site preparations and surveys completed an approval to start work will be issued by the MCWRA. Applicants will receive the approval and the appropriate list of mitigation measures and Best Management Practices to be followed during work. An Agreement between the MCWRA and the Applicant will need to be executed prior to any work commencing. Annual work will typically begin no earlier than October 15th and is dependent on annual conditions of the River, which include Scheduled Reservoir Release Operations and natural storm events. MCWRA staff may inspect any of the sites in the Program.

4.1.1 Normal Operating Hours

Monday through Saturday 7am to 6pm.

4.1.2 Paperwork Required Onsite

- Copies of regulatory permits related to the Stream Maintenance Program will be kept on-site and available for review, if requested by regulatory personnel.
- Copies of the Stream Maintenance Program Guidelines will be kept on-site.

4.2 Best Management Practices.

All maintenance Activities must follow the Best Management Practices (BMPs) located in the table at the back of these Guidelines (will be updated after approval of the Environmental Impact Report). These measures are to provide a uniform approach to activities and to minimize undesired effects of maintenance activities.

4.3 Sediment Management

In-Channel Minor Activities: For in-channel minor work activities, work will be conducted from the top of the bank if access is available and there are flows in the channel.

Prevent Scour Downstream of Sediment Removal: After sediment removal, the channel shall be graded so that the transition between the existing channel both upstream and downstream of the maintenance area is smooth and continuous between the maintained and non-maintained areas and does not present a sudden vertical transition (wall of sediment) or other blockage that could erode once flows are restored to the channel.

4.4 River Crossings

Restore Channel Features: Low-flow channels within the streams shall be contoured to facilitate fish passage and will emulate the preconstruction conditions as closely as possible, within the finished channel topography.

5 Mitigation Requirements

All actions related to maintenance activities shall be recorded so that the proper mitigation can be applied. In order to verify implementation, the applicant shall complete the Applicant Reporting Form that identifies the mitigation measure necessary. These forms will be submitted to the MCWRA and be included in the after action report.

6 Monitoring Requirements

This section is meant to provide applicants with a means to document compliance with mitigation measures included in the Salinas River Stream Maintenance Program's EIR. The mitigation measures that will be implemented during the course of this program are outlined in the table at the end of these Guidelines. The table also includes the monitoring activity, who is responsible for the implementation, and the timeframe for implementation. The applicants will be fully responsible for understanding and properly implementing the necessary mitigation measure(s) and the MCWRA will be responsible for verification of implementation, as necessary. A complete Mitigation Monitoring Plan will be developed with the Final EIR.

6.1 Reporting Requirements

6.1.1 Annual

The applicants will provide MCWRA with a completed Annual Site Report form within 60 days of completing work, typically by January 15th. This report will include photo documentation of the work site (before, during and after). If sandbar grading is part of the maintenance activities for a given year, then all points along the transect in the graded portion of the sandbar must be surveyed after stream maintenance has been completed, but prior to onset of the winter high flow season.

At the end of each maintenance season, MCWRA will compile a summary report and submit it to the appropriate regulatory agencies by March 15th. This report will include a summary of the year's maintenance projects, the effectiveness of certain practices, work area conditions and recommendations for improvement for future activities.

6.2 Program Review

6.2.1 Five Year Review

MCWRA and the permitting agencies will review the SMP for its overall effectiveness. This review will include an assessment of maintenance activities conducted to date, BMPs employed, adequacy of the SMP Mitigation Program, SMP data management, any SMP adaptive updates and revisions, and overall SMP coordination and communication between MCWRA and the regulatory permitting agencies.

7 Application Forms

Monterey County Water Resources Agency

Salinas River Stream
Maintenance Site
Work Notification

FOR AGENY USE ONLY

Application ID.

Year _____

Date:

River Mile: No.

NOTICE TO APPLICANT: *Before work begins, it will be necessary to enter into an agreement with the Water Resources Agency, wherein the applicant assumes full responsibility for the proposed work and any additional work that may be required under the Corps permit, and further, holds the Agency harmless from any liability incurred in connection with said work.*

APPLICANT (Responsible Party): Municipality _____ Owner _____ Grower _____ Operator _____

Company: _____

Contact: _____ Phone (primary): _____

Address: _____ Phone (alternate): _____

City: _____ State/Zip: _____ Fax: _____

Email: _____

GENERAL INFORMATION:

Existing RMU: _____ No _____ Yes (include name and number)

Activity Type: _____ Sediment mangement _____ Re-Vegetation _____ Vegetation Removal

Location: River Mile _____ Contiguous APN Nos. _____

USGS Quad Map _____ _____

Township_____ Range_____ Section_____ _____

Rancho _____ _____

Upstream Boundary of Project Site: Latitude _____°_____'_____" Longitude _____°_____'_____"

Downstream Boundary of Project Site: Latitude _____°_____'_____" Longitude _____°_____'_____"

Area of site: acres _____ Length _____ Width _____

_____

Conceptual Scope of Work:

A. VEGETATION COMMUNITIES

1. Native Plant Species

Description & Vegetation Type: _____

_____

_____

_____

2. Non-Native Plant Species

Description & Vegetation Type: _____

_____

_____

_____

Spoils Disposal Removal _____ Reuse for Re-Vegetation (native vegetation only) _____

Burning _____ Herbicide Application _____ (Name _____) Other _____

B. RE-VEGETATION/HABITAT RESTORATION OPPORTUNITIES

1. Dimensions - L _____ W _____ Total Acres _____

Description: _____

_____

_____

Location: _____

2. Vegetation Type: _____

_____

_____

Location: _____

NOTE - *Invasive non-native riparian plants, for example: Giant Reed or Arundo (Bamboo), German Ivy, Pampas Grass & Tamarisk, are not to be used for re-vegetation and should be removed where possible. Please read MCWRA pamphlets REVEGETATION USING NATIVE PLANTS and PEST PLANT SPECIES AND THEIR MANAGEMENT.*

C. ACCESS TO CHANNEL

_____ Existing access way

_____ Create new access way

Grading: No _____ Yes _____

Vegetation Removal: No _____ Yes _____

Length _____ Width _____

FOR AGENCY USE ONLY

REGULATORY CONDITIONS APPLIED

Cultural Survey required: No _____ Yes _____

Biological Survey required: No _____ Yes _____

Comments: _____

_____

_____

Technical and Design Committee review: No _____ Yes _____

For Existing RMU

Changed conditions

Hydraulics _____

Sediment _____

Habitiat _____

Invasive Species _____

Comments _____

_____

_____

D. ATTACHMENTS

_____ 1. photo sheets of existing conditions

_____ 2. River Management Area Location plotted on Eligibility Maps

_____ 3. Site Work Qualification Evaluation, if necessary (with required attachments)

Applicant Signature _____

Title _____ Date _____

MCWRA

Received by _____ Date _____

Program Work Approved for Inclusion in Technical and Design Committee

By _____ Date _____

Title _____ MCWRA _____

Monterey County Water Resources Agency

ATTACH 3" X 5" COLOR PHOTO HERE

Photo By: _____

Photo Date: _____

Photo Description: _____

Photo Number

ATTACH 3" X 5" COLOR PHOTO HERE

Photo By: _____

Photo Date: _____

Photo Description: _____

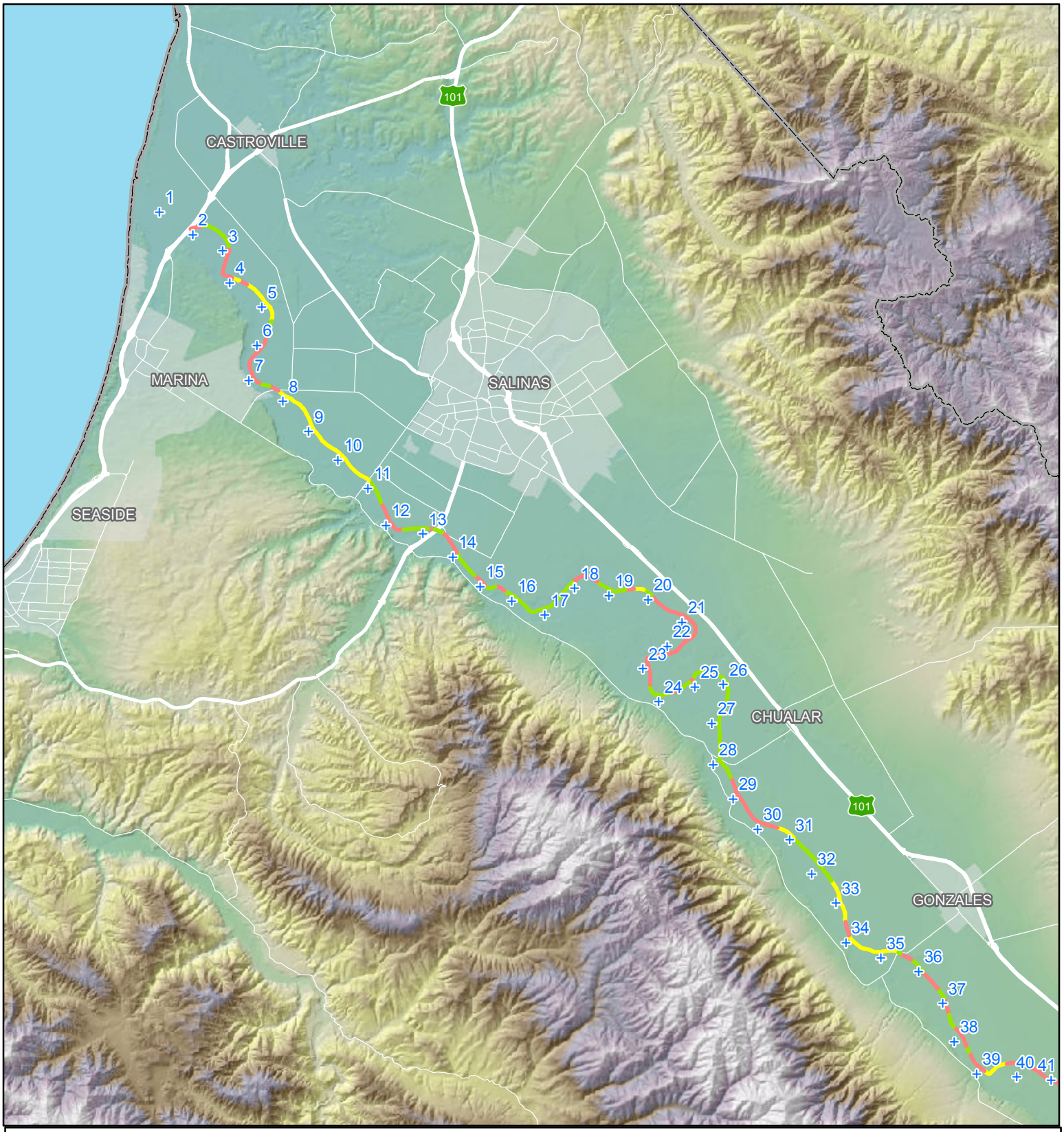
Photo Number

Responsible Party _____ Phone _____

Salinas River Stream Maintenance Photo Sheet

Year _____

Date: _____



Preliminary Eligibility and Priority Sites

- Priority 1
- Priority 2
- Priority 3

Salinas River
Stream Maintenance Program
River Work Eligibility Map #1

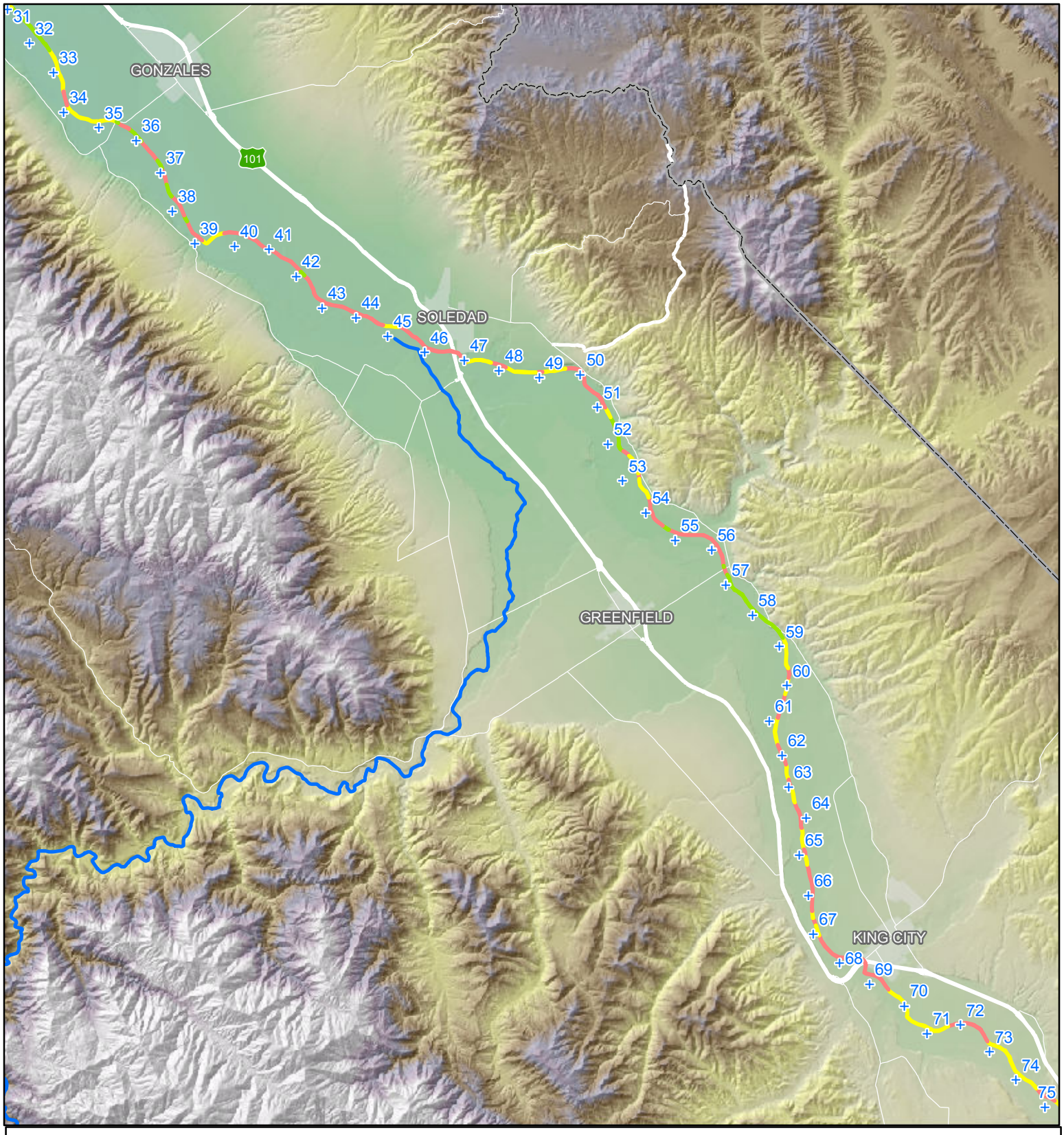
N
W E
S

0 2 4 6 8 Miles

MONTEREY COUNTY WATER RESOURCES AGENCY 1947

Note: The scale and configuration of all information shown hereon are approximate and are not intended as a guide for survey or design work.

Map Date: June 10, 2014



Preliminary Eligibility and Priority Sites

- Priority 1
- Priority 2
- Priority 3

Salinas River
Stream Maintenance Program
River Work Eligibility Map #2

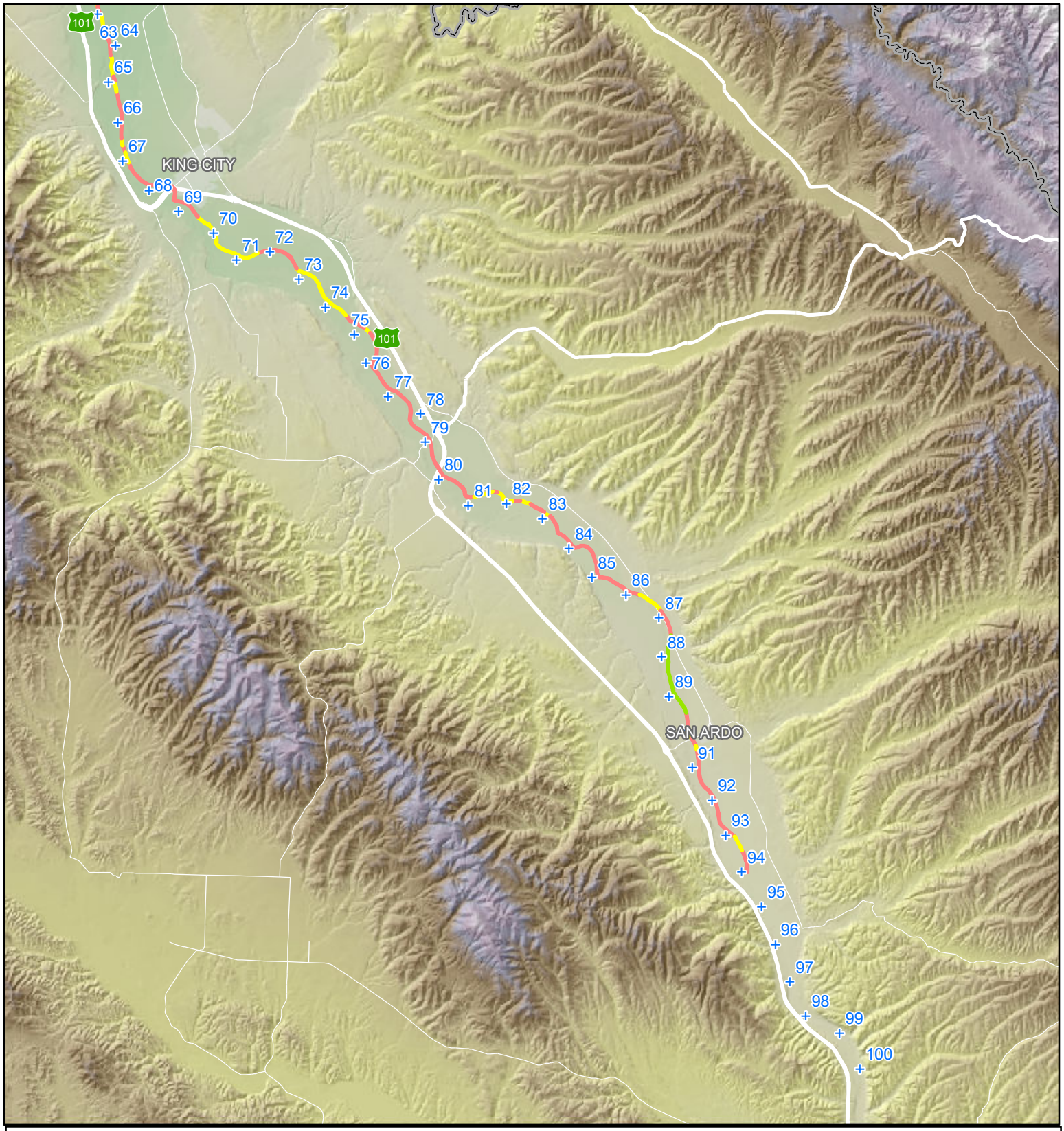
N
W E
S

0 2 4 6 8 Miles

MONTEREY COUNTY WATER RESOURCES AGENCY 1947

Note: The scale and configuration of all information shown hereon are approximate and are not intended as a guide for survey or design work.

Map Date: June 10, 2014



Preliminary Eligibility and Priority Sites

- Priority 1
- Priority 2
- Priority 3

Salinas River
Stream Maintenance Program
River Work Eligibility Map #3

N
W E
S

0 2 4 6 8 Miles

MONTEREY COUNTY WATER RESOURCES AGENCY 1947

Note: The scale and configuration of all information shown hereon are approximate and are not intended as a guide for survey or design work.

Map Date: June 10, 2014

Monterey County Water Resources Agency

Salinas River Stream Maintenance Site Work Qualification Evaluation

FOR AGENCY USE ONLY

Application ID.

Year _____

Date:

River Mile: No.

INSTRUCTIONS: *Before completing this form (1) a minimum of three complete river transects and associated data and calculations, (2) an aerial photograph or map showing the proposed work areas, and (3) photographs documenting current channel conditions. This form should be submitted to MCWRA no later than August 1st of each year.*

APPLICANT (Responsible Party): Municipality _____ Owner _____ Grower _____ Operator _____

Company: _____

Contact: _____ Phone (primary): _____

Address: _____ Phone (alternate): _____

City: _____ State/Zip: _____ Fax: _____

Email: _____

GENERAL INFORMATION: River Mile - Upstream _____ Downstream _____

LOCATION - Contiguous APN #'s: _____

_____

USGS Quad Map: _____

Township: _____ Range: _____ Section: _____ Rancho: _____

Upstream Boundary of Project Site: Latitude _____º_____'_____" Longitude _____º_____'_____"

Downstream Boundary of Project Site: Latitude _____º_____'_____" Longitude _____º_____'_____"

A. DISCHARGE TARGET PERFORMANCE SPECIFICATION (Q_p)

Q_p = 10-year flow (39,000 cfs)

B. TRANSECT SUMMARY AND CURRENT DISCHARGE & VELOCITY CALCULATION

Number of channel transects conducted: _____ (a minimum of three is required)

Transect		Current Roughness Factors (*n*)	Current Maximum Discharge (Q_c)
Location	ID No.		
Downstream Boundary			
Work Site			
Work Site			
Work Site			
Upstream Boundary			

_____ Additional Transect Summary Sheets are attached (number of sheets _____)

C. VEGETATION REMOVAL

Vegetation removal activities are planned for this site: Yes _____ No _____

For each cross-section, first calculate the revised roughness factor and discharge volume for the project site following vegetation removal and then summarize the calculations in the table below.

Transect		Estimated Roughness Factors following Vegetation Removal (n_v)	Estimated Maximum Discharge following Vegetation Removal (Qv)
Location	ID No.		
Downstream Boundary			
Work Site			
Work Site			
Work Site			
Upstream Boundary			

_____ Additional Transect Summary Sheets are attached (number of sheets _____)

D. SEDIMENT MANAGEMENT

Sediment removal and grading activities are planned for this site: Yes _____ No _____

Recalculate each transect to reflect the planned sediment removal activity and attach the revised transects to this form. In the table below, list the revised roughness factors and estimated discharge volumes for the project site following sediment removal and grading activities.

Transect		Estimated Roughness Factors following Sediment Removal (n_g)	Estimated Maximum Discharge following Sediment Removal (Q_g)
Location	ID No.		
Downstream Boundary			
Work Site			
Work Site			
Work Site			
Upstream Boundary			

_____ Additional Transect Summary Sheets are attached (number of sheets _____)

E. ATTACHED INFORMATION

Transect data and diagrams: _____ No _____ Yes (_____ # of pages attached)

Transect photographs: _____ No _____ Yes (_____ # of pages attached)

Site map showing transect locations: _____ No _____ Yes (_____ # of pages attached)

Aerial photo(s) showing transect locations: _____ No _____ Yes (_____ # of pages attached)

F. ADDITIONAL INFORMATION OR COMMENTS

Applicant Signature: _____ Date: _____

Title: _____

Registered Professional Engineer Signature

As a registered State of California Professional Engineer, I hereby attest that all information presented in this document is true and correct to the best of my knowledge. As such, the activities indentified in Section F of this form qualify for inclusion in the Salinas River Stream Maintenance Program.

Signed: _____ Date: _____

Certified by:

Expires:

If this site qualifies for any of the above maintenance activities, please compete the Salinas River Stream Maintenance Site Work Application and submit along with this form. Please include all associated transects, aerial photographs, site maps, assessors parcel maps and photographs. A Section 1600 Streambed Alteration Agreement will have to be obtained from the State of California, Department of Fish and Wildlife.

FOR AGENCY USE ONLY: QUALIFYING SITE ACTIVITIES

Based on the information provided in this form, this project is qualified for the following proposed maintenance activities:

	AGENCY APPROVAL
_____ Vegetation Removal	___ Yes ___ No By _____
_____ Sediment Management	___ Yes ___ No By _____

MCWRA

Received by _____ Title _____ Date _____

Work approved by: _____ Title _____

Agency: _____ Date _____

7.5 Site Work Qualification Evaluation Information and Definitions

7.5.1 Flow- Capacity Calculations

There are two options to calculate the flow capacity of the channel to determine site eligibility.

OPTION 1

Applicants can utilize the 2012 HEC-Geo RAS Flood Model and associated LiDAR data or update the channel geometry within the Flood Model. The hydraulic roughness values (i.e., Manning's n-values) can also be updated along each transect based on the information and photographs of vegetative cover. A model simulation could be performed with the updated data to determine if the MSWSE is above or below the capacity of the 10-year flow. If the model results determine that channel flow capacity is below the 10-year flow, then maintenance work can be proposed.

OPTION 2

The channel flow-capacity calculation can be performed by hand computations, or with the user friendly spreadsheet application prepared by MCWRA. This spreadsheet will be provided to the applicants as a part of the application package. This will also help to provide information for the applications that will be in a common format. The screening process uses reach-specific data and Manning's Equation modified to calculate flow in cfs (Equation 1).

Equation 1

Discharge (Q) = 1.49 x A x R2/3 x S1/2 n

Where:

Q = Discharge in cubic feet per second (cfs)

A = Cross-sectional area in square feet (ft2)

R = Hydraulic radius in feet (ft), which is the cross-section area divided by wetted perimeter at the specified depth (feet)

S = Slope of the energy grade line (ft/ft). Assumed to be the channel bed slope.

n = Roughness (unitless) which represents the friction in the channel presented by vegetation, substrate, and bank conditions (e.g., riprap, channel irregularities).

The information necessary to perform the flow capacity calculations include:

7.5.1.1.1.1 River Transect Data

Transect distance and elevation data will be used to determine the cross-sectional area (A), hydraulic radius (R), and slope (S) for the discharge calculation. A transect is a cross section of the river consisting of surveyed points along a line that crosses the river perpendicular to flow. Each surveyed point contains the elevation of the ground and the station (distance) along the cross section measured from the starting point. Inputs to the discharge spreadsheet for each transect derived from the river transects will be:

- Transect ID (common for all points on a transect)
- Transect data point ID (specific to a location along the transect)
- Transect data point elevation (to the nearest 0.1 foot)
- Transect data point distance (cumulative distance to the nearest 1 foot) from the starting point of the transect on the left bank (facing downstream) - the transect distance needs to define the channel topography from the top of left to top of right bank (e.g., channel cross-section area inside the levee)
- Estimated Maximum Safe Water Surface Elevation (i.e.one foot below the lower top of bank or levee)
- The elevations of the top of any sandbar proposed for maintenance and the thalweg downstream of the sandbar

From these inputs the cross-sectional area and hydraulic radius will be calculated automatically. The preferred method to determine river slope values is to use the site-specific cross-section data. If the data does not capture the thalweg adequately, then applicants may use a predetermined regional slope generated from topographic maps. This can be done by dividing the difference between the elevation of topographic contours just upstream and downstream of the project location by the length of river channel between these two contours. There are three possible approaches to generating the reach-specific transect data:

1. conduct on the ground surveys,
2. use aerial photogrammetry to establish a baseline elevation data set and photography, or
3. use the HEC-Geo RAS Flood Model and LiDAR data to establish a baseline elevation data set.

All data generated should meet the following specifications.

Elevation data shall be collected for a minimum of three transects spaced no more than 1000 ft apart for each reach being evaluated for stream maintenance. These transects should be placed at the upstream, middle, and downstream end of the proposed treatment reach. A reach may consist of a single sandbar or may consist of several sequential sandbars along a stretch of river where riverbed and bank morphology (form) is relatively consistent. In general, as the length of the reach being evaluated increases, the number of transects evaluated should also increase. In more complex river reaches where multiple

sites are being evaluated, an applicant may effectively use four or five transects to evaluate several work locations by using one transect in the evaluation of more than one site. In this way, a single transect may serve as the upstream transect for one reach and the downstream transect for another. Adjacent applicants may find it economical to share transect information to reduce the total number of transects required.

Transects will run from the top of the left riverbank (facing downstream) to the top of the right riverbank. Elevations should be recorded to the nearest 0.1 foot at each point. The river width varies substantially so distances between elevation points should be measured to the nearest whole foot for transect lengths under 200 feet and to the nearest 5 feet for transect lengths greater than 200 feet. A minimum of 15 data points is required for all transects. Transects greater than 200 feet in length should have 2 additional data points for each additional 100 feet in length. In those locations where impassable riparian forest exists, elevations should be determined at the edges of the riparian corridor. A constant slope should then be assumed through the riparian habitat along the transect. Required elevation measurement points include:

- The top of the left and right banks (facing downstream)
- The Maximum Safe Water Surface Elevation
- Both edges of the low-flow channel or wetted channel
- All major slope breaks

Transect surveys will likely be conducted between July and August. During this period, the river typically contains operational flow releases from Nacimiento and San Antonio reservoirs. Therefore, it may not be possible or safe to obtain elevation measurements from the bottom of the low-flow channel. At a minimum, the elevation of the upper edge of the wetted channel be determined and one measurement be made within the wetted channel. A maximum depth measurement should be included when possible, so that the slope estimates are as accurate as possible. In most cases, the channel will need to be accessed from both the right and left banks to complete the transect. The bottom of the low-flow channel will be assumed to be a flat or constant slope between two measured points unless direct measurements indicate otherwise.

It is essential that each transect be tied to a recoverable temporary benchmark established in the field and that all of the points in each of the transects must be tied to the same benchmark. The temporary benchmark should be located on a point equal to or higher than the top of riverbank or levee, to minimize the likelihood of its loss due to high flow events. The location of the temporary benchmark should be well documented with text, maps and/or photos. It is highly recommended that the temporary benchmark reference the North American Vertical Datum of 1988 (NAVD 88).

For LiDAR and ground-based transect data, coordinates will be determined for the beginning and end of each transect so that the transect data can be entered into a common database that may be used for the programmatic monitoring plan. Aerial

photogrammetry-based data will be associated with a common benchmark. Coordinates should be reported using the:

- Coordinate System: State Plane
- Datum: NAD 83
- Zone: California Zone 4
- Units: Feet (survey)

Once the elevation and distance data have been recorded, transect locations should be recorded on an aerial photograph or topographic map.

7.5.1.1.1.2 Maximum Safe Water Surface Elevation

The Maximum Safe Water Surface Elevation (MSWSE) represents the highest water surface elevation or depth of water in feet that can pass through the site without substantial risk of levee failure from overtopping, riverbank overtopping, or excessive erosion of bridge abutments, levees, adjacent lands, or riverbanks. This will be set at 1 foot below the top of the riverbank or levee. Levee and riverbank surface elevations are variable in many areas. The MSWSE will be determined from the lowest point at the top of either riverbank or levee. Once the MSWSE is estimated on the transect profile, the associated water depth in feet is determined by subtracting the minimum riverbed elevation from the MSWSE. This water depth is then entered into the discharge spreadsheet for each transect to generate a discharge rate Q_c (cfs).

7.5.1.1.1.3 Roughness

Roughness (n) represents the friction in the river channel that will influence the rate of flow through the cross-section. Roughness is created by the extent, height, and density of vegetation on the riverbed and banks, the shape of the river channel, the riverbed and bank substrate. Roughness shall be determined empirically using the Arcement and Schnider (1989) or Cowan (1956) methods, or a more recent equivalent method. The ground level and aerial photographs of the transects will be used to help determine the n-value.

A second method to determine the value of "n" may be back-calculated by comparing known discharge (Q) based on USGS gage data, to measure cross sectional areas and identified and field marked water surface elevations. For this second method, applicants would place at least 4 flags along the bank at the high water mark just after high flows. The elevation of these flags, along with area of the channel as calculated from transect data, would be correlated to a specific Q provided for that day. This value of Q would then be input into Equation 1 above to calculate "n". Once an applicant has completed the maintenance activities, high water marks should be flagged yearly whether or not stream maintenance is anticipated in a given year, for calculation of Q and "n" for future channel maintenance. This method is recommended by NOAA Fisheries for more accurate determination of "n" where repeated channel maintenance work is expected to occur.

7.5.2 Eligibility Assessment

The eligibility assessment process is designed to provide a consistent and quantifiable approach to determining the eligibility of a reach for stream maintenance work, as well as the extent of that work. The applicant will collect the appropriate information and submit it to MCWRA to verify the eligibility criteria has been met for conducting stream maintenance work. The same screening tool will be used to determine the extent of the work necessary to meet the minimum flood flow capacity. Some sites may be eligible for vegetation treatment only and others may require a combined vegetation and sediment management approach to meet the minimum flood flow capacity. Once the scope of work has been approved by the MCWRA, the applicant would proceed with low-flow channel marking and other preparations

This Eligibility Assessment Process could also be used by an applicant or group of adjacent applicants as a planning tool to rank the flow constraints associated with various sites so that they may develop a multi-year plan for investing in stream maintenance work. All data collection shall be completed by qualified professionals, such as a licensed land surveyor or professional engineer.

This Process consists of three steps:

1. Compare to the Minimum Flood Flow Capacity (39,000 cfs): Compare the discharge capacity (Q_c) for existing conditions to the Minimum Flood Flow Capacity (Q_{10}).
2. Determine Work Scope: Determine the scope of proposed work needed to meet the Minimum Flood Flow Capacity (Q_{10});
3. Compare Scope to SMP Protocol: Compare the proposed scope of work to the SMP Protocol to assess feasibility;

7.5.2.1.1.1 Comparison to the Minimum Flood Flow Capacity

Once the data from the river transects has been inputted to the discharge spreadsheet or HEC-Geo RAS model, discharge for the current conditions (Q_c) can be estimated. This is the anticipated discharge under existing vegetation and sediment conditions that would flow through the transect and result in a depth equal to the MSWSE. The computed Q_c is then compared to the performance spec for the 10-year (Q_{10}) recurrence interval of approximately 39,000 cfs. If Q_c is less than Q_{10}, then it is concluded that the channel cannot pass the required flow, and the applicant may proceed with determining the scope of stream maintenance work necessary.

If the reach meets or exceeds the performance specification (i.e. Q_c is greater than Q_{10}), then the reach is not eligible for native vegetation removal or sediment management work that year based on channel capacity. Non-native vegetation removal could still be applied for as necessary so the property owner may proceed to the Site Work Application.

7.5.2.1.1.2 Flow Capacity Scope of Work

In this step, the applicant provides information to determine whether the reach is eligible for native vegetation treatment only, or both native vegetation treatment and sediment management. The site is eligible for native vegetation treatment and sandbar grading to the extent necessary to meet the Minimum Flood Flow Capacity, within the limits of the minimum sand bar heights.

Vegetation removal within the reach can be simulated by changing the roughness factor (n) in the discharge spreadsheet. The discharge associated with the treated reach (Q_v) can be calculated and compared to the Q_{10}. If the calculated Q_v exceeds the Q_{10}, then vegetation maintenance needs to be scaled back or removed from the proposed work application. The property owner may proceed with only non-native vegetation removal, if applicable to the project site.

If the calculated Q_v is less than the Q_{10}, then the site is eligible for that amount of vegetation removal and the discharge spreadsheet or HEC-Geo RAS should be used to print a figure depicting the proposed river cross-section.

Applicants may proceed to sandbar grading proposal if the Q_v is still less than the Minimum Flood Flow Capacity (39,000 cfs). The riverbed profile should be examined to determine where along the transect sandbar grading could be conducted, if any is proposed. The elevation at selected transect intervals should be lowered and the discharge spreadsheet rerun to generate the discharge after grading (Q_g). To accurately evaluate the benefits of sandbar grading, it will be important to indicate in the modified cross-section for each model run where the graded sandbar material has been placed. Once the grading plan has been determined, the discharge spreadsheet or HEC-Geo RAS can be used to print a new cross-section depicting the proposed grading condition. This cross-section can be used to demonstrate the proposed change in bar elevation(s) in the application package. The site is eligible for vegetation treatment and sandbar grading to the extent necessary to meet the performance spec within the limits of the minimum sand bar heights.

7.5.2.1.1.3 Compatibility with the SMP Protocol

Minimum bar height of post-graded sandbars removed for capacity purposes will be no less than 1.5 feet higher than the elevation of the low-flow water surface at the time of stream maintenance activities. Minimum bar heights will be measured from the thalweg (bottom of the low-flow channel within the first riffle downstream of the sandbar to be graded) to the top of the bar. Sandbar grading to depths below these minimum sandbar heights is not permitted, even if additional grading would provide capacity needed to meet the 10-year flow requirement.

Discharge Calculation

A = Cross-sectional area in ft^2	50
R = Hydraulic radius in ft	2
S = Slope of the energy grade line (ft/ft) (Assumed to be the channel bed slope).	0.02
n = Manning's roughness coefficient	0.012
Q = Discharge in cfs	**1394**

where:

$$\text{Discharge } (Q) = \frac{1.49 \times A \times R^{2/3} \times S^{1/2}}{n}$$

Monterey County Water Resources Agency

Salinas River Stream Maintenance Annual Site Report

Year _____

FOR AGENY USE ONLY

Application ID.

Date:

River Mile: No.

APPLICANT (Responsible Party): Municipality _____ Owner _____ Grower _____ Operator _____

Company: _____

Contact: _____ Phone (primary): _____

Address: _____ Phone (alternate): _____

City: _____ State/Zip: _____ Fax: _____

Email: _____

GENERAL INFORMATION:

River Management Unit (RMU) Name and Number _____

Activity Type: _____ Sediment Mangement _____ Re-Vegetation _____ Vegetation Removal

Location: River Mile _____ Contiguous APN Nos. _____

USGS Quad Map _____ _____

Township_____ Range_____ Section_____ _____

Rancho _____ _____

Upstream Boundary of Project Site: Latitude _____°_____'_____" Longitude _____°_____'_____"

Downstream Boundary of Project Site: Latitude _____°_____'_____" Longitude _____°_____'_____"

Quantity of Material: Sand, cu. yds. _____ Vegetation, acres _____

Equipment: _____Dozer _____Scraper _____Backhoe _____Mower _____Disc _____Truck _____Hand

Work by: _____ Owner/Operator _____ Licensed Contractor _____ Other _____

Contact Name: _____ Phone: _____

Summary of work:

A. VEGETATION REMOVAL

Photos taken: Yes _____ No _____

_____ 1. Native Plant Species In-channel _____ On-banks _____ Other location _____

Dimensions - L _____ W _____ Total Acres _____

Description & Vegetation Type: _____

Spoils Disposal Removal _____ Reuse for Re-Vegetation (native vegetation only) _____

Burning _____ Herbicide Application _____ (Name _____) Other _____

_____ 2. Non-Native Plant Species

Dimensions - L _____ W _____ Total Acres _____

Description & Vegetation Type: _____

Spoils Disposal Removal _____ Mulching _____ Burning _____

Herbicide Application _____ (Name _____) Other _____

B. SEDIMENT MANAGEMENT

No _____ Yes _____ (If yes, please complete this section.)

_____ 1. Dimensions - L _____ W _____ H _____ Est. Cut (cy) _____ Est. Fill (cy) _____

_____ Post Work Survey Completed: Surveyor _____ Phone _____

_____ Transect Summary Sheet Attached

Pre Work Channel Capacity _____ Post Work Capacity _____

Description of completed work: _____

Spoils Disposal _____ Farm _____ Levee _____ Other _____

_____ 2. Dimensions - L _____ W _____ H _____ Est. Cut (cy) _____ Est. Fill (cy) _____

_____ Post Work Survey Completed: Surveyor _____ Phone _____

_____ Transect Summary Sheet Attached

Pre Work Channel Capacity _____ Post Work Capacity _____

Description of completed work: _____

Spoils Disposal _____ Farm _____ Levee _____ Other _____

_____ Additional sheets attached (No. of sheets _____)

C. RE-VEGETATION/HABITAT RESTORATION

1. Dimensions - L _____ W _____ Total Acres _____

Description of Completed Work: _____

_____

_____

Location: _____

2. Vegetation Type Used: _____

_____

_____

Location: _____

NOTE - *Invasive non-native riparian plants, for example: Giant Reed or Arundo (Bamboo), German Ivy, Pampas Grass & Tamarisk, are not to be used for re-vegetation and should be removed where possible. Please read MCWRA pamphlets REVEGETATION USING NATIVE PLANTS and PEST PLANT SPECIES AND THEIR MANAGEMENT.*

D. ACCESS TO CHANNEL

_____ Utilize existing access way

_____ Create new access way

Grading: No _____ Yes _____

Vegetation Removal: No _____ Yes _____

Length _____ Width _____

E. TEMPORARY STREAM CROSSING

_____ Dry channel

_____ Wet channel

Type: _____ Bridge _____ Culvert

_____ Ford _____ Other _____

F. ATTACHMENTS

_____ 1. Plan sketch, ranch map or aerial photo outlining specific work area within RMU. Include rough dimensions and north arrow.

_____ 2. River mile map with location of project marked

_____ 3. Site photo sheets showing work completed

_____ 4. Transect Summary sheets for post work transects (if required)

_____ 5. Transect Date (if required)

_____ 6. Other Documents (see instructions)

Meets USACE Nationwide 13 COE Criteria: No _____ Yes _____

Regulatory Consultation Required: No _____ Yes _____

Agency	Contact	Date of site visit	Concurrence No	Concurrence Yes	Phone
_____ NOAA Fisheries	_____	_____	_____	_____	_____
_____ USFWS	_____	_____	_____	_____	_____
_____ USACE	_____	_____	_____	_____	_____
_____ CDFW	_____	_____	_____	_____	_____

Comments _____

_____

_____

Fish & Wildlife Stream Bed Alteration Agreement

Agreement No. _____

Date Received _____

Expiration Date _____

Applicant Signature _____

Title _____ Date _____

MCWRA

Received by _____ Date _____

I certify that to the best of my knowledge, the above information is true and correct, and that the maintenance work conducted met all of the conditions of the 404 Permit and other applicable regulatory conditions.

RESPONSIBLE PARTY SIGNATURE:

_____ Date: _____

8 Best Management Practices

(available after project approval)

9 Mitigation Monitoring and Reporting Plan

(available after project approval)

10 Mitigation Measure Compliance Forms

SMP Internal Work Tracking Form

Request Number:_____

Project Type: ☐ New Site Access ☐ Sediment Removal ☐ Bank Repair ☐ Vegetation Management

Staff Assigned:_____ CC:_____ Date:___/___/___

Applicant Name:_____

Location:_____

River Miles: From:_____To:_____USGS Quad(s)_____

Preliminary Site Evaluation (in office) – Indicate Required Surveys:

Nesting Bird Survey _____	☐ Yes	☐ No	☐ N/A
Least Bell's Vireo_____	☐ Yes	☐ No	☐ N/A
Bank Swallow_____	☐ Yes	☐ No	☐ N/A
Sensitive Plant Survey _____	☐ Yes	☐ No	☐ N/A
Sensitive Wildlife Survey _____	☐ Yes	☐ No	☐ N/A
San Joaquin Kit Fox_____	☐ Yes	☐ No	☐ N/A
Bats_____	☐ Yes	☐ No	☐ N/A
Aquatic Assessment _____	☐ Yes	☐ No	☐ N/A
CA Tiger Salamander/Red legged-Frog_____	☐ Yes	☐ No	☐ N/A
South Central California Coast Steelhead_____	☐ Yes	☐ No	☐ N/A

Pre-Survey Comments:

Equipment needed: Personnel needed:

Survey Results:	If Found:		Cleared By:	Date:	Exp. Date:
Nesting Birds:	☐ No	☐ Yes	_____	__/__/__	__/__/__
Native Fish:	☐ No	☐ Yes	_____	__/__/__	__/__/__
Native Amphibians:	☐ No	☐ Yes	_____	__/__/__	__/__/__
Sensitive Wildlife:	☐ No	☐ Yes	_____	__/__/__	__/__/__
Sensitive Plants:	☐ No	☐ Yes	_____	__/__/__	__/__/__

Project notes/communications:

Field Hours:_____ Office Hours:_____ Total Hours:_____

Work Request Completed by:_____ Date:___/___/___

Monterey County Water Resource Agency Salinas River Stream Maintenance Program
Biological Resource Assessment Form

Year_____

Applicant:_____ Affiliation:_____ Activity Type:_____

River Mile: _____to_____ USGS Quad(s):_____

Species	Desk Audit (Present/Absent)	Date	Preliminary Survey	Date	Pre-Construction Survey	Date	Biological Monitoring	Date	Notes
South Central California Coast Steelhead									
California Tiger Salamander									
California Red-legged Frog									
Bank Swallow									
Least Bell's Vireo									
Migratory Birds/Raptors									
San Joaquin Kit Fox									
Special Status Bats									
Special Status Wildlife									
Special Status Fish									
Special Status Plants									

Legend
P-species present H-habitat present N-no habitat A-historical account

APPENDIX H

Stakeholder Input Post-Final EIR Release

The Nature Conservancy
Protecting nature. Preserving life.™

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nature.org
nature.org/california

Mr. David Chardavoyne
General Manager
Monterey County Water Resources Agency
893 Blanco Circle
Salinas, CA 93901

August 20, 2013

Dear Mr. Ekelund:

The Nature Conservancy (Conservancy) appreciates the continued efforts of the Monterey County Water Resources Agency (Agency) in forming an approach to the Salinas River Stream Maintenance Program (SMP) that is satisfactory to affected landowners, regulatory agencies and the community. The Conservancy understands that the Agency Board of Directors will discuss the Program's environmental impact report and associated actions at its September meeting. This letter is submitted to your Board to again reiterate an interest on the behalf of the Conservancy to engage in a process to explore a comprehensive approach to flood risk reduction and habitat protection in the Salinas River. The Conservancy has expressed its interest in this pathway in several letters submitted to the Agency as part of the CEQA Notice of Preparation scoping (letter of May 27, 2011), in a letter of October 4, 2012 providing additional information about a possible multi-objective approach, and in the comment letter the Conservancy submitted on the Draft Environmental Impact Report (EIR) submitted on May 31, 2013.

The Conservancy would again like to state it is our belief that the Stream Maintenance Program as described and reviewed in the Draft EIR will not achieve the stated goals of the program. Due to insufficiencies in the technical analyses conducted for the environmental impact report and the likelihood the program will not receive permit approvals, the Conservancy again requests that the Agency not certify the EIR at this time and instead engage in a streamlined process to develop program objectives that are supported by technical and model analyses. The Conservancy believes that such a process will result in a program where flood risks can be accurately assessed and addressed using maintenance prescriptions that are cost effective and allowable under regulatory agency requirements. The Draft EIR contains some excellent mapping and vegetation analyses that could be built upon to develop a viable SMP. Continuing to develop a program that is essentially inconsistent with regulatory priorities and that is not shown to achieve significant flood risk reduction just furthers the implementation timeframe and uses financial resources of the Agency to an unknown end.

A science-based process will provide the appropriate level of flood risk identification and will include a comprehensive analysis of a system-wide approach to flood risk reduction and habitat protection. Modeling tools such as HEC RAS (one-dimensional hydraulics) and two-dimensional hydraulic models have been utilized in other river systems in California and could be rapidly adapted to develop a truly effective program for the Salinas River that lessens risk in the appropriate management areas and provides protection throughout the river corridor. However, development of a shared statement of objectives for flood management and ecological protection is critical to building this successful program.

The Conservancy requests again that the Agency consider convening a stakeholder-led process that engages appropriate scientists and experts to examine and define a stream maintenance program that protects agricultural lands from flooding and protects and maintains the habitats of the system for their ecological importance to fish and wildlife. This process would be combined with a cost benefit analysis to assess how continual maintenance and associated costs may compare against other emerging models such as shared risk pools among multiple producers for more permanent flood protection actions (e.g. setback levees). Today it is important for all public agencies to provide programs that protect community assets, meet environmental standards, are cost-effective, and achieve stated goals. Assessing these goals within an open and transparent stakeholder process seems an appropriate course of action at this time in the program development and we respectively request that the Board take serious consideration of this request.

The Conservancy's vision about this transparent process remains the same as has been reiterated in letters submitted previously. The Conservancy offers the following as a starting point for consideration by your Board, and looks forward to a positive commitment by the Agency for this process in the near term. Recognizing the expense already incurred by the Agency in preparing the Draft EIR, the Conservancy may be willing to contribute towards the completion of the necessary analyses needed to secure necessary permits.

The process described would be conducted as a "pilot " and would occur over 6 months to test whether agreements on flood management and habitat protection could be concurrently designed in one "pilot" of the SMP program area. This pilot area should include willing landowners, acreages of documented flood damages, habitat conflicts, invasives removal, and available access. If successful in designing a permittable approach for the pilot area, the process would then be considered for the entire SMP program area if agreed on by stakeholders.

In general the process would attempt to accomplish the following goals associated with a longer term SMP:

- Goal 1: Define a flood risk reduction and habitat protection program that is based on an agreed model approach for existing conditions, levels of risk, and probable benefits.

- Goal 2: Define a flood risk reduction and habitat protection program that can be permitted for a minimum of ten years and which relies on adaptive management for maintaining habitat quality and restoration rather than permanent mitigation ratios..

- Goal 3: Define a flood risk reduction and habitat protection program that can be implemented cost effectively with costs and benefits clearly defined and valued for both implementing agencies and landowners. Removal of invasives species such as Arundo donax should be prioritized within the first five years of the program.

- Goal 4: Define a flood risk reduction program that is adaptive and fits multiple watershed objectives including maintaining ecological conditions for fish and wildlife and water supply and water quality for the Salinas River.

TECHNICAL COMMITTEE: Convene a Technical Committee for 3-6 months to define the cause of flooding in the Salinas River based on scientific analysis and assessment. The goal of the committee is to refer and review appropriate analytical methods and to integrate science into environmental

management options. This committee could work first on the initial pilot area maintenance proposal and combine with a flood model analysis of outcomes for risk reduction.

Potential tasks for this committee could include the following:

- Refine hydraulic model topography to more accurately represent overbank flow and habitat conditions
- Integrate Arroyo Seco directly (by adding Arroyo Seco channel and hydrology to existing hydraulic model) or indirectly (by adding Arroyo Seco hydrology to existing hydraulic model input flows)
- Model storm hydrographs (instead of single, steady flows) and include flows larger than the 10-year (e.g. 25-, 50-, and 100-year)

The modeling effort would be informed by "on the ground" input from landowners, historical aerial photography, and other information to better characterize flooding conditions. Refined channel maintenance activities (preferably including exotic removal) could be evaluated using modeling that includes sensitivity analysis to bound likely performance. This exercise should optimize any initial maintenance to SMP priority areas that are bottlenecks or otherwise control peak water surface elevations.

ENGINEERING, DESIGN & PERMITTING COMMITTEE: Using outcomes from the Technical Committee, convene an Engineering, Design and Permitting Committee to develop preliminary design options for achieving outcomes for flood risk reduction and habitat protection and review likelihood of success for permitting.

Potential tasks for this committee could include the following:

- Identify specific flood risk reduction metrics (e.g. peak flow water surface elevation reduction at Salinas, inundated area reduction at Chualar, etc.)
- Identify specific ecosystem enhancement/restoration metrics (e.g. adult steelhead passage, juvenile steelhead rearing, riparian vegetation diversity, etc.)
- Develop a set of pilot maintenance activities that reduce flood risk, protect or enhance ecological conditions, and are cost-effective
- Modify corrected baseline hydraulic model to represent individual maintenance actions and combinations of actions.
- Extract hydraulic model results to "score" each scenario based on its performance as measured by flood risk reduction and ecosystem enhancement / restoration metrics
- Compare scenario "scores" to baseline "scores" and rank scenarios according to their flood risk reduction and ecosystem restoration/enhancement performance
- Assess permit availability for the scenarios with the regulatory agencies with 10 year permit as stated goal

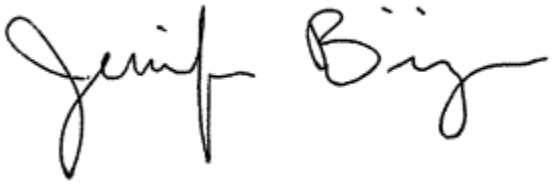
COST BENEFIT ANALYSIS: An important part of the process will be consideration of the full economic costs and benefits of pilot SMP scenarios, including quantifying up-front capital and implementation costs, on-going maintenance costs, and any potential lost value. A robust cost benefit model would also include the benefits associated with ecosystem services (e.g. groundwater recharge, more predictability in flooded areas).

The Conservancy believes market mechanisms and tools, such as risk pools and benefits transfers, could have compelling applications in the SMP program area in order to maximize positive outcomes across the list of socioeconomic and ecological benefits described above. Physical management activities are proposed to reduce flood risk; though where occasional flooding may be required in order to reduce risk for the watershed as a whole, market-based tools could be used to reduce negative financial repercussions to individual growers.

One specific issue worth highlighting is that the risks associated with certain strategies, such as allowing some flooding, could have unequal impacts on growers. In such situations of uneven risks or benefits in other settings, and where well-established tools such as insurance could not provide sufficient coverage, the Conservancy has had success in allowing producers to pool their risk. Such "risk pooling" strategies offer the advantage of aggregating risk across all farmers who are impacted, thus resulting in a more fair, less expensive, and ultimately acceptable, outcome. Such market-based approaches can also confer other benefits, e.g. allowing the growers themselves to exert governance and control over the strategy being implemented.

We hope that this process proposal, with the focus on an initial pilot project, is agreeable to the Agency as a test case for developing a longer-term cooperative partnership for the Salinas River. We look forward to your response to the above proposal at your earliest convenience.

Sincerely,



Jennifer Biringer
Sr Director, Central Coast
The Nature Conservancy, California Chapter

The Otter Project
www.otterproject.org

P.O. Box 269
Monterey, CA 93942
831/663-9460

Supervisor Lou Calcagno
Supervisor Simon Salinas
Joint Committee of the Board of Supervisors and WRA Board of Directors

Dear Supervisors Calcagno and Salinas and WRA Directors,

Today, 17 December, the Joint Committee of the Monterey County Board of Supervisors and the Water Resource Agency Board of directors meets to discuss both the Salinas Channel Maintenance Program and the 11043 Water Right.

The Otter Project/Monterey Coastkeeper appreciates the Board of Supervisors staying abreast of the current status of these critical Water Resource Agency (WRA) projects.

These two critical projects exist in a context of many projects that have been unresolved for years, even decades:

The Salinas Valley Water Project Biological Opinion. NOAA Fisheries is tasked with recovering the threatened steelhead trout and the Salinas River watershed is critical to that effort. The biological opinion issued by NOAA requires that the WRA reduce the pollution loads flowing from the Blanco Drain and ensure flows for passage of fish between Monterey Bay and Salinas River tributaries, among other things. Instead of complying with this agreement, the WRA consistently asks attorneys Downey-Brand to intervene. Although my opinion, I believe there is no longer any trust between WRA and NOAA Fisheries.

Waste Discharge Requirements for the Blanco Drain and Reclamation Ditch. It is my understanding that when water is conveyed and discharged into a receiving water, State Water Code requires the discharger to file a Report of Waste Discharge and be issued Waste Discharge Requirements (WDRs). The WRA operates and maintains a system of ditches and pumps that form a disposal system for agricultural waste. Clearly, WDRs are required but yet again the WRA has engaged Downey-Brand to fend off the Regional Water Quality Control Board. Again, I believe there is a lack of trust between the Regional Water Board and the WRA.

Pollution caused by the WRA, Blanco Drain, and Reclamation Ditch. Not only does the WRA operate and maintain the ditches, but also moves sediment and applies herbicides, further degrading water quality. The Otter Project/Monterey Coastkeeper sued the WRA to improve water quality, again Downey-Brand was paid to step in, and after three years that lawsuit has not settled. Certainly, there is a lack of trust between the WRA and my organization.

Breaching of the Salinas River Lagoon. It is undisputed that bulldozing a channel to drain a lagoon requires a Coast Commission permit. For years, the Coastal Commission has asked the WRA to obtain a permit but the WRA has not followed through. A box of papers (as characterized by Coastal Commission staff) does not constitute a permit application and other

issues (such as “take” of steelhead and other endangered species) must be resolved before the permit can be issued. Again, I believe there is a lack of trust between agencies.

One could go on and on listing programs and projects where the WRA has cut corners by not obtaining required permits or by ignoring laws and regulations (whether knowingly or not) and then backfilling with Downey-Brand. Downey-Brand has been incredibly successful “fending-off” the issues, but nothing is ever resolved and trust is never built. The WRA is juggling issues instead of resolving them. The WRA now finds itself trapped because juggling the issues is all they can afford. I believe we are at the point of collapse, the point when the juggled balls will all come tumbling down.

Over the past few months in an effort to find common ground I have met with some area growers and their representatives. Again, in my opinion, I believe some do not trust the WRA and others do not have faith in the WRA’s competence.

Now we are faced with two critical issues – Channel Maintenance and possible revocation of an important water right. Downey-Brand has a history of being involved with both issues. Will they be juggled or resolved?

Salinas River Channel Maintenance (CMP)

Over the past three weeks the WRA has held meetings in Kings City, Soledad, and Salinas to hear input and ideas about the CMP, I attended every meeting. It is important to note that the meetings were poorly attended and the only stakeholder interest represented was the growers. Very generally, the growers expressed a strong desire to keep local control and a desire to have a program similar to what has been done in the past. Generally my impressions were that environmentalists and NOAA Fisheries are blamed for the lack of maintenance.

Separate from these meetings, the WRA has convened an ad hoc group to discuss “short term” and “long term” management of the Salinas River. The short term group has generally stressed the hope The Nature Conservancy demonstration project will be successful and the feeling that the DEIR prepared by the WRA may need revision and clarification before it is ready for further review.

Although the stakeholders all agreed the DEIR was not ready for approval, in the last hour of the last meeting the WRA suggested they would move for approval. It was only when the stakeholders – more emphatically – expressed themselves that the WRA agreed to hold back. Again, the lack of trust was heightened.

Water Right 11043

Salt water intrusion has been known to be occurring for over half a century and the WRA has been tasked with solving the issue. The WRA has built two large dams, a rubber dam, and a recycled water project. The augmented water supply has generally been used by agriculture to grow more water intensive crops and vastly increase the number of irrigated acres. Although I believe the WRA has the authority to limit pumping, it has never exercised this regulatory ability. We do not believe the WRA has the inclination or political will to ever reverse intrusion – the WRA will just continue to chase its tail.

It is my belief that some State agencies share my belief and the strict terms of the settlement agreement reflect this lack of faith and trust.

The strict timeline requires that the proposed project(s) have two attributes:

1) Have little opposition. Any opposition will delay the project. I believe new storage sites and long canals will have severe opposition. I have heard some suggest that delays will be tolerated by the State Water Resources Control Board; I believe there is great risk in this belief: Will the State agree to the delays and/or will more Downey-Brand legal fees be needed?

2) The project needs to be fundable. I do not believe the Salinas Valley – by itself – has the capacity or tolerance to pay for a major project; I believe partnerships -- such as with the Monterey Peninsula or even San Luis Obispo County -- is the only viable solution.

Solutions (give a little, get a lot)

A friend recently told me that I need to be FOR something and find a project The Otter Project/Monterey Coastkeeper could support. In a separate conversation with a key grower we realized that only by solving our water "needs" (supply, flood protection, flows, water quality) TOGETHER can we make progress. I feel there is broad agreement – grower, NOAA Fisheries, Water Quality Control Board, environmental, and political – for the following:

Inter-Lake Tunnel. An Inter-Lake tunnel would dramatically increase water storage at the two lakes, would utilize the existing storage footprint and infrastructure, and would have little opposition. The water could be percolated and if done properly could turn back saltwater intrusion. Percolation means that the water becomes groundwater and is likely unavailable to the Monterey Peninsula. NOAA Fisheries would likely want additional fish passage days/opportunities. Additional releases would put further stress on Channel Maintenance.

Diversion of summer flows (plus a little). The Salinas Industrial Ponds, Blanco Drain, Salinas Stormwater, and Reclamation Ditch could be diverted to the Regional Pollution Control Agency for secondary and tertiary treatment. A portion of this flow would receive tertiary treatment and be offered to the Monterey Peninsula and/or used for groundwater replenishment. This solution resolves (some of) the NOAA Fisheries Biological Opinion, could be used to partially comply with RWQCB WDRs (my belief, but not within my control), and would go a long way in resolving the dispute between the WRA and my organization. This solution both provides needed water to the Peninsula and also provides water to the Purple Pipe recycled water project. The volume of water is sufficient that an attitude of "sharing" may be possible.

Breaching of the lagoon. I believe this is a small detail, but must be part of a broad agreement.

Salinas River Channel Maintenance. By resolving the above issues it becomes much more possible to think more broadly about Channel Maintenance. Can the environmental stakeholders live with maintenance of critical choke points? Can growers live with some areas of the river being inundated at certain high flood flows? Can environmental stakeholders live with some vegetation being removed and can growers live with some vegetation remaining in critical habitat areas?

Water Right 11043. Packaging these projects together would require amending 11043 but I feel amending will be required with any proposal. I do believe that such a broad win-win solution could have SWRCB support.

I want to believe that by solving each other's problems, by working together, such a broad deal can be brokered. I believe that the only way forward is by thinking of this larger solution as one project, one solution. With the pervasive lack of faith and trust I do not believe that stakeholders – any stakeholders – can trust that a deal by deal, step by step, approach will meet their needs.

I fear that the Monterey County Water Resources Agency does not have the board structure, capacity, or appropriate personnel to think and act in the broader interest, let alone in the interest of the entire County. I fear that as currently structured and operating the WRA is not the appropriate catalyst for a positive water future. I believe the WRA is fundamentally flawed. I would urge the Board of Supervisors to lead a new effort, an effort to find agreement for the package of projects (together), followed by an effort to refine the details. I believe such an agreement would channel much needed financial resources into solutions rather than legal fees. I believe it can all be done.

Thank you for the opportunity to express my opinion on these issues. I urge you to think broadly and creatively. I also urge the Board of Supervisors to take a leadership role in this effort.

Sincerely,

Steve Shimek
Chief Executive
exec@otterproject.org
831-663-9460 (o)
831-241-8984 (c)

Salinas Valley Water Coalition
P.O. Drawer 2670 • Greenfield, CA 93927
(831) 674-3783 • FAX (831) 674-3835

FARM BUREAU MONTEREY
P.O. Box 1449, Salinas CA 93902 <> 831/751-3100

December 16, 2013

Monterey County Water Resources Agency
Board of Directors
P.O. Box 930
Salinas, CA 93902

Hand Delivered

Dear Chair and Directors:

The Monterey County Farm Bureau and Salinas Valley Water Coalitions submit the following comments and recommendations to the Monterey County Water Resources Agency (MCWRA) Salinas River Stream Maintenance Program and its EIR for your review and consideration. We first thank you for postponing the decision on the Program and certification of its EIR to allow yourselves and staff, as well as the general public, additional time to fully understand the ramifications of Program approval and EIR certification.

We appreciate the public outreach that's been conducted by MCWRA staff over the past couple of months, including the formation of a stakeholder group to meet and discuss this issue in a collaborative manner. Our understanding, based upon staff presentations, and the discussions in the stakeholder meetings, is that the current EIR is for a project that addresses only the short-term needs for channel maintenance. Your staff has stated that a project that meets the long-term channel maintenance needs has yet to be developed. Based on this understanding, we offer the following comments and recommendations:

- The MCWRA should amend the current proposed Salinas River Stream Maintenance program so that it: 1) clarifies that the program is designed to meet the short-term channel maintenance needs; 2) eliminates those items in the proposed program that are more appropriate for a long-term program, such as permanent mitigation; and 3) commits the MCWRA to work with stakeholders to develop a process and project to meet the long-term channel maintenance needs.

- The proposed short term program should be expanded to allow for all activities that can be readily accomplished to reduce flooding risk such as:

    - Removal of obstructions from drainage ditches and culverts;
    - Removal of all non-native vegetation; and
    - Removal of vegetation and sediments at choke points (where there is no water).

- The proposed short term program should also be expanded to include the projects proposed by The Nature Conservancy, the Resource Conservation District of Monterey County, and other groups or individuals so that they may rely on the EIR and work with willing landowners.

- The MCWRA should incorporate master or regional state and federal permits (e.g., master/regional 404 Permit) into the short-term and long-term programs, rather than require individual permits as mitigation measures in the EIR, in order to expedite

channel maintenance activities. The concept of master/program permits is not new and in fact, master permits were effective in prior channel maintenance programs implemented by the MCWRA.

- The MCWRA should ***not recommend that the Board of Supervisors*** approve the current Salinas River Stream Maintenance Program, until amended/revised pursuant to this letter.

- The MCWRA should ***not recommend that the Board of Supervisors hold a public hearing to consider certifying*** the current Salinas River Stream Maintenance Program EIR, until further environment review is performed on the amended/revised project.

Once the proposed project has been modified accordingly, then it would be appropriate to perform additional environmental review, as necessary, to satisfy the CEQA requirements for the modified short term program.

Upon approval of the modified short term program and certification of its EIR, the MCWRA should continue to work with stakeholders to develop the long-term program. Since the program has yet to be defined, we ask that you consider for future discussions the following activities for the long-term program:

- Mechanical removal or relocation of vegetation, sandbars, and silt deposits in areas not greater in elevation than five feet above the relative dry channel bed, and that is either dry or more than nine inches above any standing water;
- Bank stabilization activities as necessary for erosion protection;
- Mechanical clearance of sedimentation and vegetation in areas with no water; and
- Obstruction removals from drainage ditches and culverts.

Our organizations and the other organizations of the Salinas River Channel Task Force and their members are committed to working with the MCWRA and other stakeholders on developing the long term program.

We are concerned that already-threatened legal actions against the certification by the Board of Supervisors will be initiated should the MCWRA Board recommend certification of the current EIR without modification. In such a situation, it's more than likely that MCWRA (and ratepayers) funds will be expended on defending the lawsuit rather than addressing flood control and protection for landowners, businesses, cities and the community.

We respectfully request that you not certify the EIR and proceed forward in a manner consistent with the recommendations herein.

Sincerely,

Nancy Isakson, President
Salinas Valley Water Coalition

Norm Groot, Executive Director
Monterey County Farm Bureau

Salinas River Channel Coalition

GROWER-SHIPPER ASSOCIATION
of Central California
Since 1950

Hand-Delivered

Monterey County Water Resources Agency
Board of Directors
P.O. Box 930
Salinas, CA 93902

December 16, 2013

Dear Chair and Directors:

The Salinas River Channel Coalition and the Grower Shipper Association of Central California submits the following comments and recommendations to the Monterey County Water Resources Agency (MCWRA) Salinas River Channel Maintenance Program and its EIR for your review and consideration. We first thank you for postponing the decision on the Program and certification of its EIR to allow yourselves and staff, as well as the general public, additional time to fully understand the ramifications of Program approval and EIR certification.

We appreciate the public outreach that's been conducted by MCWRA staff over the past couple of months. Our understanding, based upon staff presentations, is that the EIR is for a project that addresses only the short-term needs for channel maintenance. Your staff has stated that a project that meets the long-term channel maintenance needs has yet to be developed. Based on this understanding, we offer the following comments and recommendations:

- The MCWRA should delay certification of the Salinas River Channel Maintenance Program EIR.
- The MCWRA should delay approval the current Salinas River Channel Maintenance Program until revised pursuant to this letter.
- The MCWRA should delay certification of the current Salinas River Channel Maintenance Program until further environmental review is performed, as necessary, on a revised project as mentioned below.
- The MCWRA should revise its proposed Salinas River Channel Maintenance program so that it: 1) clarifies that the program is designed to meet the short-term channel maintenance needs; and 2) commits the MCWRA to work with stakeholders to develop a process and project to meet the long-term channel maintenance needs.
- The proposed short term program should be expanded to allow for all activities that can be readily accomplished to reduce flooding risk such as:
    - Removal of obstructions from drainage ditches and culverts;
    - Removal of all non-native vegetation; and
    - Removal of vegetation and sediments at choke points (where there is no water).

- The proposed short term program should also be expanded to include the projects proposed by The Nature Conservancy, the Resource Conservation District of Monterey County, and other groups or individuals so that they may rely on the EIR and work with willing landowners.

- The MCWRA should incorporate master or regional state and federal permits (e.g., master/regional 404 permits) into the short-term and long-term programs, rather than require individual permits as mitigation measures in the EIR, in order to expedite channel maintenance activities. The concept of master/program permits is not new and in fact, master permits were effective in prior channel maintenance programs implemented by the MCWRA.

Once the proposed project has been modified accordingly, then it would be appropriate to perform additional environmental review, as necessary, to satisfy the CEQA requirements for the modified short term program.

Upon approval of the modified short term program and certification of its EIR, the MCWRA should continue to work with stakeholders to develop the long-term program. Since the program has yet to be defined, we ask that you consider for future discussions the following activities for the long-term program:

  - Mechanical removal or relocation of vegetation, sandbars, and silt deposits in areas not greater in elevation than five feet above the relative dry channel bed, and that is either dry or more than nine inches above any standing water;
  - Bank stabilization activities as necessary for erosion protection;
  - Mechanical clearance of sedimentation and vegetation in areas with no water; and
  - Obstruction removals from drainage ditches and culverts.

The organizations of the Salinas River Channel Task Force and their members are committed to working with the MCWRA and other stakeholders on developing the long term program.

We are concerned that already-threatened legal actions against the certification will be initiated should the MCWRA Board recommend certification of the current EIR without modification. In such a situation, it's more than likely that MCWRA (and ratepayers) funds will be expended on defending the lawsuit rather than addressing flood control and protection for landowners, businesses, cities and the community.

We respectfully request that you delay the certification of the EIR and proceed forward in a manner consistent with the recommendations herein.

Sincerely,

Abby Taylor-Silva
Vice President, Policy & Communications
Grower-Shipper Association of Central California

Benny Jefferson, Chairman
Salinas River Channel Coalition

The Otter Project
www.otterproject.org

P.O. Box 269
Monterey, CA 93942
831/663-9460

February 13, 2014

Ms. Shuana Juarez, Monterey County Water Resources
Mr. David Chardavoyne, Monterey County Water Resources Agency
Board of Directors, Monterey County Water Resources Agency
Monterey County Board of Supervisors

Via Email

Re: Salinas River Channel Maintenance and Draft EIR

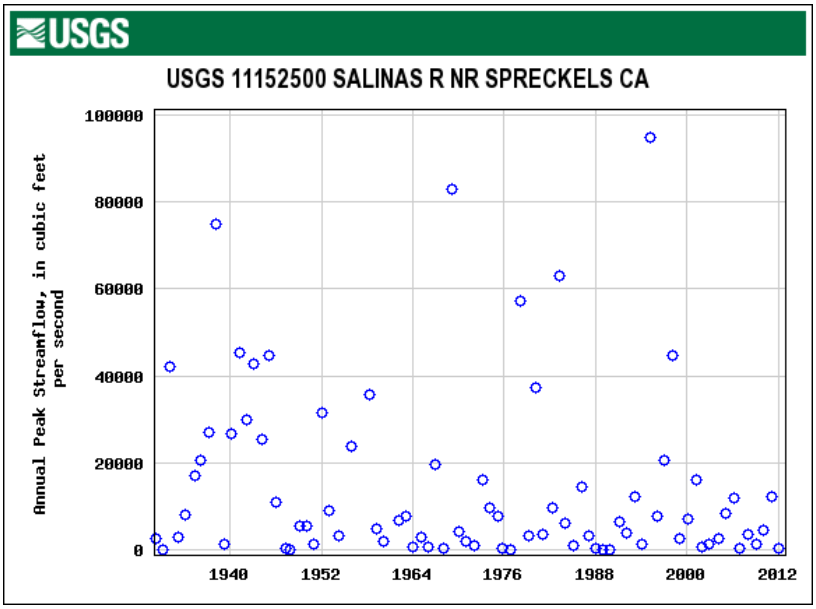
Dear Ms. Juarez, Mr. Chardavoyne, Directors, and Supervisors:

Finding solutions for any Salinas River issue is always difficult and contentious. The very nature of the river itself makes it so.

Native son and Nobel laureate John Steinbeck described the Salinas best:

> "In the winter of wet years the streams ran full-freshet, and they swelled the river until sometimes it raged and boiled, bank full, and then it was a destroyer. The river tore the edges of the farm lands and washed whole acres down; it toppled barns and houses into itself, to go floating and bobbing away. It trapped cows and pigs and sheep and drowned them in its muddy brown water and carried them to the sea. Then when the late spring came, the river drew in from its edges and the sand banks appeared. And in the summer the river didn't run at all above ground. Some pools would be left in the deep swirl places under a high bank. The tules and grasses grew back, and willows straightened up with the flood debris in their upper branches. The Salinas was only a part-time river. The summer sun drove it underground."

Prose reduced to data points paints a similar picture; flows on the Salinas River are extremely erratic.



The river that carved the Grand Canyon, the Colorado River has normal flows of around 10,000 cubic feet per second; the peak flow of the Salinas in the 1995 flood was nearly ten times the flow of the Colorado and the peak flow of the 1998 flood was over four times. Suggesting that channel maintenance – or any flood control plan – could restrain these "act of god" events creates false hope and is detrimental to a constructive conversation.

The "part-time" nature of the Salinas River is part of the problem: Because the summer-river retreats underground, agriculture has encroached on the channel to the point where the Salinas no longer has any place to go when it swells, except into the fields. The root problems of managing the Salinas are the nature of the river and the encroachment of agriculture.

Salinas River upstream of Gonzales Bridge in 1989. Arrows mark edge of channel.

Identical view of Salinas River at Gonzales in 2012. Arrows mark edge of 1989 channel.

The old-school solution to the problem has been to remove all vegetation from the channel; the theory being that brush and willows choke the channel causing flooding. However, there is no evidence that past activities have reduced flooding and recent hydrologic modeling by MCWRA and The Nature Conservancy both show that clearing the channel has marginal benefits at best.

This is perhaps the most intensively managed sections of river. January 2009


The same stretch flooded by the very modest high water of 2011.

Times have changed. Research informs us that:

- Channelizing a stream can accentuate the peak flow and erosive velocity of the water;
- Vegetation attenuates and depresses the peak flow;
- Vegetation can dramatically reduce nitrate, pesticide, and sediment pollutants in water; all severe problems in the Salinas watershed;
- Riparian and wetland vegetation increases percolation of surface waters to groundwater.

Times have also changed for resource protection, regulatory, and permitting agencies; they are now balancing the beneficial uses of riparian and wetland vegetation management between endangered species, habitat values, water quality benefits, flood control, erosion management, and more.

<u>This is not to say that the benefits of vegetation management for flood control are without merit. On the contrary, we suggest that smart vegetation management, balanced with other concerns, can offer an opportunity to reduce flooding and protect other valuable resources.</u>

The Draft EIR created for the Monterey County Water Resources Agency was found deficient and panned by every stakeholder group. More importantly, NOAA Fisheries stated:

> "NMFS believes the proposed SMP may adversely affect S-CCC steelhead and their habitat. NMFS believes the proposed SMP perpetuates large-scale, environmental degradation for minimal flood protection at the localized scale."
>
> "In conclusion, NMFS believes the SMP is not protective of steelhead and their habitat and is not sustainable. The SMP will need a U.S. Army Corps of Engineers (Corps) Clean Water Act (Section 404) permit. To issue a permit, the Corps must consult with NMFS under the ESA. NMFS is concerned the SMP, as proposed, may result in jeopardy."

And the Regional Water Quality Control Board which must issue a 401 Water Quality Certification stated:

> "Central Coast Water Board staff finds the proposed Program will degrade water quality and significantly impact beneficial uses in the Salinas River and its tributaries. The removal of vegetation and sediment will cause an increase in turbidity, mobilize pollutants, alter the geomorphology of the channel, and reduce habitat and riparian buffers. These impacts will adversely affect aquatic and biological resources in the impaired Salinas River."
>
> "Central Coast Water Board cannot certify through Clean Water Act §401 Water Quality Certification that the Project as currently proposed will comply with water quality standards."

Certifying the current Draft EIR takes us nowhere.

Likewise, simply inserting a set of small scale projects is also fundamentally flawed and may not be approved by the permitting and regulatory agencies as the projects will appear in the EIR without any analysis or justification. To suggest that the Draft EIR – panned by everyone – is broad enough to offer validation to projects concocted entirely separate from the EIR process is without merit and essentially highlights the fatal flaws expressed by NMFS Fisheries and the Regional Board.

While many stakeholders and the regulatory agencies may (mostly) agree that The Nature Conservancy (TNC) demonstration project has much merit, simply inserting that project within the current Draft EIR is

flawed for the reasons stated immediately above. Further, it also leads us to another dead-end because the rest of the River is left without a solution.

So how do we move ahead from here?

The greatest value of the TNC demonstration project is that it points us toward a process and a solution for the entire Salinas River. The Draft EIR should be immediately supplemented to define a process project proponents must follow:

- Science-based – The project applicants shall perform necessary hydrological and biological analyses to determine the existing conditions and define the basis for identifying management options;
- Impact avoidance, minimization and mitigation – Based on the biological survey, the applicants must identify and delineate on a map sensitive species' habitats and shall avoid or, minimize and mitigate those impacts;
- Baseline hydrology – Based on the hydrological survey, the applicants shall provide adequate information so that management actions are identified to address and improve upon the baseline conditions. Both pre- and post-project conditions must be defined;
- Cooperative – Cooperative projects (i.e. River Management Units) between a number of contiguous landowners will be encouraged and given preference;
- Engagement – Applicants will engage resource agencies and advisors to ensure multiple benefits;
- Site-specific management – Applicants will describe with maps and text the type and extent of management activities;
- Monitoring – Applicants agree to a monitoring program measuring multiple project benefits including flood risk reduction and ecological conditions.

Supplementing the Draft EIR with this science-based process best utilizes the existing document, creates a reasonable path forward, will hopefully be agreeable to most stakeholders, and will allow growers and property owners along the entire river to move ahead.

Certifying the existing Draft EIR is most likely dead on arrival at the permitting agencies. Simply inserting ad hoc projects that were developed far removed from the Draft EIR is similarly DOA.

Supplementing the EIR with a scientifically sound process to balance resource values with flood protection is the direction most likely to be agreeable with stakeholders and permitting agencies.

Sincerely,

Steve Shimek
Chief Executive

APPENDIX I

Chualar and Gonzales River Management Units Project Description

Salinas River Multi-Benefit Demonstration Project:

Chualar and Gonzales River Management Units

Project Description and Application for 401 Water Quality Certification

Revised Final
May 20, 2014

Prepared for:

Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401
Attn: Jennifer Epp

Table of Contents

Executive Summary

Project Purpose and Need

The Salinas River has experienced flooding events in recent years which have damaged agricultural crops along the river corridor. A flood maintenance program is desired by public and private entities to prevent damages from flood events. The Salinas River Multi-Benefit Demonstration Project is a demonstration involving a cooperative planning and design process with agencies, stakeholders, and landowners and growers to establish a flood risk reduction approach for a portion of the Salinas River that also maintains ecological conditions for fish and wildlife and is consistent with other priorities for the Salinas River including groundwater recharge. The project occurs on two River Management Units (RMUs) along the Salinas River at river miles 22.7 to 29.2 and river miles 32.7 to 37.7. These are referred to as the Chualar River Management Unit and the Gonzales River Management Unit respectively. The objective for the Chualar and Gonzales RMU's is to reduce flood risk to agricultural land adjacent to the Salinas River while maintaining or enhancing natural habitat and ecological and hydrological processes. This will be achieved through vegetation maintenance, sediment management, and non-native vegetation removal in designated secondary or high flow channels outside of the low flow channel.

Project Location

The proposed project includes 11.5 total miles of the Salinas River near the towns of Chualar and Gonzales and west of Highway 101 in Monterey County. The 11.5 miles of project area is broken into two reaches along the Salinas River. For ease of referral, these two reaches of the river have been named "River Management Units" or RMUs. The RMUs encompass the entire river channel width from bank to bank. The RMUs include primarily privately owned farm properties. These properties either are adjacent to, enter into, or cross the active river channel.

The upstream Gonzales RMU begins at river mile 37.7 and ends at river mile 32.7 or 5 miles of the river. The downstream Chualar RMU begins at river mile 29.2 and ends at river mile 22.7 or 6.5 miles of the river.

Project Activities

The Project includes vegetation maintenance (mowing and discing), sand/sediment management (channel smoothing), and non-native vegetation removal (Arundo and tamarisk) within the RMUs to reduce risk of flooding to adjacent farm fields and prevent bank erosion. Project activities will occur in a series of linear "secondary channels" designed to become active during higher flow events (5-year interval or approximately 22,000 cfs). These activities would occur annually with reduced activity expected over the 5-year permit period due to 90% of vegetation management occurring in years 1-2 and spot management in years 3, 4 and 5 as vegetation begins regrowth in the channel. The Chualar RMU has 12 proposed secondary channels and the Gonzales RMU has 18 proposed secondary channels. Sediment management

will not exceed 250,000 cubic yards over the 5-year permit period and will occur in secondary channels 10 & 11 in Chualar only.

Avoidance and Minimization

Vegetation maintenance, sediment management, and non-native vegetation removal will take place in up to 30 secondary channels that have been located and mapped with the two RMUs. The secondary channels follow natural topographic contours well outside the low-flow channel to avoid impacts to steelhead and sensitive habitat.

The secondary channels become activated in 2-year (5,000 cfs) to 5-year flow events (22,000 cfs) and thus convey waters in the broader floodplain in such events. Each secondary channel meets, or tie-ins with the low flow channel at upstream and downstream locations as would be expected in a more natural braided river channel. By concentrating maintenance in the secondary channels, maintenance near the low flow channel and in other parts of the lower floodplain can be completely avoided.

Pre-maintenance surveys will be completed no more than 60 days in advance of the commencement of maintenance work. Pre-maintenance surveys will: 1) set clear, enforceable boundaries for where work will occur 2) ensure sensitive resources are avoided, where possible, and 3) quantify unavoidable resource impacts in order to identify remaining mitigation needs. The final acreage and vegetation types affected by maintenance activities will be determined for each secondary channel and reported for each RMU after pre-maintenance surveys are completed prior to commencement of work.

To avoid impacts to listed and sensitive species and communities, maintenance activities will occur between October 1 and November 15, outside bird nesting season, amphibian breeding season, vegetation growing season, and steelhead adult and smolt migration periods. The biological impact analysis developed for this project indicates very limited potential for "take" of either plant, fish or wildlife species listed as threatened or endangered under the federal Endangered Species Act or the California Endangered Species Act. That said, if a listed species is encountered during maintenance work and take authorizations have not obtained, work will be stopped and the California Department of Fish and Wildlife and/or the US Fish and Wildlife Service will be notified immediately and a plan of action will be developed in consultation with the appropriate agency or agencies.

Equipment Best Management Practices:

- No washing of vehicles at job site.
- No fueling of equipment/vehicles in immediate floodplain or near a stream channel
- No equipment servicing will be done in a stream channel or immediate floodplain
- Proper training for handling of hazardous materials including training and notification for any emergencies or spills to Chemical Emergencies/Spills Hotline at 1-800-510-5151
- Prevention of accidental release of chemicals, fuels, lubricants, and non-storm drainage water through training for spill prevention, hazardous material control, and clean-up of spills.

- No fueling, repair, cleaning, maintenance or vehicle washing will be performed in the creek channel or in areas at the top of a channel bank that may flow into a creek channel

Sediment Removal Best Management Practices:

- Sediment removal areas in the secondary channels will be graded to match grade with adjacent elevations.
- Sediment removal will not result in vertical transitions or elevation blockages between removal areas and upstream and downstream channel areas
- Sediment will be removed to farm field or outside of active floodplain
- Sediment will not be stockpiled in the active channel

Estimated Project Impacts and Mitigation Proposal:

The estimated impact acreages for RMU management activity are detailed below. These estimates are maximum estimates of impact and will likely be less once pre-construction maintenance surveys are completed and work areas are staked. However for the purposes of the impact calculations these figures should be considered.

Chualar RMU Secondary Channels	**Total Acreage**	**Proposed Mitigation**
Arundo-dominated Removal	14 acres	none
Sparse Herbaceous with or without Arundo	29 acres	none
Early Successional Perennial Riparian	13 acres	none
Mid-Successional Willow	3 acres	3:1 Arundo Removal
Early and Mid-Successional Cottonwood	0 acres	3:1
Total	**59 acres**	
Gonzales RMU Secondary Channels	**Total Acreage**	
Arundo-dominated Removal	20 acres	none
Sparse Herbaceous with or without Arundo	30 acres	none
Early Successional Perennial Riparian	20 acres	none
Mid-Successional Willow	6.1 acres	3:1 Arundo Removal
Early and Mid-Successional Cottonwood	3.1 acres	3:1
Total	79.2 acres	

I. Location of the Proposed Project

The Salinas River flows north from San Luis Obispo County through Monterey County and empties in the Monterey Bay near Moss Landing, California. The river is ~170 miles long and includes a ~4200 square-mile watershed.

The two project areas, or River Management Units (RMUs), proposed for multi-benefit river management demonstration, are located near the towns of Chualar and Gonzales, approximately 6 and 9 miles south of Salinas in Monterey County, California. See Figure 1 - Vicinity Map of Program Area. The project areas are accessed from Highway 101 traveling west on Chualar River Road and Gonzales River Road respectively. The project areas can also be accessed traveling east from River Road. All project areas are on private properties and are located immediately south and north of the Chualar and Gonzales Bridges respectively.

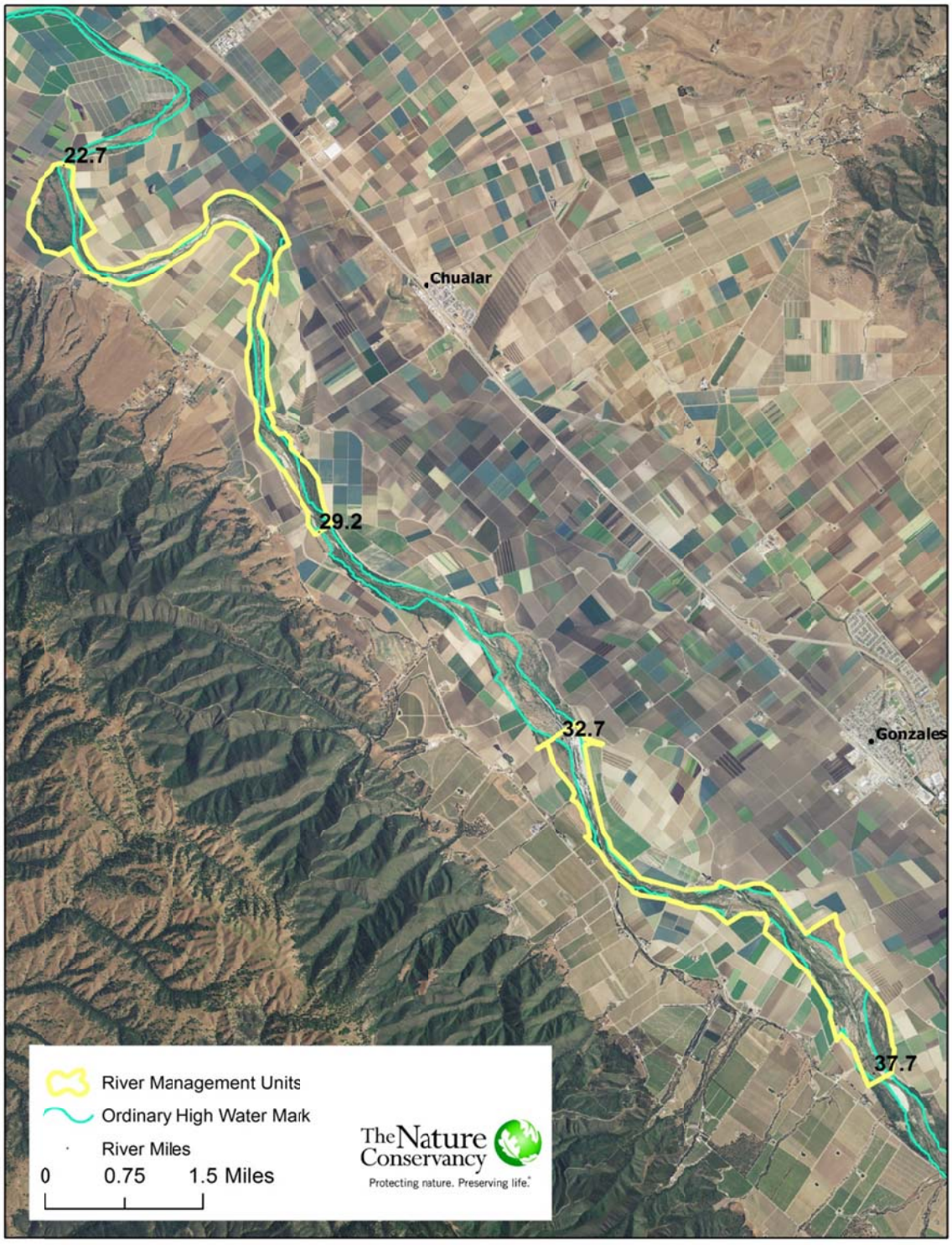
The proposed project includes 11.5 total miles of the Salinas River near the towns of Chualar and Gonzales and west of Highway 101 in Monterey County. The 11.5 miles of project area is broken into two reaches along the Salinas River. .

The upstream Gonzales RMU begins at river mile 37.7 and ends at river mile 32.7 or 5 miles of the river. The downstream Chualar RMU begins at river mile 29.2 and ends at river mile 22.7 or 6.5 miles of the river. Associated latitude and longitude points for the Gonzales and Chualar RMU's include:

Project Area	Latitude	Longitude
Chualar River Mile 22.7	36°34'46.99"N	121°34'50.35"W
Chualar River Mile 29.2	36°32'37.89"N	121°32'30.32"W
Gonzales River Mile 32.8	36°30'34.86"N	121°29'52.14"W
Gonzales River Mile 37.7	36°27'45.72"N	121°26'50.53"W

There is approximately 3.5 miles of river (river miles 32.8-29.1) between the two RMUs that are not part of the project area (see Figure 1 – Vicinity Map). These river miles are not part of the project due to limited time available to engage landowners beyond the proposed RMUs. A portion of the 3.5 miles of the river not included in the RMUs would be eligible for maintenance under criteria proposed under the Salinas River Stream Maintenance Program. That program is currently finalizing its CEQA review.

Figure 1: Vicinity Map – Project Area



II. Background for the Project

The Salinas River Multi-Benefit Demonstration Project ("Project") was initiated in October 2013 by The Nature Conservancy (TNC) in partnership with the Monterey County Water Resources Agency (MCWRA) and landowners and growers who farm along an area of the Salinas River near the towns of Chualar and Gonzales. The Project is a demonstration involving landowners and growers, MCWRA, and TNC in a cooperative planning and design process to establish a flood risk reduction approach for a portion of the Salinas River that also maintains and improves ecological conditions for fish and wildlife and is consistent with other priorities for the Salinas River including groundwater recharge. For the purposes of this Project Description the following designations describe roles for the Demonstration Project: the Project Applicant for the 404 ACOE permit and RWCQB 401 CWA certification is the MCWRA. The Project Participants for the Demonstration Project are the landowners and growers in each of the RMUs that will be doing the actual maintenance activities and these participants will secure the CA DFW 1600 permit. The Project Partner is TNC which has provided funding and technical assistance and support to landowners and growers in the RMU and partnered with MCWRA to develop the maintenance design, project description, and permit application.

The Project was proposed to shape a new process and approach for flood management in the Salinas River. It was conceived and developed by TNC and presented to MCRWA and stakeholders. In January 2013 the MCWRA completed a Draft Environmental Impact Report (DEIR) and received 26 comments from local, state and federal agencies and the public during the public review period ending May 31, 2013. A Final EIR was completed in October 2013. Certification of the FEIR was delayed by the Board of Directors until MCWRA could address comments about the proposed Salinas River Stream Maintenance Program and its potential impacts on environmental resources, cost to MCWRA and landowners and growers, and lack of a coordinated approach. This suspension action was followed up with MCWRA Board direction on September 30, 2013 for the agency to participate in the Project and also convene stakeholders to further discuss Salinas Stream Maintenance Program issues that had been identified.

The Project sought to demonstrate a new process for developing flood risk reduction and other river management activities, namely that landowners and growers are convened for areas along the river with documented flood risk and input into a scientifically valid risk analysis using hydraulic modeling, a cooperative risk reduction decision making process, and subsequent development of cooperative maintenance approaches for certain reaches of the river. These process steps sought to address many of the concerns that were raised during the EIR review about the proposed Salinas River Stream Maintenance Program including the lack of a coordinated approach, the eligibility for maintenance, and costs relating to maintenance. The process associated with the Project also sought to incorporate avoidance, minimization and mitigation into the maintenance design to further clarify costs and permit conditions for Program Participants and to avoid impacts to ecological resources.

TNC invited MCWRA staff and interested landowners and operators to an initial meeting on November 12, 2013 to provide information about the proposed process and timeline for the Project. All participants decided on project goals and that project decisions would be made based on consensus. The process involved the convening of two committees. The Technical and Design Committee consisted of landowners and growers, TNC, and MCWRA staff. The Permitting Committee included two landowners, TNC, MCWRA staff, and state and federal regulatory agencies. The two committees worked for approximately four months to develop a scientific approach to document flood risk in project areas and to identify options for reducing flood risk while maintaining or improving ecological and water quality uses of the Salinas River.

The Technical and Design Committee worked from November through January on identifying two areas of the river to be managed cooperatively by landowners and operators for multi-benefit outcomes. These two areas were termed "River Management Units" and initial boundaries for a River Management Unit at Chualar and one at Gonzales were identified between river miles 38 and 22. This section of the river included various rankings of eligibility under the EIR. River miles 22-23 were ranked Priority 3 in the EIR and river miles 33-34 and 34-35 were ranked Priority 2 in the EIR. The remaining river miles in the proposed RMUs were ranked as Priority 1 in the EIR. Priority 1 areas were defined in the EIR as areas where conveyance was below a 10-year interval event (39,000 cfs) and those that had been maintained and accessed in previous river maintenance.

During December and January, TNC staff confirmed final commitment with the landowners and operators in each of the RMUs and final boundaries in river miles have been identified for each unit. In subsequent field sessions in December the Technical and Design Committee identified flood risk utilizing a 2-dimensional flood analyses model – *SHR2D* (developed by the US Bureau of Reclamation) for each of the RMUs and compared these conditions with the HEC-RAS model from the FEIR and landowner and grower experience.

The flood risk reduction modeling was coupled with and supported by TNC conducting four days of reconnaissance survey work within the RMUs to identify and document key biological resources that would need to be avoided and/or enhanced through proposed maintenance activities. The Technical and Design Committee then explored a level of flood risk reduction that could be achieved through targeted native and non-native vegetation maintenance, including Arundo and tamarisk removal and sediment management consistent with avoiding and minimizing impact on important ecological conditions such as the low flow channel (important for steelhead migration) and high-quality native riparian habitat.

Final designs from the Technical and Design Committee were then presented to the Permitting Committee in a full day workshop in February and a subsequent field tour on March 6, 2014.

The Project Description in this permit application encompasses the final design for the two RMUs at Chualar and Gonzales for vegetation and sediment maintenance and Arundo removal.

Required Permits

The Project requires the following permits:

- US Army Corps of Engineers 404 Permit

    - Possible formal or informal consultation with National Marine Fisheries Service and US Fish and Wildlife Service
- Regional Water Quality Control Board 401 Water Quality Certification
- California Department of Fish and Wildlife Streambed Alteration Permit (1600)

III. Purpose of the Project

The objective for the Chualar and Gonzales RMU's is to reduce flood risk to agricultural land adjacent to the Salinas River while maintaining or enhancing natural habitat and ecological and hydrological processes.

The Project Partners have identified the following desired outcomes:

- 5-year permits from State and Federal agencies for the areas of the river covered by the Project;

- Understanding of costs and benefits for landowners/operators and the MCWRA for strategies to deliver multiple benefits;

- Establish baseline and existing conditions information for areas of the river included in the demonstration; and

- Demonstrated process that relies on adaptive management and addresses multiple watershed objectives including flood risk reduction, recharge, water quality improvement, and maintaining ecological conditions for fish and wildlife.

The Project Participants in the Chualar and Gonzales RMUs will conduct river maintenance in a coordinated fashion according to a management design agreement signed by all Project Participants, the Project Applicant (MCWRA) and the Project Partners. This agreement is currently being developed.

The committee structure, goal-setting process, coordinated landowner and grower involvement, science analysis, and field-based design process as described below is intended as a demonstration for the short term Salinas River Stream Maintenance Program and for additional areas / RMUs that could be designated within the river at future dates. The RMUs also are a demonstration for a systems-based, longer-term Salinas River management program that is currently in initial development stages by MCWRA.

Existing Flood Conditions Analysis, Ecological Analysis and Project Design Process

In order to guide development of the proposed maintenance approaches in each RMU, the TNC team developed three over-arching design goals. These goals are:

1. Provide a level of flood risk reduction for the farming community that is meaningful and can be modeled and measured via reduction in water surface elevation, reduction in depth and velocity of inundation, and reduction in duration of inundation.
2. Promote natural hydrologic and geomorphic processes that will support steelhead migration and floodplain use, while reducing the impact of potential stressors such as stream velocity, stream temperature, and floodplain stranding on steelhead.
3. Protect, enhance, create and/or manage a mosaic of habitat types across the Salinas River Floodplain to support a suite of birds and native wildlife species, while reducing stressors such as invasive plant infestations (Arundo and tamarisk) and removal of or impacts to rare riparian and wetland habitat types.

These goals reflect an understanding that the Salinas River and its floodplain are significantly altered from a natural state and the intent is not to "restore" the Salinas River, but instead to identify key ecological attributes that could be enhanced through channel maintenance for flood risk reduction. This effort clearly acknowledges that the hydrology has been impacted/modified by a series of dams, levees and other encroachments, while the ecology has been scaled down from a river system that spread across wide expanses of the valley and supported a mosaic of habitat types to a river that is confined by levees and farmlands and restricted to a small fraction of its historic floodplain.

Based on these goals and our understanding of the limitations of the existing system to provide flood risk reduction and ecological benefit, every effort was made to evaluate not just the impact any action would have on special status species, but to identify opportunities to enhance either natural physical processes or the overall mosaic of habitats within the floodplain. In order to marry these goals, TNC put together a multi-disciplinary team of applied scientists with backgrounds in hydrology, geomorphology, stream ecology, and both aquatic and terrestrial biology. The team used existing hydrology, hydraulics, and topographic data to develop a 2D hydraulic model for each RMU.

Flood Modeling

The Technical and Design Committee analyzed baseline flood conditions using a 2-dimensional flood analyses model – *SHR2D* (developed by the US Bureau of Reclamation) for each of the RMUs. Baseline flood results were also compared with the MCWRA HEC-RAS model from the EIR to confirm flood inundation areas within each of the RMUs. Once the baseline conditions were described and discussed by the committee, flood risk reduction goals for each RMU and associated management activities were explored and further analysis recommended.

Each area of the river included in the RMU (extending from the left bank to the right bank of the river channel) was then mapped and a design for management activities within each RMU was developed and then refined in the field with ecologists, landowners and growers, and MCWRA staff. The design focuses on avoidance of sensitive habitats and vegetation types when possible and minimization of impacts to habitat and vegetation where necessary.

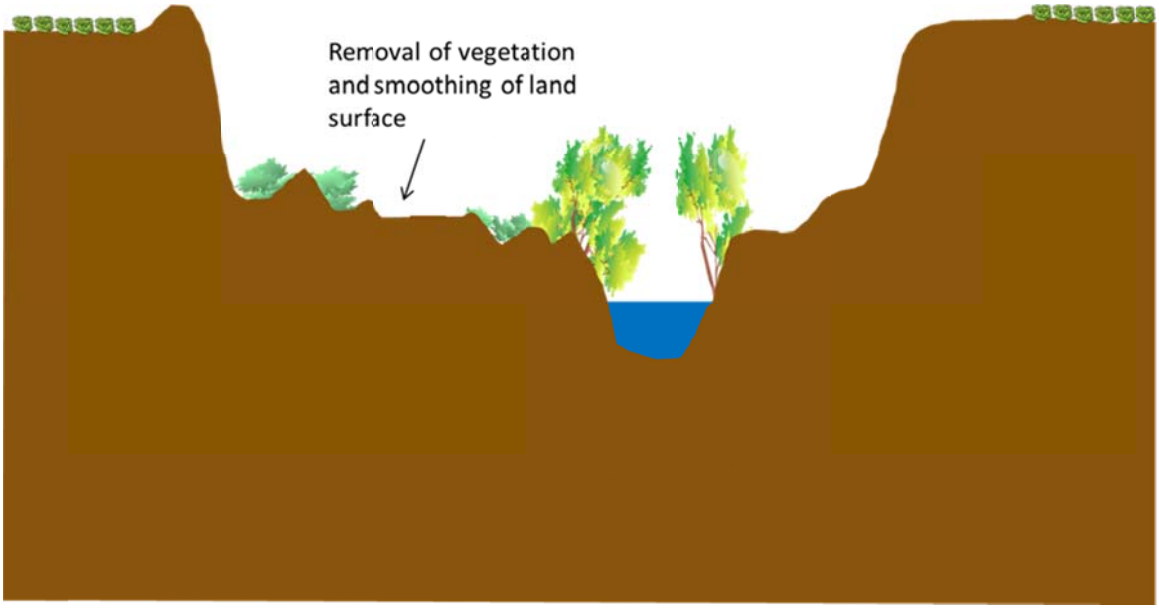
The Gonzales RMU model analysis showed that agricultural lands within the project area were affected by flooding at a flow of 22,000 cfs. This result was consistent in both 2-D and HEC RAS model results. The approximate acreage of farmlands susceptible to flooding in the vicinity of the Gonzales RMU is 3,400 acres. At higher flows such as a 10-year interval flood (45,000 cfs) agricultural land was flooded at deeper depths and experienced higher velocities. An

approximate total of 6,200 acres of land is susceptible to flooding at this higher flow event. The Chualar RMU model analysis similarly showed agricultural lands in this area were affected by flooding at 22,000 cfs with increased inundation and velocity at 10-year interval flood levels (45,000 cfs). There is an estimated 3,600 to 4,000 acres of agricultural land susceptible to flooding in the vicinity of this RMU at the 5-year and 10-year events respectively.

A series of model runs conducted by the design team and vetted with the Technical and Design Committee tested a program of river channel maintenance that could provide an incremental level of protection from 2-year to 5-year flood interval events. The Committee agreed on a design premise utilizing and enhancing historic high flow or "secondary channels" to bypass floodwaters. These historic secondary channels were mapped from aerial imagery and modeled at four flows: 5,000 cfs, 12,300 cfs, 22,000 cfs, and 45,000 cfs corresponding to the 2-year, the March 2011 flow event, 5-year, and 10-year flood intervals. See Figures 2 and 3 on pages 13 and 14 for the locations of these secondary channels.

Maintenance activities within these secondary channels was assumed to include vegetation removal within the secondary channel, smoothing and grading of the channel bottom for its length, and, where feasible, limited sediment removal. Although not mandatory, smoothing is considered a key component of maintenance as once vegetation cleared in the secondary channels, additional smoothing of the surface to homogenize the topography and, if possible, create a slight downstream gradient to the bypass channel is preferred. The sandy soils prevalent in these areas are often characterized by variable topography, and such variability may be exacerbated by vegetation removal activities. While we anticipate that natural sediment transport processes such as dune formation are likely to occur if and when high flows begin to activate the bypass channels, such smoothing activity will provide the following benefits:

- Establish downstream gradient in the secondary channels that may serve to aid in drainage following high flow events and therefore discourage stranding of aquatic species;
- Encourage efficient preferential flow down the bypass channels, especially at the onset of activation; and
  Reduce resistance to flow, at least until dune formation processes begin to occur.



Due to costs, the majority of landowners within the two RMUs are not interested in sediment removal as a widespread practice. That said, a select group of landowners (2-3) are interested in having the ability to remove sediment from the secondary channels and either incorporate the material into their adjacent farm fields or stockpile it on agricultural lands for future use (above OHW and outside of any jurisdictional wetlands). For sediment removal activities, landowners and/or growers will be required to obtain necessary and applicable local permits.

Preliminary modeling results showed that limited flood protection could be achieved with this proposed approach. In the Chualar RMU the average flood stage reduction would be 0.1 feet and the maximum flood stage reduction would be 0.4 feet at 22,000 cfs. In the Gonzales RMU the average flood stage reduction would be 0.4 feet and the maximum flood stage benefit would be 1.9 feet at 22,000 cfs. These results were beneficial enough for landowners and growers to agree to the secondary channel maintenance design. Estimates of potential reduction in flooded crop acres were 40 acres in the Chualar RMU and 170 acres in the Gonzales RMU through this secondary channel maintenance approach. Table 1 summarizes these model results.

Table 1 - Model results for 22,000 cfs flow

River Management Unit	Average flood stage reduction	Maximum flood stage reduction	Estimated acres where flooding is avoided
Chualar	0.1 feet	0.4 feet	40 acres
Gonzales	0.4 feet	1.9 feet	170 acres

The Chualar RMU has 12 proposed secondary channels and the Gonzales RMU has 18 proposed secondary channels. See Figures 2 and 3 for the location and notation for each of these secondary channels in the RMUs. The proposed secondary channels follow natural topographic contours well outside the low-flow channel to avoid impacts to steelhead and sensitive habitat.

Each secondary channel meets, or tie-ins with the low flow channel at upstream and downstream locations as would be expected in a more natural braided river channel. The secondary channels are the focus of vegetation removal and sediment management activities within the RMUs. By concentrating maintenance in the secondary channels, maintenance near the low flow channel and in other parts of the lower floodplain can be avoided. Activities in the secondary channels are considered temporary as vegetation maintenance will occur primarily in year 1 and 2 with follow up spot maintenance in years 3-5 as necessary. Other activities such as sediment management will be done annually and the material will be stored outside of the active channel. More details of the Proposed Activity are provided in Section V.

Ecological Conceptual Model

A critical component of the design process was focused on analyzing opportunities to increase the ecological conditions within the existing RMUs. Field reconnaissance in the RMUs revealed that the existing low flow channel and narrow riparian corridor contains the greatest extent of sensitive habitats such as maturing riparian vegetation in the RMU area and so avoiding this habitat became of focus in the design process. Moreover, avoiding these habitats over the longer-term will allow this maturing riparian vegetation to continue the successional process from early and mid-seral to more mature late-seral riparian habitat that is currently very rare within these RMUs and provides significant habitat value for a wide array of species.

Based on all of the available ecological and biological information analyzed and synthesized as well as significant dialogue with growers and landowners within both RMUs, the following key considerations were developed to drive the flood risk reduction and "ecological uplift" design process that has resulted in the proposed project. The following 7 concepts are directly excerpted from the Biological Report and Impact Assessment developed for this project (Robins, 2014)

1. Patchy habitat mosaics play a vital role in supporting a suite of native terrestrial and aquatic species and natural river processes are generally responsible for constantly building and destroying patches across the floodplain.

2. The Salinas River, like many sand-bedded rivers, supports multiple secondary and tertiary channels. These channels are a combination of relic low flow channels from previous avulsion events, overflow channels built and maintained by chronic overbank flooding, and natural topographic features across the floodplain resulting from complex floodplain flow patterns. These surfaces are critical for spreading water across the floodplain during bankfull events, for creating habitat patches and ecotones, and providing preferential pathways for floodwaters and aquatic species to escape and rejoin the low flow channel during flow events.

3. Arundo donax presents a major challenge and opportunity for flood risk reduction and habitat enhancement. Significant research points to monocultures of Arundo outcompeting native riparian vegetation, using significantly more water than native riparian vegetation types, and providing fewer ecological benefits for riparian and floodplain species. Systematic, coordinated, and sustained Arundo removal is a win:win for farmers and for the ecosystem.

4. The low flow channel as well as some existing secondary channels are both currently located along the outside bend of meanders and/or direct flow into existing levees in both the Chualar and Gonzales RMUs. In both cases, the natural processes are in conflict with farming and

farmers are using everything at their disposal (concrete rubble, old culverts, cars and buses, etc.) to fortify their levees. Enhancing secondary channels that are away from steep-banked meander bends and do not direct flows at exiting levees can help reduce the pressure on levees and, in turn, reduce the need to fortify levees and add additional foreign materials into the river system. As such, design parameters were developed to focus on opportunities to improve existing secondary channels so that they function to reduce pressure on levees and exploit preferential flow paths that are away from tight meanders and direct flows away from banks. We expect these secondary channels to reduce bank erosion and risk of bank failure during moderate flows (below the 5 yr. event), whereby reducing the need for farmers to armor banks and use whatever is at their disposal for fill and reventment.

5. Historic ecology data presented by SFEI, data presented in McGraw (2008), and field reconnaissance surveys along the two RMU's in the winter of 2014 suggest that the current condition of the low flow channel is more entrenched and naturally armored by heavily vegetated banks than would be expected under natural conditions. In many locations, natural banks along the low flow channel have steepened and the top of bank is now as high as 10 ft. from the bottom of the low flow channel. While the low flow channel appears to be becoming more entrenched, there also appears to be limited habitat diversity and refugia within the confines of the low flow channel (e.g. large woody debris, undercut banks, mid channel bars, etc.). This situation appears to be resulting in increased water velocities in the low flow channel and less frequent floodplain inundation during smaller storm events at or near the historic bankfull elevation. Our hypothesis is that steelhead are moving upstream and downstream during these smaller events and could benefit from access to floodplain refugia and reduced water velocities, since there is little refugia currently in the low flow channel. Based on the output from the 2d hydraulic model, velocities in the low flow channel and/or the secondary channels are likely to be reduced through the maintenance activities proposed for this project. In addition, it is possible that these secondary channels could benefit steelhead (migrating adults and smolts) by increasing the area and duration of floodplain inundated during smaller flood events and by creating better access and egress to floodplain habitats during the rising and receding limbs of the storm hydrograph (as opposed to current conditions where the entrenched low flow channel and topographic diversity on the active floodplain might increase opportunities for stranding).

6. Least Bell's vireo as well as a number of other birds, amphibians, reptiles and mammals are known to benefit from and exploit ecotones. An ecotone is a transitional area of vegetation or open ground between two different vegetation communities or types. The ecotone has some of the characteristics of each bordering biological community and research suggests these areas often contain species not found in the bordering communities. In addition, an ecotonal area often has a higher density of organisms of one species and a greater number of species than are found in either flanking biotic community. Many organisms, especially organisms adapted to dynamic ecosystems like floodplains need transitional areas or ecotones for activities such a courtship, nesting, or foraging. With decreased frequency of bankfull events due to upstream dams and increases in summertime and fall flows in the low flow channel due to the Salinas River Recharge Project, comparison of aerial photos over the past decade show an increase in willow riparian habitat adjacent to the low flow channel and a decreasing presence of sand dunes, bare soil, and early successional communities. While this pattern is just beginning to appear, we hypothesize that maintenance of secondary channels will increase the edge effect and the ecotonal areas within the floodplain.

7. Existing or relic secondary channels generally contain early successional vegetation types and would naturally experience regular disturbance by scouring flows. By focusing maintenance activities on these existing features, we can avoid impacts to currently rare mid and late successional riparian communities and focus impacts on areas that would be impacted frequently and naturally by natural disturbance, helping to maintain something similar to the natural patch dynamics and ecotones that would be sustained along the floodplain.

IV. Existing Conditions

Vegetation Types

Between January 27 and March 5, 2014 the secondary channels and access routes were surveyed in the field. Presence and extent of vegetation types was calculated using ocular estimates derived from the field surveys and from Google earth images from May 5, 2012. Table 2 summarizes vegetation types and acreages for each of the secondary channels.

Six vegetation types were observed within the secondary channels. These types were classified based on vertical structure, approximate age of perennial vegetation, presence of bare ground, presence/abundance of wetland indicator plant species, and presence of native and non-native plant species. The following provides a description of each vegetation type.

Type 1: Arundo-dominated with sparse vegetation. This type is dominated by larger patches of *Arundo donax*, with a mix of mulefat (*Baccharis salicifolia*) and sparse, primarily non-native herbaceous groundcover (e.g., *Melilotus* sp. [sweet clover], *Rumex* sp. [dock], *Brassica* spp. [mustard]) between, including a mix of upland and facultative wetland species. 50% or greater bare ground is present. The type is widespread south of Gonzales bridge on both banks. This type is found in secondary channels # 21, 22, and 24 in the Gonzlaes RMU. This type is also present in the Chualar RMU, with examples in channels # 4, 5, and 6.

Type 2: Sparse herbaceous with or without Arundo. Similar plant species composition to Type 1 described above, but with smaller patches of Arundo, and mostly herbaceous non-woody species interspersed 25-75% bare ground present. Examples are seen in Gonzales secondary channels # 23, 25, 26, and Chualar channels # 2 and 3.

Type 3: Early-successional perennial riparian. Species include mulefat and willow up to 6 feet tall, typically 1" diameter at breast height (dbh) or smaller but could contain individuals up to 2" dbh, intermixed with native and non-native upland and wetland herbaceous cover. Patchy distribution across both RMUs, with larger examples in Gonzales RMU channels # 23, 25, and 26. Up to 25% bare ground.

Type 4: Mid-successional willow. Mostly dbh between 2 and 6 inches, occasional larger stems interspersed with herbaceous cover including rough horsetail (*Equisitem hyemale*) with minimal bare ground present. Impacts to trees and tree cover will be mitigated. Common where secondary channels tie into low flow channel. Examples are seen in Gonzales secondary channels # 23 and 25.

Type 5: Early- and mid-successional cottonwood. Mostly dbh <6in, occasional larger stems interspersed with herbaceous cover and early successional perennial riparian. Impacts to trees and tree cover will be mitigated. Found in scattered locations along Gonzales secondary channels 13, 14, and 15 only.

Type 6: Low stature herbaceous wetland. This vegetation type is dominated by narrow bands of *Typha latifolia* (cattail), *Scheonoplectus acutus* (tule), or other bulrushes or sedges (*Scirpus* spp., *Eliocharis* spp., *Cyperus* spp.) adjacent to the low flow channel. This type was only observed in isolated patches along the low flow channel and would only be impacted through the proposed maintenance activities at tie-in areas where the secondary channels meet the low-flow channel.

In addition to describing and estimating the extent of the common vegetation types within the secondary channels, field surveys focused on tie-in locations to and from the low flow channel in an effort to avoid and/or minimize impacts to mature riparian areas and areas dominated by herbaceous wetland species.

Tie-in locations are the upstream and downstream areas where the secondary channels connect to the main low flow channel of the Salinas River. Field surveys focused on noting any high value, native vegetation types not observed within the secondary channels and modifying the locations of tie-in points to avoid or reduce any potential impact to those vegetation types. Field surveys enabled minor repositioning of tie-in areas, which significantly reduced the potential for impacts to well-developed native riparian vegetation and wetlands. Approximately 75% of proposed secondary channels now tie-in with the low-flow channel at either large Arundo patches or in areas dominated with sparse herbaceous non-wetland vegetation, entirely avoiding impacts to sensitive habitats. The remaining ~25% of tie-in areas will impact small areas of more sensitive habitat, including early-successional perennial riparian, mid-successional willow, and/or herbaceous wetland not observed in any of the secondary channels except at tie-in points. This vegetation type is dominated by narrow bands of *Typha latifolia* (cattail), *Scheonoplectus acutus* (tule), or other bulrushes or sedges (*Scirpus* spp., *Eliocharis* spp., *Cyperus* spp.) adjacent to the low flow channel (see photo 3 in Gonzales RMU photos). While herbaceous wetland represents less than 5% (probably less than 1%) of the total vegetation types to be impacted by maintenance work, this type is dominated by Facultative, Facultative Wet and some obligate wetland species and therefore requires mention.

However, due to the elevation of the secondary channels being 3-5 feet above the thalweg of the low flow channel, the bands of herbaceous wetland that exist on the banks of the low flow channel may not need to be impacted during maintenance and may function as an appropriate tie-in without modification (e.g. they are already at the proper elevation). Efforts will be made to avoid impacts to this vegetation type, including careful preconstruction staking.

Due to the very small percentage of total cover across all of the secondary channels in the RMUs, this type is not called out in Table 2, below.

Table 2 - Vegetation Types and Acreages for Secondary Channels

Channel #	Total Acres	*Arundo Dominant*		*Sparse Herbaceous*		*Early Successional Riparian*		*Mid Successional Willow*		*Early Successional Cottonwood*		*Bareground/ Sand**	
		%	Ac	%	Ac	%	Ac	%	Ac	%	Ac	%	Ac
Chualar													
1	5.5	30	1.7	60	3.3	10	0.6	0	0	0	0	0	0
2	8.1	10	0.8	80	6.5	10	0.8	0	0	0	0	0	0
3	4.8	10	0.5	70	3.4	10	0.5	0	0	0	0	10	0.5
4	10.4	10	1	50	5.2	10	1	0	0	0	0	30	3
5	7.7	40	3.1	20	1.5	30	2.3	10	0.8	0	0	0	0
6	4	60	2.4	20	0.8	15	0.6	5	0.2	0	0	0	0
7	1.9	20	0.4	30	0.6	40	0.8	10	0.2	0	0	0	0
8	4.6	35	1.6	20	0.9	40	1.8	5	0.2	0	0	0	0
9	2.9	10	0.3	40	1.2	40	1.2	10	0.3	0	0	0	0
9b	2.3	35	0.8	20	0.5	30	0.7	15	0.3	0	0	0	0
10	5.1	20	1	55	2.8	10	0.5	5	0.3	0	0	10	0.5
11	5.9	10	0.6	35	2.1	40	2.4	15	0.9	0	0	0	0
RMU Total	**63.2**	**22%**	**14**	**46%**	**29**	**21%**	**13**	**5%**	**3**	**0%**	**0**	**6%**	**4**
Gonzales													
12	6	0	0	10	0.6	0	0	0	0	0	0	90	5.4
13	3.6	0	0	50	1.8	20	0.7	5	0.2	5	0.2	20	0.7
14	3.5	0	0	20	0.7	30	1.1	15	0.3	35	1.2	0	0
15	2.3	0	0	10	0.2	40	0.9	15	0.3	35	0.8	0	0
16	4.3	0	0	20	0.9	50	2.2	10	0.4	20	0.9	0	0
17	2.3	9	0.2	50	1.2	20	0.5	20	0.5	0	0	0	0
18	3.5	11	0.4	50	1.8	25	0.9	10	0.4	0	0	5	0.2
19	3.7	30	1.1	40	1.5	25	0.9	5	0.2	0	0	0	0
20	4.8	20	1	30	1.4	35	1.7	15	0.7	0	0	0	0
21	3.7	27	1.1	50	1.9	15	0.6	5	0.2	0	0	0	0
22	9	30	2.7	40	3.6	30	2.7	0	0	0	0	0	0
23	6.5	20	1.3	40	2.6	30	2	10	0.7	0	0	0	0
24	8.3	60	5	30	2.5	10	0.8	0	0	0	0	0	0
25	7.2	20	1.4	30	2.2	30	2.2	20	1.4	0	0	0	0
26	6.8	40	2.7	35	2.4	20	1.4	5	0.3	0	0	0	0
26b	3.4	50	1.7	30	1	20	0.7	0	0	0	0	0	0
27	6.6	20	1.3	60	4	15	1	5	0.3	0	0	0	0
RMU Total	**85.5**	**24%**	**20**	**35%**	**30**	**23 %**	**20**	**7%**	**6.1**	**4%**	**3.1**	**7%**	**7.3**

Special Status Species and Habitats

Below is a summary of the methods and findings that are included in the Biological Report and Impact Assessment document (Robins, 2014).

For the best available science on special status species, we started with MCWRA's DEIR (2013), which provides extensive information and analysis for a wide array of special status species with the potential to exist within the larger 94 mile Stream Maintenance Program Area covered by that DEIR. For the purposes of this permit application, our analysis focuses specifically on the subset of species analyzed in the DEIR that meet the following criteria:
(a) are known to occur within 5 miles of either proposed RMU; and
(b) have critical habitat listed within 5 miles of either proposed RMU.
Table 2 shows the outputs from this analysis.

Table 2. Outputs from January 2014 CNDDB- Species within 5 miles of either RMU

SPECIES		
Common Name	**Scientific Name**	**Proximity to Closest Secondary Channel (miles)**
Pinnacles buckwheat	*Eriogonum nortonii*	0.41
Congdon's tarplant	*Centromadia parryi ssp. congdonii*	0.83
burrowing owl	*Athene cunicularia*	0.82
Toro manzanita	*Arctostaphylos montereyensis*	1.02
California tiger salamander	*Ambystoma californiense*	0.66
Steelhead (S. Central California DPS)	*Oncorhynchus mykiss*	0.00
CRITICAL HABITAT		
California red-legged frog	*Rana aurora draytonii*	3.97
Steelhead	*Oncorhynchus mykiss*	0.00

The team then analyzed biological and ecological data from the following sources to develop a more coherent understanding of historic and current habitat conditions and use by sensitive species:

- Hagar Environmental Science and Conservation Collaborative (2012) Lower Salinas River Estuary Status of Aquatic Habitat and Fish Communities. Prepared for The Nature Conservancy.
- McGraw, J (2008) Rapid Biological Resource Assessment for the Salinas River, Monterey County, California. Submitted to The Nature Conservancy.
- Monterey County Water Resource Agency (2013) DEIR for Salinas River Stream Maintenance Program
- Riparian Habitat Joint Venture (2004). The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian associated birds in California. California Partners in Flight. http://www.prbo.org/calpif/pdfs/riparian_v-2.pdf
- San Francisco Estuary Institute (2009) Historical Ecology Reconnaissance for the Lower Salinas River. Prepared for the Natural Conservancy.
- United State Fish and Wildlife Service (2014). Arroyo Toad (*Anaxyrus californicus*) Species Report: Final Report. Published by the Ventura Fish and Wildlife Field Office.

These existing reports and data were supplemented by discussions with staff from MCWRA, USFWS, NMFS, and CDFW and review of 2009 Vegetation Mapping of the Salinas Channel (TNC) and aerial photography over the past 5 decades available from Google Earth.

The final list of species for analysis includes those in Table 1 and the following additional 5 species and 3 groups of species with various levels of state or federal protection:

- Least Bell's Vireo (*Vireo bellii pusillus*)
- Southwestern willow flycatcher (*Empidonax traillii extimus)*
- Arroyo Toad (*Anaxyrus californicus*) (AT)
- San Joaquin Kit Fox (*Vulpes macrotis mutica*)
- Bank Swallow (*Riparia riparia)*
- Migratory birds
- Raptors
- Bats

Field Surveys

Field surveys of the proposed project area occurred between January 27 and March 5, 2014 and included reconnaissance-level assessment of potential habitat for the protected or listed wildlife species either identified through the CNDDB search, literature search and discussions with staff at the resource agencies. Field assessment methods were developed based on available resource agency protocols and data, and adapted for this project area based on further discussions with staff. Sensitive species/habitat survey protocols and guidelines were accessed through USFWS (http://www.fws.gov/ventura/species_information/protocols_guidelines/) and/or DFW (http://www.dfg.ca.gov/wildlife/nongame/survey_monitor.html).

Observation and documentation was also made for the following sensitive and/or protected habitats:

- Wetlands as indicated by presence of facultative, facultative wet, or obligate wetland plants; hydric soils; marshes; and/or presence of surface water including residual ponding in the low-flow river channel
- Mature stands of riparian trees including willow (*Salix* spp.), California sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*), red and white alder (*Alnus rubra* and *A. rhombifolia*)

Assessment also included:

- Assessment via flashlight (for eyeshine) and visual assessment of any areas of standing water for amphibians and/or reptiles
- Sign of wide-ranging mammals such as coyote (*Canis latrans*)and bobcat (*Lynx rufus*)
- Sign of fossorial rodents as indicated by burrows (which could provide estivation habitat for sensitive amphibians)
- Signs of burrowing owls at burrow sites (pellets, feces, and feathers)
- Sign of any rocky outcrops, large crevices, or buildings close the secondary channels that could support bat populations
- Observation of abandoned or active nests (too early for migratory birds)
- Observations of all birds and other wildlife observed

- Extent, distribution of patches of the invasive non-native *Arundo donax*

After 5 field days, ecologists did not observe any listed species or sign (scat, nests, tracks, etc.). It should be noted that California was in the middle of an extreme drought during the survey window and the low flow channel of the Salinas River was dry except for 3 isolated, stagnant pools. No standing water or sign of recently standing water was observed in any of the secondary channel locations. The survey team did observe the following bird species during field reconnaissance: American crow, California thrasher, American goldfinch, American robin, northern flicker, black phoebe, red tailed hawk, tree swallow, barn swallow, mixed flock of European starling/red winged blackbird/ Brewers blackbird, song sparrow, cowbird, white-crowned sparrow, turkey vulture, ruby-crowned kinglet and white tailed kite. Animal tracks observed in the field included coyote, raccoon, bobcat, pig, mule deer.

While the presence of any of these listed species cannot be ruled out due to the fact that these surveys were reconnaissance level and not protocol level, our survey findings illustrate the following:

- Amphibians - There are no CNDDB records for listed amphibians including CRLF, CTS, or AT within or adjacent to the RMU's. Regardless, the field team looked for potential habitat (burrows, standing water, etc.) or signs (visual observation, vocalization, etc.) of listed amphibians. Over the course of 5 field days we only encountered one area of standing water and it was in the main low flow channel, not a secondary channel. Careful observation of this area to listen for vocalization and to look for "eye-shine" with a flashlight resulted in no observations. While we noted a limited number of scattered burrows within the Salinas River floodplain, the majority of these were in areas higher than where the secondary channels would be located. Burrows were observed in only one secondary channel. 100% of all secondary channels were dry and no amphibians or suitable breeding habitat was noted. In addition, all maintenance work will be conducted outside of the breeding window for listed amphibians and generally prior to the onset of winter rains that would signal amphibians to begin winter migration to/from breeding areas.
- Steelhead- The reaches of the Salinas River that flow through the two RMU's are known migration corridors for federally threatened South-Central California DPS of Steelhead. There will be no work within the main low flow channel and all maintenance work will be conducted outside of the adult migration season (Dec-March) and smolt out-migration season (Feb-May). In order to avoid impacts to steelhead, secondary channels (100% of the secondary channels were dry during the field visits) will all be graded to avoid increasing the natural potential for stranding that currently exists throughout the Salinas River floodplain (based on anecdotal evidence and observations during field reconnaissance). Moreover, hydraulic model results suggest that the secondary channels will reduce flow velocities within the low flow channel and provide increased areas of low velocity refuge for steelhead during high water.
- Birds and Mammals- Very few rodents were directly observed and there was no observation of any sign of burrowing owl (feathers, pellets, etc.) near any of the burrows. Also, burrows within the secondary channels (e.g., those that will be impacted) are generally in areas prone to periodic flooding and not amenable to owl burrows or other species that would use burrows in the wet season where inundation and/or high groundwater would make them inhospitable.

- General- based on field condition observed at all secondary channel locations, (a) the vast majority of tie-in locations can be co-located at areas with significant Arundo infestations resulting in removal of Arundo and avoidance of impacts to native riparian canopy along the banks of the existing low flow channel and (b) current habitat quality at most secondary channels is characterized by early successional species and/or invasive species such as Arundo with a dominant cover across all areas of impact either sparse herbaceous vegetation, Arundo, or early successional riparian.

The detailed impact analysis is contained in the Biological Report and Impact Assessment document. In summary, we do not expect the Project to result in impacts to any federally listed species or impacts to federally listed critical habitat. The project has been developed to avoid impacts to rare habitat types and listed species. While raptors and/or western burrowing owls could be present near or within the work areas, any active burrows or nests will be flagged during pre-construction surveys and avoided during implementation. If, during the course of pre-construction surveys or implementation, an ESA or CESA listed species is encountered and cannot be avoided (i.e. actions would result in unauthorized take), the appropriate state and/or federal agency will be notified immediately and all work will stop pending input from agency staff.

Ordinary High Water – Wetlands

An Ordinary High Water Mark (OHWM) delineation was conducted along the Salinas River between Soledad State Prison and Spence Road to determine the area of the channel that would require permits for channel work conducted in jurisdictional waters. The delineation was conducted using a desktop analysis of aerial photography and hydrologic models using methods from A *Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the arid West Region of the Western United States* (Lichvar and McColley 2008). This is common practice for delineating waters of the U.S. and Waters of the State for larger, programmatic efforts like this. The OHWM is shown on Figures 2 and 3 and background documentation is included as Appendix A in this Project Description.

V. Proposed Activity

River Channel Maintenance Areas

Parcels in the Salinas River do enter into and cross the active river channel and maintenance activities therefore occur almost entirely on private properties. In the Chualar RMU (Figure 2 - Chualar River Management Unit), portions of 11 properties are included in the proposed project. In the Gonzales RMU (Figure 3 - Gonzales River Management Unit), portions of 17 properties are included in the proposed project. Tables 3 and 4 summarize property information for the RMUs.

Figure 2: Chualar River Management Unit

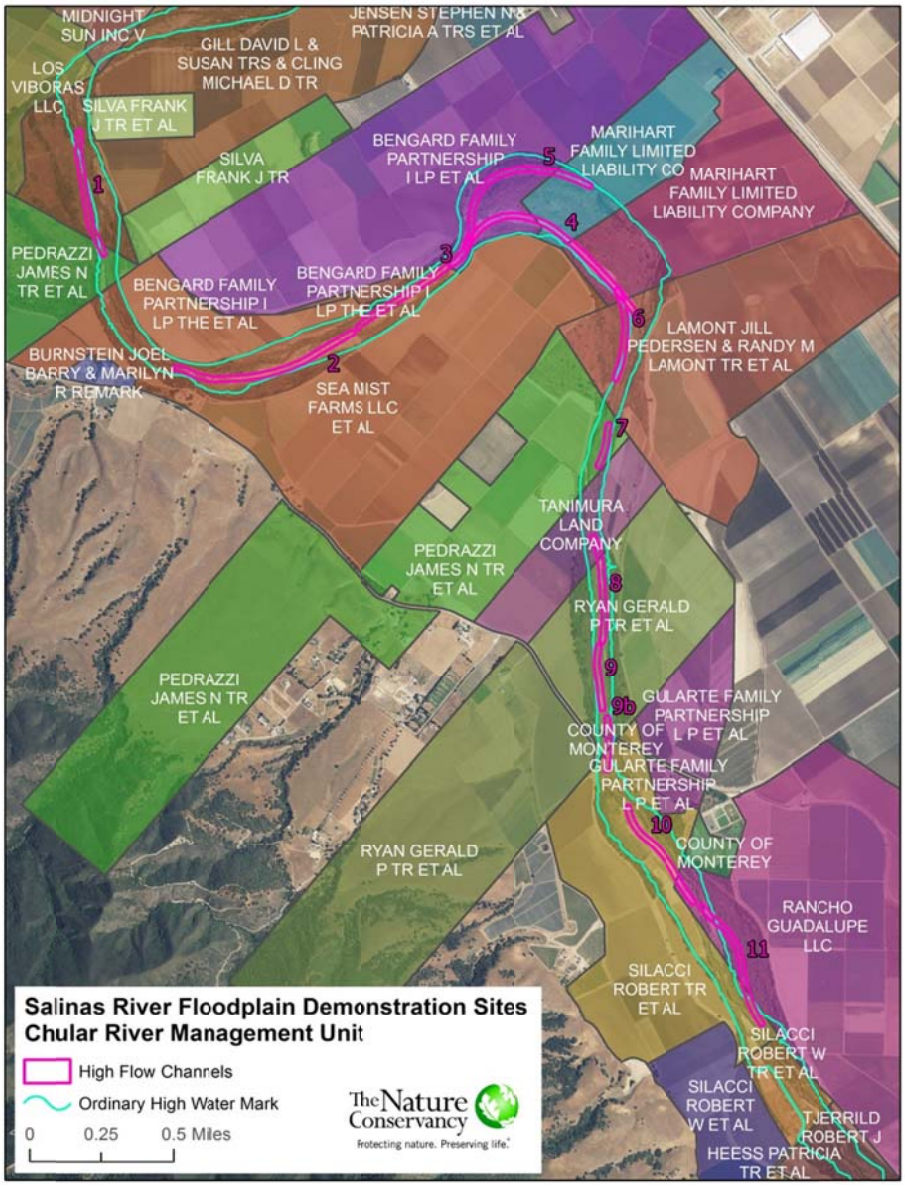


Figure 3: Gonzales River Management Unit

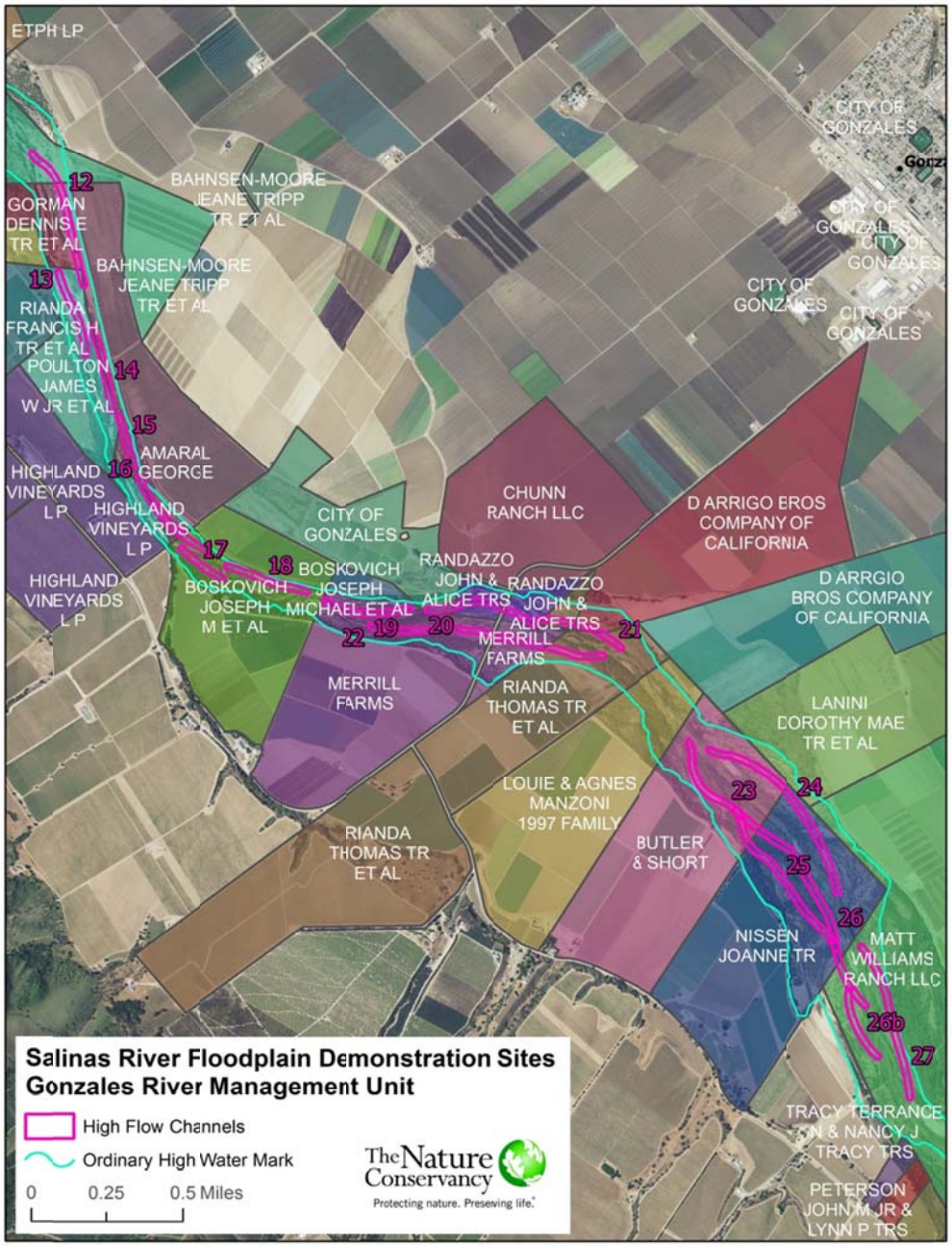


Table 3 – Chualar APNs and Secondary Channels

Chualar RMU APNs	Secondary Channels
167-033-010	10, 11
167-032-003	8
167-032-002	7
167-032-010	8, 9b, 9
137-151-005	4, 5
167-081-006 137-151-003 137-151-004 137-151-006 137-151-007 137-151-008 167-011-015 167-011-013	2, 3
139-101-028 139-101-029 137-041-019	1
137-151-001 137-151-002	5
269-031-008 269-031-009	11
145-011-001 145-011-037 269-011-004	4, 6

Table 4 – Gonzales APNs and Secondary Channels

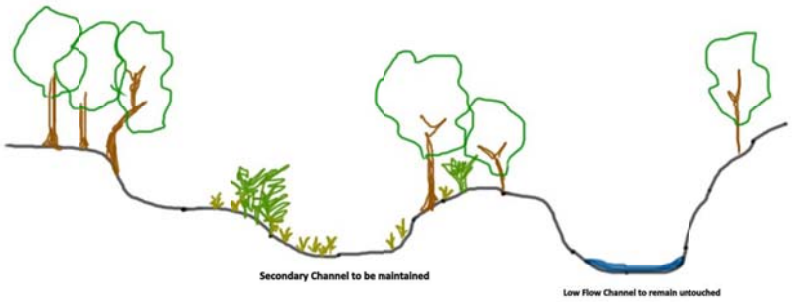
Gonzales RMU APNs	Secondary Channels
216-031-001 216-031-018	19,20,21,22
216-012-004	23,24,25
216-012-002	20, 21
216-021-022 257-041-15 257-041-16	26B, 27
167-052-013, 014, 016	12, 14, 15 and 16
216-032-015, 017	16, 17, 18
223-011-040 223-012-005	21
216-021-001	24, 25, 26

Overall Maintenance Approach for the Gonzales and Chualar RMUs

The Project includes vegetation removal and sand/sediment management activities within the RMUs to reduce risk of flooding to adjacent farm fields and bank erosion. Project activities will occur in a series of linear “secondary channels” designed to become active during higher flow

events. The secondary channels follow natural topographic contours well outside the low-flow channel.

Figure 4: Depiction of low flow and secondary channels.



Compared to historical conditions the current hydrograph of the Salinas River is altered to provide for flood management at the reservoirs and groundwater enhancement. Generally high flow events are muted and scouring is less frequent due to these conditions. Low, non-scouring flows are maintained well into the dry season, extending the growing season for vegetation in the low-flow channel.

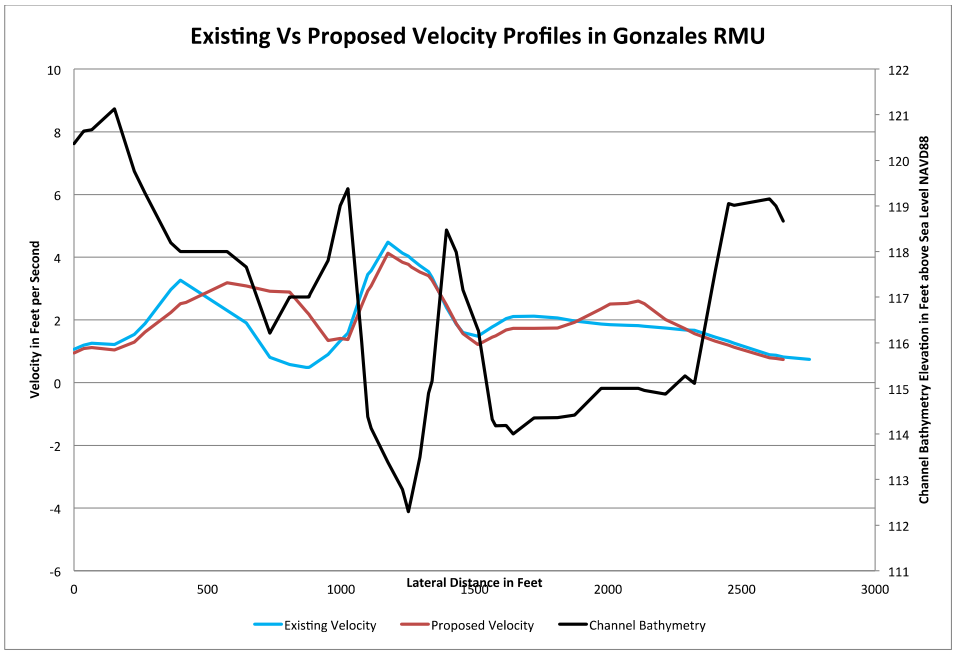
The objective of the proposed management activities within these RMUs is to:

1) mimic natural braiding in the Salinas River historically provided by higher, scouring flows and especially in secondary channels where the goal is to increase channel complexity and slow velocities in the primary low flow channel; and

2) encourage a wider range of riparian habitat conditions (earlier to later successional vegetation communities) that would have been present historically.

The secondary channels are located at elevations above those of the low-flow channel and therefore will not impact velocity or other hydraulic properties during base-flow conditions in the Salinas River. At higher flows, such as during typical yearly storm events, these secondary channels will begin to activate and convey flow but will remain relatively shallow. During these periods, the secondary channels will have little effect on velocities or depth in the primary channel because they will not convey a significant proportion of the flow. The existing versus proposed velocity profile example in the Gonzales RMU below shows the secondary channel will experience an estimated velocity change but the primary or low flow channel velocity will be slightly lower than existing. Such events may cause sand dune formation to occur, but otherwise minimal sediment transport, scour, or erosion is expected.

Figure 5:



During 2 to 5 year return interval peak flows, the secondary channels will increase the flood-carrying capacity of the river over existing conditions. Because the secondary channels will flow at lower depths than the primary channel, velocities will be lower in the secondary channels, but a progression of dune formation, scour, and deposition will likely occur during the rising, peak, and falling limbs (respectively) of a storm event. At these 2-5 year events, the secondary channels will have a complex effect on primary channel velocities. In most cases, the effect of the secondary channels will be to decrease peak velocities in the primary channel due to the additional conveyance capacity provided by the secondary channels (see example above). In some instances the lowering of the water surface due to the additional conveyance may slightly increase primary channel velocity in localized areas. However, the secondary channels themselves create lower velocity areas connected to the primary channel that provide a lower velocity refuge for fish at these flows.

At flow events greater than the 5-year return interval (22,000 cfs), the modeling analysis generally showed diminishing returns in flood risk reduction through vegetation removal of any kind. During these events, the Salinas River may naturally shift its alignment and secondary channels may aggrade, scour, or even become claimed by the river as a new primary alignment of the low flow channel. After such events, future maintenance of the secondary channels described in this project description may need to be re-evaluated to determine impacts and value of future maintenance at these locations.

Avoidance and Minimization Considerations

As described in previous sections, the secondary channels and associated vegetation and sediment management activities have been located to avoid impacts to sensitive aquatic and riparian habitats to the extent practicable. The RMU maintenance strategy focuses on retaining more mature riparian areas thus increasing the diversity of the current conditions of the RMU which is dominated by early successional willow and Arundo primarily. The secondary channels have been selected and field verified to avoid later successional willow vegetation and less common riparian vegetation including cottonwood, sycamore, and alder stands. Field reconnaissance conducted in the secondary channels for project development noted that these vegetation conditions are relatively rare in the RMU areas of the river system.

With regards to aquatic habitat avoidance, the secondary channels have also been designed to avoid the low flow channel except where they join the low flow channel. The secondary channels are located to tie into the low flow channel from an upstream location to encourage higher flow access to the secondary channels and then rejoin the low flow channel at a downstream location. The downstream tie-in points will be positively graded at the area joining the low flow channel to avoid potential steelhead stranding[1]. Field reconnaissance efforts focused on identifying geomorphically, hydrologically, and biologically appropriate areas to locate tie-in points.

The design team looked for areas where natural processes would facilitate creation of secondary channels and where both downstream hydrologic impacts could be avoided (i.e. creating unwanted bank erosion) and where impacts to mature native vegetation or wetlands could be avoided. Where possible and practicable, the design team modified the tie-in points to meet the following criteria:

1. co-located with large patches of Arundo (i.e. double benefit of removing Arundo and creating tie-in);
2. located where banks were already naturally low (i.e. already 3-5 ft. above the low flow thalweg vs 6-12 ft.);
3. upstream tie-in located upstream of existing bends to facilitate natural overbank flows;
4. downstream tie-in be located and aligned to avoid potential impacts to adjacent banks via increased scour.

Depending on local conditions, some secondary channels may have 1 or 2 main tie-ins at either or both the upstream or downstream end. Multiple tie-ins were suggested to avoid impacts and increase benefit by removing additional bankside Arundo patches and/or providing multiple pathways for flow to enter and exit the secondary channel. In a limited number of cases (<25%), the tie-in point that made the most sense from a geomorphic and hydrologic perspective will result in the removal of between 2 to 6 individual mid-succession willows greater than 6" DBH (diameter at breast height). In cases where a large stand of willows was the only feasible place for the tie-in, the connection will be made through 2 to 4 smaller notches ranging from 15-30 feet wide in the riparian corridor versus one larger opening that would engender a large impact and removal of more trees.

[1] Devin Best, NOAA/NMFS, February 7, 2014 field visit

The following photo pages provide details and examples for the secondary channel conditions, vegetation types as described above, and tie-in examples for the existing conditions in the channel for the Chualar and Gonzales RMUs.

Chualar River Management Unit – Photos 1-8

Photo 1: Representative of **Sparse herbaceous with or without Arundo (Type #2)** in Chualar. This photo is from Secondary Channel #2 and is the dominant type in channels #2, #3, #10, and #11. Note the extent of bare sandy soil, sparse cover of herbaceous mustard, and stands of young willow bordering the secondary channel to both the right and left.

Photo 2: Representative of **Arundo-dominated with sparse vegetation (Type #1)** in Chualar. This photo is from channel #5, which contains a mix of Arundo clumps, bare ground and herbaceous cover (see photo 1), and a horsetail dominated vegetation community (see photo 3).

Photo 3: Representative of **Early-successional perennial riparian (Type #3)** in Chular. This photo is from channel #5. In addition to the dominant cover by horsetail, notice the line of Arundo that should be removed adjacent to larger stands of willow along both the lateral borders.

Photo 4: Representative of **Sparse herbaceous with or without Arundo (Type #2)** in Chualar. Photo is from #10, where this type is dominant. Note the margin of young willows between the secondary channel and the main channel (right). This vegetation type is dominated by a mix of sweet clover, mustard, rumex, and other herbaceous species.

Photo 5: Representative of **Early-succession perennial riparian (Type #3)** in Chualar. This photo from channel #5 shows a dense mix of mulefat and willow (all < 4" dbh). This type is not common in Chualar.

Photo 6: Representative of **Arundo patch at tie-in (Type #1)** This photo shows the downstream tie-in for channel #10. Approximately 75% of tie-in areas for the SC's were designed to coincide with large Arundo stands along the banks of the main channel to avoid existing wetlands and willows (photo 7) and focus impact on Arundo removal.

Photo 7: Representative of **Willow patch at tie-in (Type #4)**. Taken looking downstream from channel

#11. Note the stand of willows in the background. This type of tie-in will require removal of as many as 6-8 willows greater than 4" dbh and accounts for less than 10% of tie-ins in this RMU.

Photo 8: Representative of **Herbaceous wetland patch at tie-in**. Taken at upstream tie-in for #9. Photo shows typical tie-in with wetlands species such as cattails, tules, or sedges. While this areas are generally not subject to grading, wetland plants could be mowed or disced as part of maintenance. Approximately 15% of tie-in in this RMU contain small acreages of this type (< 1 acre in total).

Gonzales River Management Unit – Photos 1-8

Photo 1: Representative of **Sparse herbaceous with Arundo (Type #2**) in Gonzales. This photo is from #24 and is indicative of vegetation conditions throughout most of channels # 21, 24, 26b, and 27 where clumps of Arundo, sparse herbaceous matter and occasional mulefat and coyote brush shrubs dominate.

Photo 2: Representative of **Arundo-dominated with sparse vegetation (Type #1)** in Gonzales. This photo is from the Gonzales Bridge looking upstream at #20. While still dominated by Arundo patches and both mulefat and coyote brush, this site also supports multiple willow shrubs (< 4" dbh).

Photo 3: Representative of **Mix of early-successional perennial riparian, bordered by mid-successional willow (Types #3 and 4)** in Gonzales. Taken at #25, this shows some of the most dense wetland communities along the secondary channels. Note the foreground dominated by horsetail and the margins dominated by larger willows (2-6"dbh). At this site, as well as #23 and #16, the natural topography supports limited linear stretches (150'-250') with widths between willow margins of between 30-150 ft. Specific secondary channel widths will be field fit to minimize impacts and maximize conveyance.

Photo 4: Representative of the wider version of photo 3, **Mix of early-successional perennial riparian, bordered by mid-successional willow (Types #3 and 4)**, where the willow margins are approximately 75-80 feet apart.

Photo 5: Representative of **Sparse herbaceous with or without Arundo (Type #2)** in Gonzales. This vegetation community is dominated by sweet clover, rumex, and mustard and is found in large patches within channel #'s 18, 22, 23, 25, and 27. This photo is from # 23.

Photo 6: Representative of young, isolated cottonwoods **Early- and mid-successional cottonwood (Type #5)** in channel #14 in the Gonzales RMU. Channel #15 and #14 currently support a number of cottonwood saplings within a sparse matrix of mulefat, Arundo, and willow scrub. Cottonwoods will be avoided and/or replaced via transplanting of saplings from the secondary channel to nearby banks or planting seedlings on banks and at the toe of slopes.

Photo 7: Representative of **Willow patch at tie-in (Mix of Type #3 and #4)** along Gonzales RMU. Taken from the main channel looking toward the downstream tie-in for #23. This site contains a narrow margin of tules and sedges along the bank and narrow line of willows (dbh 2"-5") behind. Some of these willows will need to be removed and the tules/sedges may need to be mowed.

Photo 8: Representative of **Arundo patch at tie-in (Type #1)**. Taken at a possible upstream tie-in for channel #24. Approximately 75% of tie-in areas have been co-located with large Arundo clumps.

Timing, frequency, and magnitude of maintenance activities

Vegetation removal and sand/sediment management would be undertaken in each of the secondary channels as frequently as annually, based on initiation by the landowners or growers and in review with MCWRA staff. To avoid impacts to listed and sensitive species and communities, maintenance activities will occur between October 1 and December 1, outside bird nesting season, amphibian breeding season, vegetation growing season, and steelhead adult and smolt migration periods. Activities may occur when the low-flow channel of the Salinas River is flowing due to releases associated with the Salinas Valley Water Project. However, the proposed project does not occur near the low flow channel and should not impact flows should they be present while maintenance was under way.

Due to a number of factors including the cessation of channel maintenance work after 2008, modification of the natural hydrograph through dam releases during the summer months as part of the Salinas Valley Water Project, and a lack of scouring flows in the past five years, there is currently established vegetation along the main channel as well as several seasons' growth of vegetation in many of the proposed secondary channels.

The secondary channels comprise 148.7 acres between the two RMUs. This is gross acreage and actual maintenance acreage is expected to be slightly less once pre-maintenance surveys and

staking occurs. However, for the purposes of this permit application this is the estimated maximum area of impact for the proposed project over the 11.5 miles of the river.

During the first two years of the program, it is estimated that up to 95% of the acreage or 141 acres within the secondary channels would be managed for vegetation. Logistical considerations, coordination of Arundo work, and cost constraints may limit the total acreage cleared in years 1-2 to less than that amount. We estimate approximately 25% of the total acreage or 37 acres of the proposed secondary channels would be cleared and graded per year in subsequent years (years 2-3). Subsequent years (years 4-5) would likely see significantly less acreage of newly cleared secondary channels and less intensive activity since vegetation re-growth would typically be limited to herbaceous species and perennial seedlings and saplings.

Any native vegetation will be managed by mowing and discing within the RMUs.

Removal of *Arundo donax* is a foundational component of the maintenance approach described in this program. It is understood that this is a common goal for all stakeholders in the watershed and the Project seeks to work closely with the Monterey County RCD Arundo removal program as achieving success for Arundo removal. Based on local topography, equipment used for vegetation management, and partnership with the RCD's Arundo removal program, the following options are proposed for addressing Arundo within each RMU:

- Arundo will either be cut and stump treated with an approved aquatic herbicide as per the protocols described in Monterey County RCD's program or Arundo stalks and roots will be excavated using either an excavator and/or dozer. If Arundo roots are excavated, the process will involve using the teeth of the excavator bucket or a pronged attachment to a dozer to gently grab the entire root mass.

- Once either cut or excavated, Arundo biomass will either be chipped on site as per protocols established by the RCD or stockpiled and dried in higher elevation areas to avoid mobilization of active material. Stockpiled Arundo will be left to dry and burning of the stockpiles will be conducted in accordance with Monterey Bay Unified Air Pollution Control District and any other appropriate regulations.

Areas treated for Arundo will not be actively revegetated with planting, but instead left for native recruitment and monitored for Arundo resprouting and retreatment. A 5-year retreatment procedure is expected in each RMU with photo documentation conducted annually to show conditions post-treatment. The Project will further continue consultation and effectiveness evaluation with Monterey County RCD Arundo removal program.

It is estimated that a maximum of 250,000 cubic yards of sediment would be moved from two secondary channels over the 5-year permit period. Sediment would be moved outside of the active floodplain. This activity would occur in secondary channels 10 and 11 and removal would not be allowed over 2 feet deep. These channels are located higher than 3 feet above the low flow channel. It is not expected that this sediment removal will result in these two secondary channels affecting the low flow channel in terms of channel migration because of the higher elevation of these channels and distance from the low flows channel.

This maximum assumes one or more major deposition events during the 5-year permit term. Sediment would be removed from the secondary channels by truck and moved to either integrate into adjacent farm fields or stored in demarcated stockpile areas above the OHWM and outside of any jurisdictional wetlands. At secondary channels 10 and 11, existing sediment stockpile areas established during the previous maintenance permit period will be re-used to store removed sediment.

At higher flows (greater than a 10-year flow) it is acknowledged that the secondary channels may change location due to hydrology. Similarly the low flow channel could also change location in larger flows. It is the intent that the maintenance activities remain away from the low flow channel and that maintenance activities would not occur in the low flow channel in this project.

In the case that the main low-flow channel's course is naturally realigned during a high-flow event, one or more secondary channel(s) currently proposed for maintenance may require minor modifications in location, length, or other characteristics to avoid impacts to the new low flow channel and enable continuation of maintenance activities. If modifications in the proposed secondary channels are required after a large storm event, the proposal would be distributed to all of the responsible permitting agencies for consideration and comment by May 15 of that year. Permitting agency staff would have 30 days to respond to the suggested modification request and an additional 30 days for final consideration. The same design and survey protocols developed for the currently proposed set of secondary channels would be used for any realignments. Activities within realigned channels would include vegetation clearing and Arundo removal in the newly-defined secondary channel. Sand/sediment management would not be allowed in the new channel locations unless proposed in the realignment proposal and fully vetted by the permitting agencies. Neither the existing low flow channel nor the new low-flow channel would be cleared or managed as part of this program.

Proposed Access Routes

Nearly all proposed access routes, shown on Figure 6 (Gonzales RMU Access) and Figure 7 (Chualar Access), are located along existing roads and trails to reduce impacts to natural resources. In two cases where exiting access is not sufficient, new temporary access ramps will be built along unvegetated sections of existing farm levees and will be aligned as to avoid impacts to native vegetation. These two new access sites will be subject to mitigation included in the FEIR. All but three access routes are co-located on the same bank as the proposed secondary channels to minimize potential low-flow channel crossings and impacts to resources. The two exceptions are secondary channels 9 and 11; in dry years, access to these secondary channels could be achieved with minimal impact by crossing the dry bed of the low-flow channel. Alternative access routes to these secondary channels may be proposed for wet years. No equipment will enter the live, wetted stream as a part of these proposed activities.

Figure 6: Gonzales Access Map

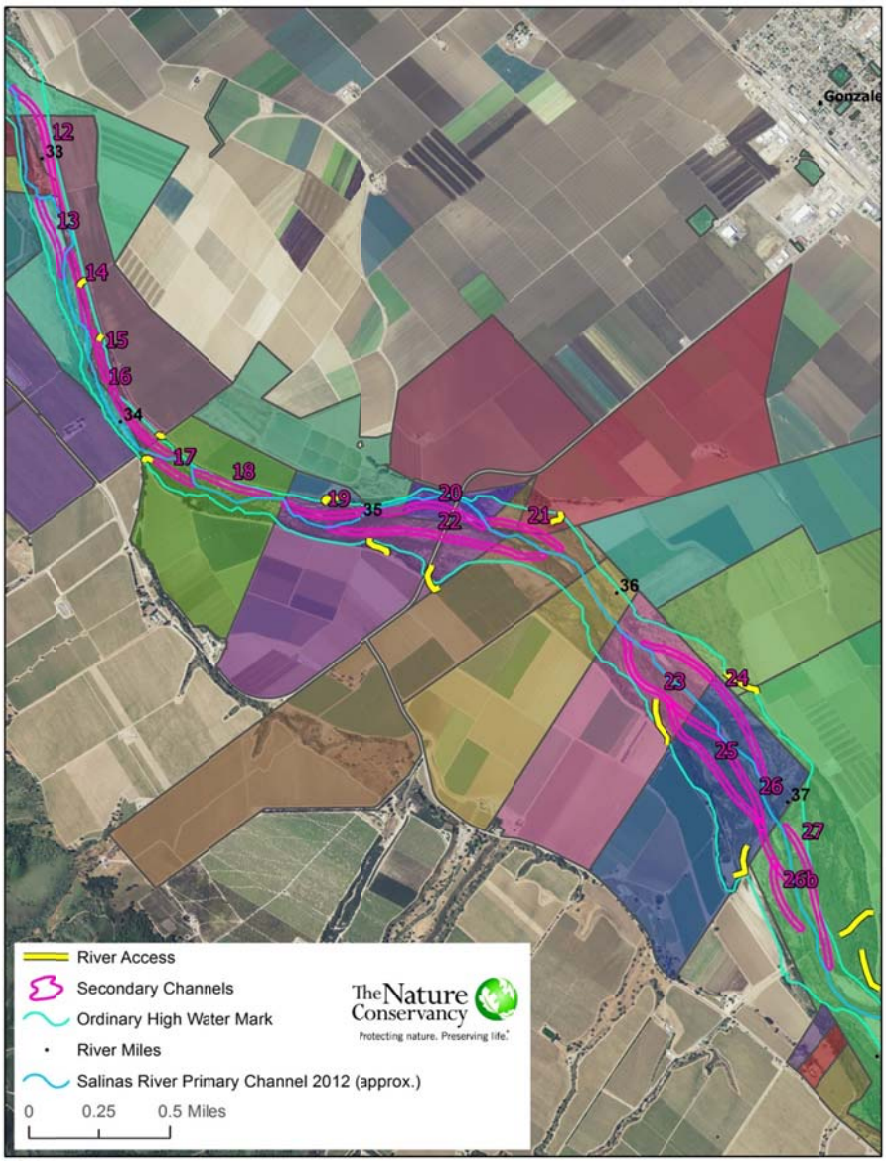
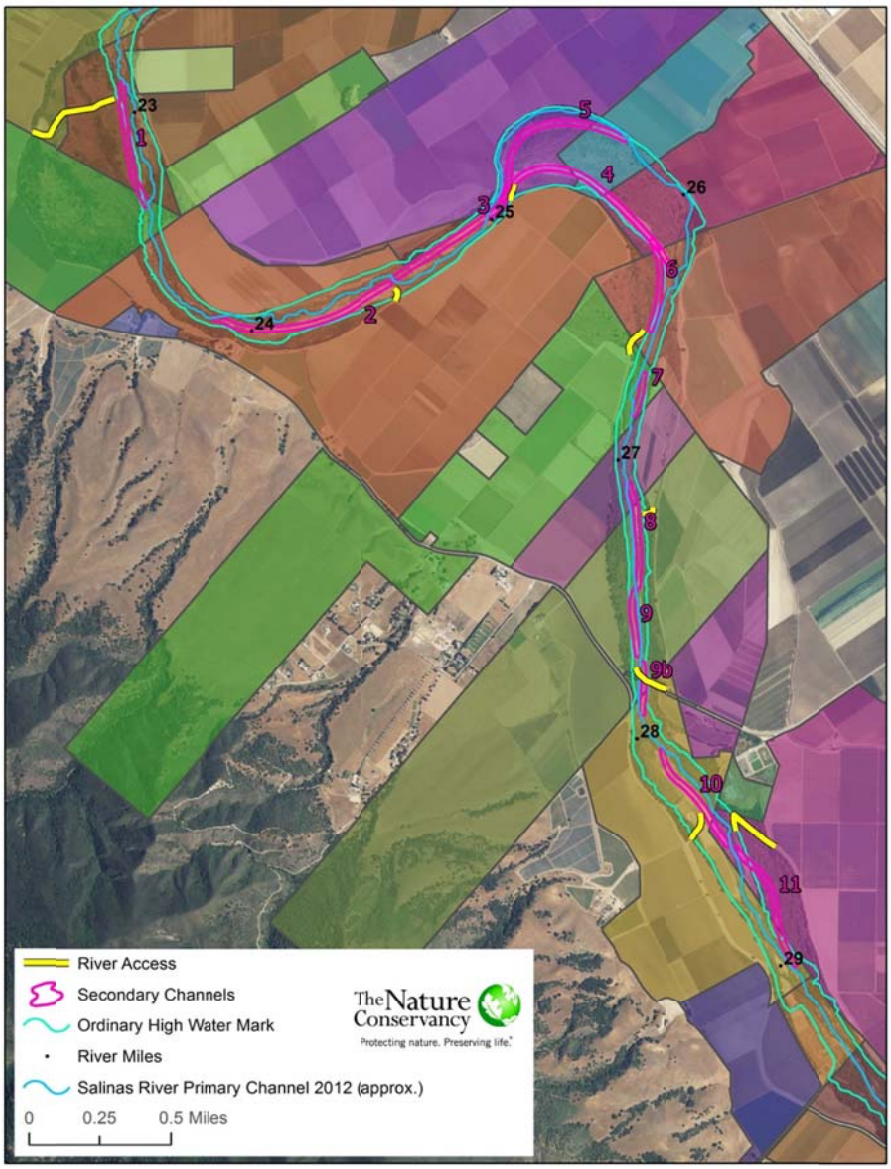


Figure 7: Chualar Access Map



Equipment Types

The project will use excavators, backhoes, tractors, frontend loaders, and trucks (dump) during maintenance activities. Diesel fuel is required for machinery and heavy equipment; refueling such equipment would be limited to designated areas so as not to expose sensitive habitats to the possibility of a fuel spill. Additionally, spill prevention BMPs will be incorporated during the maintenance period as required in the FEIR.

Based on interviews with landowners and growers who will be doing the maintenance, it is anticipated that five different types of equipment will be used for maintenance activities.

1. Bulldozers of various sizes (D7 and D9)

2. Excavators of various sizes
3. Tractor or excavator fitted with a grinder (cutting Arundo from top down)
4. Adjustable mower (can make passes at various heights) with comb-like teeth (can gentle pull out Arundo or other veg by roots) and/or disc (for discing)
5. Heavy-duty mulcher for in-situ treatment of Arundo

Pre-maintenance Surveys and Impacts Calculation

The estimated impact acreages for RMU management activity is detailed below. These estimates are maximum estimates of impact and will likely be less once pre-construction maintenance surveys are completed and work areas are staked. However for the purposes of the impact calculations these figures should be considered.

Chualar RMU Secondary Channels	**Total Acreage**
Arundo-dominated Removal	14 acres
Sparse Herbaceous with or without Arundo	29 acres
Early Successional Perennial Riparian	13 acres
Mid-Successional Willow	3 acres
Early and Mid-Successional Cottonwood	0 acres
Total	**59 acres**
Gonzales RMU Secondary Channels	**Total Acreage**
Arundo-dominated Removal	20 acres
Sparse Herbaceous with or without Arundo	30 acres
Early Successional Perennial Riparian	20 acres
Mid-Successional Willow	6.1 acres
Early and Mid-Successional Cottonwood	3.1 acres
Total	79.2 acres

Pre-maintenance surveys will be completed no more than 60 days in advance of the commencement of work. Pre-maintenance surveys will: 1) set clear, enforceable boundaries for where work will occur 2) ensure sensitive resources are avoided, where possible, and 3) quantify unavoidable resource impacts in order to identify remaining mitigation needs. The final acreage and vegetation types affected by maintenance activities in Year 1 will be determined for each secondary channel and reported for each RMU after pre-maintenance surveys are completed prior to commencement of work.

Pre-maintenance surveys of the secondary channels within each RMU will be conducted by a qualified biologist (proven education and experience with riparian species and vegetation types and aquatic ecosystems) with landowners, TNC and MCWRA personnel present in the field as necessary. Project area staking and avoidance area flagging will be conducted during these surveys. A standard report template will be developed for this reporting. The report will include maps and narrative documentation of the following:

- Survey date(s), APN's and/or secondary channels visited, landowner name and contact information, name/position/contact information for qualified biologist and any other individuals accompanying the landowner and biologist.

- GPS'd track of the centerline of each the secondary channels (with endpoints at the upstream and downstream tie-in areas) and ocular estimate or measured cross-section of the width of the channel. This information will be reported out as a GIS shapefile with appropriate attribute table and metadata, and as an indexed map;
- Calculations of acreages of the non-sensitive vegetation types proposed for removal within each secondary channel based on ocular estimates in the field, with separate calculation of the vegetation types removed at the tie-in points along the low-flow channel. Dominant and any sensitive plant species would also be documented. Representative photographs of each vegetation type from each secondary channel and photographs of each tie-in point.
- Calculations of acreages and GPS points where patches of Arundo will be treated, both within the secondary channels and any proposed mitigation areas adjacent to the channels. For each patch, also identify treatment method including mechanical or hand-held equipment to be used and herbicide use plan.
- GPS'd locations of individual trees and/or patches of sensitive habitats or large stature trees that cannot reasonably be avoided during activities (willows >6" DBH; alder, sycamore, cottonwood or other native riparian tree >2" DBH). Include species name, DBH (or average DBH if patch), approximate height (or average height if patch), and condition, if appropriate.
- Biologist will conduct visual survey of work area to ensure that potential impacts to active nests (bird and woodrat), burrows with sign of owl activities (feces, pellets and/or feathers), and/or areas of standing water are avoided. If any of these features are observed, they will be noted, GPS'd, photographed, and flagging will be used to demarcate an avoidance buffer.
- Description of proposed sediment and sand grading and movement activities, including estimates of total cubic yards to be graded or moved per secondary channel, approximate location of sediment placement out of the active floodplain (GPS'd location preferred), and photographs of representative grading and sediment movement.
- List of equipment proposed for use.
- Document proposed entry or crossing of the low-flow channel according to mapped access points for each secondary channel, including equipment to be used and before and after photographs.
- Proposed timing of activities (start and end dates, approximate number of man-hours and equipment operations hours)

In addition to the pre-construction survey work, the following modified table of Best Management Practices for Biological Resources from the DEIR will be incorporated into all work.

Biological Resources	
BIO-1: area of disturbance	Soil disturbance shall not exceed the minimum area necessary to complete the operations as described in application.

BIO-2: pre-maintenance educational training	MCWRA will annually implement an Employee Training Program (ETP) to educate MCWRA personnel, Program Participants, and contractors (as appropriate) about special status biological resources in the vicinity of the Program Area. The ETP will include the following components: • Instruction on how to identify bird nests; • Instruction on how to recognize special-status plant and wildlife species that may occur in work areas; • Instruction on how to recognize sensitive habitats, including coastal and valley freshwater marsh, sycamore alluvial woodland, and valley oak woodland; • Instructions on how to recognize non-native species, including *Arundo*, tamarisk, jubata grass, and Canary Island date palm, and other species that may be identified during implementation of the Program. • Review of measures to be implemented to protect special status plant and wildlife species, including BMP measures, mitigation measures, and measures required by various permits; • Review of reporting procedures for discovery of any nests or special status plant or wildlife species during maintenance activities; and • Review of appropriate disposal methods of cut non-native species, including *Arundo*, tamarisk, jubata grass, and Canary Island date palm, as to not contribute further to the spread of the species.
BIO-3: on-call wildlife biologist [text in italics added]	A MCWRA-qualified biologist will be on-call and available to visit a maintenance work area at any point during SMP activities in the event a special status species is encountered. *If a CESA or ESA listed species is encountered during maintenance activities and valid take authorization has not been obtained, all work will stop and the appropriate resource agency staff will be notified immediately.*

BIO-4: special status species GIS database	MCWRA will develop and maintain a GIS database of special status plant and wildlife species presence and absence information, including nests and bat roosts, verified land cover and habitats, and areas surveyed for biological resources within the Program Area, including sensitive habitats. This information will be primarily based on surveys completed as part of this Program, but will also include updated information from other surveys or studies that may be completed in the Program Area. This will allow MCWRA to more easily adapt mitigation requirements and BMP measures over time based on known conditions at locations within the Program Area. This information will be used to periodically update the biologically sensitive area matrices.
BIO-5: stream access	MCWRA and Program Participants will use existing access ramps and roads as feasible. For any site that requires a new access road from a disturbed area to the river channel or river channel crossing, prior to constructing a new stream access, the proposed access area will be surveyed and inspected for sensitive biological species (see measures below), including the presence of large mature trees or other significant habitat feature by a qualified biologist. If any are found during the pre-construction surveys, the qualified biologist will ensure avoidance and/or minimization of impacts by implementing one or more of the following, as appropriate: • Flag or delineate in the field the sensitive resources, including large mature trees or other significant habitat to be protected; • If vegetation removal is required for site access, non-native species and/or quick growing species shall be targeted first. Removal of slower-growing species, such as oaks (*Quercus* sp.) will be preferentially avoided, to the extent feasible; • Access points will be constructed as close to the work area as possible to minimum equipment transport; and, Slopes greater than 20 percent will be avoided.
BIO-6: avoid spread of non-native plant species after removal	Invasive species, including *Arundo*, will be disposed of in a manner that will not contribute to further spread of the species. *Arundo* canes will be prevented from floating downstream or otherwise entering the Salinas River or other creeks.

BIO-7: minimize removal of mature native vegetation in *Arundo* dominated areas	Non-native vegetation removal may occur anywhere within the river channel; although proper techniques must be adhered to so that the removal is effective, as outlined in the SMP guidelines. To protect mature, native willows that may occur in the buffer zone, no willows measuring greater than 6-inches in diameter at breast height will be removed.
BIO-8: avoid impacts to special status wildlife species during herbicide treatment	Only herbicides approved for use in aquatic and wetland environments that have no impacts on wildlife species will be used for non-vegetation removal (formulation of glyphosate, imazapyr, or tricolpyr). All mixing of herbicides will only occur in areas without native vegetation, adjacent to existing roads, and have compacted disturbed soils.
BIO-9: minimize root impacts to woody vegetation	Maintenance activities will be minimized to the extent practicable in the root zone of existing woody vegetation to promote soil and bank stability.
BIO-10: minimize local erosion from vegetation and sediment removal	To minimize the potential effect of localized erosion during vegetation and sediment maintenance activities, native vegetation on the toe of the bank or on river banks that are steeper than 15 percent will not be removed, as outlined in the SMP guidelines. In addition, 5 to 10 foot wide vegetated buffers will be maintained along the channel margins, which will help anchor the sandy soils. The buffer area will be clearly marked prior to the initiation of any SMP activities. There are no restrictions on where removal of non-native plants can be removed; although proper techniques must be adhered so that removal is effective and other measures to protect water quality will be followed.
BIO-11: work windows to avoid disturbing nesting birds (text in italics added)	To avoid potential impacts to nesting birds including raptors and migratory song birds, all maintenance work will commence following the nest seasoning, after September 30th.

Mitigation for Remaining Impacts

Mitigation needs will be identified after avoidance and minimization measures have been implemented during pre-maintenance surveys. Annual impacts to sensitive habitat and vegetation types in the secondary channels from maintenance would be calculated at the RMU-level and will be used to determine annual mitigation needs by type. These will be tracked for each secondary channel and rolled up into Annual RMU Report.

Based on January-March 2014 field surveys, we estimate less than 5 acres of mature willow (defined as 6" dbh), cottonwood, alder or sycamore (defined as 2" dbh), wetland, or other sensitive habitat will be impacted per RMU. Most of the potential impacts we observed are at tie-in points between secondary channels and the low-flow channel. These tie-in points have been located to avoid removal of sensitive habitats and to focus on Arundo treatment instead.

Specific Vegetation Type Impacts and Mitigation Ratios

With respect to impacts due to vegetation types in the RMUs, the following mitigation ratios are proposed.

- No mitigation is proposed for annual sparse herbaceous vegetation and Arundo dominated, types removed during maintenance.

- No direct mitigation for early successional perennial riparian (e.g., mulefat, bulrushes, horsetail, seeding/sapling willow that are on average approximately 1" in dbh with a maximum dbh of less than 2", blackberry, sedges) is proposed. Due to the rapid re-growth of this habitat type, we anticipate that Arundo removal (with adequate follow-up) in both the secondary channels AND in the mitigation areas described below will quickly colonize with species commonly found in this vegetation type. In addition, recent field observations indicate that this type is proliferating in previously managed areas as well in areas that have experience recent disturbance. This vegetation type is not currently rare within the RMU's and seems to be re-establishing naturally on a variety of surfaces. As such, we expect the overall area of this type to be expanding in the RMU's over the coming 5 years of the permit term.

- Mitigation for mid-successional willow (less than 6" dbh) and herbaceous wetland type will be mitigated on an acre for acre basis using Arundo removal at a 3:1 ratio in the RMU (outside of the secondary channels) as the key mitigation activity. Program Participants will document Arundo removal areas and extent on a map after maintenance. While the percentage of mid-successional willow is low within the secondary channels, it is a commonly occurring habitat type that is perhaps over-represented in comparison with other species types. Arundo removal areas will be required to be sprayed in subsequent years to retard Arundo sprouts. Evaluation of Arundo clearing areas will be done annually and appropriate follow up treatment will be conducted over the 5-year permit period including spraying and grubbing of new growth. Photo documentation will be provided of Arundo removal areas and post-treatment. Passive restoration of a more diverse species set in addition to willow will be encouraged in later years at Arundo removal areas.

- For early to mid-successional cottonwood, avoidance of alders, sycamores, and cottonwoods will be the primary goal in pre-maintenance staking and flagging. Any remaining impacts to any individual alder, sycamores or cottonwoods of 2" dbh or greater would require 3:1 mitigation in individual trees of like species. Mitigation for larger stature willows (6" or greater dbh) would be replaced at a 2:1 ratio, with a preference for replanting with cottonwood, alder or sycamore in order to improve the representation of this species. These replantings will be selected together with the biologist and landowner/operator and likely be sited to encourage bank stabilization.

RMU-Wide Mitigation

Due to the naturally dynamic nature of the Salinas River and the coordinated design and implementation of the secondary channels, we propose implementing mitigation throughout the RMU over the length of the permit period. RMU-wide mitigation is expected to promote a more complex riparian and active river channel over time in the RMUs. Components of the RMU-Wide Mitigation approach include the following:

1. **Arundo Removal**. Participants are encouraged to remove additional Arundo within each RMU in areas adjacent to the secondary channels. Not only would these areas be easy to access after maintenance work is complete, but this action has the secondary benefit of reducing the need for future flood risk reduction efforts due to the co-benefit of removing an invasive species and reducing roughness. In addition, Arundo has a proportionately high water usage rate, and therefore its removal will improve groundwater recharge. Arundo is prolific throughout the RMUs and this condition should ideally be addressed concurrent with the maintenance to the extent possible. Appropriate extents of Arundo removal would be determined with participants based on capacity and during the pre-maintenance surveys and annual review of work areas with a preference for removal in years 1 and 2. The project participants are coordinating with the Monterey County RCD on an Arundo removal solution for the broader watershed to maximize success of its eradication. Post removal treatment would be required in areas where additional removal was completed as described above.

2. **Multi-Year Revegetation**. Specific impacts in the secondary channels to cottonwoods, sycamores, and alders, and larger stature willows that provide structural diversity and high value habitat for birds and other wildlife are expected to be minimal (0-10 trees/RMU/yr.) in the RMUs. These impacts will be mitigated through a multi-year revegetation sequence at the 3:1 mitigation ratio for direct replacement of tree species at the toe, bank and/or top of levees and management of trees to establishment (including watering).

3. **Off-Site Enhancement**. Off-site enhancement or revegetation in other areas of the river (including Arundo removal) could be explored as well. This approach is consistent with the language of the EIR but is less preferred due to the focus of maximizing the conversion of the RMUs into more hydrological and biologically diverse areas. It is important to retain though as an option for the Demonstration Project

Maintenance Monitoring

Annual RMU Report. At the conclusion of each year's maintenance season, a summary report would be developed by RMU Program Participants and submitted to MCWRA for review and approval. MCRWA will provide the approved Annual RMU Report to permitting agencies, as necessary. The Annual RMU Report will include documentation of maintenance and mitigation actions for the year.

For maintenance actions, the report would include a summary of the year's maintenance in the RMU by activity and acreage (vegetation management and sediment grading or movement); photos of work areas before and after maintenance; photos at end of rainy season and each

year before October 1; and evaluation of adaptive management needs for the following year's maintenance in the RMU if significant flows (5-year flow or greater) occurred.

Subsequent year maintenance will be based off the Year 1 pre-maintenance survey and Annual RMU Report but maintenance is anticipated to be less each year over the 5-year permit period as vegetation and sediment management is implemented and vegetation and sediment conditions do not change significantly.

For mitigation actions, the Annual RMU Report would include documentation of replacement planting including number of plants, species, GPS location, and photo documentation. Arundo removal for mitigation ratios would be provided and documented via GPS location and provided on maps.

Physical Process or Effectiveness Monitoring. Effectiveness monitoring of secondary channels will include pre-maintenance and post-maintenance centerline topographic surveys for 10% of all secondary channels. The surveys will be conducted using traditional rod and level survey, total station, or robotic total station equipment. Surveys will extend from the low flow channel of the Salinas River into the upstream tie-in point thought the secondary channel and out the downstream tie-in and back into the low flow channel. These data could be used to refine the inputs to the hydraulic model to account for major changes in topography. Moreover, future repeat surveys of these secondary channels following flood flows could be used to better understand sediment dynamics (scour and deposition) and the effectiveness of the secondary channels in both inducing scour and/or inducing deposition.

The channel maintenance program, as described in the project description, is based on a number of biological and physical factors focused on balancing ecological integrity and processes with flood risk reduction. From a flood risk reduction perspective, the project concept was developed and tested through use of the US Bureau of Reclamation's 2D Hydraulic Model SRH2D. As part of the effectiveness monitoring program, we propose using SRH2D,or any equivalent 2-D model and the GPS data from each of the maintained secondary channels (obtained through pre-maintenance surveys) to re-run the hydraulic model for each RMU and compare both the water surface elevations and flow velocity data against the baseline model runs. Reductions in both water surface elevations and flow velocity across the RMU at the 2yr (Q2) and 5yr (Q5) return interval flows are expected when comparing the pre-treatment baseline conditions with the post-maintenance conditions. The results from updated modeling runs will be compiled and reported in the year 2 monitoring report and the final (year 5) monitoring report.

Figure 8 – Chualar Arundo Locations

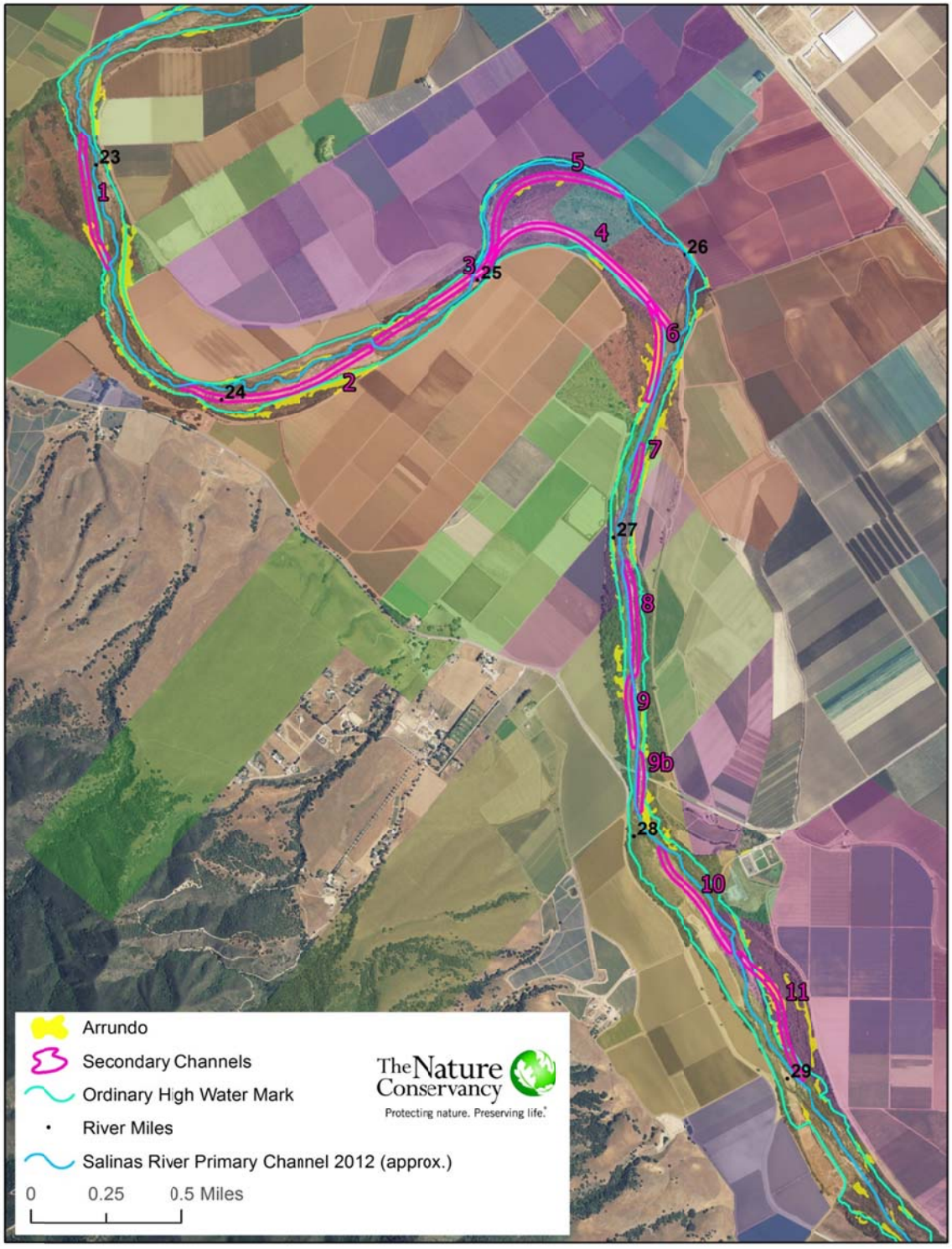
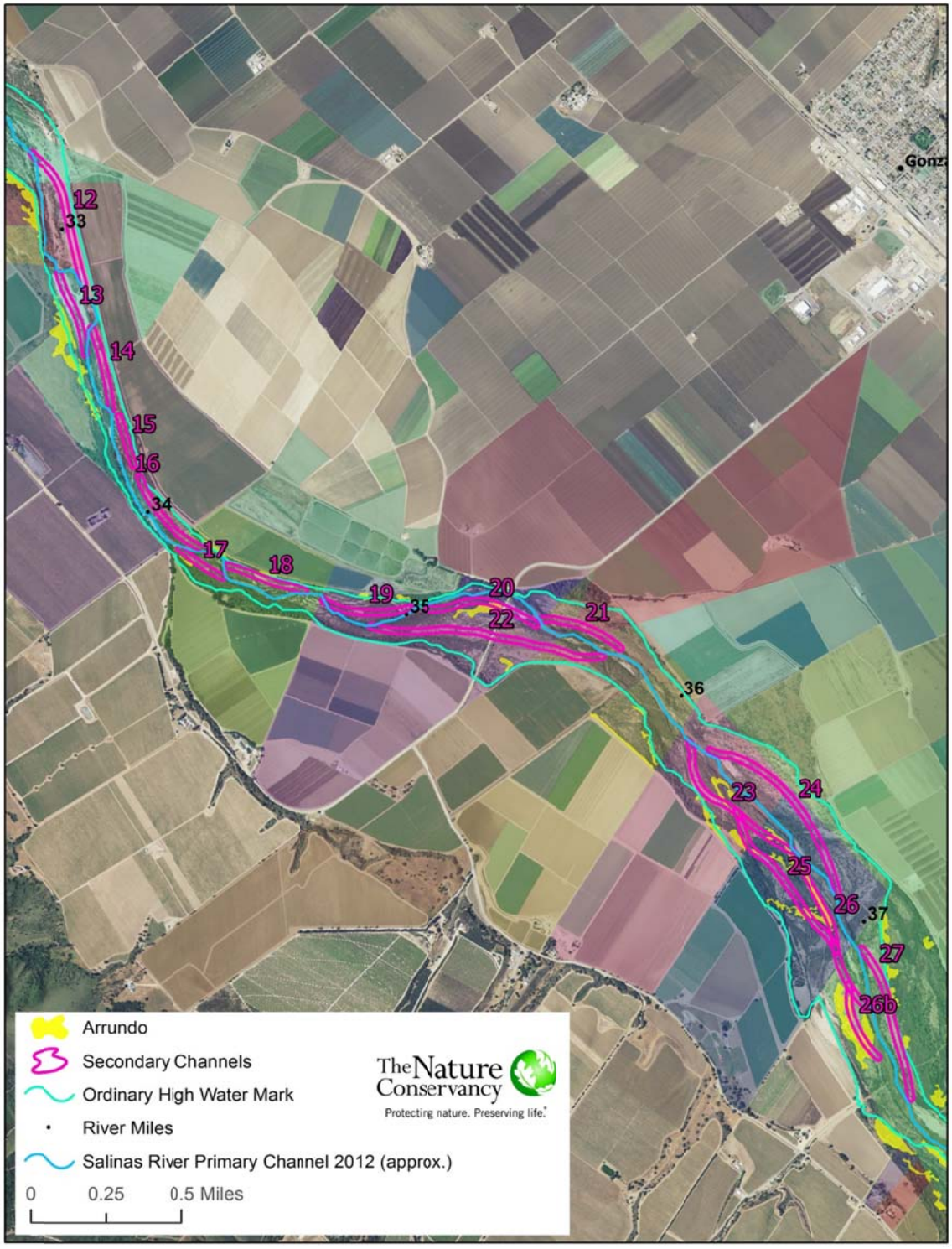


Figure 9: Gonzales Arundo Locations



References

Cardno Entrix, Salinas River Stream Maintenance Program Draft EIR, March 2013.

Lichvar, R. W., S. M. McColley. 2008. A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States: A Delineation Manual. ERDC/CRREL TR-08012. Hanover, NH: U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory.

US Army Corps of Engineers, National Wetland Plant List for the Arid West Region, 2008 update 2013.

Appendix A: OHWM Delineation

Salinas River OHWM Delineation Notes

Purpose

NewFields delineated the Ordinary High Water Mark (OHWM) to determine the spatial extend of the waters of the US along the Salinas River from Soledad State Prison downstream to Spence road. The delineation was conducted to determine the area of the channel that would require permits for channel work conducted in jurisdictional waters.

Methods

NewFields followed guidance presented in *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the arid West Region of the Western United States* (USACE 2008). The approach presented in USACE 2008 is a two stage process that prescribes a desktop analysis followed by field verification. The preliminary, desktop delineation was based on aerial photos, modeling results and the supporting information listed in Table 1. Data layers were incorporated into the project GIS and the OHWM was delineated in ArcMap 10.1. We did not conduct the second stage of analysis recommended in USACE 2008, which calls for identification of OHWMs in the field and verification of the preliminary results. If desired, NewFields can conduct the second stage of the analysis in the future.

Data Layer	Description
Aerial Photography	
	2012 NAIP (National Agricultural Imagery Program)
	2010 NAIP (National Agricultural Imagery Program)
	2009 NAIP (National Agricultural Imagery Program)
	2005 NAIP (National Agricultural Imagery Program)
Topography	
	1 ft contours derived from USGS LiDAR data
	DEM derived from USGS LiDAR data
	Hillshade derived from USGS LiDAR data
Modeling Results	
	5,000 cfs wetted extent (2 yr reoccurrence interval discharge)
	12,000 cfs wetted extent (5 yr reoccurrence interval discharge)
	45,000 cfs wetted extent (10 yr reoccurrence interval discharge)
Vegetation	
	Salinas River vegetation

Table 1 Data layers used to delineate the Ordinary High Water Marks for the Salinas River in the study reach.

We downloaded daily average discharge data for the USGS Gage # 11152500 Salinas River near Spreckels, CA from September 30, 1999 to January 22, 2014 to determine the magnitude of recent flows before each set of aerial photographs. Figure 1 shows the daily average discharge

and dates of the four sets of aerial photographs. The 2, 5, and 10-year reoccurrence interval discharges are approximately 5,000, 12,000, and 45,000 cubic feet per second (cfs) respectively.

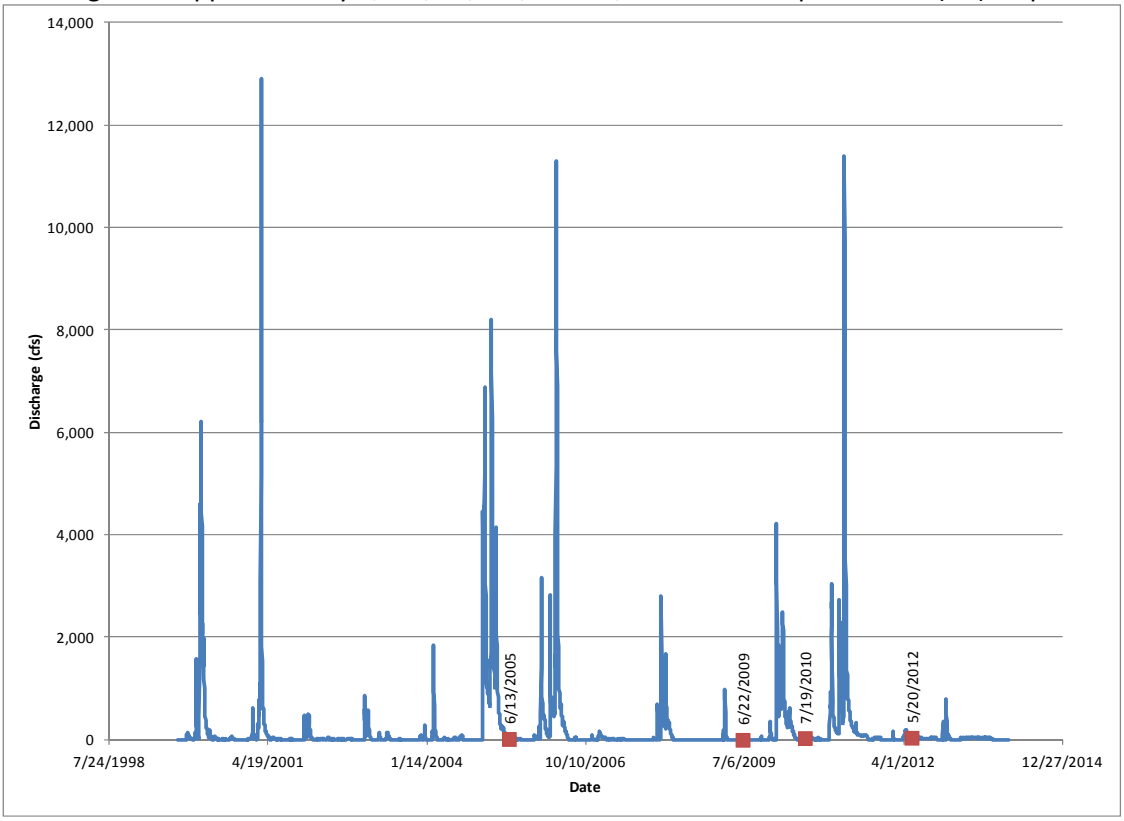


Figure 1 Daily average discharge at USGS Gage # 11151500 Salinas River near Spreckels from September 1999 to January 22, 2014. Red squares show the date of aerial photography used for this analysis.

In addition to the layers listed in Table 1, we also reviewed NRCS soil data for the study area, but determined that the resolution of the mapping units was not helpful for delineating the OHWM. Geology data was considered and excluded from the analysis for the same reason.

Delineation of stream channels in the arid west are difficult compared to perennial streams in more humid climates because low flow features tend to be formed and may be relocated during low to moderate discharge events (5-10 yr) due to unconsolidated soils typically found in arid systems, lack of stabilizing vegetation, and episodic discharge patterns (USACE 2008). The Salinas River is a compound channel that is characterized by a single, low flow meandering channel inset into a wider braided channel network. USACE 2008 classifies compound channels as highly susceptible to widening and channel relocation during moderate to high discharges. After channel forming flow events, the low flow channel is re-established (USACE 2008). After incorporating the data listed in Table 1 into a GIS basemap, we delineated the OHWM using a combination of topography, aerial photography, modeling results. Using these data sources we delineated the boundary between the active floodplain (including the active channel) and terrace floodplain. In the aerial photographs of the site, we looked for contrasting patterns of vegetation and geomorphic features related to breaks in slope. We relied largely on the reworked appearance of the active floodplain and made visual inferences on the lateral

variability of the image across the cross section. We used the topography to identify breaks in slope across the channel cross section and to assist in the interpretation of the features identified in the aerial photographs. Results of the extent of inundation from a 2-year event (5,000 cfs) from the hydraulic model NewFields developed of the Salinas River were used a check of our delineation.

Results

The NewFields OHWM delineation is contained in a shapefile with a continuous right and left bank line along the study reach. The delineation in most locations is slightly wider than the extent of the 2-year modeling results. The delineation could be refined with additional effort. In locations where the low areas are inundated outside of the active channel the modeling results extend outside of what we have delineated as the active channel. Examples of these locations include the inundation of agricultural fields that are in the floodplain and backwater from bridges that cross the channel. This delineation should be used as a guide for determining the permits required for potential in channel work. To finalize this delineation, the OHWMs should be identified in the field and compared to this delineation. Based on the results of the field review, the delineation should be revised as needed.

References

Lichvar, R. W., S. M. McColley. 2008. *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States: A Delineation Manual.* ERDC/CRREL TR-08012. Hanover, NH: U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory.