LOCATION HYDRAULICS MEMORANDUM

Route 1 / Route 9 Intersection
Improvement Project
San Lorenzo River

City of Santa Cruz, Santa Cruz County, California

Prepared for

Caltrans District 4

March 5, 2012

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Figure 1 Project Location Map

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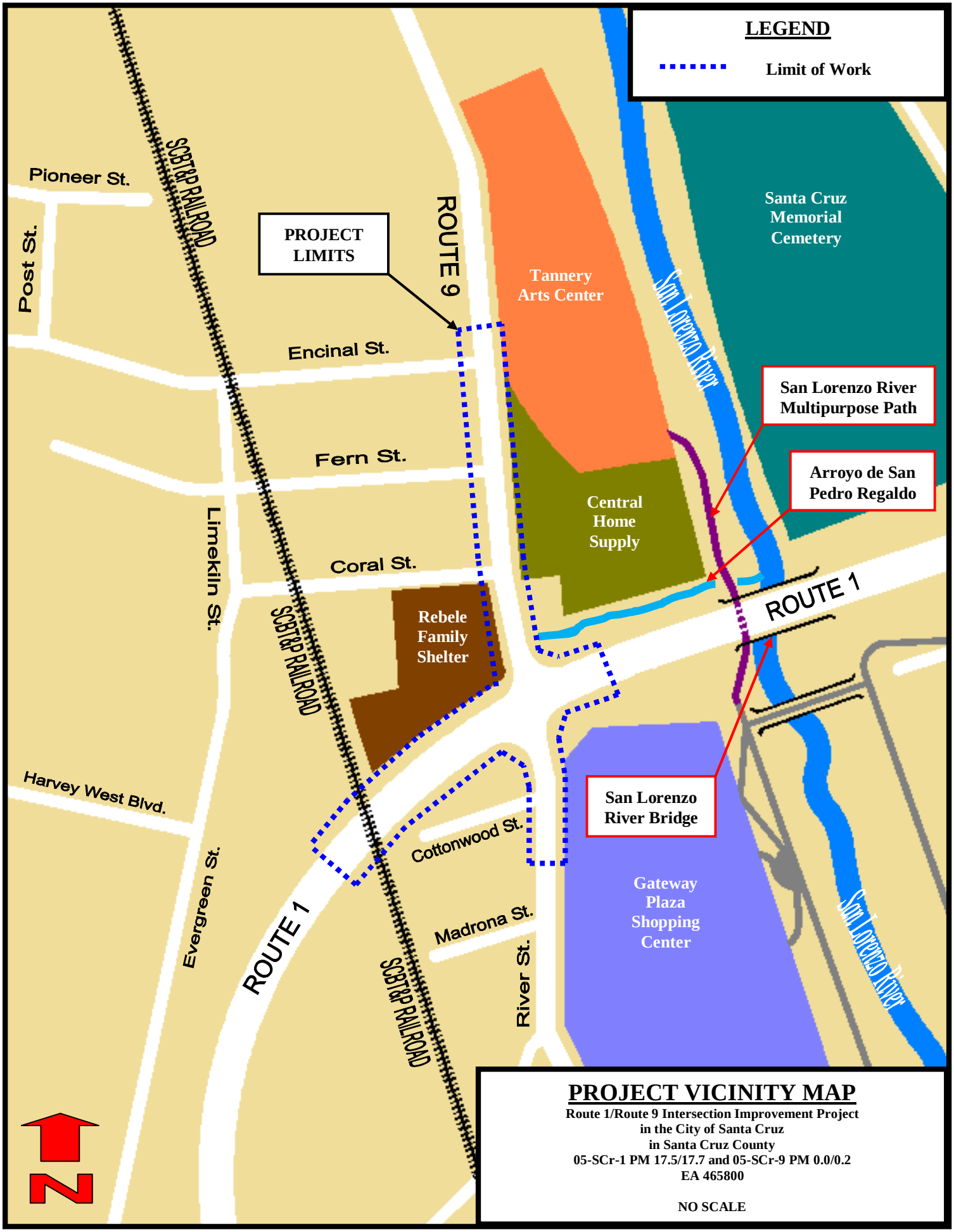
Appendix A

Exhibit 1 Firmette of FLOODPLAIN FEMA Map Number 060687 C0332D

PROJECT LOCATION MAP

Route 1/Route 9 Intersection Improvement Project
in the City of Santa Cruz
in Santa Cruz County
05-SCr-1 PM 17.5/17.7 and 05-SCr-9 PM 0.0/0.2
EA 465800

NO SCALE


LEGEND
Limit of Work
Pioneer St.
Post St.
SCBT&P RAILROAD
PROJECT LIMITS
ROUTE 9
Encinal St.
Fern St.
Limekiln St.
Coral St.
Tannery Arts Center
Santa Cruz Memorial Cemetery
San Lorenzo River
San Lorenzo River Multipurpose Path
Arroyo de San Pedro Regaldo
Central Home Supply
ROUTE 1
Rebele Family Shelter
Harvey West Blvd.
Evergreen St.
Cottonwood St.
Madrona St.
River St.
San Lorenzo River Bridge
Gateway Plaza Shopping Center
N
PROJECT VICINITY MAP
Route 1/Route 9 Intersection Improvement Project
in the City of Santa Cruz
in Santa Cruz County
05-SCr-1 PM 17.5/17.7 and 05-SCr-9 PM 0.0/0.2
EA 465800
NO SCALE

SETTING

The California Department of Transportation District 4 is proposing to improve the Route 1 and Route 9 Intersection (Intersection) in the City of Santa Cruz (project). The project area is in the vicinity of the San Lorenzo River (River). The project proposes roadway widening and pavement resurfacing 400 feet west of the San Lorenzo River. This grading would have no affect on River water levels. As currently proposed, the project will be outside of the Federal Emergency Management Agency 100-year inundation area except for a limited area of fill associated with roadway widening that will be placed at the northeast corner of the Intersection, upstream of the Highway 1 Bridge. The fill is downstream of two existing buildings that block flows through the project area, making the zone where the fill will be placed ineffective for conveying River flow. The fill needed for roadway widening will not impact 100-year water levels in the San Lorenzo River. The project vicinity is shown in Figure 1.

The proposed project will be adjacent to the overland flow path of the San Lorenzo River. The purpose of this report is to present the following:

- The design 100-year flow rates
- Existing 100-year water levels
- Impact of project on the 100-year water level

The area has a relatively mild climate, with temperatures ranging from an average high of about 75 degrees Fahrenheit during July to an average low of 39 degrees Fahrenheit in January. Fog and low overcast are common during the night and morning hours. Nearby temperature gages are Santa Cruz (2 miles away) and Felton (6 miles away). About ninety percent of the rainfall occurs between November 1 and April 30. January is usually the month with the most rainfall. Although thunderstorms do occur during the summer months, they do not contribute significantly to the annual precipitation. At the project location, the mean annual precipitation is about 30 inches.

The peak recorded flow in the San Lorenzo River at the Santa Cruz gage (USGS 11161000 SAN LORENZO R A SANTA CRUZ CA) is 30,400 cfs on December 23, 1955. Gage data is available for 1953 through 1960 and for 1988 through current. The highest reading for the 1988 through current period is 19,000 cfs on February 3, 1988. The USGS reports a total drainage area of 115 square miles at the stream gage. Flood control improvements were constructed along the San Lorenzo River through downtown Santa Cruz following the 1955 floods.

PROJECT DESCRIPTION

The project proposes widening and pavement replacement at the intersection of Route 1 and Route 9. The project includes relocating the outfall for Arroyo de San Pedro Regaldo. About 10-feet to the east to accommodate the Route 9 roadway widening. Modifications to Arroyo de San Pedro Regaldo are not included in this Location Hydraulics Study.

NATIONAL FLOOD INSURANCE MAPS

The project is adjacent to the 100-year inundation area of the San Lorenzo River. The San Lorenzo River is shown on the Federal Emergency Management Agent (FEMA) Flood Insurance Rate Map (FIRM), with a substantial overbank area identified as Hazard Zone A. The FEMA Flood Insurance Rate Map is attached as Exhibit 1 in Appendix A. The flood map shows that runoff overtops the Creek banks, but does not overtop the existing Route 1 Bridge. No in-stream improvements are proposed that would affect 100-year water levels.

> EXHIBIT 1 –Santa Cruz County, California, Panel 332 of 470. The map is Community Panel number 060687 C0332D and has a revised date of March 2, 2006.

METHODOLOGY

No Creek modeling was conducted as a part of this evaluation. Water levels and design flows are from the FEMA FIS.

BRIDGE HYDRAULICS

The 100-year water level of the Creek at the San Lorenzo River Highway 1 Bridge is identified on the FEMA Flood Insurance Study as Elevation 27 upstream of the bridge and elevation 26 downstream of the bridge.

Based on the City of Santa Cruz Flood Insurance Study by FEMA, the peak flow rate in the San Lorenzo River during the 100-year storm event (1-percent design flood) is 47,600 cfs upstream of the confluence with Branciforte Creek about one mile downstream of the project. The FEMA 50-year flow at this location is 39,600 cfs and the 500-year flow is 66,500 cfs. The upstream tributary area is 118 square miles.

Scour - The project will not impact Creek flows or scour potential.

IMPACTS ON FLOODPLAIN

The following addresses project impacts on the floodplain.

1. Risk Associated with Implementation of the Action

   There is no increase in flooding risk associated with the project. The proposed project will fill a small portion of the Creek overbank reducing total overbank flow area by less than 1%. The grading would occur above the 10-year water level and will not change hydraulics for storm events more frequent than a 10-year event. The fill would occur outside the effective of flow path of the bridge and will not impact flow velocities and friction losses. The risks associated with the proposed action are not significant.

2. Impacts on Natural and Beneficial Flood-plain Values

   There are no detrimental project impacts on natural and beneficial flood-plain values. The project proposes no changes below top of bank and impacts only an area that is already developed.

3. Support of Probable Incompatible Floodplain Development.

   The proposed project includes grading of the overbank. The project will not adversely affect the floodplain. The project will not result in or support incompatible floodplain development.

4. Measures to Minimize Floodplain Impacts Associated with the Action

   No actions are proposed within the floodplain.

5. Measures to Restore and Preserve the Natural and Beneficial Floodplain Values Impacted by the Action

   No actions are proposed within the top of bank of the River, thereby preserving the natural floodplain value.

6. Practicability of Alternatives to any Significant Encroachment

   No significant floodplain encroachments are proposed as a part of the project, and no incompatible floodplain development is proposed.

7. Practicability of Alternatives to any Longitudinal Encroachment

   The proposed project is not a longitudinal encroachment of the base floodplain.

CONCLUSION

The proposed changes to pavement and roadway will result in a minor reduction in ineffective 100-year flow area within the San Lorenzo River floodplain. Work will be away from the top of bank of the River and will have no direct affect on River conditions. The adjacent area will be inundated to elevation 27 during a 100-year event. The project proposes minor fill to an area below elevation 27, including for the relocation of the Arroyo de San Pedro Regaldo outfall. No flooding of the Intersection roadway improvements would occur during the 100year event. The project does not impact beneficial uses of the Creek or adversely impact floodplain values.

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

A — A — Cross section line

23 — 23 — Transect line

87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

$^{24}76^{000m}N$ — 1000-meter Universal Transverse Mercator grid values, zone 10N

600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone II (FIPSZONE 0402), Lambert Conformal Conic projection

DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)

● M1.5 — River Mile

SANTA CRUZ COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 332 OF 470

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

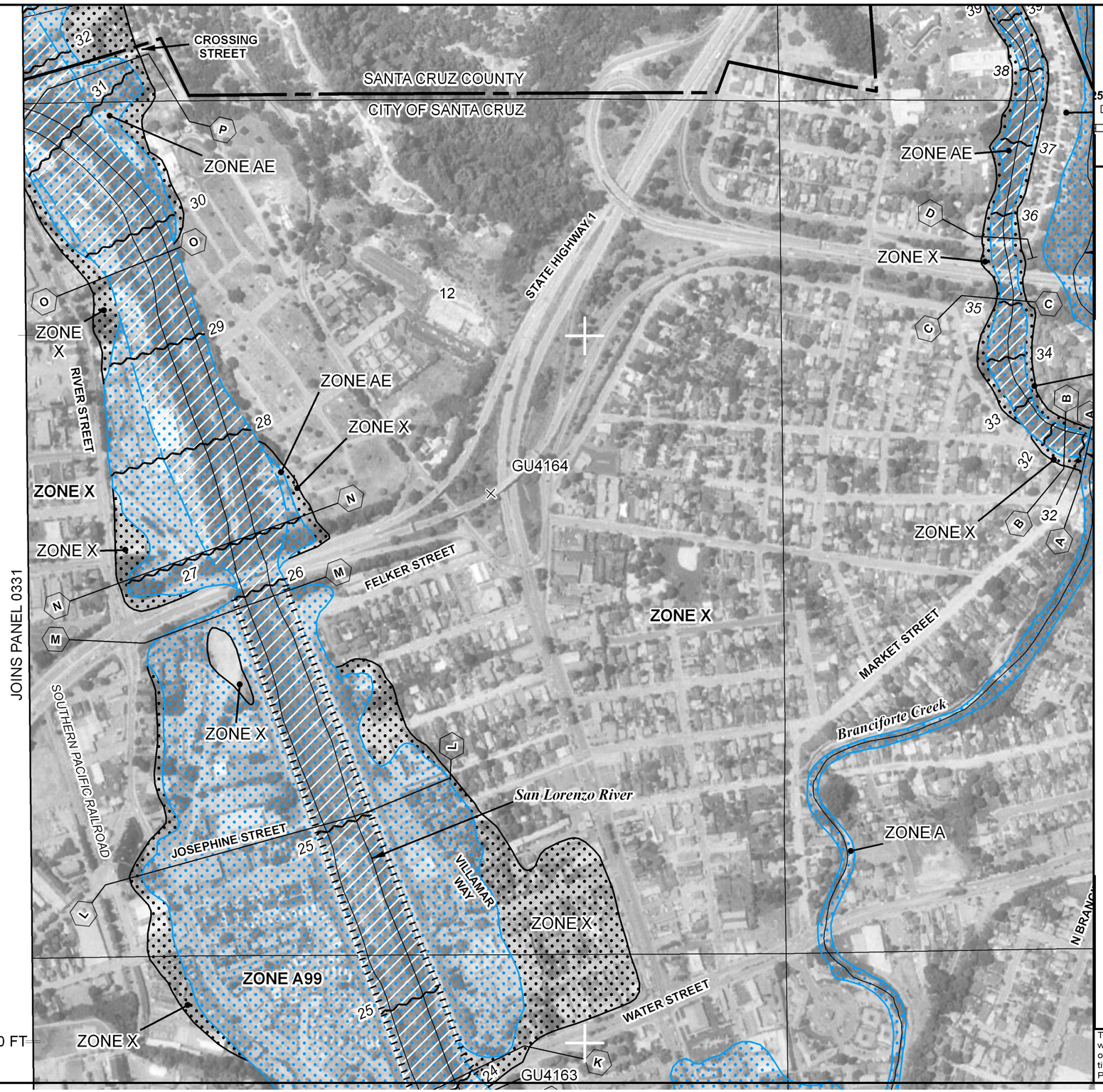
EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
March 2, 2006

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



MAP SCALE 1" = 500'

250 0 500 1000

FEET

METER

NFIP

PANEL 0332D

FIRM

FLOOD INSURANCE RATE MAP

SANTA CRUZ COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 332 OF 470

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SANTA CRUZ COUNTY	060353	0332	D
SANTA CRUZ, CITY OF	060355	0332	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06087C0332D

EFFECTIVE DATE
MARCH 2, 2006

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

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