

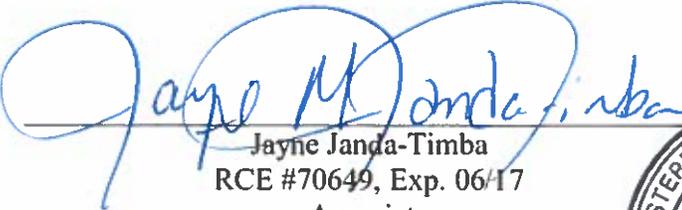
**SUMMARY OF FINDINGS FOR THE
ANNUAL DRAINAGE CHANNEL FIELD
ASSESSMENT AND MAINTENANCE PRIORITIZATION
PROJECT (PHASE 1)
FOR
THE CITY OF SAN DIEGO – MASTER STORM WATER
SYSTEM MAINTENANCE PROGRAM (MMP) MAP 92:
35TH ST & MARTIN AVE**

**Job Number 17204-D
August 4, 2015**

RICK
RICK ENGINEERING COMPANY
ENGINEERING COMPANY
RICK ENGINEERING CO

**SUMMARY OF FINDINGS FOR THE
ANNUAL DRAINAGE CHANNEL FIELD
ASSESSMENT AND MAINTENANCE PRIORITIZATION PROJECT (PHASE 1)
FOR
THE CITY OF SAN DIEGO – MASTER STORM WATER SYSTEM MAINTENANCE
PROGRAM (MMP) MAP 92: 35TH ST & MARTIN AVE**

Job Number 17204-D


Jayne Janda-Timba
RCE #70649, Exp. 06/17
Associate



Prepared For:
City of San Diego
2781 Caminito Chollas
San Diego, California 92105

Prepared By:
Rick Engineering Company
Water Resources Division
5620 Friars Road
San Diego, California 92110-2596
(619) 291-0707

August 4, 2015

TABLE OF CONTENTS

1.0 Executive Summary	1
2.0 Introduction.....	1
3.0 Desktop Channel Maintenance Prioritization Analysis	1
4.0 Hydrologic Summary.....	2
5.0 Hydraulic Analysis.....	3
6.0 Other Channel Prioritization Factors	4
7.0 Summary of Findings and Recommendations	4

Tables

Table 1: Channel Prioritization Assessment Factors and Weighting	2
Table 2: 100-year Peak Discharge (Q100) Estimation Based on Watershed Size	2
Table 3: Summary of Approximate Hydrologic Data	3
Table 4: Summary of Hydraulic Analysis Results	4
Table 5: Channel Prioritization Assessment Scoring Summary.....	4

Appendices

Appendix A: Master Storm Water System Maintenance Program (MMP), dated October 2011, Storm Water Facilities Key Map and Map 92: 35th St & Martin Ave	
Appendix B: City of San Diego Operations and Maintenance (O&M) Channel Maintenance Inspection Forms completed for the channel and Site photos taken by the City of San Diego	
Appendix C: Hydrologic Support Material	
Appendix D: Hydraulic Analysis Output	
Appendix E: Channel Prioritization Assessment Sheet	
Appendix F: Channel Maintenance Prioritization Summary Sheet	
Appendix G: Available As-built plans	
Appendix H: Compact Disc: PDF Version of Full Report	

1.0 Executive Summary

This report and preliminary analyses concludes that the Channel Prioritization Score for the 35th St & Martin Ave (MMP Map 92) is **57.4 out of 100**. This score is at average and indicates that the channel is recommended for maintenance. If the channel is maintained to reflect the as-built condition, the hydraulic capacity of the channel will increase from the current 113 cfs (less than 2-year storm event) capacity to a 227 cfs (less than 2-year storm event) capacity. In addition to the hydraulic capacity, the analyses considered other factors including water quality, community input and aesthetics. The analyses concluded that these other factors are generally in good condition and the benefits of maintaining the channel are mainly to reduce the flood risk.

2.0 Introduction

This report summarizes the findings for the Annual Drainage Channel Field Assessment and Maintenance Prioritization Project (Phase 1) for the City of San Diego for Master Storm Water System Maintenance Program (MMP), dated October 2011, Map 92: 35th St & Martin Ave. Refer to Appendix A for the MMP Storm Water Facilities Key Map and Map 92.

Purpose

As part of the Master Storm Water System Maintenance Program (MMP), the City of San Diego performed site visits to drainage channels within the MMP and designated several drainage channels as maintenance priorities. The purpose of Phase 1 of this project is to perform a desktop analysis to evaluate the drainage channels identified by the City of San Diego and rank them in order of significance for the purposes of City of San Diego maintenance activities.

3.0 Desktop Channel Maintenance Prioritization Analysis

The desktop channel maintenance prioritization analysis is based on the following items which were reviewed and evaluated to determine the maintenance priority:

- City of San Diego Operations and Maintenance (O&M) Channel Maintenance Inspection Forms completed for the channel by the City of San Diego (Refer to Appendix B)
- Site photos taken by the City of San Diego (Refer to Appendix B)
- Available as-built plans (Refer to Appendix G)
- Hydraulic Analysis (Refer to Section 5.0 and Appendix D for detailed output)

Section 5.1 of the MMP discusses the Annual Maintenance Needs Determination Process. As part of the determination process, the MMP recommends that certain factors be evaluated including flood risk to life and property, water quality, community input and aesthetics. These four factors were utilized for this channel maintenance prioritization analysis. For the purposes of prioritizing the channel for maintenance activities, each main factor is weighted as shown in Table 1 below:

Table 1

Channel Prioritization Assessment Factors and Weighting	
Factor	Percent Weighted (%)
Flood Risk	75
Water Quality	10
Community Input	10
Aesthetics	5

As part of the channel prioritization analysis, each of the main factors has been divided into sub-factors. To determine the Flood Risk factor, a basic hydraulic analysis was performed for the channel. The hydraulic analysis is described in more detail in the Hydraulic Analysis section (Section 5.0) of this report. The remaining factors, Water Quality, Community Input and Aesthetics were assessed based on the site photos and the information provided on the (O&M) Channel Maintenance Inspection Form completed for the channel provided by the City of San Diego. These factors and sub-factors and how they relate to the Channel Prioritization Score are shown in more detail on the Channel Prioritization Assessment Sheet located in Appendix E.

4.0 Hydrologic Summary

Estimated Peak Discharges

A drainage study for the channel was not available at the authorship of this report. The drainage channel is not a Federal Emergency Management Agency (FEMA) defined channel and no detailed hydrologic analysis was available. Therefore, the 100-year storm event peak discharge (Q100) for the channel was estimated based on the size of the watershed tributary to the channel as shown in Table 2 below:

Table 2

100-year Peak Discharge (Q100) Estimation Based on Watershed Size				
Watershed Area (square	<1	1	2	>4
cfs per acre	4	2	1.5	1

cfs = cubic feet per second

The 2-, 5-, 10-, 25-, and 50-year storm event flow rates were then approximated by taking the ratio of the unknown storm event 6-hour precipitation and the 100-year storm event 6-hour precipitation, and then multiplying Q100 by the ratio to estimate the flow rate for the unknown storm event. Hydrologic support material is located in Appendix C. A summary of the estimated peak discharges are provided in the table below:

Table 3

Summary of Approximate Hydrologic Data						
Drainage Area: 128 acres						
6-hour Precipitation (in)	1.2	1.4	1.6	1.8	2.25	2.5
Frequency	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Discharge (cfs)	246	287	328	369	461	512

cfs = cubic feet per second

5.0 Hydraulic Analysis

A basic hydraulic analysis of the channel was performed to assess the Flood Risk factor. The channel assessment limits are shown on Map 92 located in Appendix A. Manning's equation was utilized to calculate the capacity of the channel under two conditions:

1. Post-Maintenance Conditions: based on the material and geometry as observed on a site visit conducted on July 20, 2015 along with City of San Diego's 1999 2-foot topography.
2. Current Conditions: based on the vegetation and sediment levels estimated from the site photos taken by the City of San Diego and information provided on the (O&M) Channel Maintenance Inspection Form prepared by the City of San Diego.

In the absence of As-Builts for this channel, City of San Diego 1999 topography was used to obtain the geometry of the channel. This channel is entirely earthen and was measured using the 1999 topography to have a bottom width of approximately 6 feet, 2 foot depth, side slopes of 4:1, and the channel's overall slope to be approximately 0.02 ft/ft. These channel properties were used for hydraulic calculations of the Post-Maintenance Conditions.

Culvert crossings that may exist within the channel reach were not analyzed as part of this hydraulic analysis. Existing culverts may be inefficient or undersized, however the culvert hydraulics were not considered as part of this analysis.

The multiple storm event peak discharges previously calculated in Section 4.0 were evaluated under each condition to assess the capacity of the channel and evaluate the benefit of performing maintenance activities on the channel. See the table below for a summary of the hydraulic results and Appendix D for detailed hydraulic output.

Table 4

Summary of Hydraulic Analysis Results			
CURRENT CHANNEL CAPACITY		AS-BUILT CHANNEL CAPACITY	
Current Condition (cfs)	Equivalent Storm Event (year)	As-built Condition (cfs)	Equivalent Storm Event (year)
113	Less than 2	227	Less than 2

cfs = cubic feet per second

6.0 Other Channel Prioritization Factors

Sections 4.0 and 5.0 above discuss the determination process for the Flood Risk factor. For more information on the assessment of the Water Quality, Community Input, and Aesthetics factors please refer to the Channel Prioritization Assessment Sheet in Attachment E. The Channel Prioritization Assessment Sheet lists and describes the sub-factors that are considered in the determination of the four main channel assessment factors.

7.0 Summary of Findings and Recommendations

A summary of the Channel Assessment is shown in the table below:

Table 5

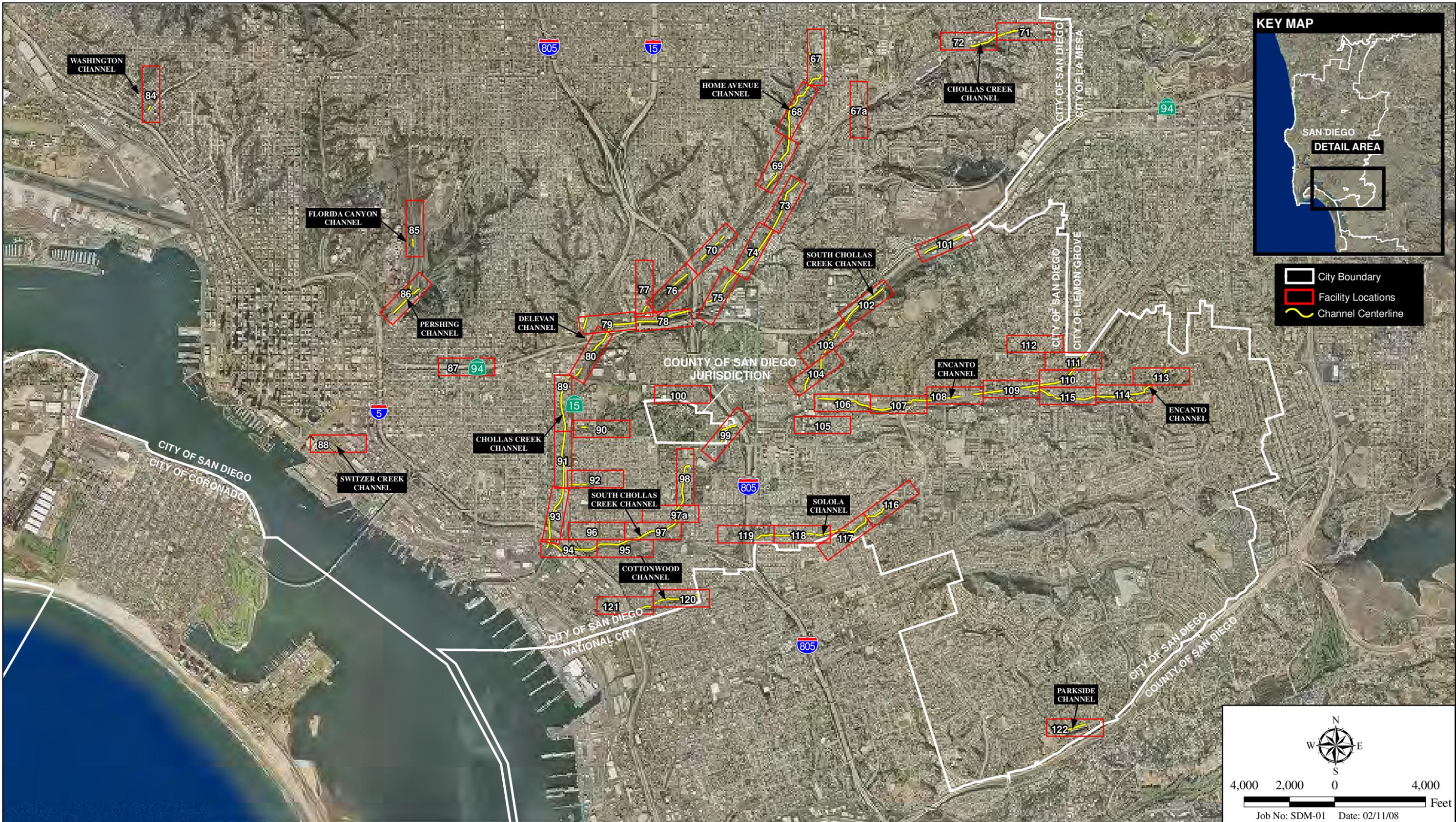
Channel Prioritization Assessment Scoring Summary		
Factor	Percent Weighted (%)	Weighted Factor Score/Maximum
Flood Risk	75	54.4/75
Water Quality	10	3/10
Community Input	10	0/10
Aesthetics	5	0/5
Overall Channel Score:		<i>57.4/100</i>

Based on the evaluation of the four weighted channel prioritization factors described in Section 3.0 of this report, the Channel Prioritization Score for MMP Map 92: 35th St & Martin Ave is **57.4**. Refer to the Channel Prioritization Assessment Sheet located in Appendix E for details on the evaluation of the weighted factors and resulting score for this channel.

It is recommended that this drainage channel be maintained to increase the current capacity of the channel from a 113 cfs (less than a 2-year storm event) back to a 227 cfs (less than 2-year storm event) capacity. It is important to note that although maintenance will not reduce the frequency of flooding, it will reduce the overall effect of flooding.

A summary of the channel including an aerial map, channel prioritization score, and other pertinent information is shown on the exhibit titled “Channel Maintenance Prioritization Summary Sheet” located in Appendix F.

Appendix A
Master Storm Water System Maintenance Program (MMP),
dated October 2011, Storm Water Facilities
Key Map and Map 92: 35th St & Martin Ave



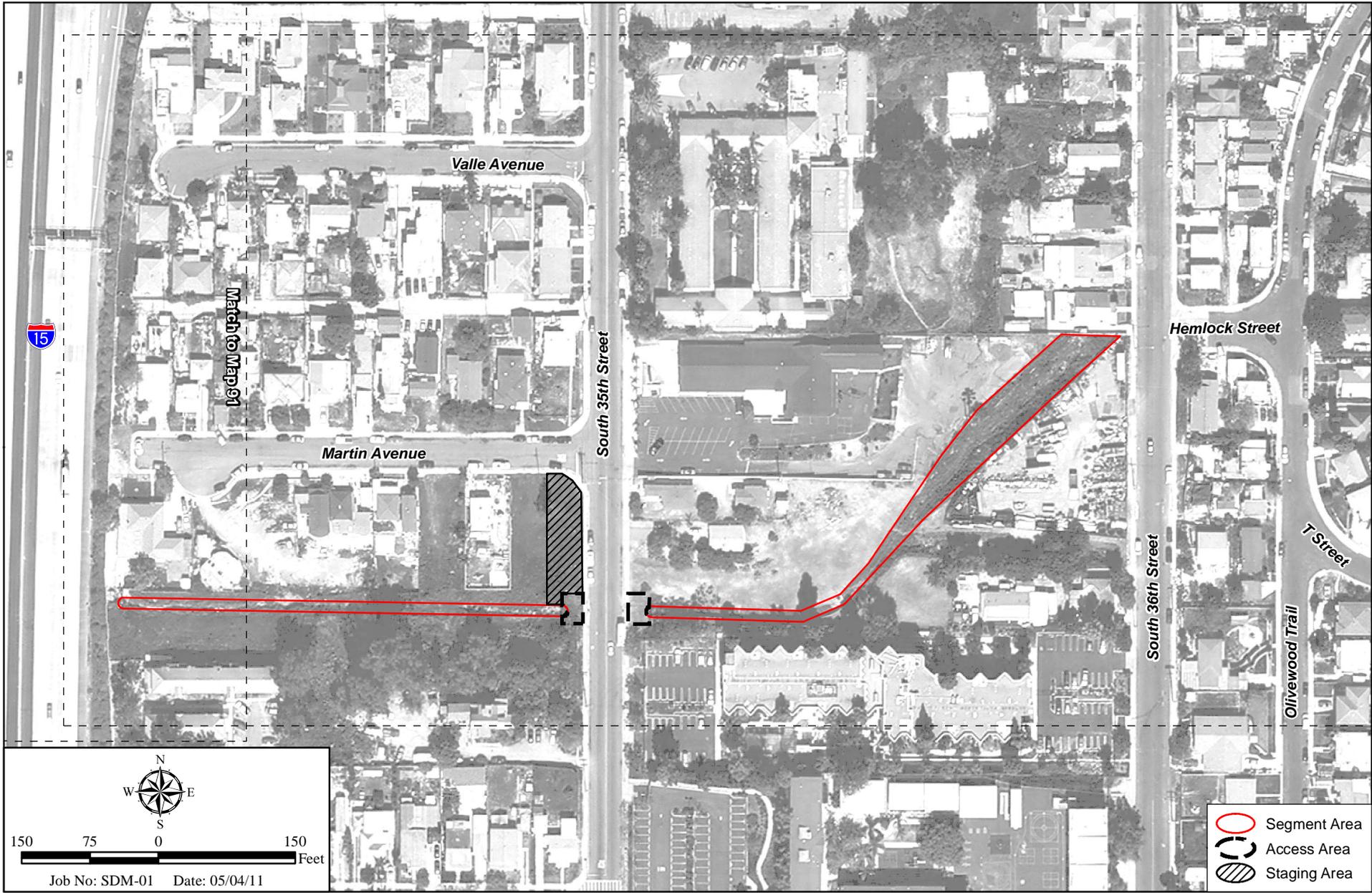
I:\ArcGIS\SDM-01\Map\ENV\MSMP\Fig2d_CentralSD.mxd-NM

Stormwater Facilities - Central San Diego Area

CITY OF SAN DIEGO MASTER STORMWATER SYSTEM MAINTENANCE PROGRAM

Figure 2d





E:\ArcGIS\SDM-01 StormDrainMaintenance\Map\ENV\MasterPlan\Map92.mxd -RK

Access and Staging Areas

CITY OF SAN DIEGO MASTER STORMWATER SYSTEM MAINTENANCE PROGRAM

Appendix B
City of San Diego Operations and Maintenance (O&M)
Channel Maintenance Inspection Forms completed
for the channel and Site photos taken by the City of San Diego

Operations and Maintenance

Channel Maintenance Inspection Form

Date: 5/6/15 Time: 4m

Channel Map No.: 92 35st @ martin ave

Watershed: pueblo S.D

Inspector: Sam/Richard

Weather: cloudy

Initial Inspection *yes*

Follow Up Inspection

Item	Condition	Comments
A. Channel Condition		
1= Poor Condition/Needs Immediate Attention		
2= Moderate Condition		
3= Good Condition		
1. Structure Condition	1 2 3 N/A	
2. Erosion	1 2 3 N/A	
3. Trash/Debris	1 2 3 N/A	Type of trash and source: <i>light house hold</i>
4. Water Conveyance/ Volume	1 2 3 N/A	<i>90% volume</i>
5. Standing Water	Y N	
A. Ponding	Y N	
B. Noticeable odors	Y N	
C. Algae	Y N	
6. Vegetation	1 2 3 N/A	Approx. Coverage/Density of Vegetation: <i>90%</i>
A. Invasive (Arundo)	1 2 3 N/A	
B. Native	1 2 3 N/A	
7. Sediment	1 2 3 N/A	Approx. Depth/Coverage of Sediment: <i>20%</i>
8. Transients/ encampments	Y N	

B. Culverts and Outfalls

1= Poor Condition/Needs Immediate Attention

2= Moderate Condition

3= Good Condition

Item	Condition	Comments
1. Structure Condition	1 2 3 N/A	
2. Trash/Debris/Sediment	1 2 3 N/A	
3. Clogging	1 2 3 N/A	

C. See Map Attached

-Identify Key Issues on Map

-Inspect and take photographs from vantage points identified on Map

Other Comments:

D. To Be Completed by Management

Follow Up Actions

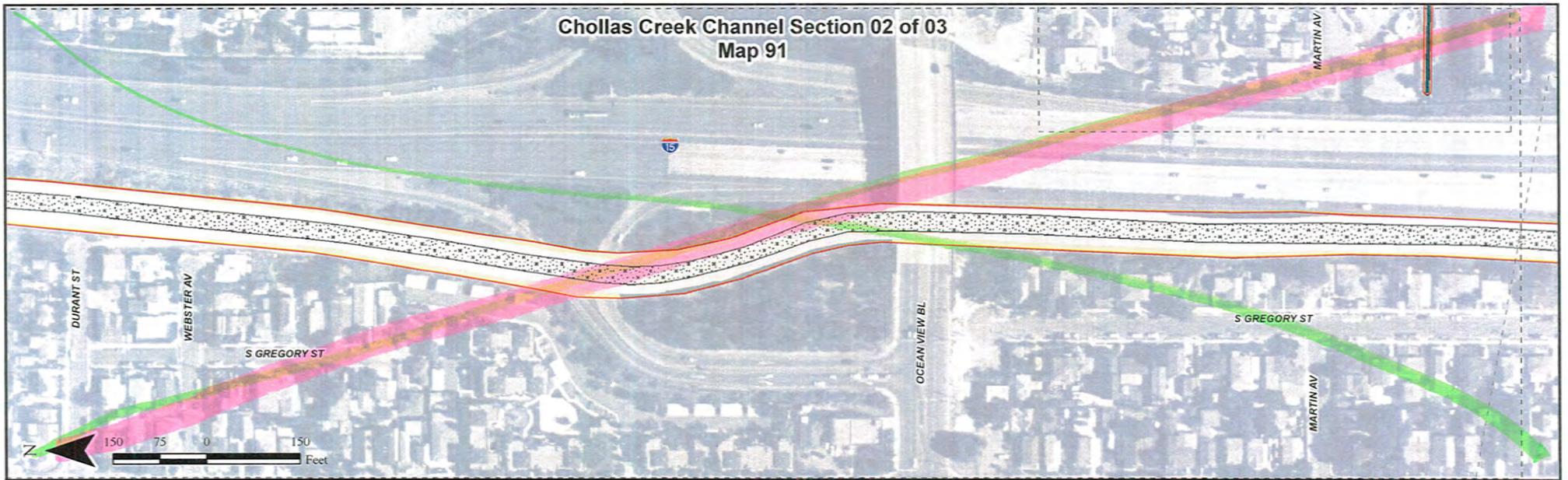
- 1.
- 2.
- 3.

E. Infrastructure Failure Issues

Item	Condition	Comments
1. Broken Concrete/Gunite?	Y <input checked="" type="radio"/> N N/A	
2. Broken/Missing Trash Fence?	Y <input checked="" type="radio"/> N N/A	
3. Broken/Missing Poles/Supports?	Y <input checked="" type="radio"/> N N/A	
4. Exposed Rebar?	Y <input checked="" type="radio"/> N N/A	
5. Rock/Debris Accumulation?	<input checked="" type="radio"/> Y N N/A	
6. Potential Flooding/Litigation?	Y <input checked="" type="radio"/> N N/A	
7. Slope Failure?	Y <input checked="" type="radio"/> N N/A	

Other Comments/Observations:

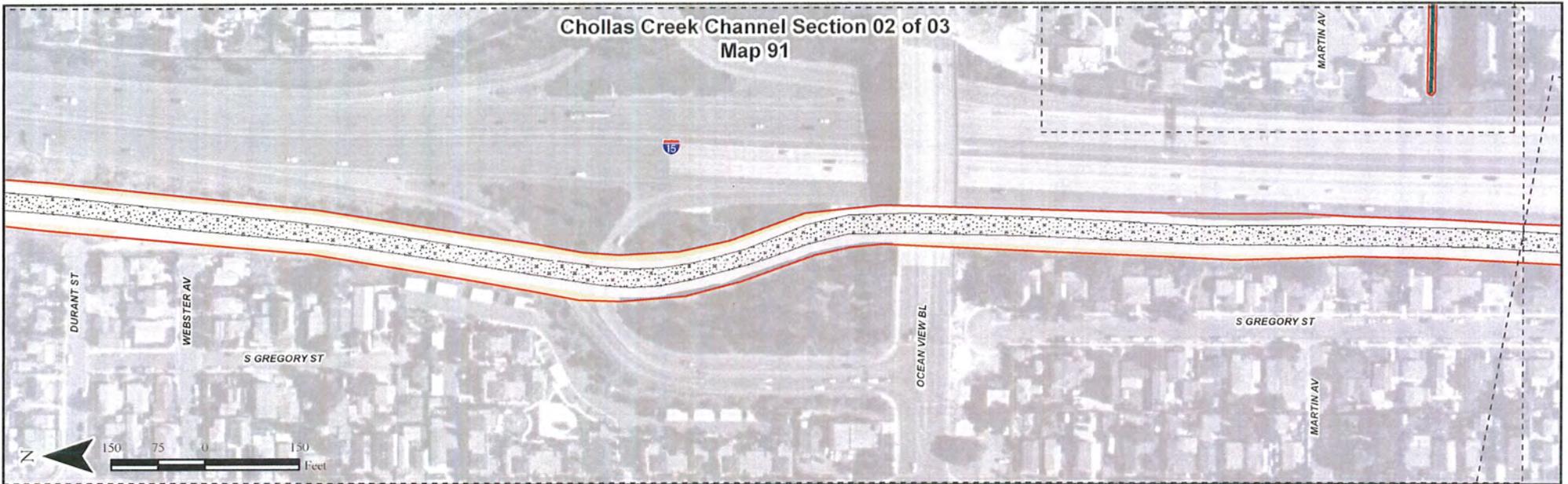
Sediment built up after out fall on East side of channel.



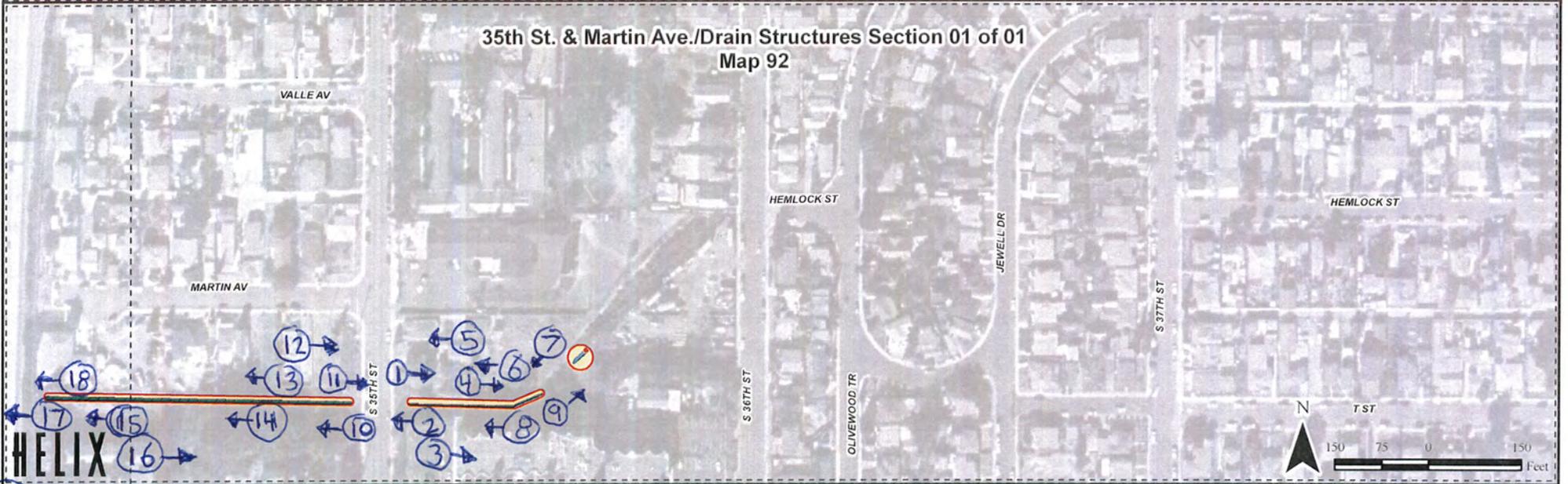
HELIX

I:\proj\05-2015\01 Storm Drain Maintenance Map\05-2015\Map\Map\Map91_92.mxd-001

Chollas Creek Channel Section 02 of 03
Map 91



35th St. & Martin Ave./Drain Structures Section 01 of 01
Map 92



HELIX
19



35th Street & Martin Avenue.1 (7-17-2015)



35th Street & Martin Avenue.2 (7-17-2015).jpg



35th Street & Martin Avenue.3 (7-17-2015).jpg



35th Street & Martin Avenue.4 (7-17-2015).jpg



35th Street & Martin Avenue.5 (7-17-2015).jpg



35th Street & Martin Avenue.6 (7-17-2015).jpg



35th Street & Martin Avenue.7 (7-17-2015).jpg



35th Street & Martin Avenue.8 (7-17-2015).jpg



35th Street & Martin Avenue.9 (7-17-2015).jpg



35th Street & Martin Avenue.10 (7-17-2015).jpg



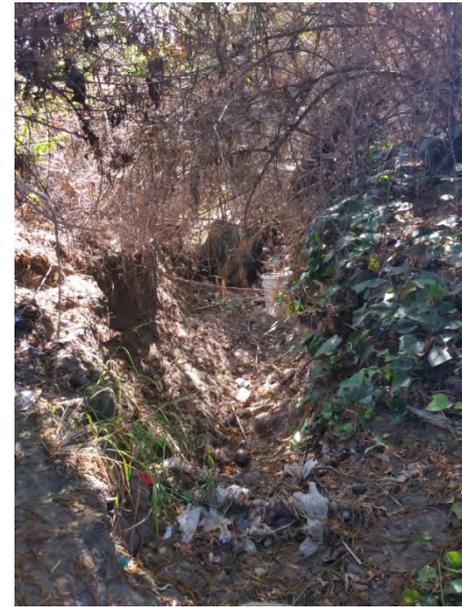
35th Street & Martin Avenue.11 (7-17-2015).jpg



35th Street & Martin Avenue.12 (7-17-2015).jpg



35th Street & Martin Avenue.13 (7-17-2015).jpg



35th Street & Martin Avenue.14 (7-17-2015).jpg



35th Street & Martin Avenue.15 (7-17-2015).jpg



35th Street & Martin Avenue.16 (7-17-2015).jpg



35th Street & Martin Avenue.17 (7-17-2015).jpg

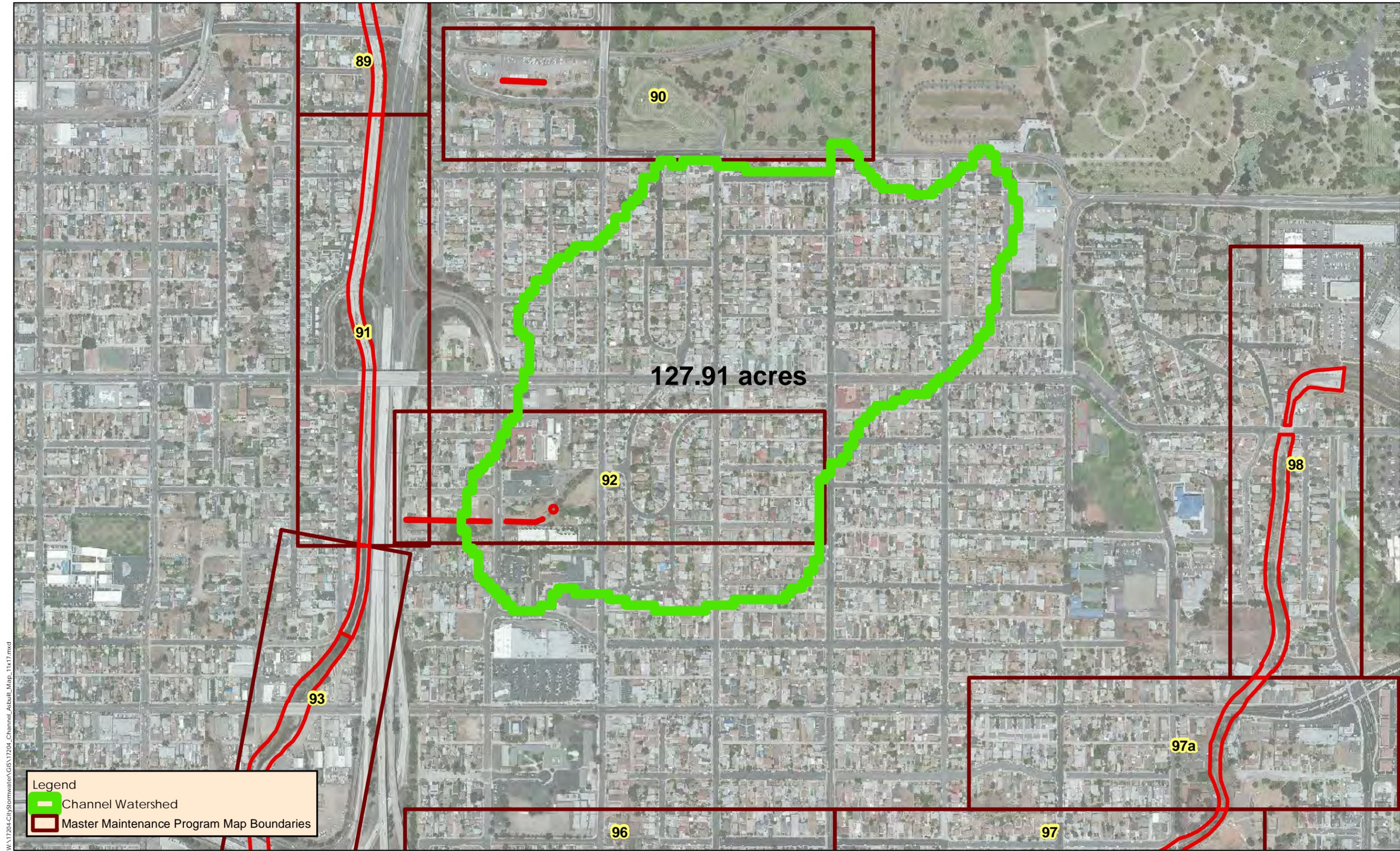


35th Street & Martin Avenue.18 (7-17-2015).jpg



35th Street & Martin Avenue.19 (7-17-2015).jpg

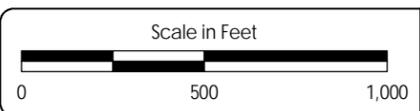
Appendix C
Hydrologic Support Material



W:\17204-CityStormwater\GIS\17204_Channel_About_Map_11x17.mxd

Legend

- █ Channel Watershed
- Master Maintenance Program Map Boundaries



Date of Exhibit: 7/24/2015
 DigitalGlobe Aerial Image: 04.2013

35th Street & Martin Avenue Map 92 - Watershed Map
 Master Maintenance Program Proposed Map

CITY OF SAN DIEGO



**DRAINAGE DESIGN
MANUAL**

APRIL • 1984

TABLE OF CONTENTS (Continued)

1-104.12	Chart/Gutter and Roadway Discharge - Velocity Chart . . .	70A
1-104.13	Channel Easements	71
1-104.14	Mannings Roughness coefficient	73
1-104.14A	Table/Design Values for Mannings Roughness	
	Coefficient (n)	74
1-104.14B	Chart/Nomograph for Solution of Manning Equation . . .	76
1-104.15	Design Guides	77
1-104-15A	Figure/Typical Channel Plan	78
1-104.15B	Figure/Typical Channel Profile	79
 APPENDIX I		
	Rational Method	80 thru 87
 APPENDIX II		
	Modified Rational Method	88 thru 92
 APPENDIX III		
	SCS Method	93 thru 119
 SEDIMENT DETENTION		
	Basin Desilting	120 thru 126
 APPENDIX IV		
	What pH Values Mean	131
	Definitions (CALTRANS-Highway Design Manual).	132 thru 138
	Department Instructionf for C.I.P.C.P.	139 thru 142
 INDEX		
	Index	143 thru 146

TABLE 1-104.14A

DESIGN VALUES FOR MANNINGS ROUGHNESS COEFFICIENT (n)

<u>TYPE OF CHANNEL</u>	<u>N VALUE</u>
Unlined Channels:	
Clay Loam;	0.023
Sand	0.020
Gravel	0.030
Rock	0.040
Lined Channels:	
Portland Cement Concrete	0.015
Air Blown Mortar	0.018
Asphalt Concrete	0.018
Grass Lined Channels: (Shallow depths)	
2 inch length	0.050
4 - 6 inch length	0.060
6 - 12 inch length	0.120
12 - 24 inch + length	0.200
Pavement and Gutters:	
Concrete	0.015
Asphalt Concrete	0.018
Natural Streams: (Less than 100 feet wide at flood stage)	
1. Regular section	
a. Some grass and weeds, little or no brush	0.030
b. Dense growth of weeds, depth of flow substantially greater than weed height	0.040
c. Some weeds, light brush on bank	0.040
d. Some weeds, heavy brush on banks	0.060
e. With trees in channel, branches submerged at flood stage, increase above values by	0.015

TABLE 1-104.14A (Continued)

2.	Irregular section, with pools, slight channel meander increase all values listed in 1. Regular Section, by	0.015
----	--	-------

Flood Plains: (adjacent to natural streams)

1.	Pasture, no brush	
	a. Short grass	0.030
	b. High grass	0.040
2.	Cultivated areas	
	a. No crop	0.040
	b. Mature row crops	0.040
	c. Mature field crops	0.050
3.	Heavy weeds, scattered brush	0.050
4.	Light brush and trees	0.060
5.	Medium to dense brush	0.090
6.	Dense willows	0.170
7.	Cleared land with tree stumps, 100-150 per acre	0.060
8.	Heavy stand of timer, little undergrowth	
	a. Flood depth below branches	0.110
	b. Flood depth reaches branches	0.140

County of San Diego Hydrology Manual



Rainfall Isopleths

2 Year Rainfall Event - 6 Hours

..... Isopleth (inches)

** P₆ = 1.2 inches*

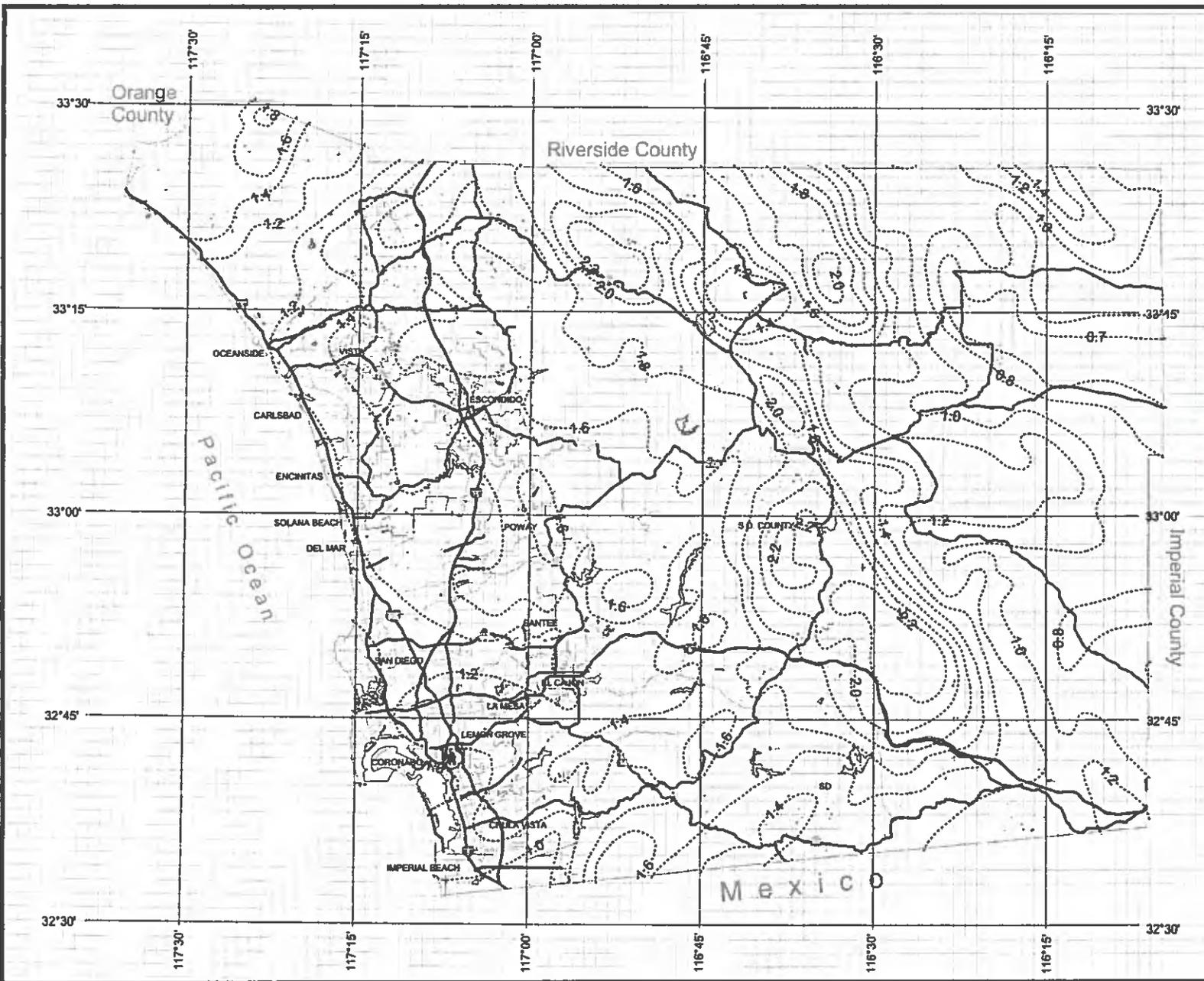


THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This product may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

3 0 3 Miles



County of San Diego Hydrology Manual

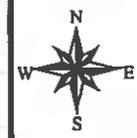
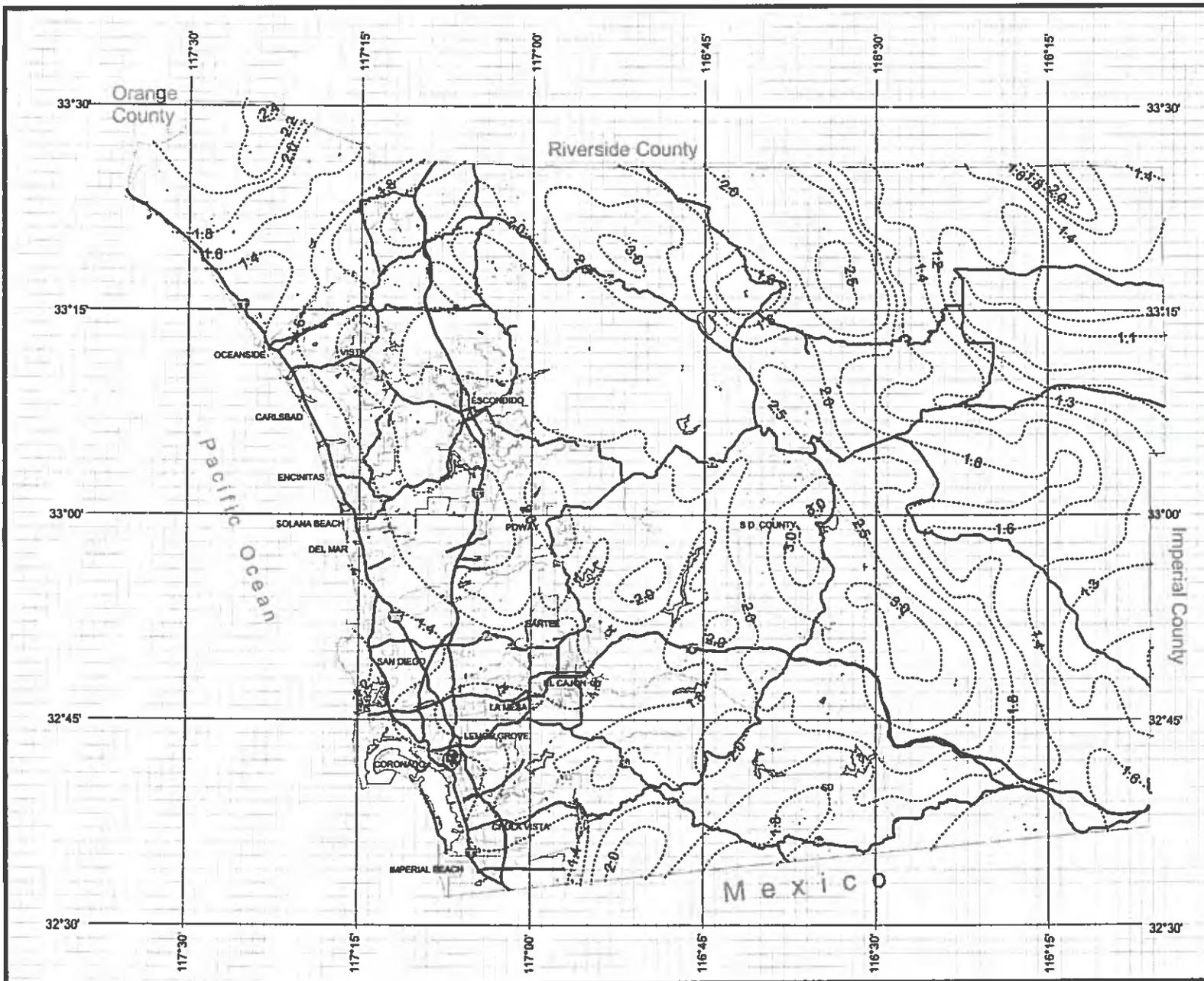


Rainfall Isopluvials

5 Year Rainfall Event - 6 Hours

..... Isopluvial (inches)

() P₆ = 1.4 inches*



3 0 3 Miles

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This product may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Barthel Maps.

County of San Diego Hydrology Manual

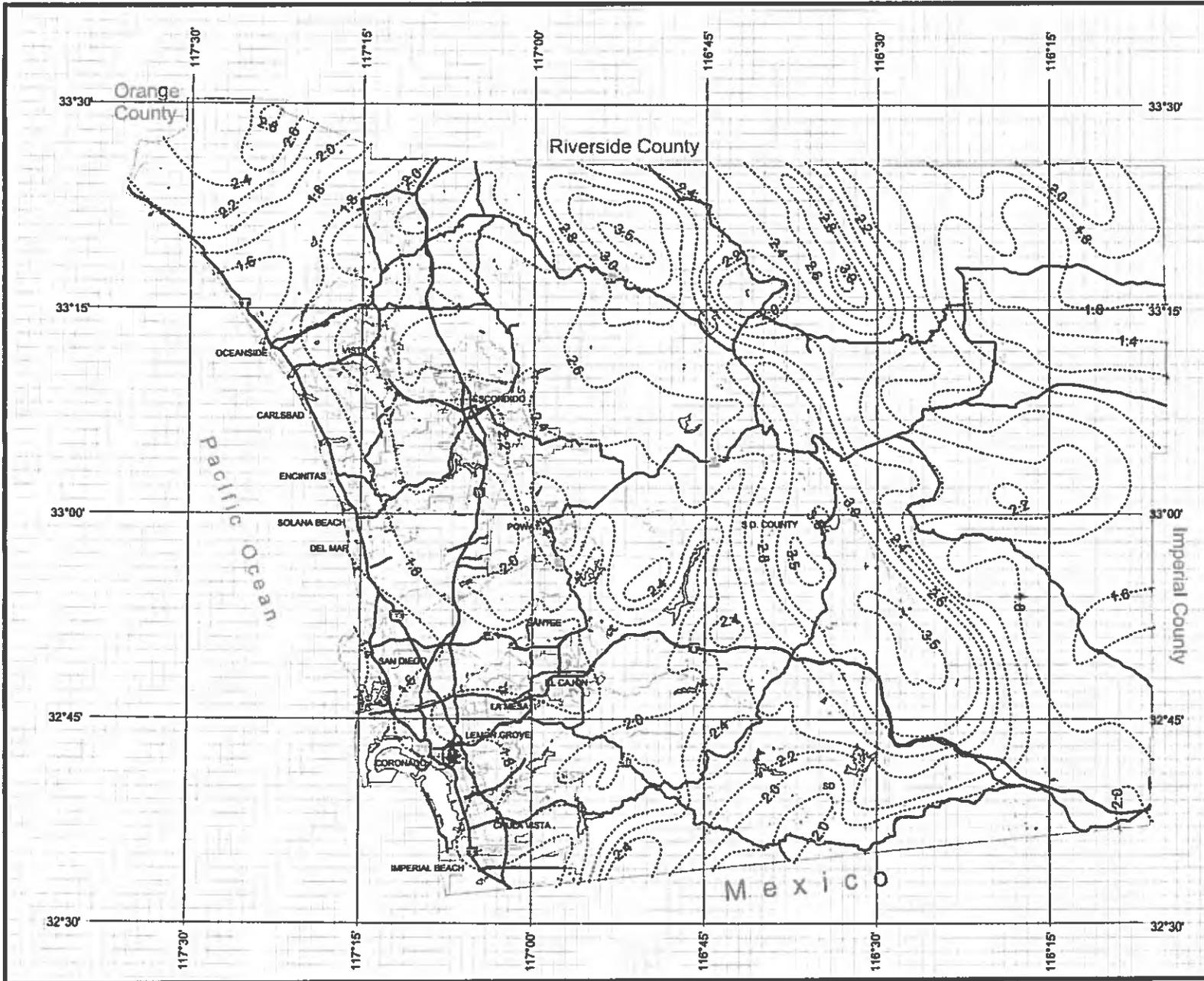


Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

..... Isopluvial (inches)

** P₆ = 1.6 inches*



3 0 3 Miles

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright 2005. All Rights Reserved.

This product may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

County of San Diego Hydrology Manual



Rainfall Isopluvials

25 Year Rainfall Event - 6 Hours

..... Isopluvial (inches)

** P₆ = 1.8 inches*

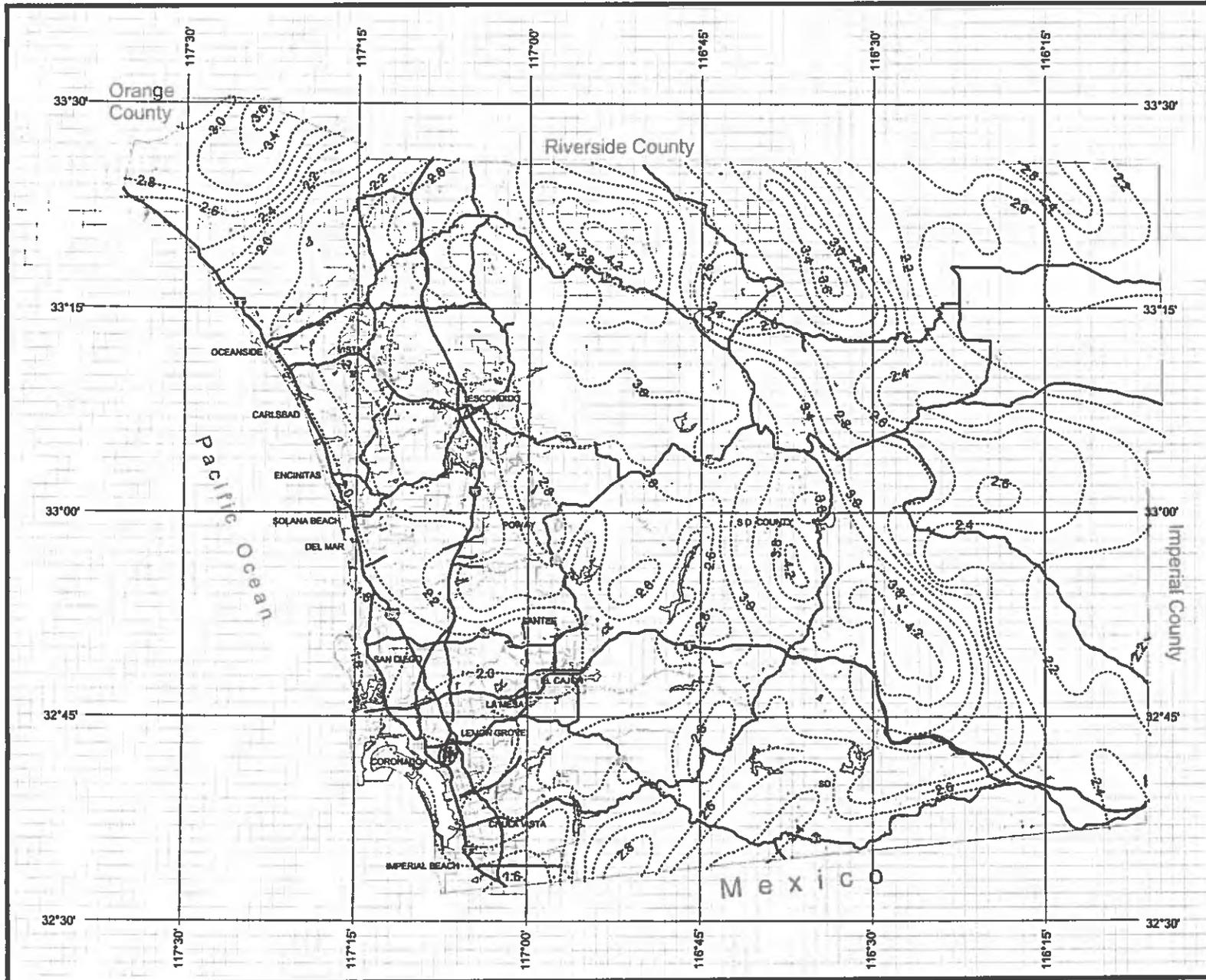


THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This product uses certain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

3 0 3 Miles



County of San Diego Hydrology Manual

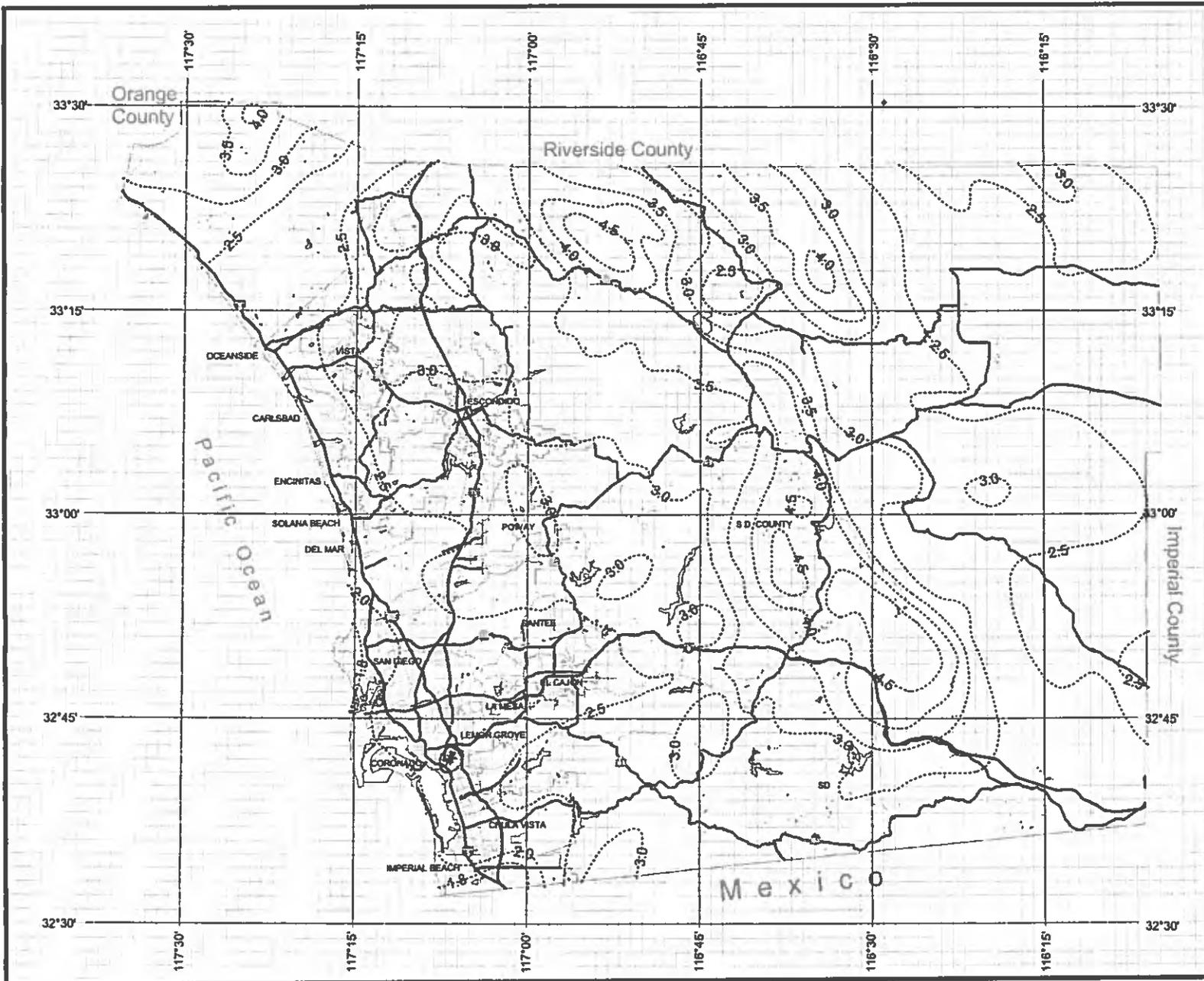


Rainfall Isopleths

50 Year Rainfall Event - 6 Hours

----- Isopleth (inches)

$P_6 = 2.25$ inches



THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS, All Rights Reserved.

This product may contain information from the SANDAG Regional Information System which cannot be reproduced without the express permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

3 0 3 Miles

Appendix D
Hydraulic Analysis Output

Hydraulic Analysis Report

Project Data

Project Title: Project – 35th St. & Martin Ave. Channel - Map 92

Designer: Rick Engineering Company

J-17204-D

Project Date: Tuesday, July 21, 2015

Project Units: U.S. Customary Units

Channel Analysis: As-Built_Map92_<2

Notes: In the absence of As-Builts for this channel, City of San Diego 1999 topography was used to obtain the geometry of the channel. This channel is entirely earthen and was measured using the 1999 topography to have a bottom width of approximately 6 feet, 2 foot depth, side slopes of 4:1, and the channel's overall slope to be approximately 0.02 ft/ft. Pursuant to Table 1-104.14A of the City of San Diego Drainage Design Manual, dated April 1984, the roughness coefficient used for the channel side slopes and channel bottom is 0.03. This roughness coefficient is based on some weeds, little to no brush on banks.

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 4.0000 (ft/ft)

Side Slope 2 (Z2): 4.0000 (ft/ft)

Channel Width: 6.0000 (ft)

Longitudinal Slope: 0.0200 (ft/ft)

Manning's n: 0.0300

Depth: 2.0000 (ft)

Result Parameters

Flow: 226.9787 (cfs)

Area of Flow: 28.0000 (ft²)

Wetted Perimeter: 22.4924 (ft)

Hydraulic Radius: 1.2449 (ft)

Average Velocity: 8.1064 (ft/s)

Top Width: 22.0000 (ft)

Froude Number: 1.2663

Critical Depth: 2.2493 (ft)

Critical Velocity: 6.7285 (ft/s)

Critical Slope: 0.0121 (ft/ft)

Critical Top Width: 23.9947 (ft)

Calculated Max Shear Stress: 2.4960 (lb/ft²)

Calculated Avg Shear Stress: 1.5536 (lb/ft²)

Channel Analysis: Current_Condition_Map92_<2

Notes: In the absence of As-Builts for this channel, City of San Diego 1999 topography was used to obtain the geometry of the channel. This channel is entirely earthen and was measured using the 1999 topography to have a bottom width of approximately 6 feet, 2 foot depth, side slopes of 4:1, and the channel's overall slope to be approximately 0.02 ft/ft. Pursuant to Table 1-104.14A of the City of San Diego Drainage Design Manual, dated April 1984, the roughness coefficient used for the channel side slopes and channel bottom is 0.06. This roughness coefficient is based on some weeds, heavy brush on banks.

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 4.0000 (ft/ft)
Side Slope 2 (Z2): 4.0000 (ft/ft)
Channel Width: 6.0000 (ft)
Longitudinal Slope: 0.0200 (ft/ft)
Manning's n: 0.0600
Depth: 2.0000 (ft)

Result Parameters

Flow: 113.4894 (cfs)
Area of Flow: 28.0000 (ft²)
Wetted Perimeter: 22.4924 (ft)
Hydraulic Radius: 1.2449 (ft)
Average Velocity: 4.0532 (ft/s)
Top Width: 22.0000 (ft)
Froude Number: 0.6331
Critical Depth: 1.5845 (ft)
Critical Velocity: 5.8052 (ft/s)
Critical Slope: 0.0531 (ft/ft)
Critical Top Width: 18.6760 (ft)
Calculated Max Shear Stress: 2.4960 (lb/ft²)
Calculated Avg Shear Stress: 1.5536 (lb/ft²)

CITY OF SAN DIEGO



**DRAINAGE DESIGN
MANUAL**

APRIL • 1984

TABLE OF CONTENTS (Continued)

1-104.12	Chart/Gutter and Roadway Discharge - Velocity Chart . . .	70A
1-104.13	Channel Easements	71
1-104.14	Mannings Roughness coefficient	73
1-104.14A	Table/Design Values for Mannings Roughness	
	Coefficient (n)	74
1-104.14B	Chart/Nomograph for Solution of Manning Equation . . .	76
1-104.15	Design Guides	77
1-104-15A	Figure/Typical Channel Plan	78
1-104.15B	Figure/Typical Channel Profile	79
APPENDIX I		
	Rational Method	80 thru 87
APPENDIX II		
	Modified Rational Method	88 thru 92
APPENDIX III		
	SCS Method	93 thru 119
SEDIMENT DETENTION		
	Basin Desilting	120 thru 126
APPENDIX IV		
	What pH Values Mean	131
	Definitions (CALTRANS-Highway Design Manual).	132 thru 138
	Department Instructionf for C.I.P.C.P.	139 thru 142
INDEX		
	Index	143 thru 146

TABLE 1-104.14A

DESIGN VALUES FOR MANNINGS ROUGHNESS COEFFICIENT (n)

<u>TYPE OF CHANNEL</u>	<u>N VALUE</u>
Unlined Channels:	
Clay Loam;	0.023
Sand	0.020
Gravel	0.030
Rock	0.040
Lined Channels:	
Portland Cement Concrete	0.015
Air Blown Mortar	0.018
Asphalt Concrete	0.018
Grass Lined Channels: (Shallow depths)	
2 inch length	0.050
4 - 6 inch length	0.060
6 - 12 inch length	0.120
12 - 24 inch + length	0.200
Pavement and Gutters:	
Concrete	0.015
Asphalt Concrete	0.018
Natural Streams: (Less than 100 feet wide at flood stage)	
1. Regular section	
a. Some grass and weeds, little or no brush	0.030
b. Dense growth of weeds, depth of flow substantially greater than weed height	0.040
c. Some weeds, light brush on bank	0.040
d. Some weeds, heavy brush on banks	0.060
e. With trees in channel, branches submerged at flood stage, increase above values by	0.015

TABLE 1-104.14A (Continued)

2.	Irregular section, with pools, slight channel meander increase all values listed in 1. Regular Section, by	0.015
----	--	-------

Flood Plains: (adjacent to natural streams)

1.	Pasture, no brush	
	a. Short grass	0.030
	b. High grass	0.040
2.	Cultivated areas	
	a. No crop	0.040
	b. Mature row crops	0.040
	c. Mature field crops	0.050
3.	Heavy weeds, scattered brush	0.050
4.	Light brush and trees	0.060
5.	Medium to dense brush	0.090
6.	Dense willows	0.170
7.	Cleared land with tree stumps, 100-150 per acre	0.060
8.	Heavy stand of timer, little undergrowth	
	a. Flood depth below branches	0.110
	b. Flood depth reaches branches	0.140

Appendix E
Channel Prioritization Assessment Sheet

Channel Prioritization Assessment Sheet for 35th Street & Martin Avenue MMP Map 92

Total Channel Score: 57.4 /100

Flood Hazard (75% of total weight)				Score	factor weight	Weighted Points
Δ capacity				Sum of sub-factor a-c scores:	6	25%
a. Risk of flooding	Current Channel Normal depth capacity ¹ :	113 cfs	<2 -yr. storm event	2-yr.=score of 5; 5-yr.=score of 4; 10-yr.=score of 3; 25-yr.=score of 2; 50-yr.=score of 1; 100-yr.=score of 0	(out of 15)	7.5
b. Increase in storm event capacity	Channel As-Built normal depth capacity ¹ :	227 cfs	<2 -yr. storm event	1 point given for every level increase in -year storm event capacity, post-maintenance		
c. Net percent increase in channel capacity post-maintenance		101%		Less than 100% = score of 0; 100%-199% = score of 1; 200%-299% = score of 2; 300%-399% = score of 3; 400%-500%= score of 4; Over 500% = score of 5		
Consequence of flooding adjacent areas						
Surrounding area land use: (area within 100 feet of the channel or area in which more than 10,000 ft ² is impacted from flooding.)		Residential		Residential = score of 4; Commercial = score of 4; Roads = score of 2; Agriculture = score of 1; Other = score of 1	50%	28.125
Is there open space surrounding the channel?		Yes		If yes, subtract land use score by 1		
Clogging Potential						
Are there trees/large debris that have potential to flow D/S and clog culverts/the channel?		Yes			25%	18.75
Total Weighted Flood Hazard Points						54.4

Water Quality/Channel Condition (10% of total weight)				Score	factor weight	Weighted Points
Trash/Debris						
Type of trash and Source:		Light household trash			20%	1
Standing water						
Ponding?		No			15%	0
Noticeable odors?		No				
Algae?		No				
Sediment						
Approx. sediment coverage: (Based on information provided on City of San Diego O&M Channel Maintenance Inspection Form)		20%			35%	2
Rock/debris Accumulation?		Yes				
Transients/encampments						
Culverts and Outfalls					10%	0
Infrastructure Issues					10%	0
Culvert structure condition		Good				
Broken concrete/gunite?		No				
Broken or missing trash fence/fence poles/supports?		No				
Slope failure?		No				
Total Weighted Water Quality Points						3.0

Community Input (10% of total weight)				Score	factor weight	Weighted Points	
Community Complaints Received				YES	NO	50%	No Answer
Community Outreach Input				0	1 2 3 4	50%	0
Total Weighted Community Input Points						0.0	

Aesthetics (5% of total weight)				Score	factor weight	Weighted Points
Aesthetics						
Are the aesthetics of the channel compromised?		No			100%	0
Total Weighted Aesthetics Points						0.0

1. See appendix D for geometry parameters

Scoring Legend	
0	Factor is in good condition and does not need attention
1	Factor is in good condition, but will eventually need attention
2	Factor needs attention
3	Factor is in bad condition and needs attention
4	Factor is in severe condition and needs immediate attention

Appendix F
Channel Maintenance Prioritization Summary Sheet



Legend

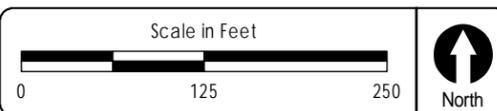
- Photo Location
- Channel Survey
- City Storm Drain Structure
- City Storm Drain

Photos:



Assessment Results

- **Channel Prioritization Score:**
57.4 out of 100
 - **Flood Hazard Score:**
54.4 out of 75
 - **Water Quality Score:**
3 out of 10
 - **Community Input Score:**
0 out of 10
 - **Aesthetics Score:**
0 out of 5
- **Capacity Prior to Maintenance:**
Less than 2-year storm event
- **Capacity After Maintenance (As-built Capacity):**
Less than 2-year storm event
- **Clogging Potential:** *MEDIUM*
- **Approximate Vegetation Coverage:** *HIGH*
- **Surrounding Area:** *Residential*
- **Infrastructure Failures:**
None
- **Site Evaluation Date:**
July 17, 2015
- **Notes/Comments:**



Channel: 35th St. & Martin Ave.

MMP Map # 92

Channel Maintenance Prioritization Summary Sheet

Appendix G
Available As-built plans

No Available As-built Plans

Appendix H
Compact Disc
PDF Version of Full Report