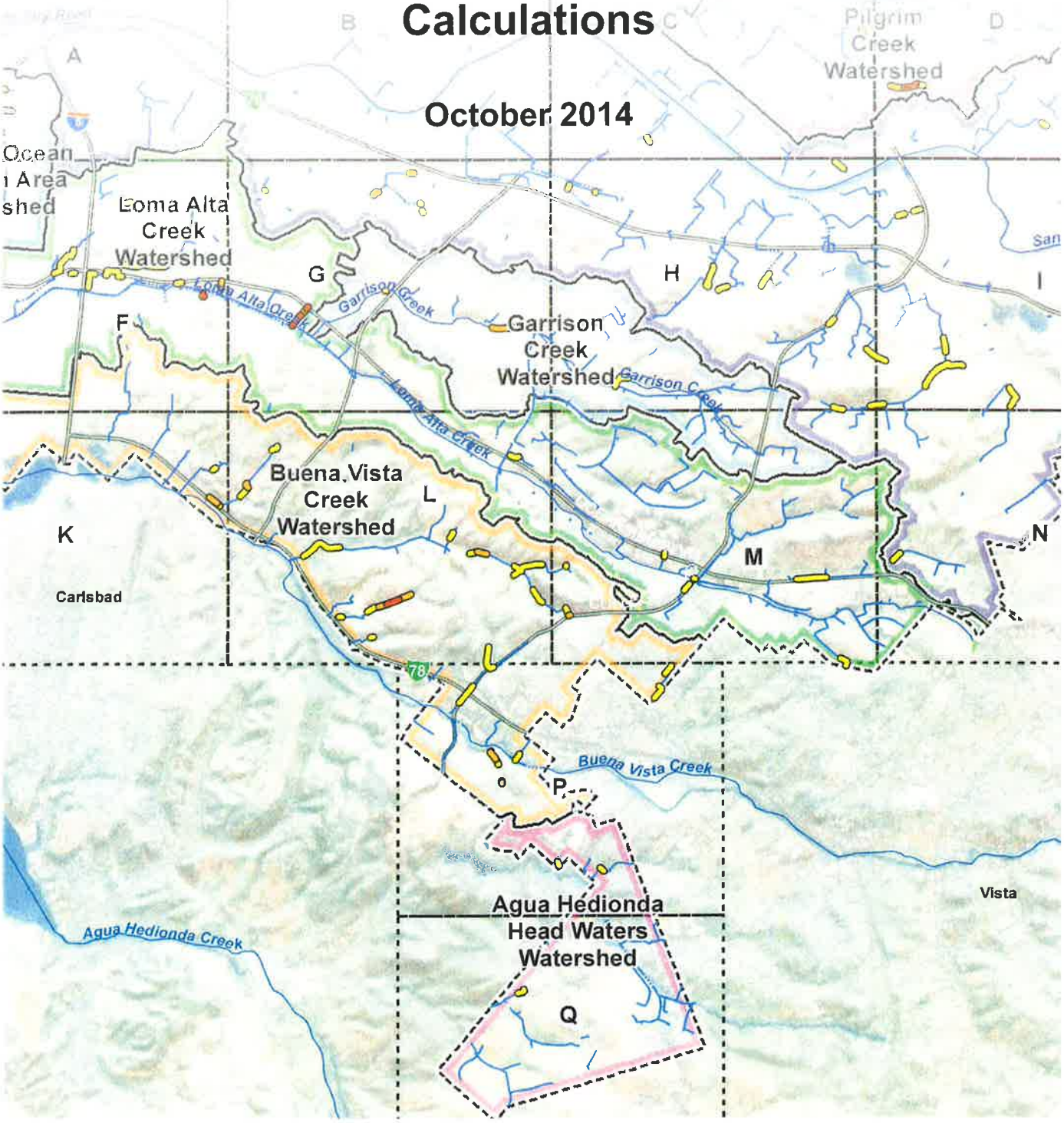
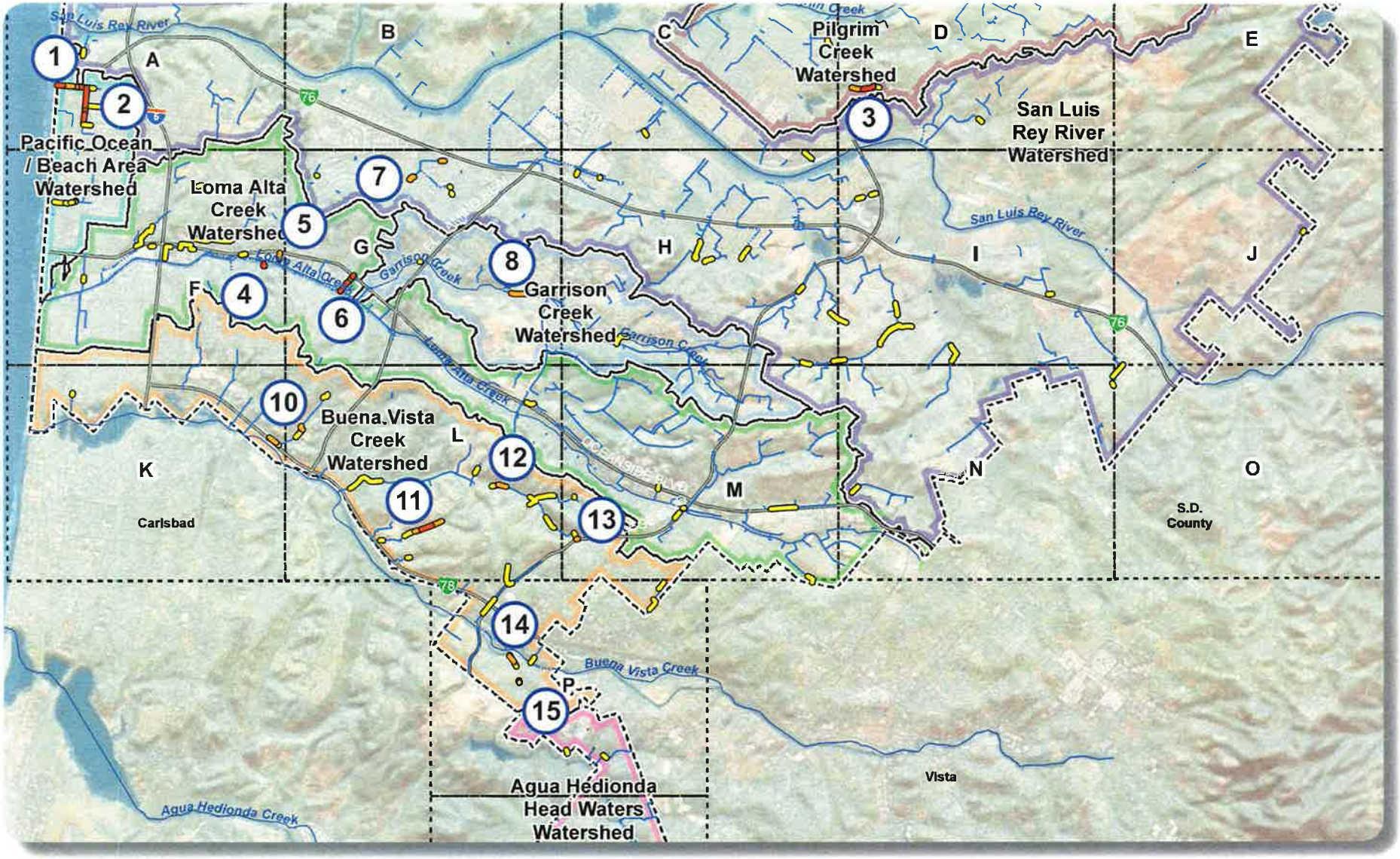
City of Oceanside
Master Drainage Plan Supplemental Modeling Calculations

October 2014



TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

Master Drainage Plan Supplemental Modeling Calculations



Index Map

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RELIABLE SOLUTIONS IN WATER RESOURCES
122 CIVIC CENTER DR, STE 206, VISTA, CA 92084 • 760-414-9212

Alternative A - Cleveland Street

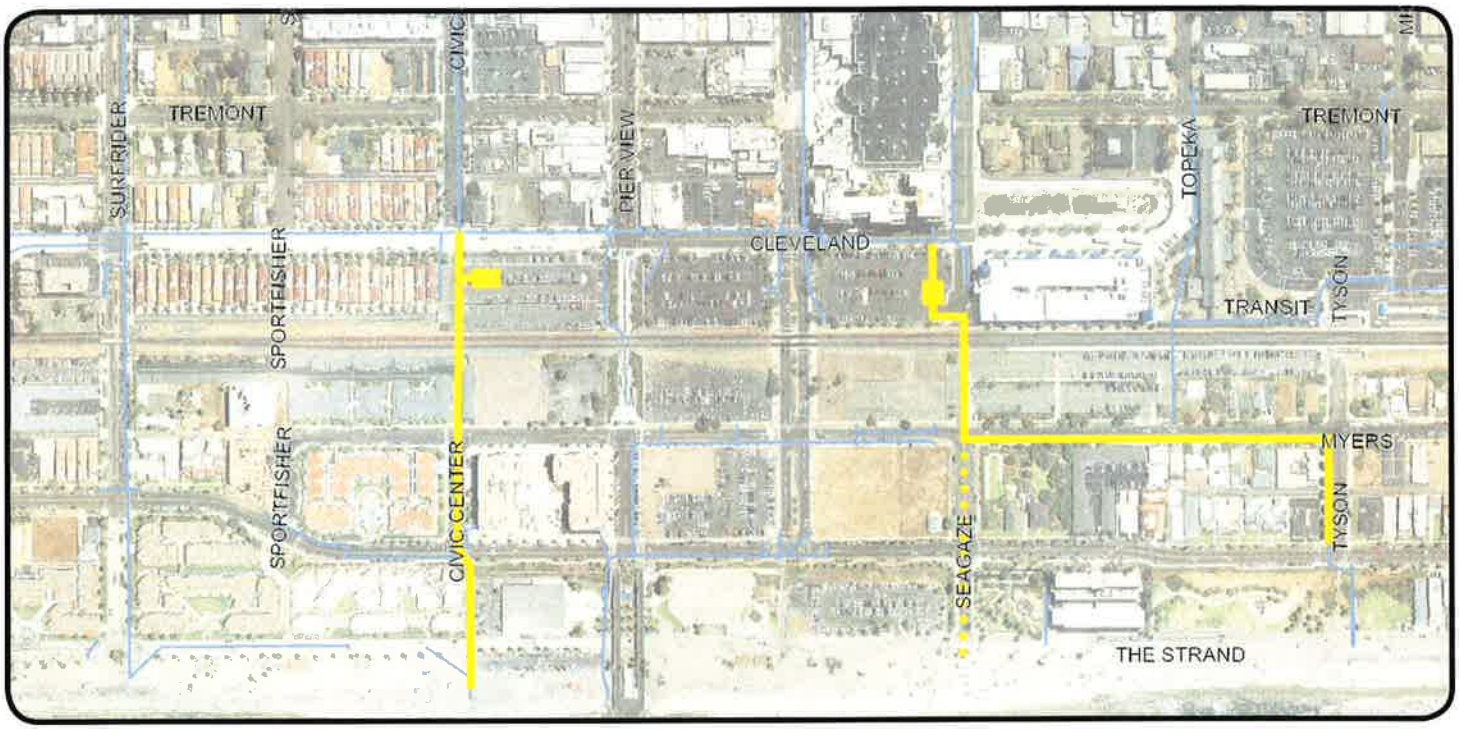
City of Oceanside, Downtown Area

Parallel 48" Storm Drain

Notes:

- Ongoing flooding in Seagaze/Cleveland intersection toward transit center parking structure.
- Begin parallel pipe at Seagaze/Cleveland intersection.
- Moving north, there are two sewer outfall lines in Cleveland St., (Fallbrook and Camp Pendleton 16" DIP outfalls). These outfalls create very tight utility clearance in Cleveland St. between Seagaze and Mission.
- Propose first reach of 48" to be constructed in public parking lot west of Cleveland, to avoid utility conflicts.
- Fallbrook sewer outfall jogs north at Mission, therefore the proposed 48" could swing back into Cleveland St. moving north.
- Between Pierview Way and Civic Center Drive, the proposed 48" storm drain would have to be centered between sewer and waterlines which are 10 to 11 feet apart (2 to 2.5 foot horiz. clearance on each side). This is typically non-standard, but with special construction methods, this may be feasible.
- Storm drain turns west in Surfrider.
- Jack and bore assumed under railroad.
- Alignment lies in the north side of Surfrider.
- Connect to existing 42" RCP (built in 1985) in Surfrider turnaround at the Strand.
- Proposed 48" and 42" storm drain should join existing 36" storm drain at existing cleanout. Modify cleanout as necessary to function as a bubble-up structure in extreme events.

Alternative B - Cleveland Street
City of Oceanside, Downtown Area
Multiple Diversion Outlets



Civic Center Diversion:

- Total tributary area at Cleveland/Civic Center intersection is approximately 90 acres.
- Civic Center diversion should be combined with Seagaze diversion for maximum relief of Cleveland Street system deficiency.
- Diversion proposed as split flow; preliminary estimate of flow into diversion is 50 cfs.
- Provide underground detention in public parking lot as needed/able. (Concept only – would need to research feasibility further).
- Need for possible detention would be confirmed once design constraints of railroad undercrossing are determined.
- Jack and bore assumed underneath railroad.
- Trunk storm drain to continue west in Civic Center Drive, size to be determined.
- Existing system at Pacific/Civic Center to be realigned to accommodate trunk system.
- Outfall just north of Beach Community Center to be modified along with upsized trunk system.
- Existing outfall at beach to be modified.

Seagaze Diversion:

- Divert total trunk system flow into new trunk storm drain at Seagaze/Cleveland intersection.
- Upstream tributary area at this location approximately 40 acres.
- Provide underground detention in public parking lot as needed/able. (Concept only – would need to research feasibility further).
- Need for possible detention would be confirmed once design constraints of railroad undercrossing are determined.
- Jack and bore assumed underneath railroad near transit center parking structure.
- Moving west from railroad, trunk system turns south in Myers and picks up runoff from transit center system.
- Vertical constraints could require box culvert for trunk system – to be determined.
- Myers Street has historical flooding – new system could possibly alleviate that.
- Trunk system to turn west at Tyson.
- Existing storm drain system at Tyson to be replaced with upsized trunk system.
- Existing Tyson outfall at beach to be modified.

Alternative B – Diversion from Cleveland storm drain

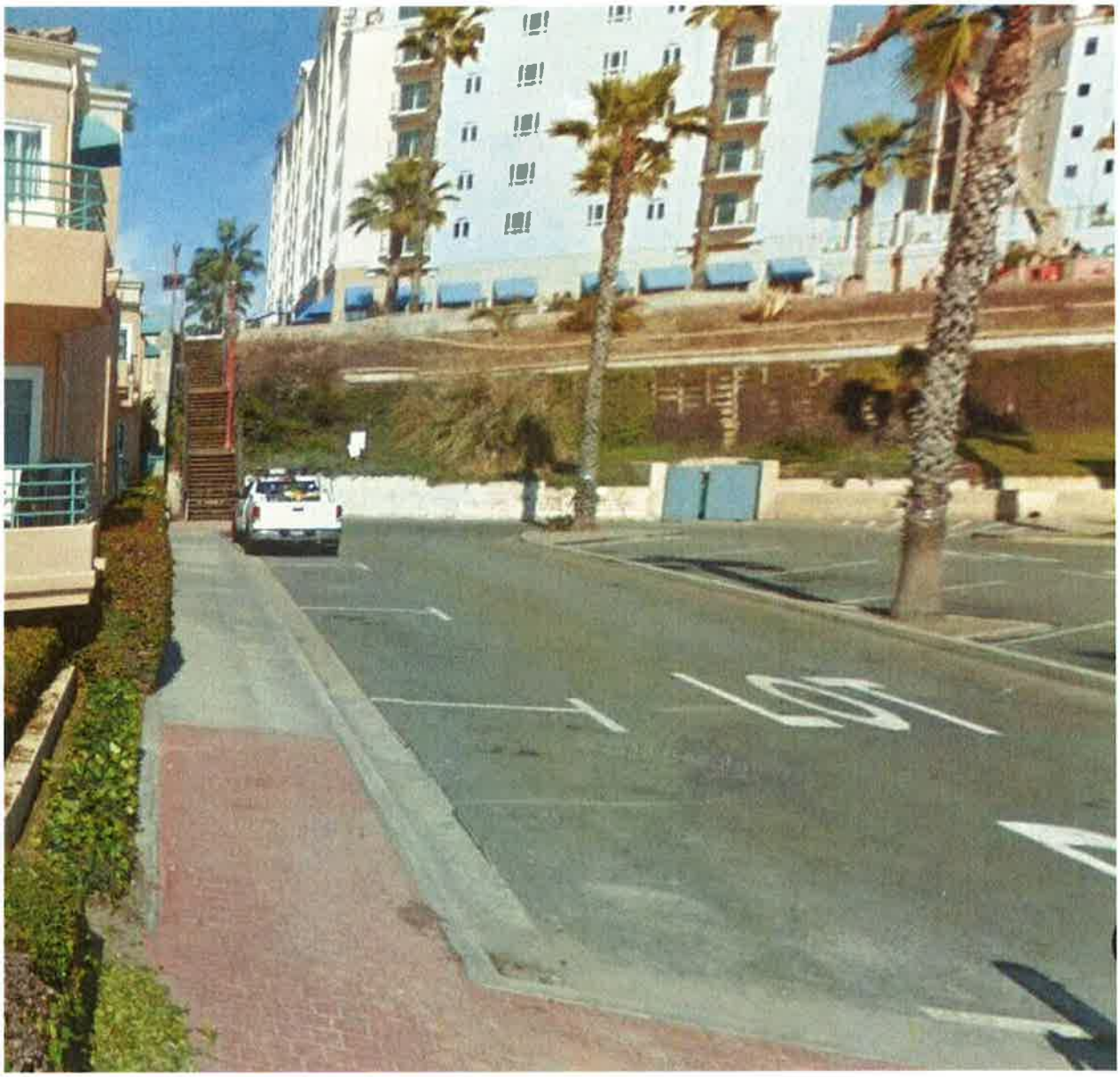
Tyson Street @ The Strand – possible outfall location

Alternative B – Diversion from Cleveland storm drain

Seagaze @ The Strand – possible outfall location

Alternative B – Diversion from Cleveland storm drain

Beach Community Center @ The Strand – possible outfall location
(Below Civic Center Drive @ Pacific)



ALTERNATIVE A PARALLEL 48" SD IN CLEVELAND

DITMAR
SURFRIDER
SPORTFISHER
CIVIC CENTER
PIER VIEW
MISSION
SEAGAZE
TOPEKA
MICHIGAN
MISSOURI
FREEMAN
COAST HIGHWAY
TREMONT
CLEVELAND
TRANSIT
TYSON
MYERS
FIR
PACIFIC
THE STRAND

CONCRETE PAVEMT. IN CLEVELAND
48" parallel proposed S.D
PENDLETON SEWER OUTFALL
FALLBROOK SEWER OUTFALL
Utility CONFLICTS IN STREET
substandard with exist. clearance utilities
STORM DRAIN IN AQT. PARKING LOT - proposed
Jack + bore under railroad
proposed parallel 48"
CONNECT TO EXIST parallel 42" SD
JOIN @ CLEANOUT

1 inch = 225 feet

Date: 9/24/2014

CLEVELAND STORM DRAIN SYSTEM DIVERSION CONCEPTS

ALTERNATIV

DITMAR
SURFRIDER
SPORTFISHER
FREEMAN
CIVIC CENTER
PIER VIEW
MISSION
SEAGAZE
TOPEKA
MICHIGAN
MISSOURI
COAST HIGHWAY
TREMONT
CLEVELAND
MYERS
PACIFIC
THE STRAND
TRANSIT
TYSON
FIR

≈90 AC TOTAL TRIBUTARY TO CIVIC CENTER

PROPOSE SPLIT FLOW - PARTIAL DIVERSION

≈40 AC DIVERSION

EXISTING DEFICIENT TRUNK STORM DRAIN (≈180 ACRES TOTAL)

DIVERSION TO CIVIC CENTER

DIVERSION TO SEAGAZE/MYERS

FLOODING

SUB-SURFACE DETENTION

Sub-surf. Detention

Parking Structure

Jack & bore @ R.R.

2-36" SD or box culvert

2-36" SD or box culv.

BLDG. UNDER CONSTR.

MALKIN HOTEL

OPTIONAL OUTFALL

Prop SD in Myers

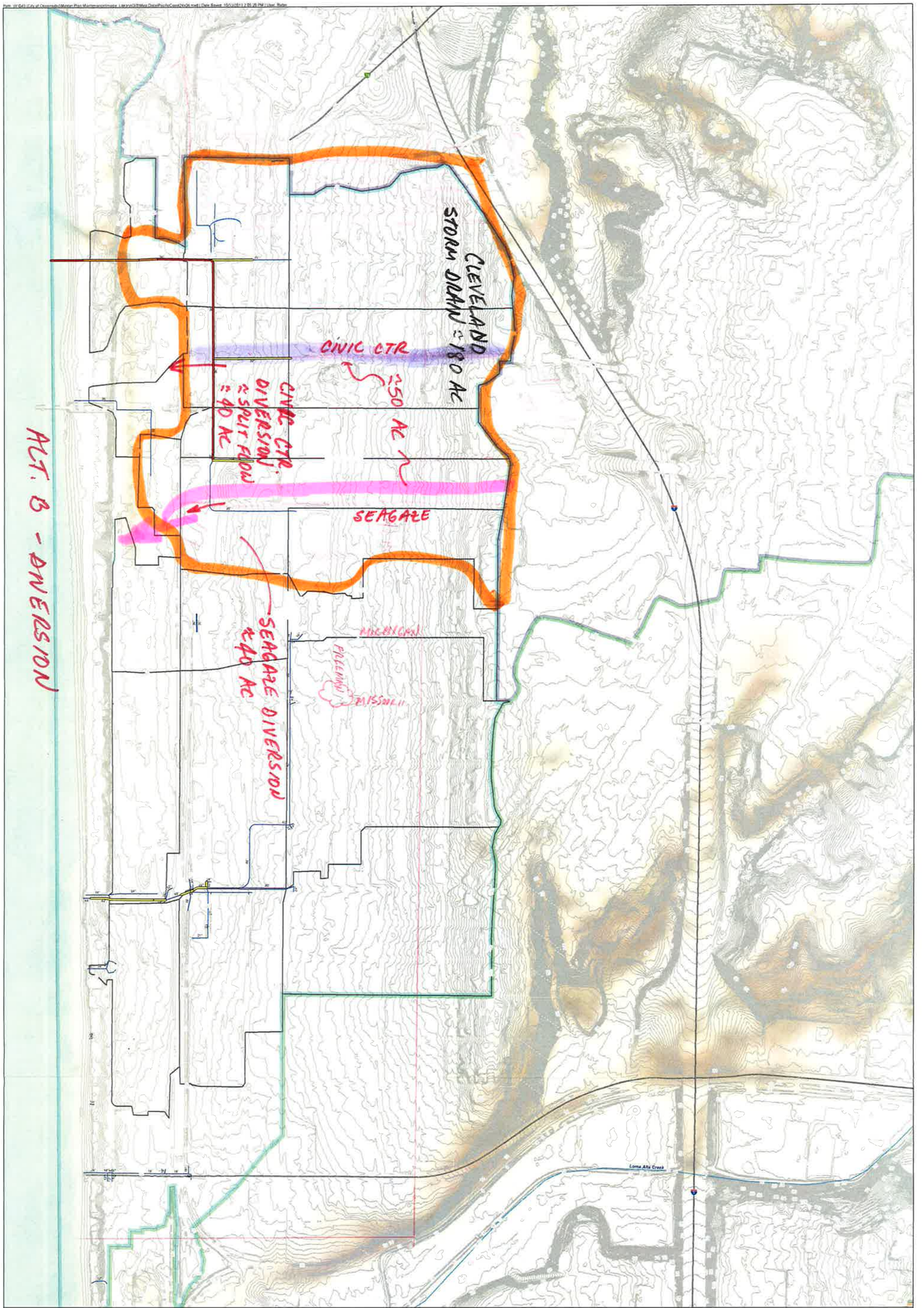
(LESSENS FLOODING IN Myers St.)

UPGRADE EXIST. SD OUTFALL

UPGRADE OUTFALL

1 inch = 225 feet

Date: 9/24/2014



1" = 690'

Storm Drains Inadequacies For:

- 10-Year Event
- 25-Year Event
- 100-Year Event

- Existing Storm Drains (Diameter)
- Open Channel - Lined (Depth)
- Natural Channel/Creek
- Subbasins

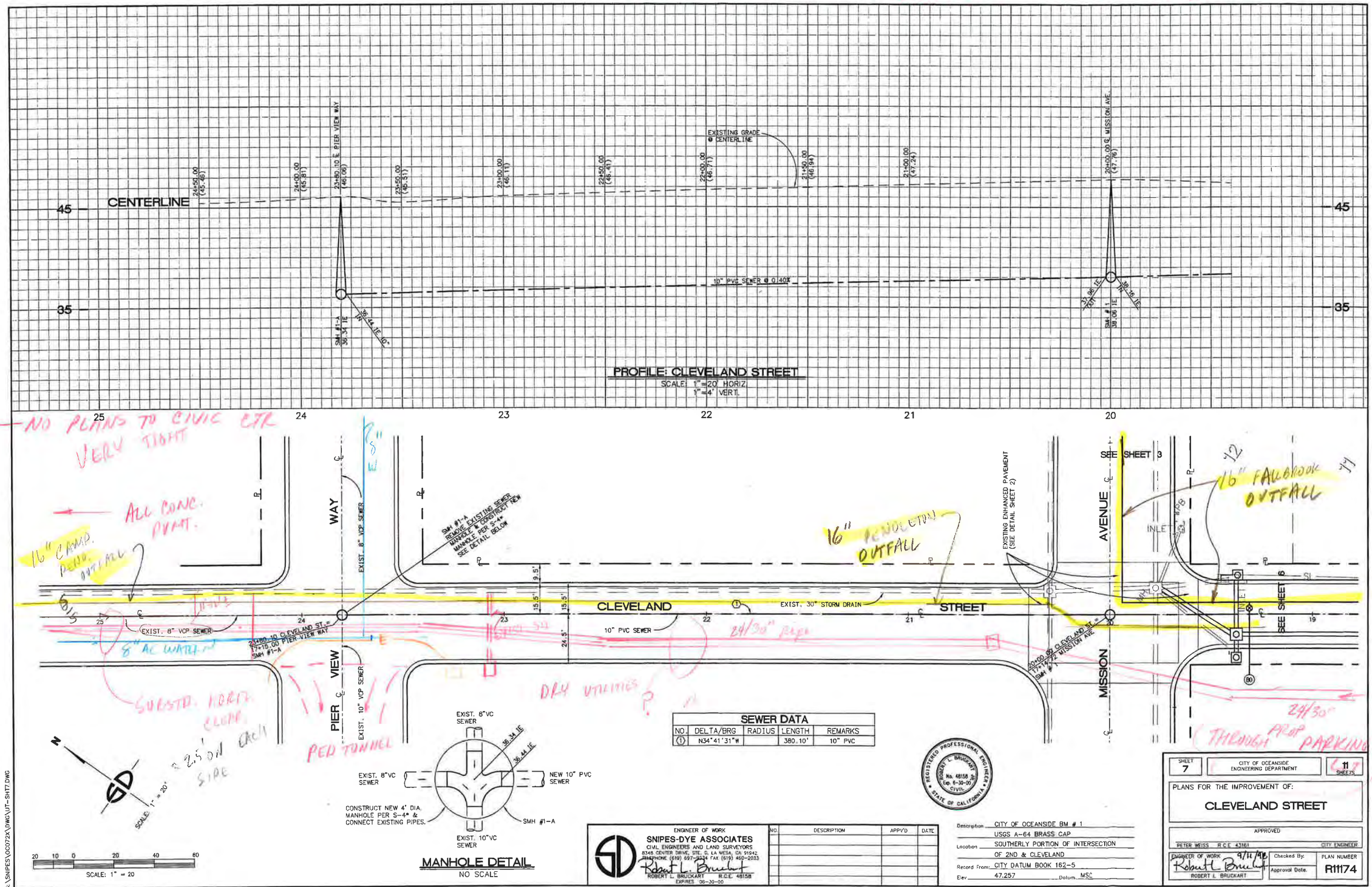
Watershed Boundary

- San Luis Rey River
- Loma Alta Creek
- Pacific Ocean / Beach Area

FIGURE TITLE
FIGURE NUMBER
Client | Project | Report

TORY R. WALKER ENGINEERING, INC.
WATER RESOURCES PLANNING & ENGINEERING
122 Civic Center Drive, Suite 208, Vista, CA 92084 | P: 760-414-6312 | www.toryrwalkerengineering.com

ALTERNATIVE A – PARALLEL S.D. IN CLEVELAND



← NO PLANS TO CIVIC CTR VERY TIGHT

← ALL CONC. PVMT.

16" CAMP. PEND. OUTFALL

WAY

PIER VIEW

EXIST. 8" VCP SEWER

EXIST. 10" VCP SEWER

8" AC WATER

SMH #1-A REMOVE EXISTING SEWER MANHOLE & CONSTRUCT NEW MANHOLE PER S-4* SEE DETAIL BELOW

24+80.10 CLEVELAND ST.= 17+16.00 PIER VIEW WAY SMH #1-A

CLEVELAND STREET

10" PVC SEWER

EXIST. 30" STORM DRAIN

16" REINFORCED OUTFALL

EXISTING ENHANCED PAVEMENT (SEE DETAIL SHEET 2)

AVENUE

MISSION

20+00.00 CLEVELAND ST.= 17+16.00 MISSION AVE. SMH #1

SEE SHEET 3

SEE SHEET 6

16" FALLBROOK OUTFALL

INLET

24/30" RCP

24/30" (THROUGH PROP PARKING)

SUGGSTD. HORIZ. CLEAR. EACH SIDE

DRY UTILITIES ?

PED TUNNEL

EXIST. 8"VC SEWER

36.34 IE

36.44 IE

EXIST. 8"VC SEWER

NEW 10" PVC SEWER

CONSTRUCT NEW 4' DIA. MANHOLE PER S-4* & CONNECT EXISTING PIPES.

SMH #1-A

EXIST. 10"VC SEWER

MANHOLE DETAIL
NO SCALE

SCALE: 1" = 20'

20 10 0 20 40 80
SCALE: 1" = 20

SEWER DATA				
NO.	DELTA/BRG	RADIUS	LENGTH	REMARKS
(1)	N34°41'31"W		380.10'	10" PVC

REGISTERED PROFESSIONAL ENGINEER — ROBERT L. BRUCKART — No. 48158 — Exp. 6-30-00 — CIVIL — STATE OF CALIFORNIA

ENGINEER OF WORK
SNIPES-DYE ASSOCIATES
CIVIL ENGINEERS AND LAND SURVEYORS
8348 CENTER DRIVE, STE. G, LA MESA, CA 91942
TELEPHONE (619) 697-9334 FAX (619) 460-2033
Robert L. Bruckart
ROBERT L. BRUCKART R.C.E. 48158
EXPIRES 06-30-00

NO.	DESCRIPTION	APP'D	DATE

Description CITY OF OCEANSIDE BM # 1
USGS A-64 BRASS CAP
Location SOUTHERLY PORTION OF INTERSECTION OF 2ND & CLEVELAND
Record From: CITY DATUM BOOK 162-5
Elev 47.257 Datum MSL

SHEET 7	CITY OF OCEANSIDE ENGINEERING DEPARTMENT	11 SHEETS

PLANS FOR THE IMPROVEMENT OF:
CLEVELAND STREET

APPROVED
PETER WEISS R.C.E. 43161 CITY ENGINEER

ENGINEER OF WORK Robert L. Bruckart 9/11/98 — ROBERT L. BRUCKART
Checked By:
Approval Date.
PLAN NUMBER R11174

JOB NUMBER: 0C0723 (C2)

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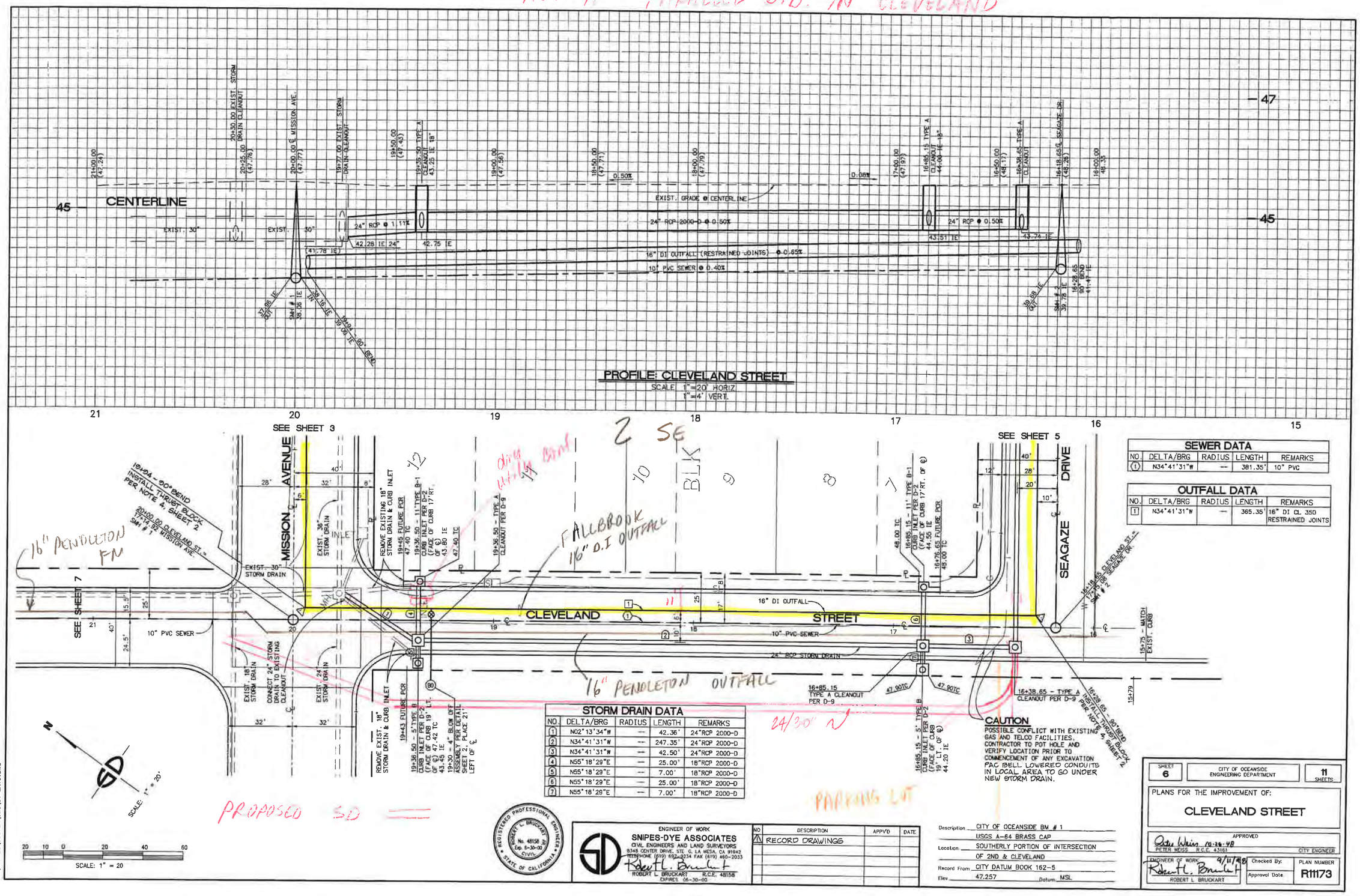
ALT. A PARALLEL S.D. IN CLEVELAND



STORM DRAIN DATA				
NO.	DELTA/BRG	RADIUS	LENGTH	REMARKS
1	N02°13'34"W	—	42.36'	24"RCP 2000-D
2	N34°41'31"W	—	247.35'	24"RCP 2000-D
3	N34°41'31"W	—	42.50'	24"RCP 2000-D
4	N55°18'29"E	—	25.00'	18"RCP 2000-D
5	N55°18'29"E	—	7.00'	18"RCP 2000-D
6	N55°18'29"E	—	25.00'	18"RCP 2000-D
7	N55°18'29"E	—	7.00'	18"RCP 2000-D

SEWER DATA				
NO.	DELTA/BRG	RADIUS	LENGTH	REMARKS
1	N34°41'31"W	—	381.35'	10" PVC

OUTFALL DATA				
NO.	DELTA/BRG	RADIUS	LENGTH	REMARKS
1	N34°41'31"W	—	365.35'	16" DI CL 350 RESTRAINED JOINTS

CAUTION
POSSIBLE CONFLICT WITH EXISTING GAS AND TELCO FACILITIES. CONTRACTOR TO POT HOLE AND VERIFY LOCATION PRIOR TO COMMENCEMENT OF ANY EXCAVATION PAC BELL LOWERED CONDUITS IN LOCAL AREA TO GO UNDER NEW STORM DRAIN.

REGISTERED PROFESSIONAL ENGINEER ROBERT L. BRUCKART No. 48158 Exp. 6-30-00 CIVIL STATE OF CALIFORNIA

ENGINEER OF WORK
SNIPES-DYE ASSOCIATES
CIVIL ENGINEERS AND LAND SURVEYORS
8348 CENTER DRIVE, STE. G, LA MESA, CA 91942
TELEPHONE (619) 698-2234 FAX (619) 460-2033
Robert L. Bruckart
ROBERT L. BRUCKART R.C.E. 48158
EXPIRES 06-30-00

NO	DESCRIPTION	APPVD	DATE
1	RECORD DRAWINGS		

Description CITY OF OCEANSIDE BM # 1
USGS A-64 BRASS CAP
Location SOUTHERLY PORTION OF INTERSECTION OF 2ND & CLEVELAND
Record From CITY DATUM BOOK 162-5
Elev. 47.257 Datum MSL

SHEET 6	CITY OF OCEANSIDE ENGINEERING DEPARTMENT	11 SHEETS

PLANS FOR THE IMPROVEMENT OF:
CLEVELAND STREET

APPROVED
Peter Weiss 10-26-98
PETER WEISS R.C.E. 43161 CITY ENGINEER

ENGINEER OF WORK 9/11/98
Robert L. Bruckart
ROBERT L. BRUCKART
Checked By:
Approval Date:
PLAN NUMBER R11173

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JOB NUMBER: OC0723 (C2)

R11173

CLEVELAND STORM DRAIN

SURFRIDER WAY

MAP NO. 344

CLEVELAND STREET HOUSING PROJECT

CLEVELAND ST

MAP NO 13594

R-11229

M-11107

AJ MYER'S ADDITION

10,11,12

16" DIP CAMP PENDLETON OUTFALL

16" DIP 35° N/CL 2000

10" PVC 2000

CLOSED

NEED TO CONFIRM IF ANY
GAS TRANSMISSION (NOT IN CLEVELAND)

Area 3

Marcario Dr. & Libby Lake Area

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

Project Name.....	MPD Supplemental Modeling
Project No.....	045-17
Date.....	9/4/2014
Design by.....	TD
Checked by.....	____

Project Overview for Area 3

Project Overview

Purpose: Determine storm drain facility adequacy. Facility is considered adequate if at least one lane of traffic is open in each direction (total of two dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

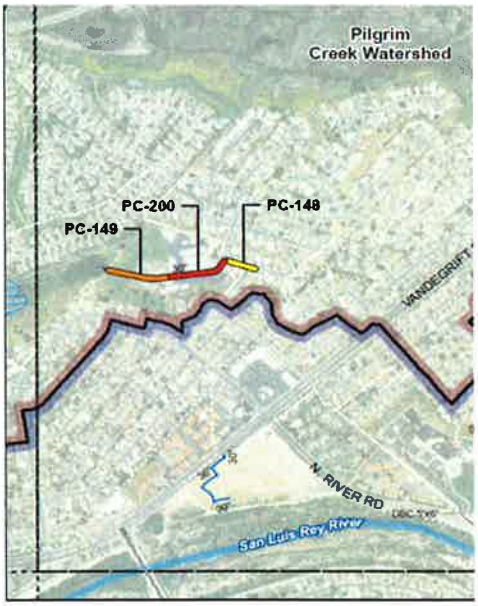
As Area 3 is a sump location, a 100-yr storm event was used for this analysis.

Problem: Ponding at the sump inlet along the curb line at the former elementary school frontage, at the intersection of Monica Circle and Macario Drive. Only one dry lane is available at sump location.

Q100 Existing results: Model shows ponding at the sump inlet (IL_24) at Monica Circle and Macario Drive. Water rising above the sump TC elev of 100.00 will spill to the school property. Peak WSEL above sump inlet will be about 101.00, which will allow for at least one dry lane in the sump location per Plan ID R-1563. Street flow modeling shows two dry lanes (one in either direction) are available for the portion of Macario Drive that runs from Roja Drive to the sump inlet.

Q100 Proposed results: Model shows ponding at the sump inlet (IL_24) at Monica Circle and Macario Drive. Water rising above the sump TC elev of 100.00 will spill to the school property. Peak WSEL above sump inlet will be about 100.3, which will allow for at least two dry lanes in the sump location per Plan ID R-1563. Street flow modeling shows two dry lanes (one in either direction) are available for the portion of Macario Drive that runs from Roja Drive to the sump inlet.

AREA 3



MPD Atlas Sheet D

Results Summary

Monica Circle:

- Upsize sump inlet from 4.5' to 21' (IL_24).
- Add 1,050 LF of parallel 30" RCP to existing 30" CIPP (PC-200, 149, & 199).

+ OUTFALL - HEADWALL + ENERGY DISSIPATOR

Hydrology Calculations for Area 3

Purpose: Verify and adjust hydrology as appropriate for Area 3 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 3.1).
2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 3.1 and Table 3.1).
3) As Area 3 is a sump location, analyze the 100-yr storm event. Calculate Q100 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 3.1 for Q100 flows).

Given:

Subbasin map from MPD.

Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.

As-built construction plans.

Calculation Summary:

Table 3.1 Hydrologic Calculation for Area 3

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling					
XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	Notes		
IL_23	39.7	69.7	IL_23	44.5	78.1	Transferred some contributing area from IL_24 to IL_23.		
IL_24	27.9	50.6	IL_24	14.1	25.6	Removed some contributing area from IL_24 because this area drains to the north via Roja St to Pilgrim Creek (see Figure 3.1).		
Total	**67.6**	**120.3**	**Total**	**58.6**	**103.7**			

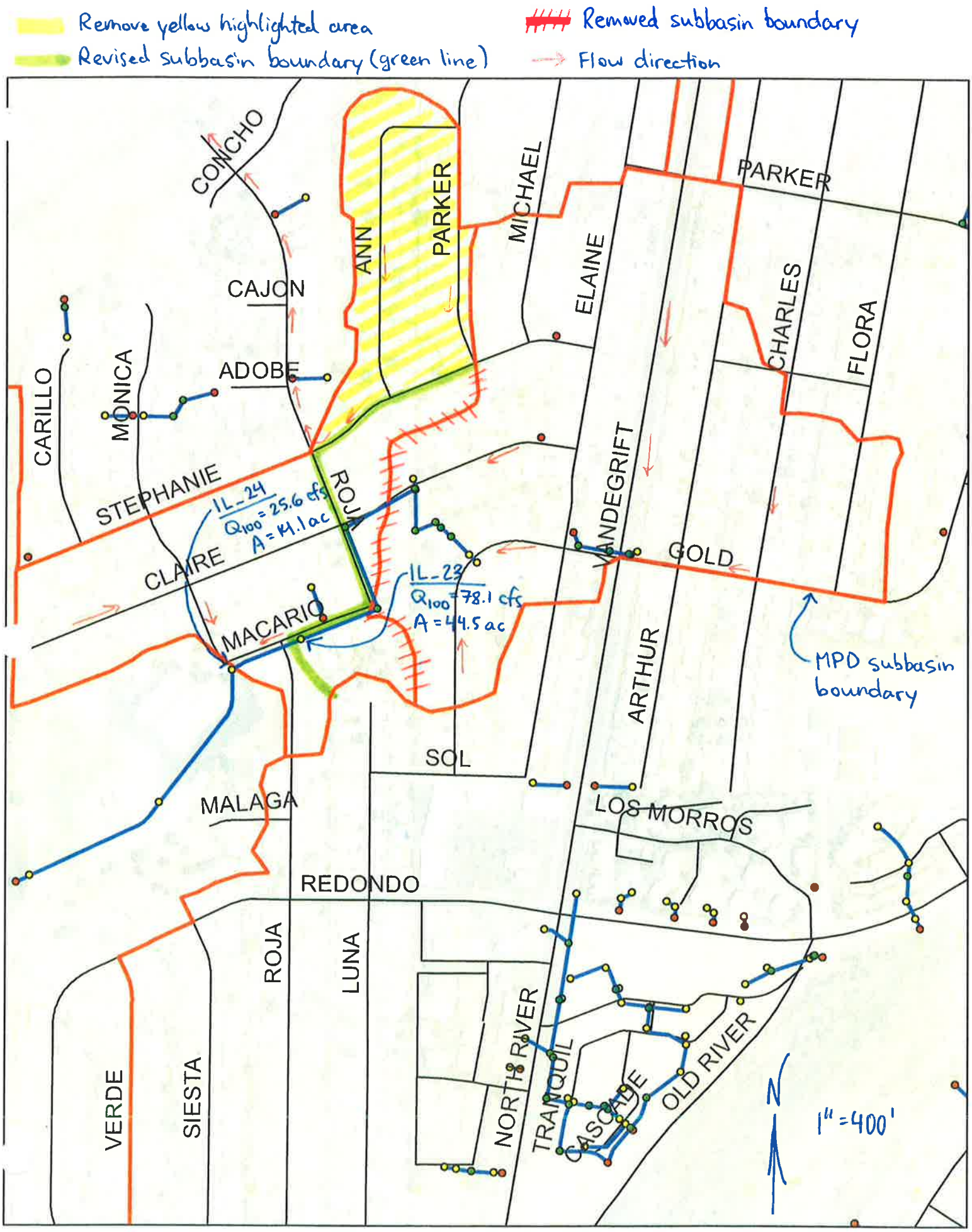


Figure 3.1 - Hydrology Calculations Area 3

Existing Inlet Analysis

Area 3

Inlet ID	IL_24	
Plan ID	R-1563	
Type	Sump	
Location	Outside corner of Macario and Monica	
TC Elev (ft)	100.00	top of curb elevation
Curb height (ft)	0.5	
a (in)	4	gutter depression
Inlet FL	99.17	
ROW Elev (ft)	100.2	at sump location, assuming 10' horiz at 2% slope from TC
ROW depth (ft)	1.03	at sump location, measured from FL of curb opening
Spill Elev (ft)	100.00	TC elev at which water spills from sump location to the south into the school property
Inlet Capacity (cfs)	12.0	maximum inlet capacity used in xpstorm, all flow above this value will spill to the school property
Q100 to Inlet (cfs)	60.6	Peak runoff to IL_24 (25.6 cfs) plus peak street overflow from IL_23 (35 cfs)
WSEL_100yr (ft)	101.0	100-yr water surface elevation at sump inlet. Assuming TC acts as a 20 ft weir, spilling flow will rise to a head of about 1 ft => 100 + 1 = 101 ft
As weir:		$Q = C_w * L_w * d^{1.5}$
C_w	3	weir discharge coeff
L_w (ft)	3.5	weir length = curb opening length
As orifice:		$Q = C_o * A_g * (2*g*(d-h/2))^{0.5}$
h (ft)	0.5	height of curb opening orifice (includes any gutter depression)
L (ft)	3.5	length of curb opening orifice (same as weir length above)
A_g (ft^2)	1.75	Clear area of opening
C_o	0.67	Orifice coefficient
g	32.2	ft/sec^2

Elev (ft)	d (ft)*	Q_weir (cfs)	Q_orif (cfs)	Q_effective (cfs)	
99.17	0	0.00	0.00	0.00	
99.27	0.1	0.33	0.00	0.33	
99.37	0.2	0.94	0.00	0.94	
99.47	0.3	1.73	0.00	1.73	
99.57	0.4	2.66	0.00	2.66	
99.67	0.5	3.71	0.00	3.71	
99.77	0.6	4.88	5.57	4.88	
99.87	0.7	6.15	6.31	6.15	
99.97	0.8	7.51	6.98	6.98	Top of Curb (TC) Elevation 100.00
100.07	0.9	8.97	7.59	7.59	
100.17	1	10.50	8.15	8.15	
100.27	1.1	12.11	8.67	8.67	
100.37	1.2	13.80	9.17	9.17	
100.47	1.3	15.56	9.64	9.64	
100.57	1.4	17.39	10.09	10.09	
100.67	1.5	19.29	10.52	10.52	
100.77	1.6	21.25	10.93	10.93	
100.87	1.7	23.27	11.33	11.33	
100.97	1.8	25.36	11.71	11.71	
101.07	1.9	27.50	12.09	12.09	
101.17	2	29.70	12.45	12.45	
101.27	2.1	31.95	12.80	12.80	
101.37	2.2	34.26	13.14	13.14	
101.47	2.3	36.63	13.47	13.47	

Notes:

*d = depth of flow at curb opening = depth of flow in adjacent gutter plus the gutter depression (a) at the inlet

Proposed Inlet Analysis

Area 3

Inlet ID	IL_24	
Plan ID	R-1563	
Type	Sump	
Location	Outside corner of Macario and Monica	
TC Elev (ft)	100.00	top of curb elevation
Curb height (ft)	0.5	
a (in)	4	gutter depression
Inlet FL	99.17	
ROW Elev (ft)	100.2	at sump location, assuming 10' horiz at 2% slope from TC
ROW depth (ft)	1.03	at sump location, measured from FL of curb opening
Spill Elev (ft)	100.00	TC elev at which water spills from sump location to the south into the school property
Inlet Capacity (cfs)	50.0	maximum inlet capacity used in xpstorm, all flow above this value will spill to the school property
Q100 to Inlet (cfs)	60.6	Peak runoff to IL_24 (25.6 cfs) plus peak street overflow from IL_23 (35 cfs)
WSEL_100yr (ft)	100.3	100-yr water surface elvation at sump inlet. Assuming TC acts as a 20 ft weir, spilling flow will rise to a head of about 0.3 ft => 100 + 0.3 = 100.3 ft

Curb Opening Inlet

As weir:	$Q = C_W * L_W * d^{1.5}$	
C_W	3	weir discharge coeff
L_W (ft)	20	weir length = curb opening length
As orifice:	$Q = C_o * A_g * (2*g*(d-h/2))^{0.5}$	
h (ft)	0.5	height of curb opening orifice (includes any gutter depression)
L (ft)	20	length of curb opening orifice (same as weir length above)
A_g (ft^2)	10	Clear area of opening
C_o	0.67	Orifice coefficient
g	32.2	ft/sec^2

Overflow (flow spilling over top of curb to school property)

Assume top of curb acts as a weir to discharge overflows from sump to school property.

C	3	Weir Coefficient
L (ft)	20	Weir length. Assumed length of 20 ft based on top of curb elevations.

		Curb Inlet Q			Overflow Q[2]		
Elev (ft)	d (ft)[1]	Q_weir (cfs)	Q_orif (cfs)	Q_effective (cfs)	Q_weir (cfs)	Total Q (cfs)	
99.17	0	0.00	0.00	0.00	0.00	0.00	
99.27	0.1	1.90	0.00	1.90	0.00	1.90	
99.37	0.2	5.37	0.00	5.37	0.00	5.37	
99.47	0.3	9.86	0.00	9.86	0.00	9.86	
99.57	0.4	15.18	0.00	15.18	0.00	15.18	
99.67	0.5	21.21	0.00	21.21	0.00	21.21	
99.77	0.6	27.89	31.81	27.89	0.00	27.89	
99.87	0.7	35.14	36.07	35.14	0.00	35.14	
99.97	0.8	42.93	39.87	39.87	0.00	39.87	Top of Curb (TC) Elevation 100.00
100.07	0.9	51.23	43.35	43.35	1.03	44.38	
100.17	1	60.00	46.56	46.56	4.08	50.65	
100.27	1.1	69.22	49.57	49.57	8.26	57.83	
100.37	1.2	78.87	52.41	52.41	13.32	65.73	
100.47	1.3	88.93	55.10	55.10	19.13	74.22	
100.57	1.4	99.39	57.66	57.66	25.59	83.25	
100.67	1.5	110.23	60.11	60.11	32.66	92.77	
100.77	1.6	121.43	62.47	62.47	40.28	102.75	
100.87	1.7	132.99	64.74	64.74	48.41	113.15	
100.97	1.8	144.90	66.94	66.94	57.03	123.96	
101.07	1.9	157.14	69.07	69.07	66.10	135.16	

Notes:

[1]d = depth of flow at lip of curb opening = depth of flow in adjacent gutter plus the gutter depression (a) at the the inlet

[2]Overflow from sump location that spills over top of curb into school property.

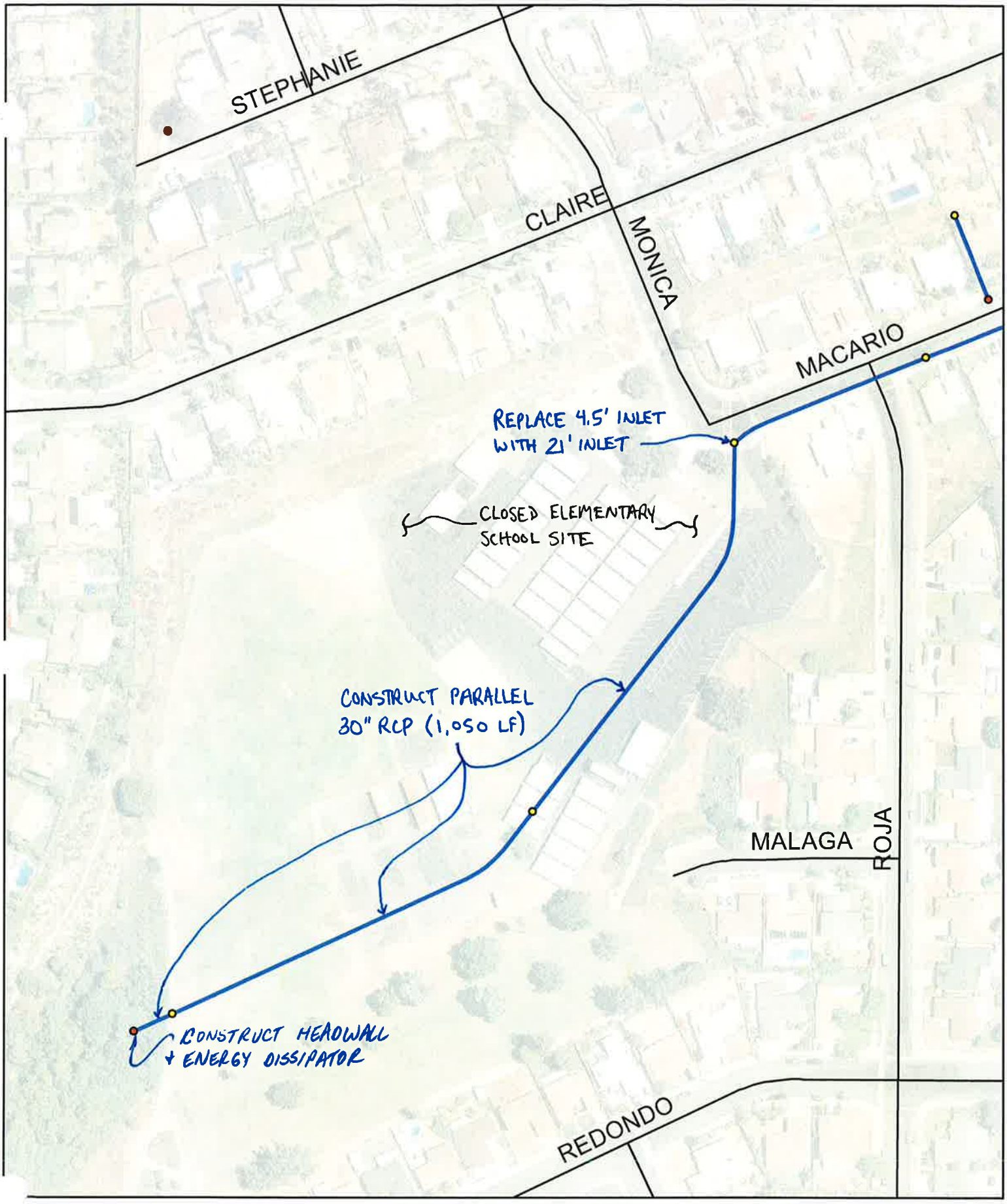


Figure 3.2 Proposed Storm Drains for Area 3

Area 4

Downs Street

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

Project Overview for Area 4

Project Overview

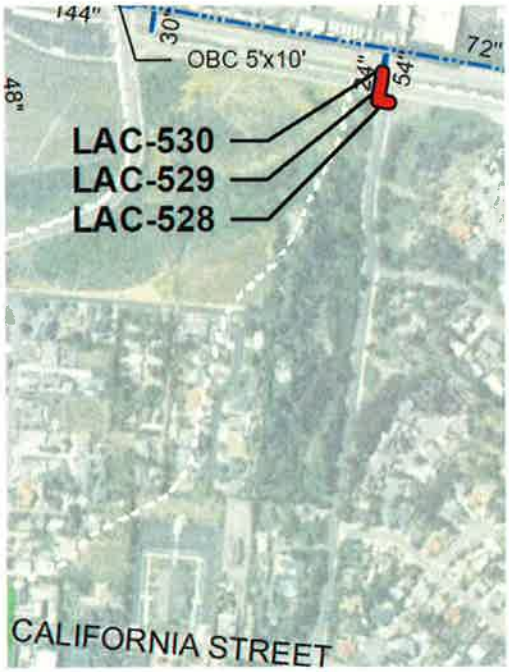
Purpose: Determine storm drain facility adequacy, and street flow capacities in Downs and Skylark. Facility is considered adequate if at least one lane of traffic is open in each direction (total of two dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

As Area 4 is a sump location, the 100-yr storm event was used for this analysis.

Problem: Model indicates street flooding at the intersection of Downs Street and Skylark Drive. In addition, moving south on Downs Street, erosion has occurred over years along the westerly right-of-way. Dry lanes are currently not provided in Downs for a reach southerly from the intersection.

Q100 Existing results: Storm drain system and associated inlets at the Skylark/Downs intersection are undersized. Sufficient dry lanes are not provided, excepting north side of Skylark. At Q100, some overflow to west from Downs to Skylark occurs, toward Crouch Street. Additional field survey at final design stage would supplement hydraulic calculations for final sizing.

AREA 4



MPD Atlas Sheet F

Q100 Proposed results: Proposed storm drains and inlets provide needed dry lanes throughout the intersection. Final field survey and hydraulic calculations would quantify flow to west toward Crouch Street.

Historical Maintenace Records: In addition to the Area 4 improvements, we recommend additional work for the City to improve two historical flooding areas along Skylark, located approximately 800 and 1,400 feet east of Downs Street. At each location, curb openings were provided with the 2005 Sprinter rail construction. The openings route surface flow from tributary areas into conduits built by the railroad. Historical photos indicate flooding at each location post-railroad and conduit construction. Further analysis is needed to determine if backup from Loma Alta Creek or conduit-sizing for the railroad is the problem. At the minimum, it is recommended that the City of Oceanside lengthen the curb-openings at each location, which appear to be 5 feet or less in each case.

Project Overview for Area 4

Results Summary

Downs Street:

- Add 4-15' inlets on Downs St. one of these inlets will replace an existing curb outlet (two between Zabyn and Dunstan and two at Dunstan. See Fig. 4.2).
- Upsize sump inlets at bottom of Downs St. from 12' to 21' (IL_98 and IL_99).
- Install concrete ditch on west side of Downs St. 820 LF (see Fig. 4.2).
- Install 36" RCP on west side of Downs St. 440 LF (see Fig. 4.2).
- Install 42" RCP or box culvert on west side of Downs St. 570 LF (see Fig. 4.2).
- Upsize RCP from 30" to 2.5'x6.5' RCB. 74 LF (LAC-529).
- Upsize CMP from 24" to 2.5'x6.5' RCB. 22 LF (LAC-530).
- Construct 64 LF 24" RCP
- CONSTRUCT TYPE F CATCH BASIN

Hydrology Calculations for Area 4

Purpose: Verify and adjust hydrology as appropriate for Area 4 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 4.1).
2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 4.1 and Table 4.1).
3) As Area 4 is a sump location, analyze the 100-yr storm event. Calculate Q100 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 4.1 for Q100 flows).

Given:

Subbasin map from MPD.

Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.

As-built construction plans.

Calculation Summary:

Table 4.1 Hydrologic Calculation for Area 4

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling			
XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	Notes
IL_98	112.9	210.6	IL_98	77.8	145.1	Area adjusted per Figure 4.1.
			IL_99	34.7	64.7	Area adjusted per Figure 4.1.
			IL_100	0.4	0.8	Area adjusted per Figure 4.1.
Total	**112.9**	**210.6**	**Total**	**112.9**	**210.6**	

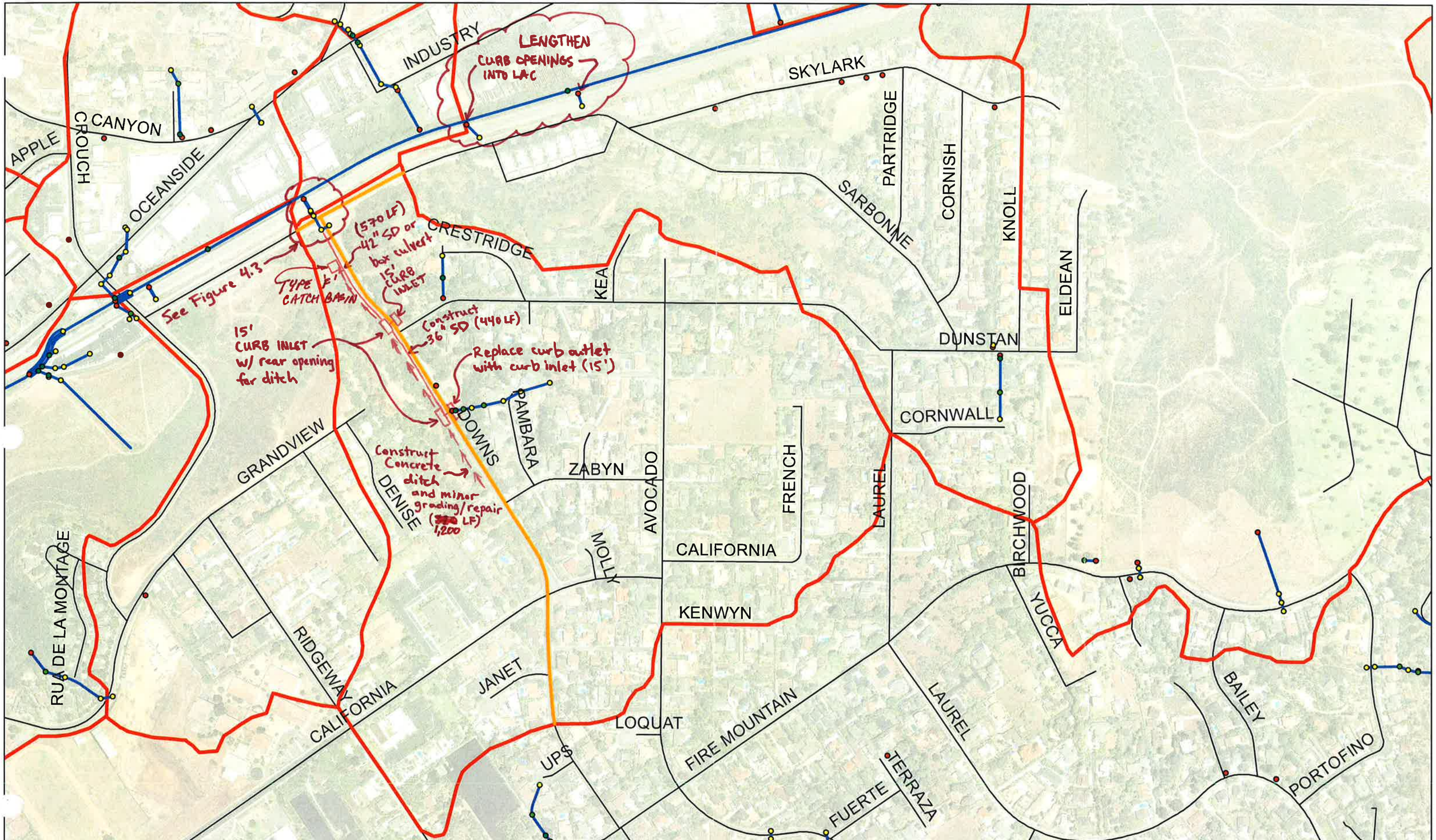


Figure 4.2 Proposed Storm Drains for Area 4

N

1"=400'

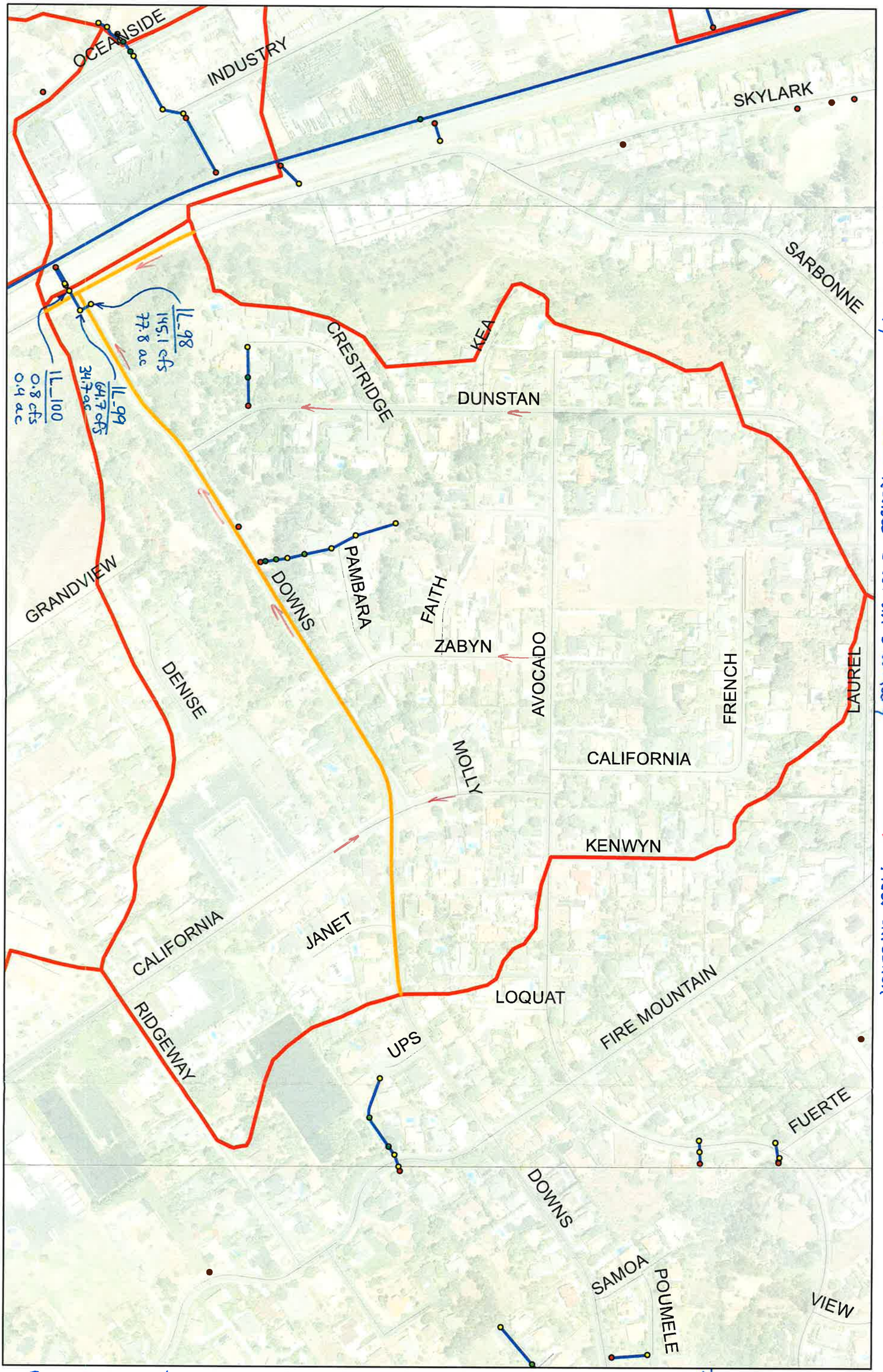


Figure 4.1 - Hydrology Calculations Area 4

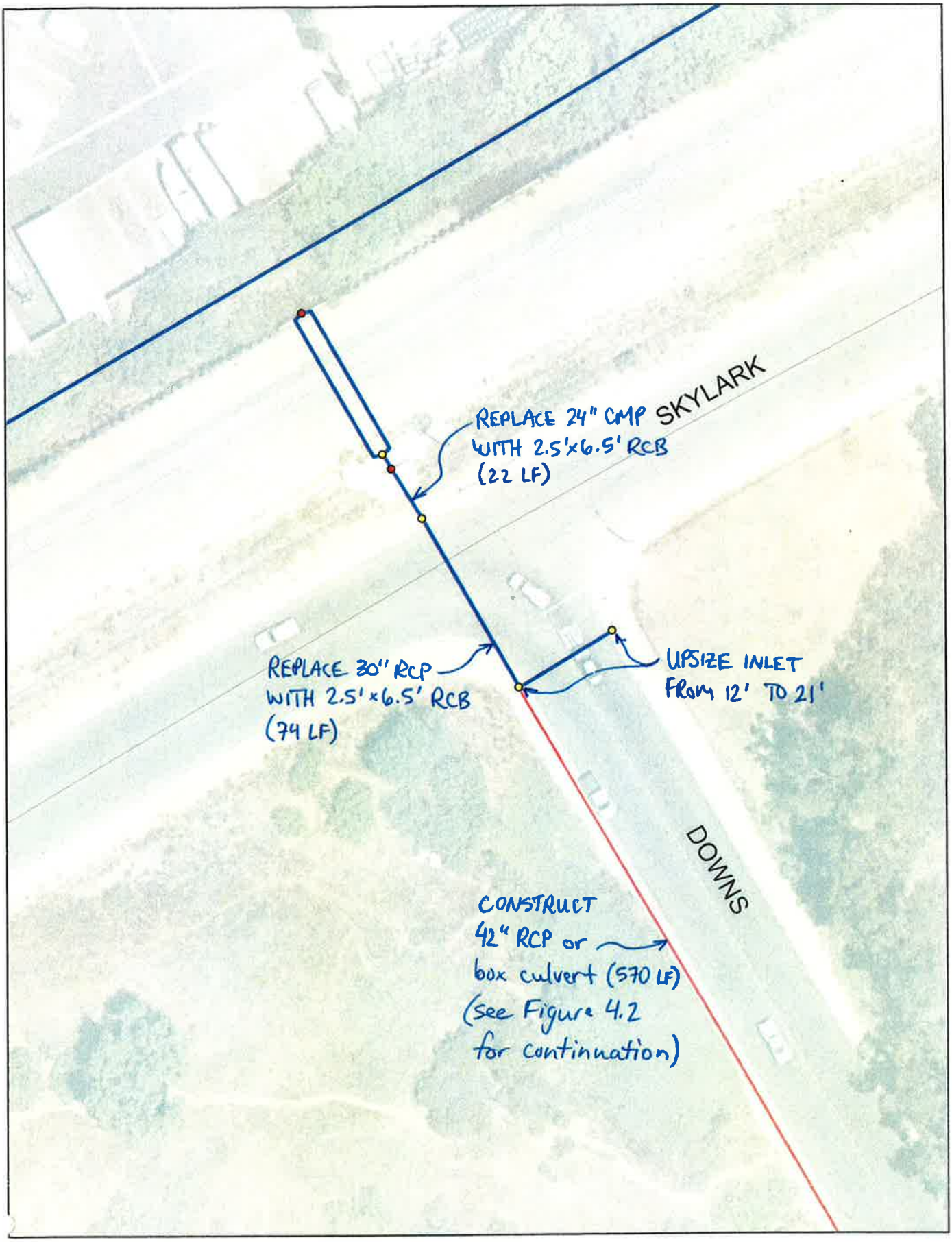


Figure 4.3 Proposed Storm Drains for Area 4

Area 5

Hoover St. and Oceanside Blvd.

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

Project Overview for Area 5

Project Overview

Purpose: Determine storm drain facility adequacy. Facility is considered adequate if at least one lane of traffic is open in each direction (total of two dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

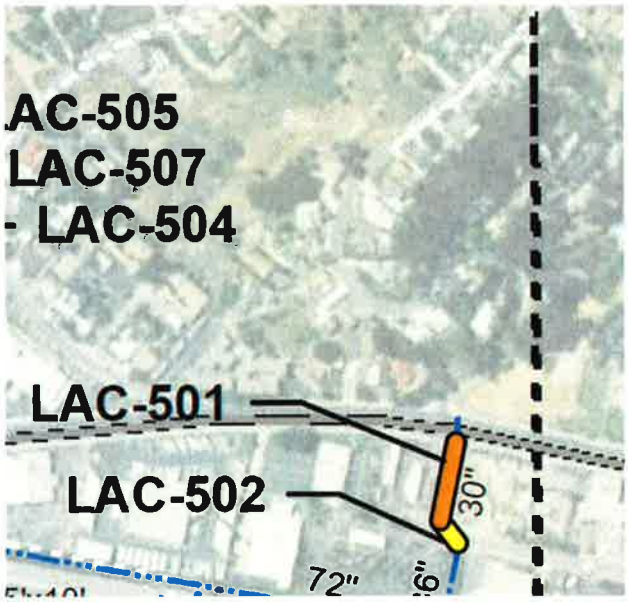
The 100-yr storm event was used for this analysis as this area is a sump location.

Problem: Storm drain system is undersized and flow backs up into Oceanside Blvd and Industry Street.

Q50 Existing results: Model shows flow backs up and the storm drain system overflows on the north and south side of Oceanside Blvd at the intersection with Hoover St. This results in street flow that ponds at the receiving sump inlets on Industry St. Flow depth exceeds ROW elevation and no dry lanes at the sump on Industry are provided. In addition, no dry lanes are provided at the intersection of Hoover and Oceanside Blvd.

Q50 Proposed results: Model shows that the proposed storm drains provide two dry lanes on Oceanside Blvd and Industry Street. The downstream concrete open channel was upsized because the flow depth in the channel controls the upstream HGL.

AREA 5



MPD Atlas Sheet F

Results Summary

Hoover Street:

- Upsize inlet from 4' to 10' (per Figure 5.2).
- Upsize RCP from 12" to 18" RCP. 31 LF (per Figure 5.2).
- Upsize inlet from 7' to 15' (per Figure 5.2).

Oceanside Blvd:

- Upsize inlet from 7' to 15' (per Figure 5.2).
- Construct 20' inlet (per Figure 5.2).
- Construct 24" RCP. 300 LF (per Figure 5.2).
- Upsize inlet from 7' to 20' (per Figure 5.2).
- Upsize RCP from 30" to 2.5'x4' RCB. 71 LF (LAC-499, 500).

Industry Street:

- Upsize RCP from 30" to 2.5'x5' RCB. 290 LF (LAC-501, 502, 503).
- Upsize 3' deep trapezoidal concrete channel to 8' wide x 3' high rectangular concrete channel. 207 LF (LAC-727).

Hydrology Calculations for Area 5

Purpose: Verify and adjust hydrology as appropriate for Area 5 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 5.1).
2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 5.1 and Table 5.1).
3) Analyze the 100-yr storm event as Area 5 is a sump location. Calculate Q100 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 5.1 for Q100 flows).

Given:

Subbasin map from MPD.
Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.
As-built construction plans.

Calculation Summary:

Table 5.1 Hydrologic Calculation for Area 5

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling			
XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	Notes
MN_53	54.2	126.6	MN_53	59.2	138.2	Subbasin boundaries adjusted to include upstream area along Mesa Drive (per Figure 5.1). Also see additional note below.
MN_152	12.3	37.4	IL_106	1.2	3.7	Subbasin boundary adjusted to remove area that flows directly to Loma Alta Creek. Remaining area distributed to inlets IL_106, IL_107, and IL_108.
			IL_107	5.9	18.0	Area adjusted per Figure 5.1.
			IL_108	0.7	2.1	Area adjusted per Figure 5.1.
Total	**66.5**	**164.0**	**Total**	**67.1**	**162.0**	

Note: For node MN_53, the portion of the area east of Mac Donald St. drains to a 12" and 18" SD. Q100 peak flow to the inlet to the 18" pipe is about 45 cfs. Full flow capacity of 18" pipe @ 5.5% is approximately 24 cfs. However, the inlet to the 18" is a 7' flow-by type on a 3.75% grade with a Q100 capacity of approximately 6 cfs. Therefore, assumed all flow bypasses this inlet and proceeds to MN_53.

MPD Subbasin Boundary

Revised Subbasin Boundary

Removed Subbasin Boundary

Flow direction

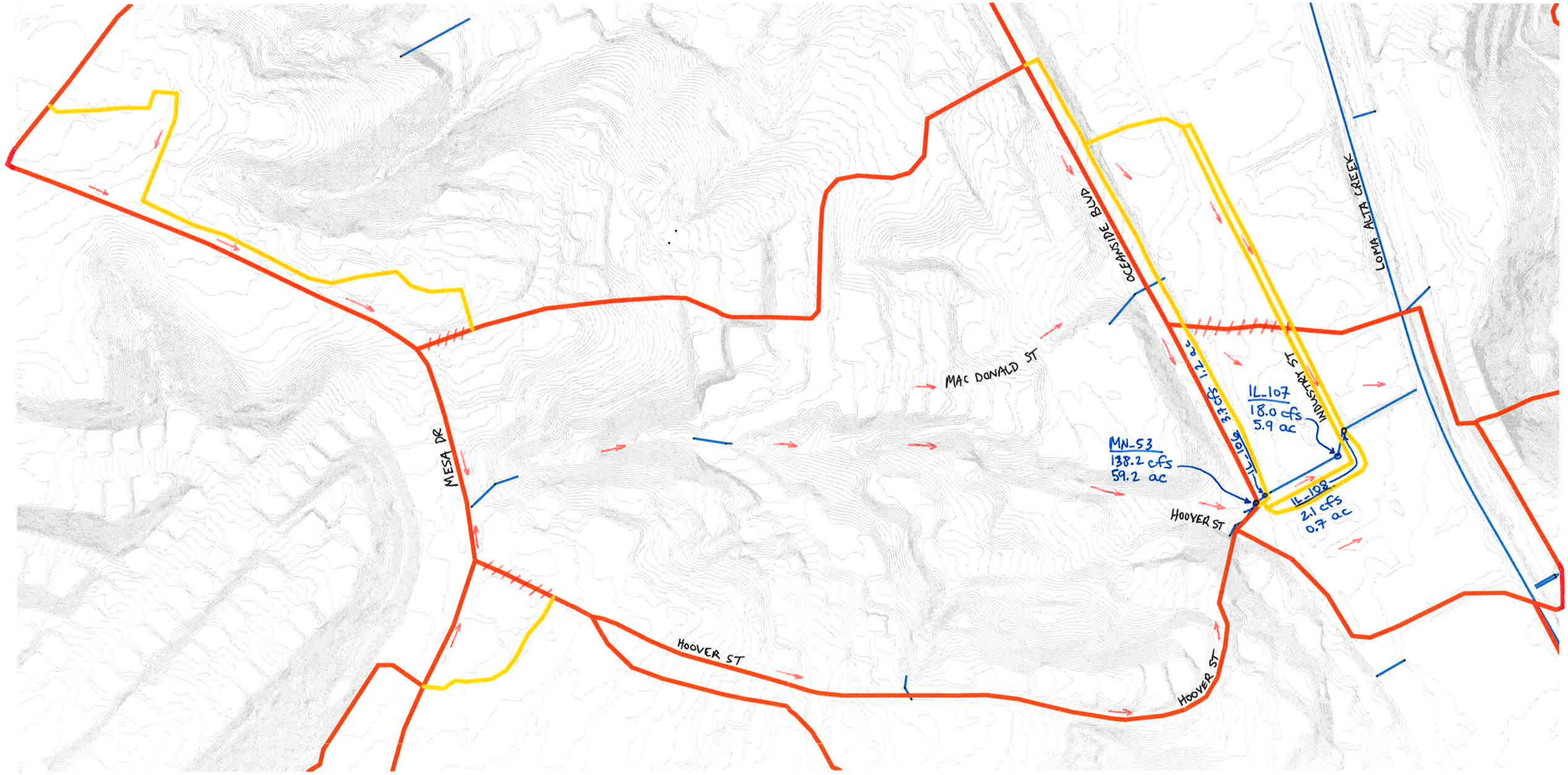


Figure 5.1 - Hydrology Calculations Area 5

N

1"=250'

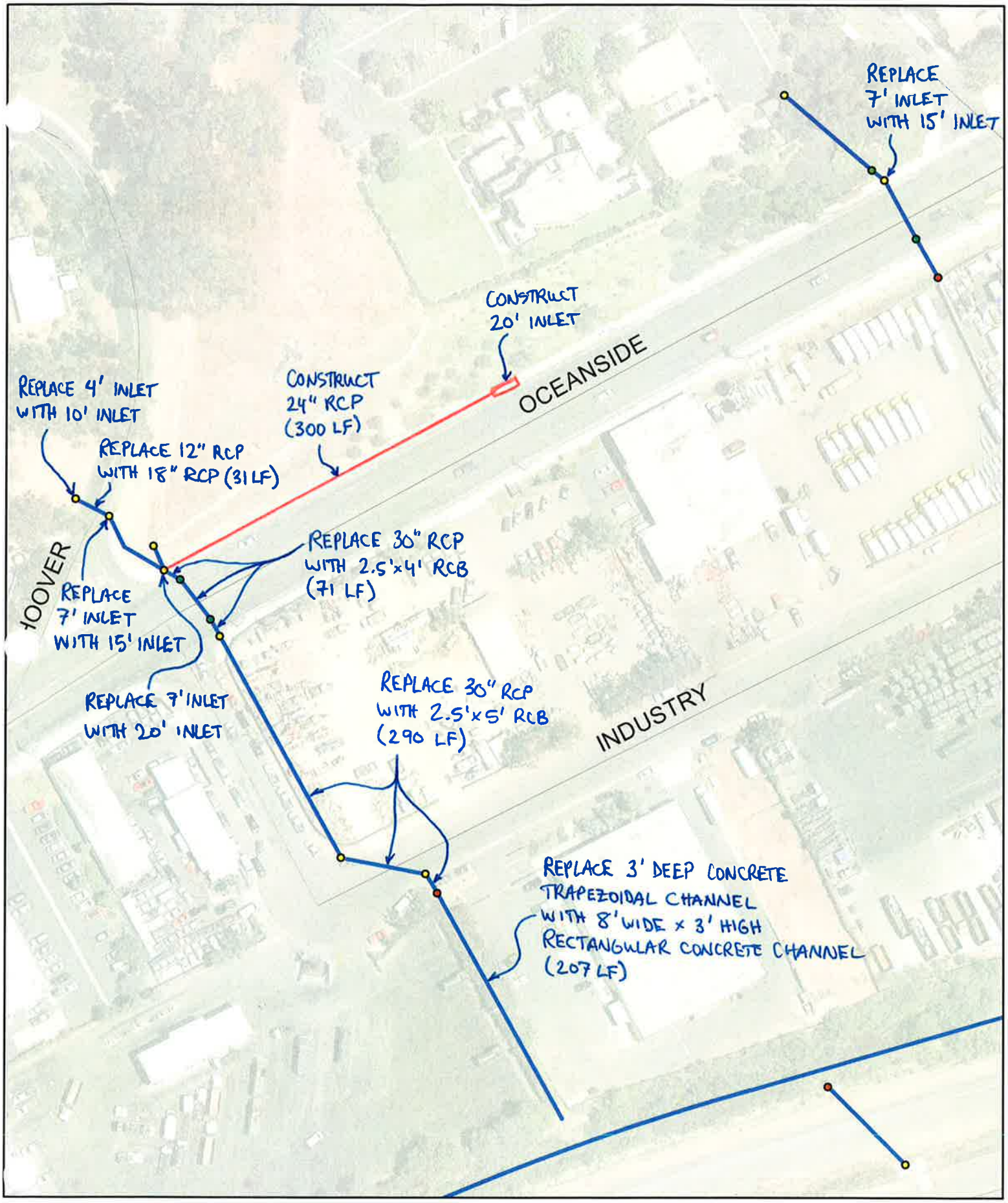


Figure 5.2 Proposed Storm Drains for Area 5

Area 6

Oceanside Blvd. at Foussat Rd.

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

Project Overview for Area 6

Project Overview

Purpose: Determine storm drain facility adequacy. Facility is considered adequate if at least one lane of traffic is open in each direction (total of two dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

As Area 6 contains a sump location, the 100-yr storm event was used for this analysis.

Problem: Model indicates flooding in Oceanside Blvd. and Industry Street due to inadequate storm drain capacity. Sump inlets overwhelmed just east of trunk storm drain in Oceanside Blvd due to backup of flows in system.

Q100 Existing Results: A large area is tributary to the inlets at the bottom of Foussat (75.5 ac) and Edgehill (28.1 ac). For the 100-year event significant flow-by will occur at these inlets and combine with overflow from the storm drain system, eventually flowing east to the sump location on Oceanside Blvd. No dry lanes will be available at the sump location and flows may spill toward the buildings between Oceanside Blvd. and Industry St. Flow backup from the system at Industry St. is not at a sump location, but the flat slope of the street will result in ponding.

Q100 Proposed Results: Storm drain and inlet upgrades at both Foussat and Edgehill are needed to capture flows from the large tributary areas north of these intersections with Oceanside Blvd. The proposed main trunk system upgrade will convey the 100-year flows, provide the dry lanes in Oceanside Blvd., and alleviate the flooding problems due to lack of adequate capacity in current system.

AREA 6

MPD Atlas Sheet G

Results Summary

Foussat Road:

- Upsize 2 existing inlets from 14' to 21' and add 3-21' inlets on Foussat (per Figure 6.2).
- Upsize RCP from 18" to 48" RCP. 36 LF.
- Additional SD to support proposed inlets: 60 LF 18" RCP, 40 LF 24" RCP, 180 LF 36" RCP.

Edgehill Lane:

- Upsize 2 existing inlets from 14' to 21' and add 2-21' inlets on Edgehill (per Figure 6.2).
- Upsize RCP from 24" to 36" RCP. 41 LF.
- Additional SD to support proposed inlets: 40 LF of 24" RCP, 260 LF 30" RCP.

Oceanside Blvd:

- Upsize RCP from 24" to 48" RCP. 328 LF.
- Upsize RCP from 36" to 54" RCP. 62 LF (LAC-490).
- Upsize CMPA from 43"x27" to 54" RCP. 29 LF (LAC-717).
- Upsize CMPA from 57"x38" to 60" RCP. 298 LF (LAC-718).

Industry Street:

- Upsize CMPA from 43"x27" to 66" RCP. 42 LF (LAC-719).
- Upsize CMPA from 57"x38" to 66" RCP. 451 LF (LAC-489).

Purpose: Verify and adjust hydrology as appropriate for Area 6 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 6.1).
2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 6.1 and Table 6.1).
3) As Area 6 contains a sump location, analyze the 100-yr storm event. Calculate Q100 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 6.1 for Q100 flows).

Given:

Subbasin map from MPD.

Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.

As-built construction plans.

Calculation Summary:

Table 6.1 Hydrologic Calculation for Area 6

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling			
XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	Notes
CO_258	108.8	247.9	CO_258A	75.5	172.0	Area adjusted per Figure 6.1.
			CO_258	28.1	64.0	Area adjusted per Figure 6.1.
			IL_199	0.3	0.6	Area adjusted per Figure 6.1.
			CO_257	1.6	3.6	Area adjusted per Figure 6.1.
			IL_198	1.2	2.7	Area adjusted per Figure 6.1.
OL_70	10.5	26.7	IL_200	6.4	16.2	Area adjusted per Figure 6.1.
			OL_70	6.4	16.2	Area adjusted per Figure 6.1.
Total	**119.3**	**275**	**Total**	**119.4**	**275**	

100-yr (Adjusted Hydrology)

AREA 6

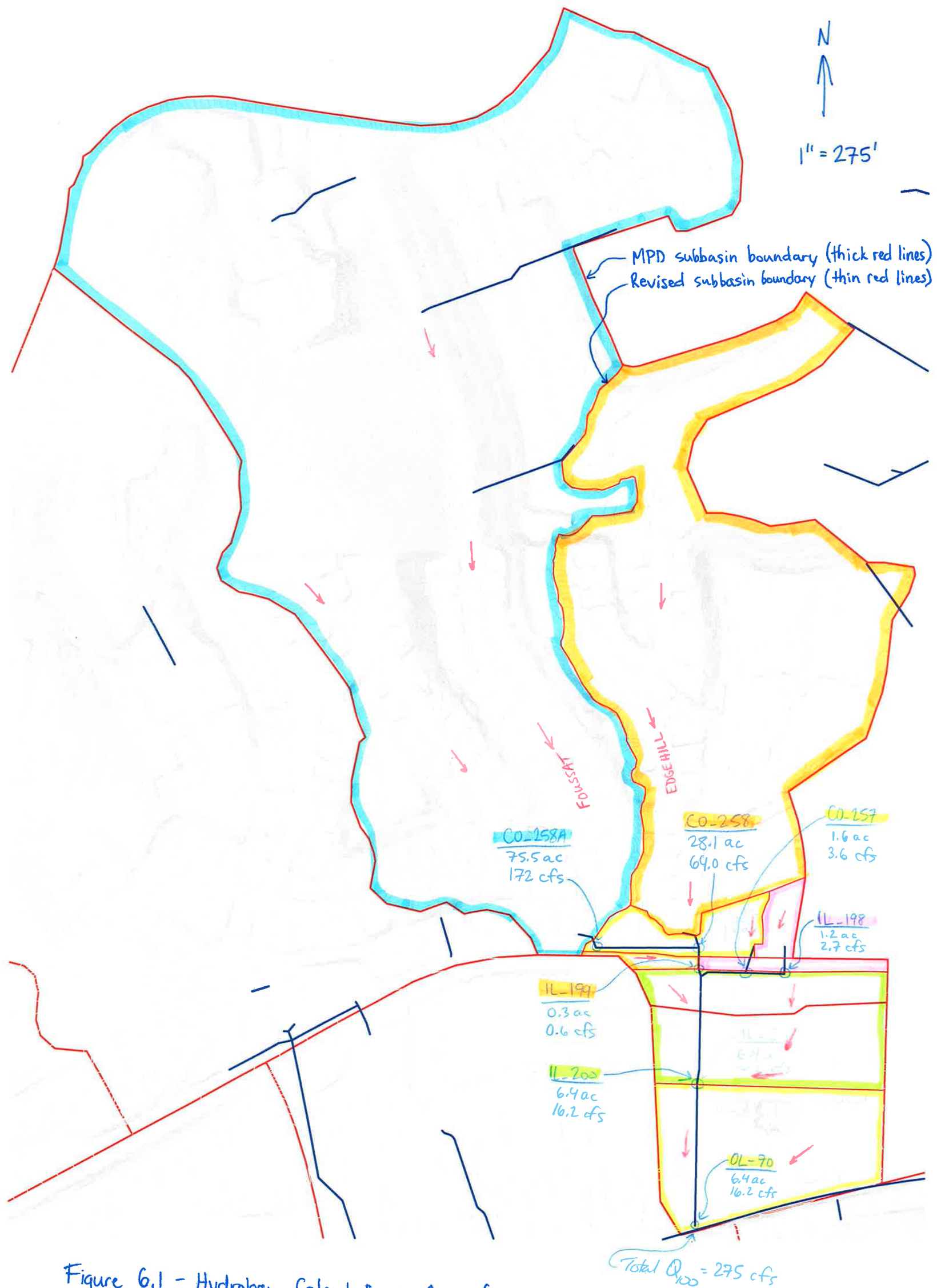


Figure 6.1 - Hydrology Calculations Area 6

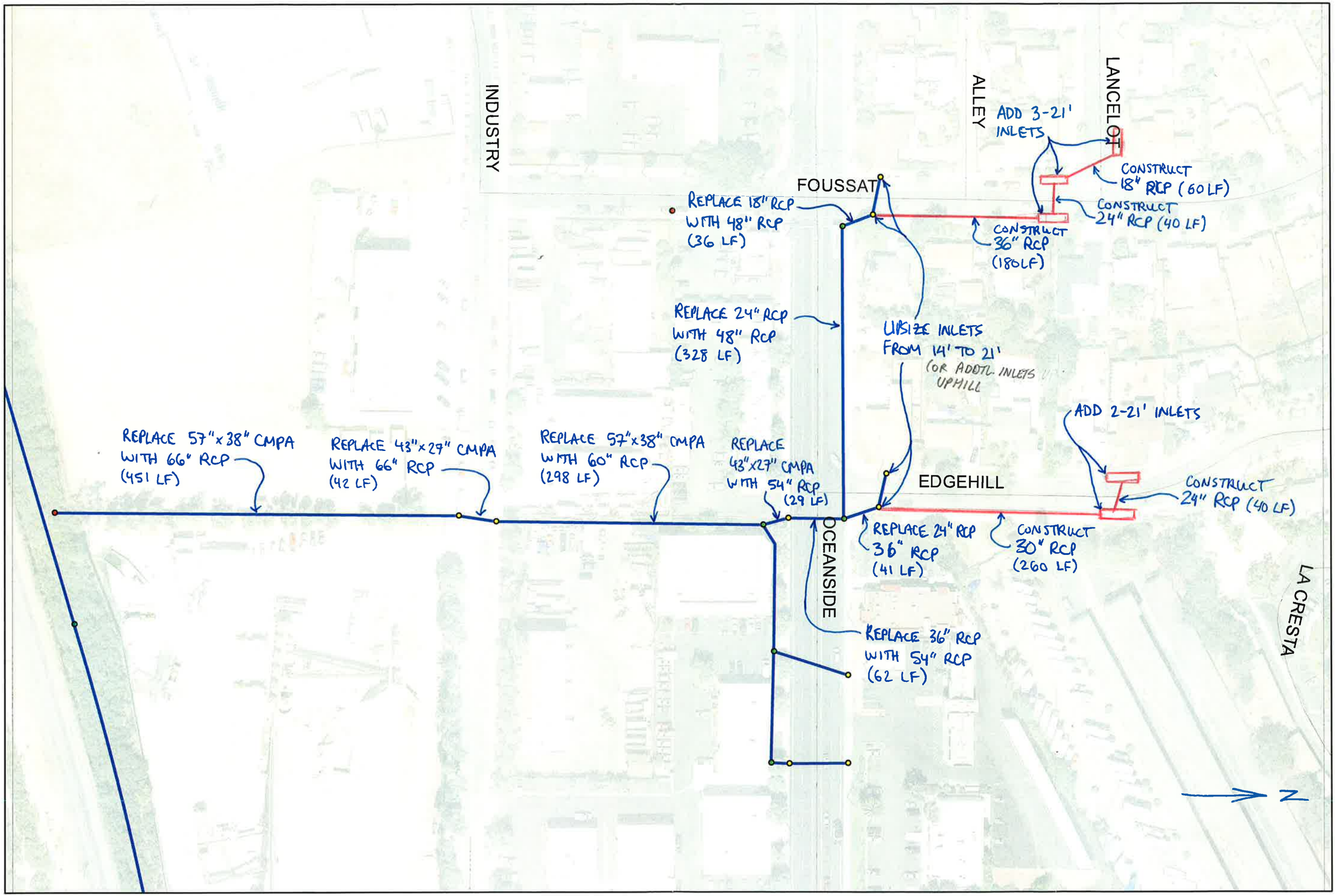


Figure 6.2 Proposed Storm Drains for Area 6

1" = 100'

Area 7

No. Foussat Rd. at Tonopah St.

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

Project Name..... MPD Supplemental Modeling
Project No..... 045-17
Date..... 10.8.14
Design by..... TP
Checked by..... ____ Page # 1 of ___

Project Overview for Area 7

Project Overview

Purpose: Determine storm drain facility adequacy. Facility is considered adequate if at least one lane of traffic is open in each direction (total of two dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

As Area 7 is an on-grade location, the 50-yr storm event was used for this analysis.

Problem: Model shows street flooding with no dry lanes on Foussat Road for the reach between Tonopah and Tropicana due to inadequate storm drains. In addition, only one or less dry lane is available on Foussat Road for the reach between Tonopah and Mesa Drive.

Q50 Existing Results: No dry lanes are available on Foussat Road for the reach between Tonopah and Tropicana due to inadequate storm drain and inlet capacity. In addition, only one or less dry lane is available on Foussat Road for the reach between Tonopah and Mesa Drive. There are three curb outlets and multiple ditch outlets onto Foussat Road that contribute to street flooding between Mesa Drive and Tonopah. This upstream street flow on Foussat exceeds the capacity of the inlets on Foussat located just before the intersection with Tonopah. The receiving storm drain system in Foussat is also undersized resulting in flow back up into the street between Tonopah and Tropicana.

AREA 7

MPD Atlas Sheet G

Q50 Proposed Results: The proposed storm drain system and inlets provide at least one dry lane in both directions for Foussat Road between Noreen and Tropicana (annotated in blue on Figure 7.2). An optional upstream extension of the storm drain system would ensure one dry lane is available in both directions for Foussat Road between Noreen and Mesa Drive (red clouded area shown on Figure 7.2). The optional extension would also help reduce erosion and potential debris slides along the east side of Foussat Road.

Results Summary

Foussat Road:

- Replace curb outlet with 21' inlet (per Figure 7.2).
- Construct 21' inlet (per Figure 7.2).
- Additional SD to support proposed inlets: 960 LF of 24" RCP (per Figure 7.2).
- Replace curb outlet with cleanout in order to directly connect brow ditch to proposed 24" RCP (per Figure 7.2).
- Upsize 2 existing inlets: one from 11' to 21' and one from 14' to 21' (per Figure 7.2).
- Upsize CMP from 22"x36" to 2'x6' RCB. 195 LF (SLR-727 & 728).
- Upsize CMP from 22"x36" to 2'x3' RCB. 217 LF (SLR-725).
- Upsize RCB from 2'x3' to 2'x7' RCB. 90 LF (SLR-724).
- Upsize RCB from 2'x5' to 2'x8' RCB. 231 LF (SLR-729).
- Upsize RCB from 4'x3' to 4'x8' RCB. 36 LF (SLR-731).

Foussat Road (optional upstream extension):

- Construct headwall for 18" RCP (per Figure 7.2).
- Construct 18" RCP. 210 LF (per Figure 7.2).
- Construct 2-15' inlets (per Figure 7.2).
- Replace curb outlet with 15' inlet (per Figure 7.2).
- Construct 24" RCP. 850 LF (per Figure 7.2).
- Construct catch basin (per Figure 7.2).

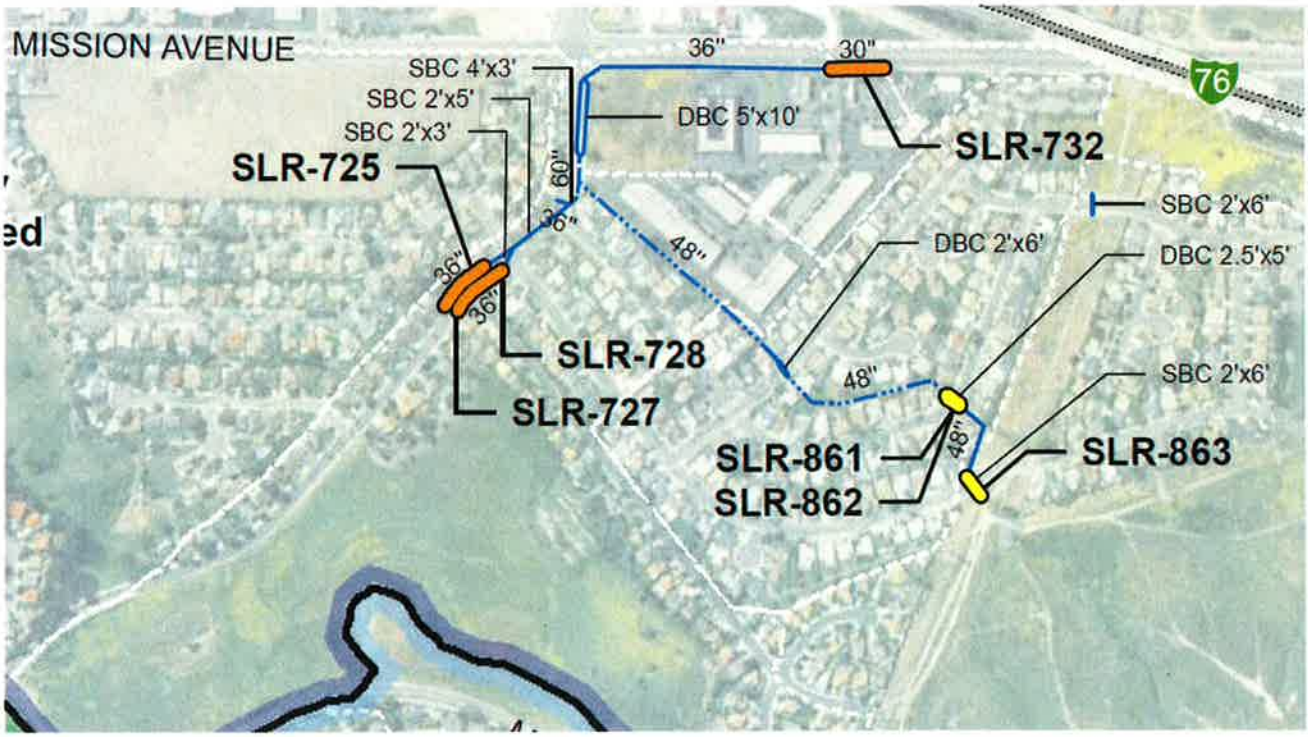
Project Overview for Area 7

Additional Maintenance Concerns

- From a review of City maintenance records, there are three locations east of Area 7 that have experienced historical flooding. All three are along the SDGE easement in the easterly third of the housing tract. Box culvert crossings at Hacienda and Las Vegas Drives have flooded with flow into the streets. Ely Street flooding is also noted in the records, without specific information as to cause.

- Further investigation into these areas with more detailed hydraulic analysis is recommended.

Additional locations east of Area 7:



MPD Atlas Sheet G

Hydrology Calculations for Area 7

Purpose: Verify and adjust hydrology as appropriate for Area 7 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 7.1).
2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 7.1 and Table 7.1).
3) As street flow at Area 7 is on-grade, analyze the 50-yr storm event. Calculate Q50 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 7.1 for Q50 flows).

Given:

Subbasin map from MPD.

Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.

As-built construction plans.

Calculation Summary:

Table 7.1 Hydrologic Calculation for Area 7

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling			
XPSTORM Node ID	**Tributary Area (ac)**	**Q50 (cfs)**	**XPSTORM Node ID**	**Tributary Area (ac)**	**Q50 (cfs)**	**Notes**
HD_4	65.9	120	IL_198	17.8	32.4	Added ~14 ac. Area adjusted per Figure 7.1.
			IL_201	25.3	46.0	Area adjusted per Figure 7.1.
			CO_438	22.7	41.3	Area adjusted per Figure 7.1.
			IL_199	0.6	1.1	Area adjusted per Figure 7.1.
			IL_200	2.7	4.9	Area adjusted per Figure 7.1.
			IL_203	0.7	1.3	Area adjusted per Figure 7.1.
			IL_202	5.1	9.3	Area adjusted per Figure 7.1.
			MN_92	5.0	9.1	Area adjusted per Figure 7.1.
Total	**65.9**	**120**	**Total**	**79.9**	**120**	

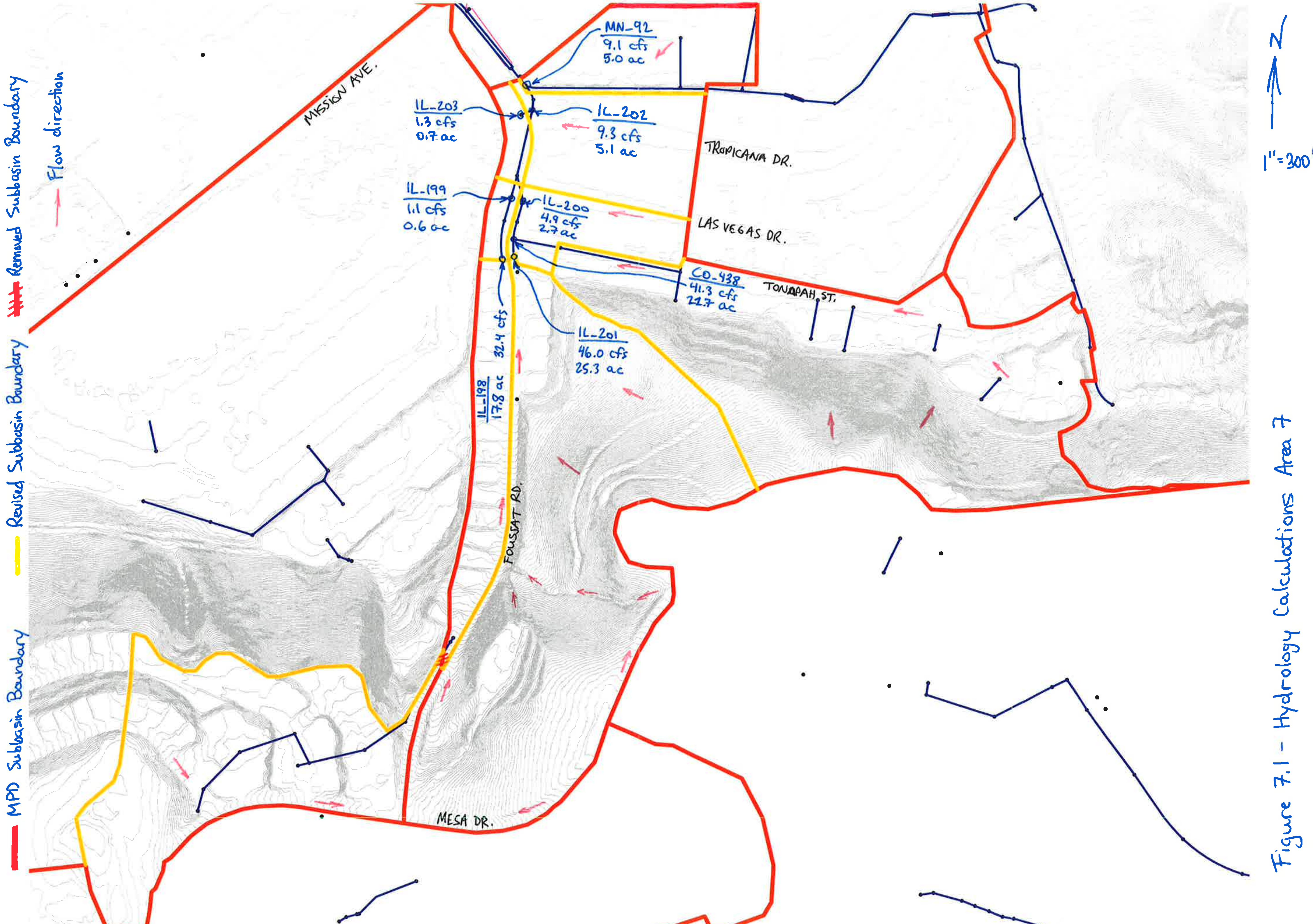


Figure 7.1 - Hydrology Calculations Area 7

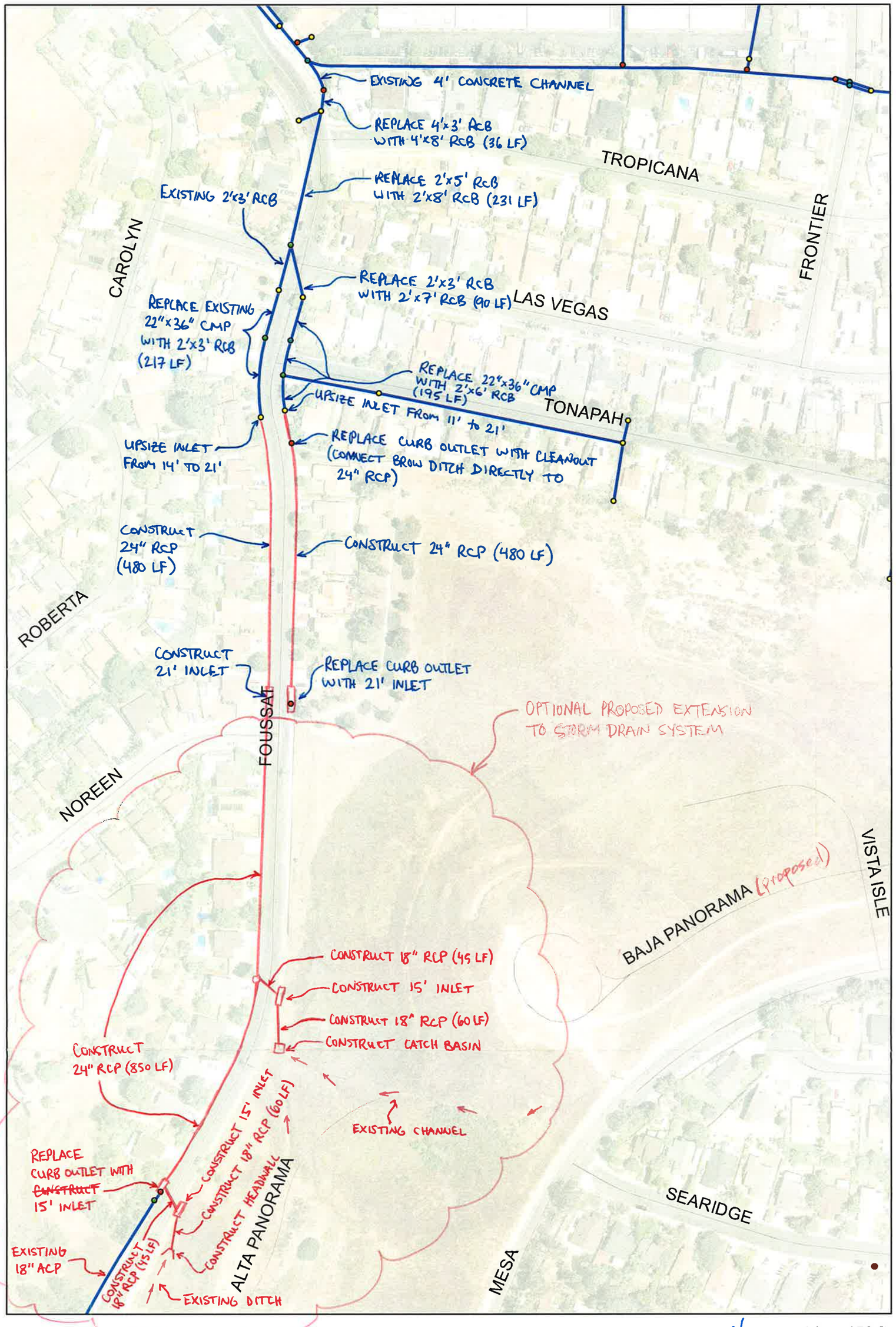


Figure 7.2 Proposed Storm Drains for Area 7

Area 8

Mesa Dr. at Parsley Way

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

Project Name.....	MPD Supplemental Modeling
Project No.....	045-17
Date.....	10.8.14
Design by.....	TD
Checked by.....	JD

Page # 1 of ___

Project Overview for Area 8

Project Overview

Purpose: Determine storm drain facility adequacy. Facility is considered adequate if at least one lane of traffic is open in each direction (total of two dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

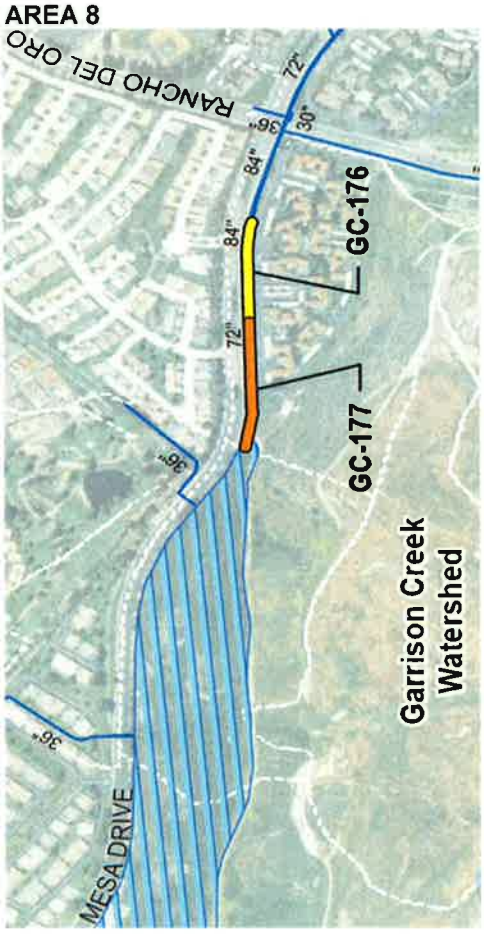
As there are no sumps in this area, the 50-yr storm event was used for this analysis.

Problem: None. The original MPD model showed street flooding on Mesa Drive for the reach between Parsley Way and Cinnamon Way. However, more detailed street flow modeling shows that one dry lane in both directions is available on Mesa Drive.

Q50 Existing Results: Model indicates storm drain system is adequate with the street flow capacity of Mesa Drive. The affected reach includes two separate CIPCP pipes, 72" and 84". During the 50-storm event, flows in the 72" storm drain surcharge into the adjacent residential parking lot which has positive outflow back to Mesa Drive. Adjacent residential buildings are elevated well above the storm flow. Flow on the south side of Mesa Drive is partially intercepted with at-grade inlets, and sufficient dry lane width is available.

Q50 Proposed Results: None. Existing storm drain system is adequate.

AREA 8



MPD Atlas Sheet G

Results Summary

Mesa Drive:

- No proposed facilities. Existing storm drain system is adequate to provide one dry lane in each direction for Q50.

Hydrology Calculations for Area 8

Purpose: Verify and adjust hydrology as appropriate for Area 8 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 8.1).
2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 8.1 and Table 8.1).
3) As Area 8 is an on-grade location, analyze the 50-yr storm event. Calculate Q50 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 8.1 for Q50 flows).

Given:

Subbasin map from MPD.

Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.

As-built construction plans.

Calculation Summary:

Table 8.1 Hydrologic Calculation for Area 8

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling			
XPSTORM Node ID	Tributary Area (ac)	Q50 (cfs)	XPSTORM Node ID	Tributary Area (ac)	Q50 (cfs)	Notes
N/A	826.7	1,124.6	N/A	826.7	1,124.6	Total area and flow to storm drain system at the intersection of Mesa Drive and Rancho del Oro Dr. No change was made to the distribution of area upstream of this point.
OL_7	27.3	48.4	CO_140	10.9	19.4	Distributed area from OL_7 to CO_140.
			CO_142	16.4	29.0	Distributed area from OL_7 to CO_142.
Total	**854**	**1,173**	**Total**	**854**	**1,173**	

MPD Subbasin Boundary Flow direction

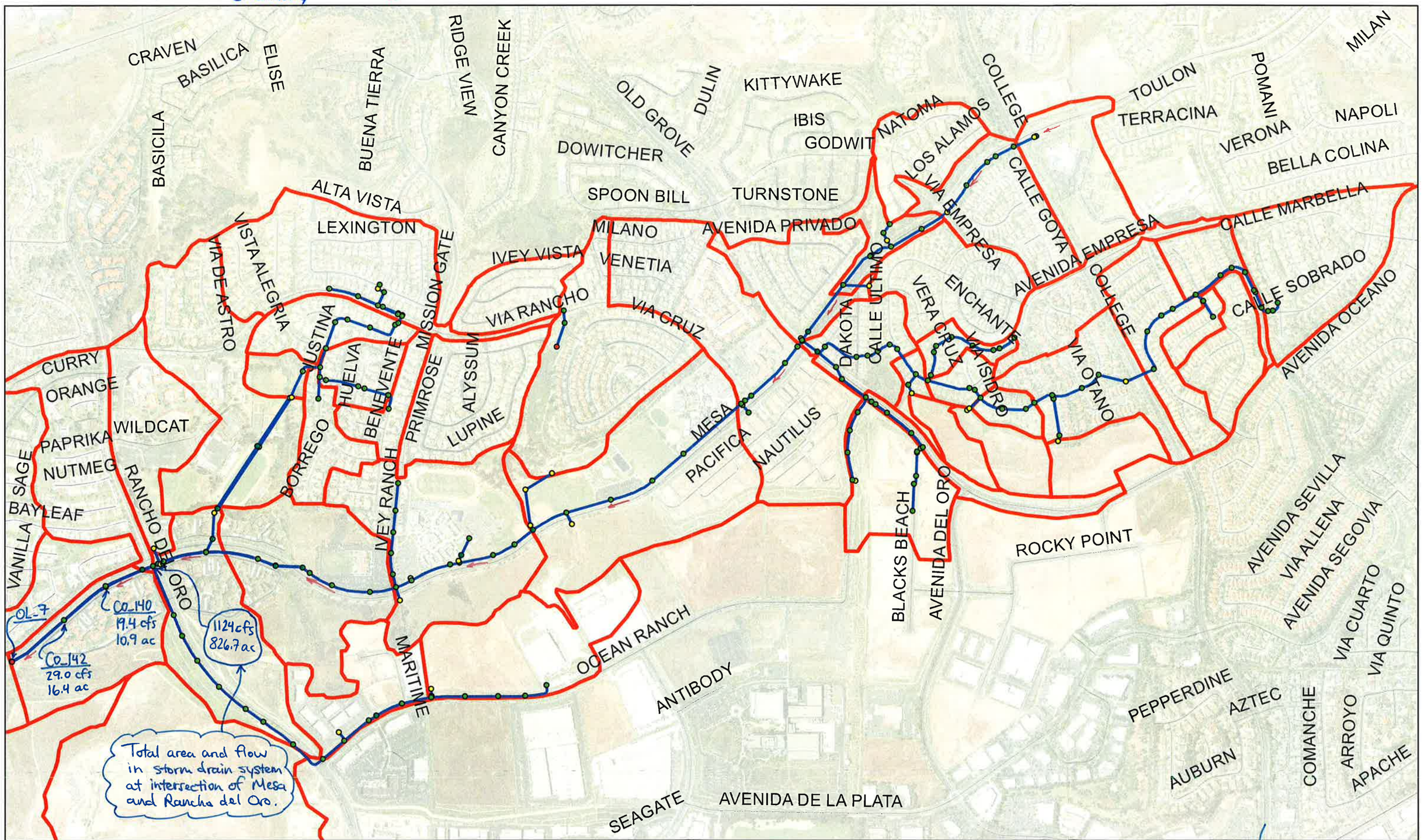


Figure 8.1 - Hydrology Calculations Area 8

N

1 in = 800 ft

Area 10

Via Esmarca at Vista Way

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

Project Name..... MPD Supplemental Modeling
Project No..... 045-17
Date..... 10.8.14
Design by..... TD
Checked by..... JD Page # 1 of ___

Project Overview for Area 10

Project Overview

Purpose: Determine storm drain facility adequacy. Facility is considered adequate if at least one lane of traffic is open in each direction (total of 2 dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

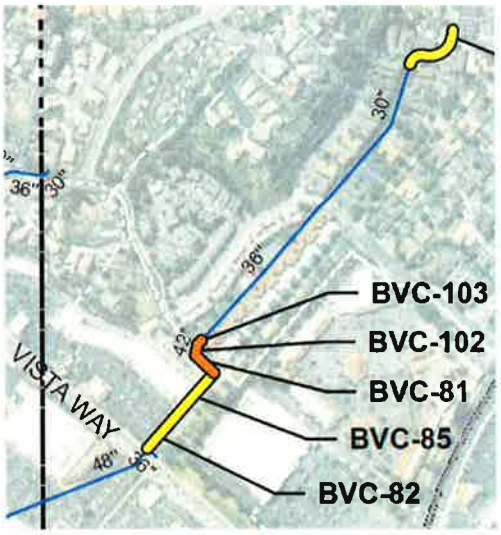
The 50-yr storm event was used for this analysis. Area 10 contains a sump location on Ivy Road, but the 100-yr storm event was not analyzed because it is a localized sump and overflow will spill to Via Esmarca.

Problem: Model shows flooding at sump location on Ivy Road and flooding on Via Esmarca due to inadequate storm drains and inlets. A large tributary area to the northeast of Via Esmarca at Via Las Rosas is drained only by street flow onto Via Esmarca (no storm drain exists to capture this runoff).

Q100 Existing Results: Model shows flooding at Ivy Road sump located just to the west of the Ivy and Via Esmarca intersection. Inadequate storm drain and inlets cause flow backup. No dry lanes are available at this sump, and flow eventually spills to Via Esmarca at ponding depths over approximately 10-12 inches. In addition, no dry lanes are available on Via Esmarca due to inadequate storm drain and inlets.

Q100 Proposed Results: The proposed storm drain upgrades provide one dry lane in either direction at the sump on Ivy Road and along Via Esmarca between Vista Way and Via Las Rosas.

AREA 10



MPD Atlas Sheet L

Results Summary

Ivy Road:

- Upsize existing inlet from 15' to 21' (IL_45).
- Add one 21' inlet (per Figure 10.2).
- Additional SD to support proposed inlets: 120 LF 24" RCP (per Figure 10.2).
- Upsize RCP from 42" to 66" RCP. 47 LF (BVC-102).

Via Esmarca:

- Add 2-21' inlets (per Figure 10.2)
- Additional SD to support proposed inlets: 105 LF 24" RCP, 750 LF 30" RCP.
- Upsize CIPCP from 48" to 66" RCP. 540 LF (BVC-81, 85, 82).
- Upsize RCP from 24" to 30" RCP. 44 LF (per Figure 10.2).

Hydrology Calculations for Area 10

Purpose: Verify and adjust hydrology as appropriate for Area 10 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 10.1).
2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 10.1 and Table 10.1).
3) The 50-yr storm event was analyzed. Area 10 contains a sump location on Ivy Road, but the 100-yr storm event was not analyzed because it is a localized sump and overflow will spill to Via Esmarca. Calculate Q50 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 10.1 for Q50 flows).

Given:

Subbasin map from MPD.

Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.

As-built construction plans.

Calculation Summary:

Table 10.1 Hydrologic Calculation for Area 10

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling			
XPSTORM Node ID	Tributary Area (ac)	Q50 (cfs)	XPSTORM Node ID	Tributary Area (ac)	Q50 (cfs)	Notes
CO_49	40.8	103	CO_49	40.8	103.0	
CO_51	58.3	140	IL_44	11.6	27.8	Area adjusted per Figure 10.1.
			IL_45	18.3	44.0	Area adjusted per Figure 10.1.
			IL_51A	23.7	56.9	Area adjusted per Figure 10.1.
CO_55	31.6	78	IL_46	0.8	2.0	Area adjusted per Figure 10.1.
			MN_25	1.3	3.2	Area adjusted per Figure 10.1.
			CO_55	27.3	67.4	Area adjusted per Figure 10.1.
Total*	**130.7**	**321**	**Total***	**123.8**	**304**	

*Note: Total area is not the same for original MPD and Supplemental Modeling. This is due to the revised drainage boundaries used for supplemental modeling, which completely removed some tributary area that was originally assigned to CO_51 and CO_55.

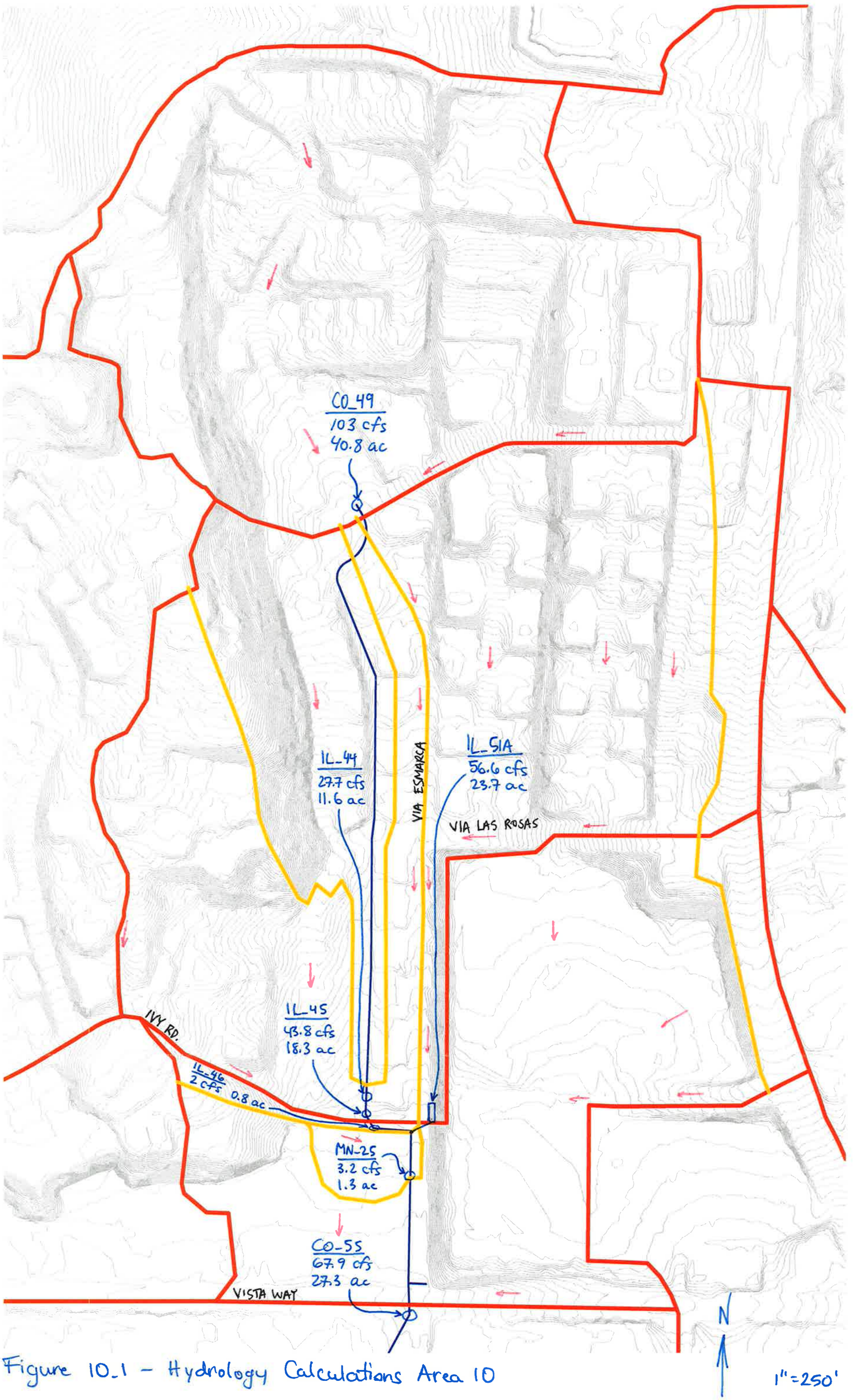


Figure 10_1 – Hydrology Calculations Area 10

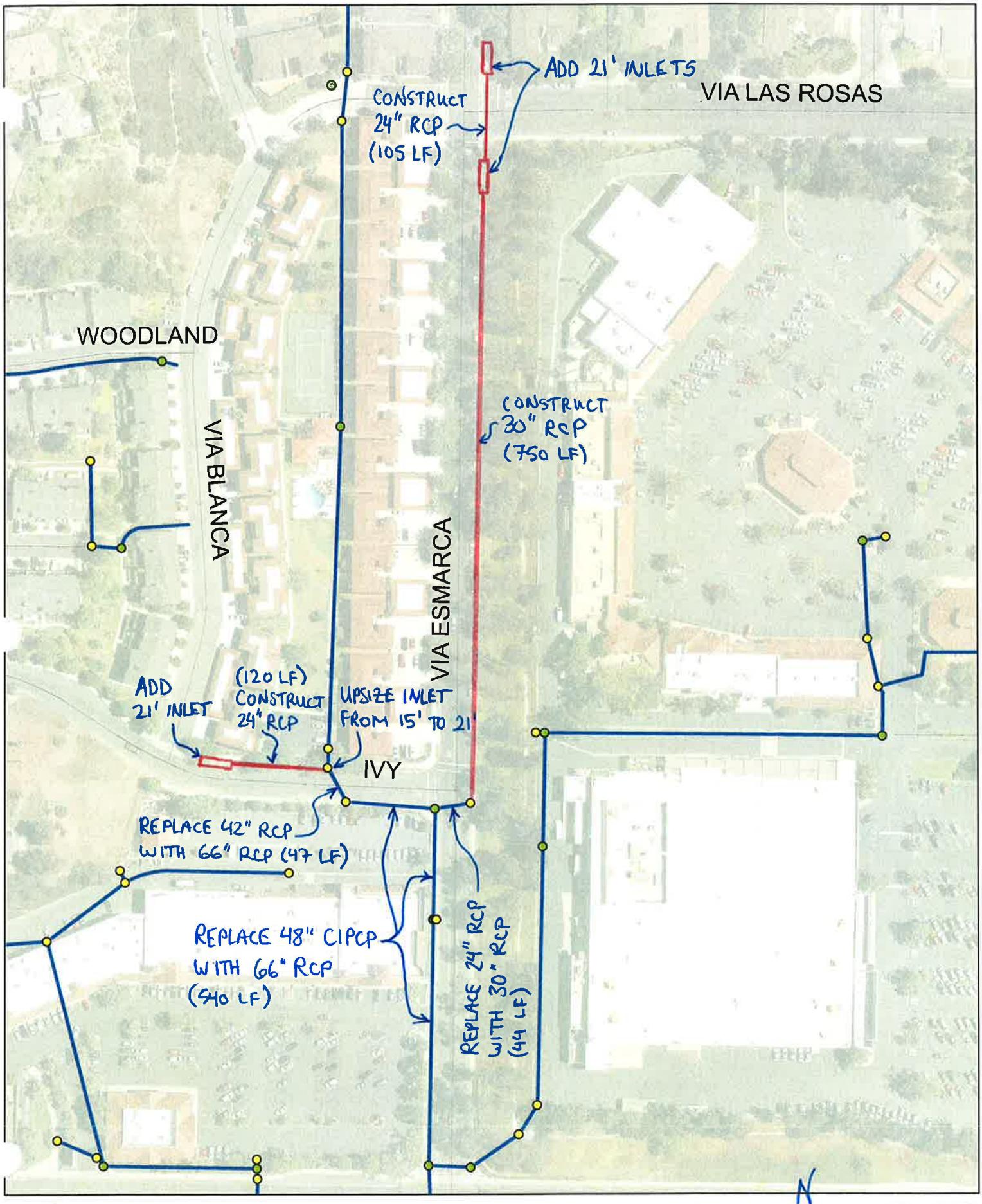


Figure 10.2 Proposed Storm Drains for Area 10

Area 11

Rancho del Oro Rd at Vista Way

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

Project Name..... MPD Supplemental Modeling
Project No..... 045-17
Date..... 10.8.14
Design by..... TD
Checked by..... JO Page # 1 of ___

Project Overview for Area 11

Project Overview

Purpose: Determine storm drain facility adequacy. Facility is considered adequate if at least one lane of traffic is open in each direction (total of two dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

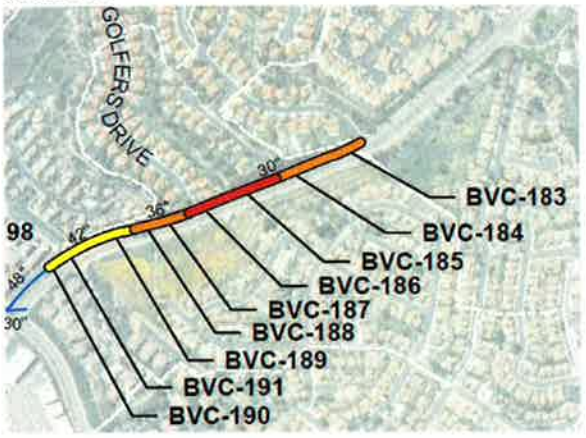
As there are no sumps in this reach, the 50-yr storm event was used for this analysis.

Problem: None. The original MPD model showed deficient pipe capacity on Rancho Del Oro Drive for the reach between Tournament Drive and Las Tiendas. A more detailed look at the hydrologic area and Rancho Del Oro pipe system and street flow capacity now indicates two dry lanes are available on RDO Drive.

Q50 Existing Results: Model shows that existing storm drain system is adequate and two dry lanes are available for the entire reach of Rancho del Oro Rd. Note that Rancho del Oro road superelevates near intersection with Las Tiendas, which would direct excess street flow to street inlet IL_73 .

Q50 Proposed Results: None. Existing storm drain system is adequate.

AREA 11



MPD Atlas Sheet L

Results Summary

Rancho Del Oro Drive:

- No proposed facilities. Existing storm drain system is adequate to provide one dry lane each direction for Q50.

Hydrology Calculations for Area 11

Purpose: Verify and adjust hydrology as appropriate for Area 11 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 11.1).
2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 11.1 and Table 11.1).
3) As Area 11 is an on-grade location, analyze the 50-yr storm event. Calculate Q50 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 11.1 for Q50 flows).

Given:

Subbasin map from MPD.

Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.

As-built construction plans.

Calculation Summary:

Table 11.1 Hydrologic Calculation for Area 11

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling			
XPSTORM Node ID	Tributary Area (ac)	Q50 (cfs)	XPSTORM Node ID	Tributary Area (ac)	Q50 (cfs)	Notes
CO_94	78.8	180.6	CO_94	45.9	105.2	Approximately 33 ac of tributary area was removed from the Area 11 storm drain system based on revised subbasin boundaries (yellow highlighted area per Figure 11.1).
CO_96	59.2	117.6	CO_96	26.8	53.2	Area adjusted per Figure 11.1.
			CO_100	23.9	47.5	Area adjusted per Figure 11.1.
			CO_102	3.2	6.4	Area adjusted per Figure 11.1.
			IL_73	3.8	7.5	Area adjusted per Figure 11.1.
			CO_106	1.5	3.0	Area adjusted per Figure 11.1.
CO_90	28.6	71.6	CO_90	28.6	71.6	No change.
Total*	**166.6**	**352**	**Total***	**133.7**	**272**	

* Total peak flow is the confluenced peak flow (not the sum on reported peaks for each node).

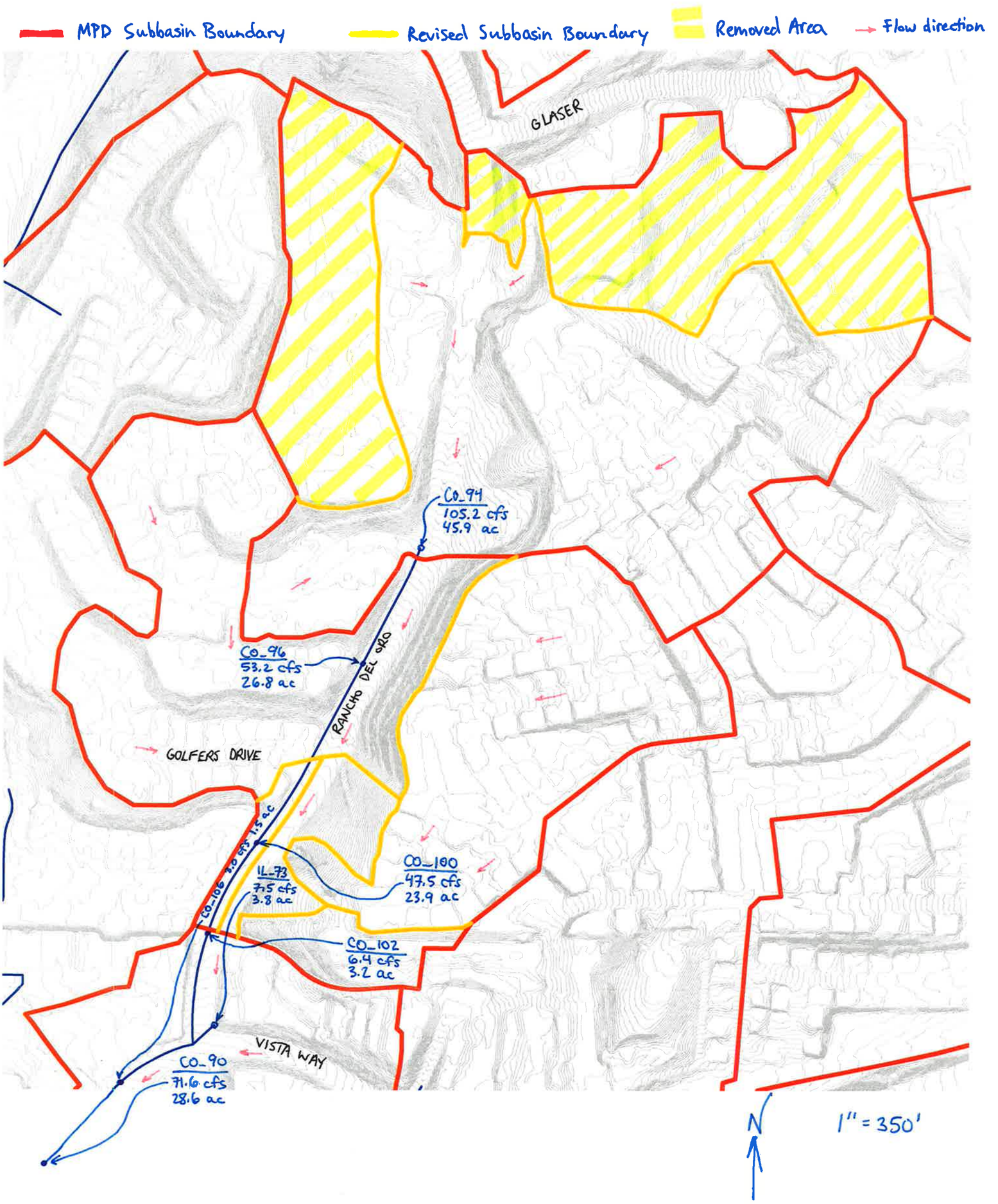


Figure 11.1 - Hydrology Calculations Area 11

Area 12

Cameo Dr. at Colombia Dr.

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

Project Overview for Area 12

Project Overview

Purpose: Determine storm drain facility adequacy. Facility is considered adequate if at least one lane of traffic is open in each direction (total of two dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

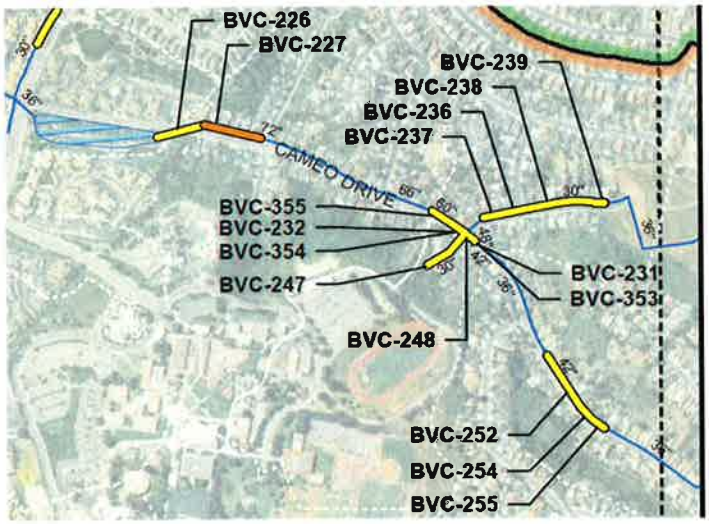
The 50-yr storm event was used for this analysis as there are no sumps.

Problem: Storm drain system is undersized and flow backs up into Cameo Drive between intersections with Colgate Drive and Brandeis Drive.

Q50 Existing results: Model shows flooding in Cameo Drive between Colgate and Brandeis Drives. Storm drain size inadequate and no dry lanes provided.

Q50 Proposed results: Model shows the proposed HGL is just below or very slightly above the street gutter flow line. Two dry lanes are available for the entire stretch of Cameo Drive.

AREA 12



MPD Atlas Sheet L

Unique Features:

1) The proposed design for Area 12 is dependent on upstream Area 13 improvements also being implemented. Area 13 upgrades are intended to alleviate significant flooding at the Marvin Street/College Boulevard intersection. Area 13 would likely be the higher priority for funding and implementation, but flooding problems will not be eliminated unless both areas are improved.

2) It is recommended that additional studies should be undertaken to further investigate opportunities for detention within Area 12, especially in the area upstream of Colgate Drive, in the open space area near Sepulveda Park. Preliminary reviews of this area indicate this to be favorable for detention basin opportunities.

Results Summary

Cameo Drive:

- Upsize RCP from 36" to 48" RCP. 646 LF (BVC-256 & 253).
- Upsize CIPCP from 42" to 48" RCP. 538 LF (BVC-255, 254, & 252).
- Add 886 LF of parallel 60" RCP to existing 60" RCP and existing 66"-72" CIPCP (BVC-355, 230, 229).
- Add 2 transition structures as shown on Figure 12.2
- Upsize 6 inlets along Cameo Drive as shown on Figure 12.2
- Upsize RCP from 18" to ~~4~~ 24" RCP, 65 LF (per Figure 12.2).

Hydrology Calculations for Area 12

Purpose: Verify and adjust hydrology as appropriate for Area 12 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 12.1).
2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 12.1 and Table 12.1).
3) Analyze the 50-yr storm event because street flow for Area 12 is on-grade. Calculate Q50 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 12.1 for Q100 flows).

Given: Subbasin map from MPD.

Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.

As-built construction plans.

Calculation Summary:

Table 12.1 Hydrologic Calculation for Area 12

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling			
XPSTORM Node ID	Tributary Area (ac)	Q50 (cfs)	XPSTORM Node ID	Tributary Area (ac)	Q50 (cfs)	Notes
IL_99	74.2	128.5	IL_99	75.0	129.8	Area adjusted per Figure 12.1.
IL_96	46.0	72.0	IL_96	18.6	29.1	Area adjusted per Figure 12.1.
			IL_94	24.6	38.5	Area adjusted per Figure 12.1.
IL_90	69.8	103.7	IL_89	69.0	103.7	Area adjusted per Figure 12.1.
IL_86	48.2	72.1	IL_86	22.7	34.0	Area adjusted per Figure 12.1.
			CO_140	11.3	16.9	Area adjusted per Figure 12.1.
			CO_134	7.3	10.9	Area adjusted per Figure 12.1.
			CO_135	12.3	18.4	Area adjusted per Figure 12.1.
IL_93	35.9	85.0	IL_93	34.2	80.9	Area adjusted per Figure 12.1.
IL_82	78.9	119.8	IL_82	23.9	36.3	Area adjusted per Figure 12.1.
			IL_83	31.3	47.5	Area adjusted per Figure 12.1.
			IL_81	15.5	23.5	Area adjusted per Figure 12.1.
OL_28	30.0	69.1	OL_28	20.7	47.7	Area adjusted per Figure 12.1.
			CO_108	16.9	38.9	Area adjusted per Figure 12.1.
Total	**383.0**	**388**[1]	**Total**	**383.3**	**492**[1]	Total Adjusted Area is 0.3 ac larger because Subbasin 140 was expanded slightly along the southern boundary.

(1) Total Q50 is the confluenced peak inflow to the Cameo detention basin. Note that the total peak is lower because overland routing was not considered in the MPD.

MPD Subbasin Boundary Revised Subbasin Boundary Removed Subbasin Boundary Flow direction

SEA CLIFF
KELTON
CARNEGIE
STANFORD
CORNELL
WOOSTER
BARBARA
BEDFORD
THUNDER
SHENANDOAH
SHERBOURNE
SAN HELENA
VISTA DEL ORO
SORRENTO
MADIERA
RAMADA
CASERAS
RUTGERS
LEIHIGH
DARTMOUTH
COLGATE
BRANDEIS
COLUMBIA
CAMBRIDGE
MARVIN
COLLEGE
JONATHON
THOMAS
LEWIS
MARVIN
LONNIE
FORDHAM
JODY
ALTURA
ECHO
ROSELLE
LUZ
VISCAYA
RANCHO DEL ORO
CAMEO
GLASER
BARNARD
JOHNSON
BERNIE
CARR
CAMARILLO
MIRA MESA
LINDA
LUNA
SCOTT

IL-89
CO-140
IL-86
CO-135
CO-134
IL-83
IL-82
IL-81
IL-93
IL-94
IL-96
IL-99
CO-108
OL-28
Detention Basin

Figure 12.1 - Hydrology Calculations Area 12

N

1"=400'

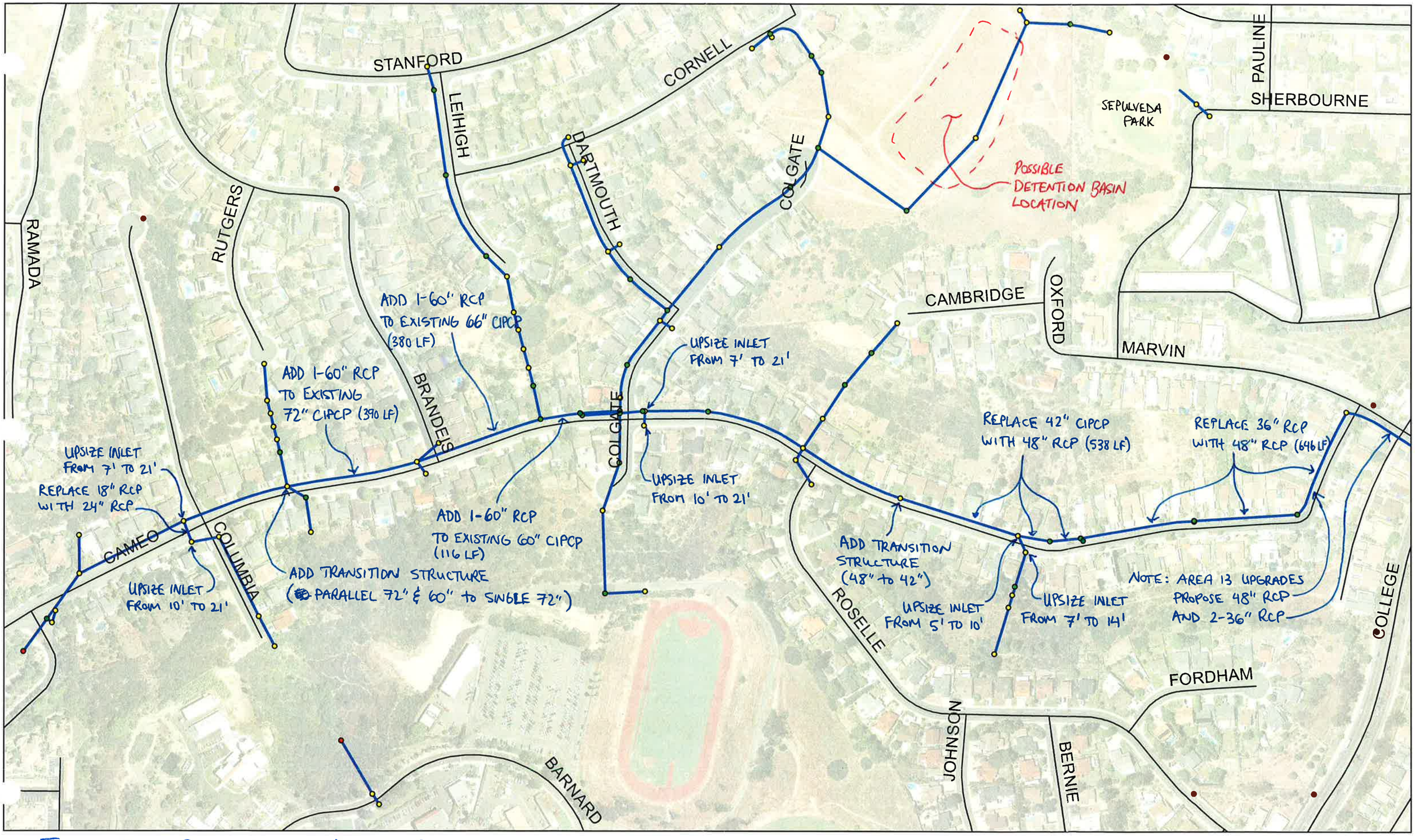


Figure 12.2 Proposed Storm Drains for Area 12

1"=250'

Area 13

Marvin St. North of College Blvd.

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

Project Name.....	MPD Supplemental Modeling
Project No.....	045-17
Date.....	9/4/2014
Design by.....	TP
Checked by.....	JD

Project Overview for Area 13

Project Overview

Purpose: Determine storm drain facility adequacy. Facility is considered adequate if at least one lane of traffic is open in each direction (total of two dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

The 100-yr storm event was used for this analysis as this is a sump location.

Problem: Model shows storm drain system is undersized and flow backs up into the sump at the intersection of College Blvd. and South Marvin St. Flow also backs up onto College Blvd. at the intersection of College Blvd. and North Marvin St.

Q100 Existing results: Model shows severe ponding occurs at sump location at intersection of College Blvd and South Marvin St due to undersized storm drains and inlets. No dry lanes are provided at this location. In addition, no dry lane is provided for College Blvd between North and South Marvin St.

AREA 13

MPD Atlas Sheet M

Q100 Proposed results: Model shows the proposed design provides dry lane in both directions for College Blvd between North and South Marvin St., as well as in the vicinity of the sump at the intersection of College Blvd. and South Marvin St.

Unique Features:

1) The proposed design for Area 13 is related to downstream Area 12 improvements. Flooding problems will not be eliminated unless both areas are improved. See Area 12 Project Overview for further discussion.

Results Summary

North Marvin Street:

- Upsize inlet from 5' to 21' (per Figure 13.2).
- Upsize inlet from 7' to 21' (per Figure 13.2).

College Blvd:

- Construct 21' inlet (per Figure 13.2).
- Construct 18" RCP. 35 LF (per Figure 13.2).
- Upsize RCP from 24" to 36" RCP. 94 LF (per Figure 13.2).
- Upsize two inlets from 7' to 21' (per Figure 13.2).
- Upsize RCP from 24" to 2-36" RCP. 315 LF (per Figure 13.2).
- Upsize RCP from 30" to 2-36" RCP. 61 LF (BVC-259).

South Marvin Street:

- Construct 36" RCP parallel to existing 36" RCP. 280 LF (BVC-258).

Cameo Drive:

- Upsize RCP from 36" to 48" RCP. 333 LF (BVC-257).

Hydrology Calculations for Area 13

Purpose: Verify and adjust hydrology as appropriate for Area 13 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 13.1).

2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 13.1 and Table 13.1).

3) Analyze the 100-yr storm event as Area 13 is a sump location. Calculate Q100 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 13.1 for Q100 flows).

Given: Subbasin map from MPD.
Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.
As-built construction plans.

Calculation Summary:

Table 13.1 Hydrologic Calculation for Area 13

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling			
XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	Notes
IL_99	74.2	152.1	IL_99	75.0	153.6	Area adjusted per Figure 13.1.
IL_96	46.0	85.7	IL_96	43.2	80.4	Area adjusted per Figure 13.1.
Total	**120.2**	**233[1]**	**Total**	**118.2**	**227[1]**	

(1) Total Q100 is the confluenced peak flow (not the sum of the reported individual node peak flows).

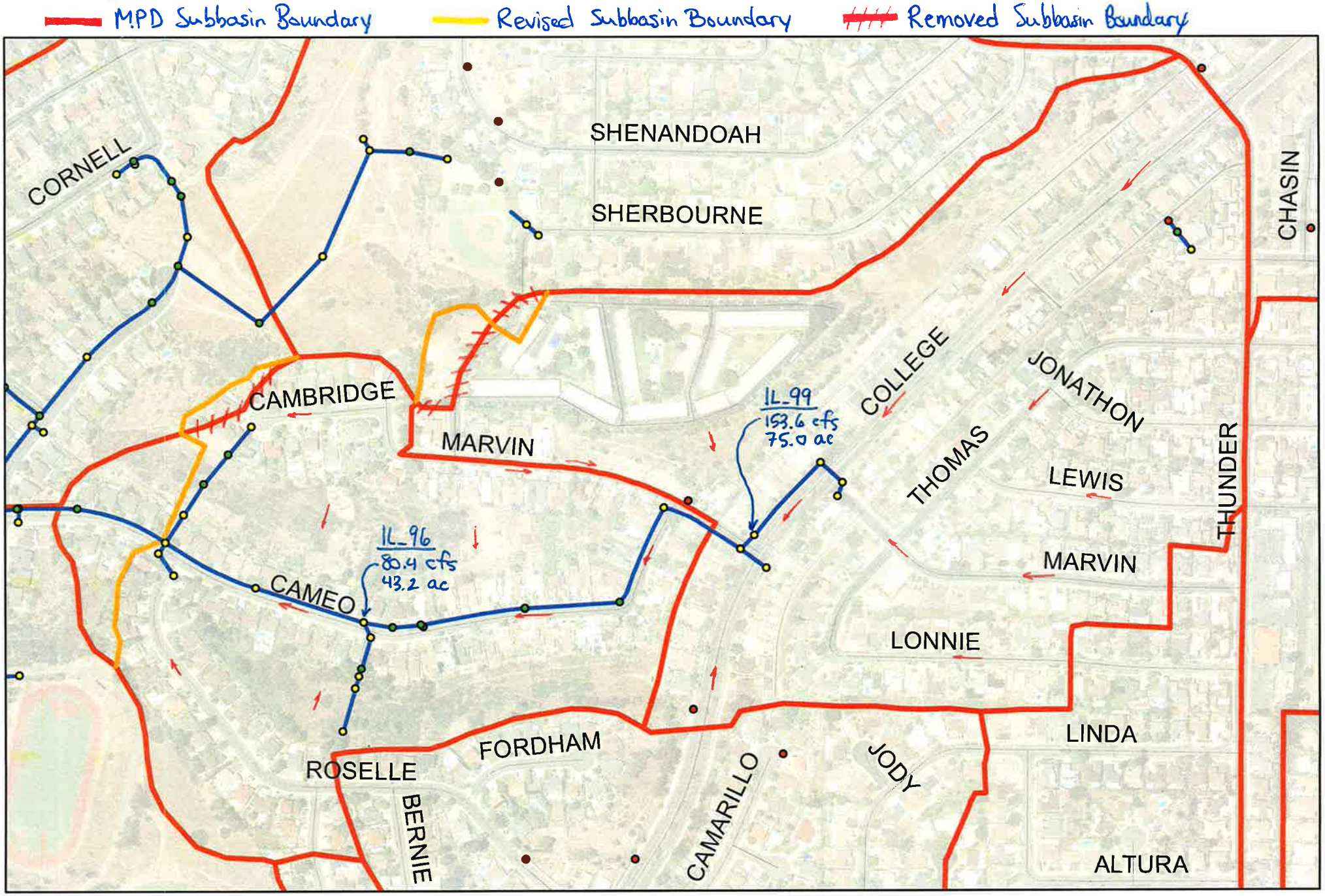


Figure 13.1 – Hydrology Calculations Area 13

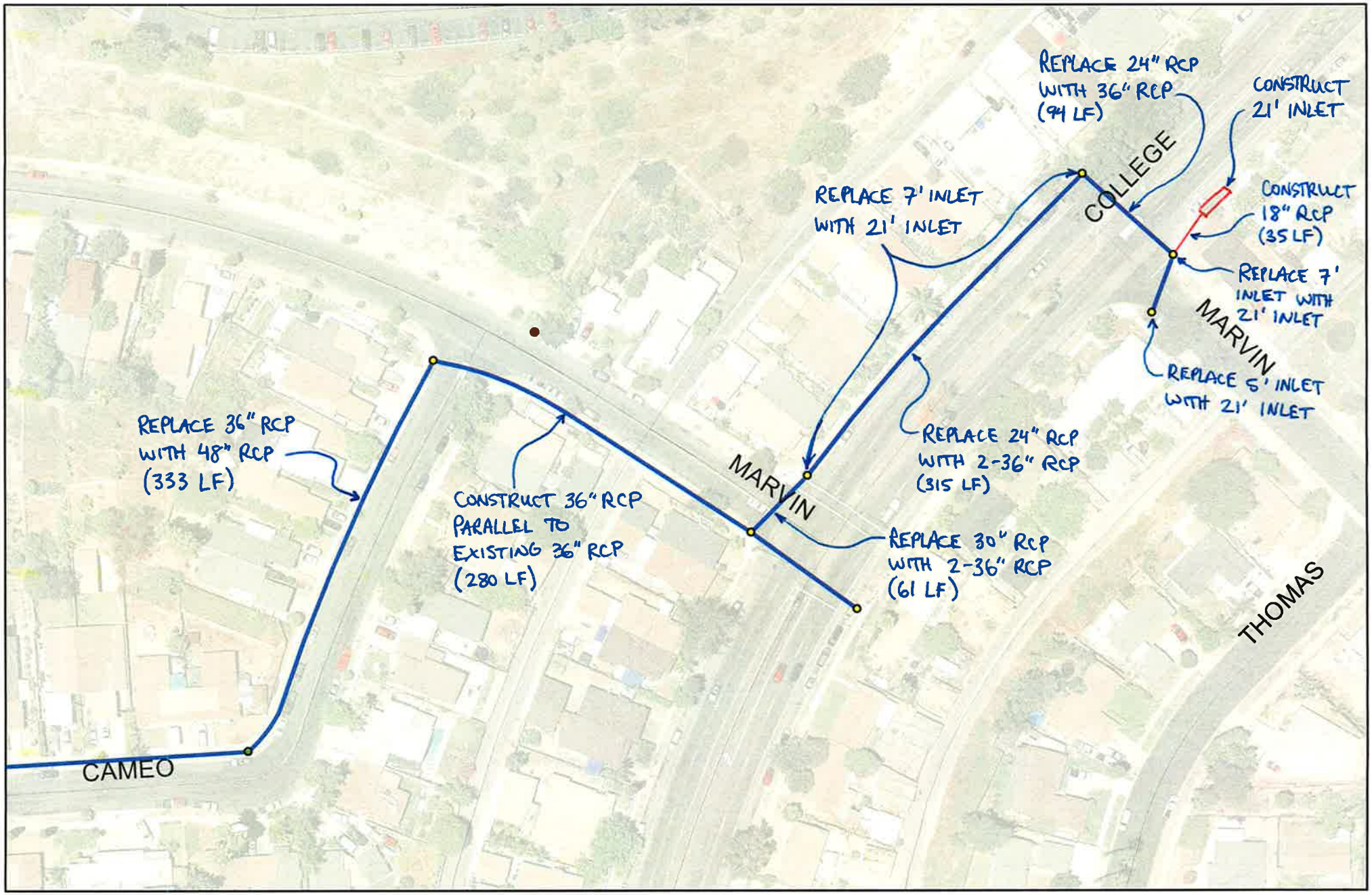


Figure 13.2 Proposed Storm Drains for Area 13

Area 14

Lake Blvd. West of Thunder Dr.

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

Project Name..... MPD Supplemental Modeling
Project No..... 045-17
Date..... 10.8.14
Design by..... TR
Checked by..... JD

Project Overview for Area 14

Project Overview

Purpose: Determine storm drain facility adequacy. Facility is considered adequate if at least one lane of traffic is open in each direction (total of two dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

As Area 14 contains a sump location, the 100-yr storm event was used for this analysis.

Problem: Model shows street flooding with no dry lanes at the sump inlet on the south side of Lake Blvd due to inadequate storm drain and inlet capacity. Note that the north side of Lake Blvd. is not flooded as ponding on the south side of Lake Blvd. does not overtop the street crown.

Q100 Existing Results: Pipes with a diameter 30" and greater have sufficient capacity for Q100 flows after hydrology was updated (tributary area reduced). A small amount of flow backs up into the Salvation Army parking lot at the parking lot sump inlet, but any overflow is minor and will spill to Lake Blvd. if needed. About 45% of the runoff flowing down Esplanade St. is intercepted by an existing inlet at the intersection of Esplanade St. and Lake Blvd. The bypass flow contributes to flooding at the sump inlet on the south side of Lake Blvd. The sump inlet on the south side of Lake Blvd and receiving 18" RCP will back up, but flow will not overtop the crown of Lake Blvd. Therefore, the north side of Lake Blvd. will provide at least 20' of dry lane.

Q100 Proposed Results: The upsized sump inlet on the south side of Lake Blvd. and the proposed receiving 24" RCP will provide one 10' dry lane on the south side of Lake Blvd., in addition to the 20' of dry lane on the north side of Lake Blvd.

AREA 14

MPD Atlas Sheet P

Results Summary

Lake Blvd:

- Upsize existing inlet from 14' to 18' (per Figure 14.2).
- Upsize RCP from 18" to 24" RCP. 66 LF (per Figure 14.2).

Hydrology Calculations for Area 14

Purpose: Verify and adjust hydrology as appropriate for Area 14 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 14.1).
2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 14.1 and Table 14.1).
3) As Area 14 contains a sump location, analyze the 100-yr storm event. Calculate Q100 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 14.1 for Q100 flows).

Given:

Subbasin map from MPD.

Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.

As-built construction plans.

Calculation Summary:

Table 14.1 Hydrologic Calculation for Area 14

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling			
XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	Notes
IL_5	78.9	174.7	IL_5	5.4	11.9	Approximately 30 ac of tributary area north of Lake Blvd was removed from the Area 14 storm drain system based on revised subbasin boundaries (yellow highlighted area epr Figure 14.1). Also redistributed area to IL_4 and IL_3 on Mira Monte.
			IL_4	24.0	53.1	Area adjusted per Figure 14.1.
			IL_3	18.7	41.4	Area adjusted per Figure 14.1.
IL_16	34.3	85.2	IL_16	12.2	30.4	Approximately 4.5 ac of tributary area north of Lake Blvd was removed from the Area 14 storm drain system based on revised subbasin boundaries (yellow highlighted area per Figure 14.1). Also redistributed area to inlet at the bottom of Esplanade St (IL_EsplSt).
			IL_EsplSt	17.5	43.6	Inlet at the bottom of Esplanade St.
***Total**	**113.2**	**251.9**	***Total**	**77.9**	**140.9**	

*Note: total peak flow is the confluenced peak flow at the system outlet (not the sum of reported peaks for each node).

MPD Subbasin Boundary

Revised Subbasin Boundary

Removed Subbasin Boundary

Flow direction

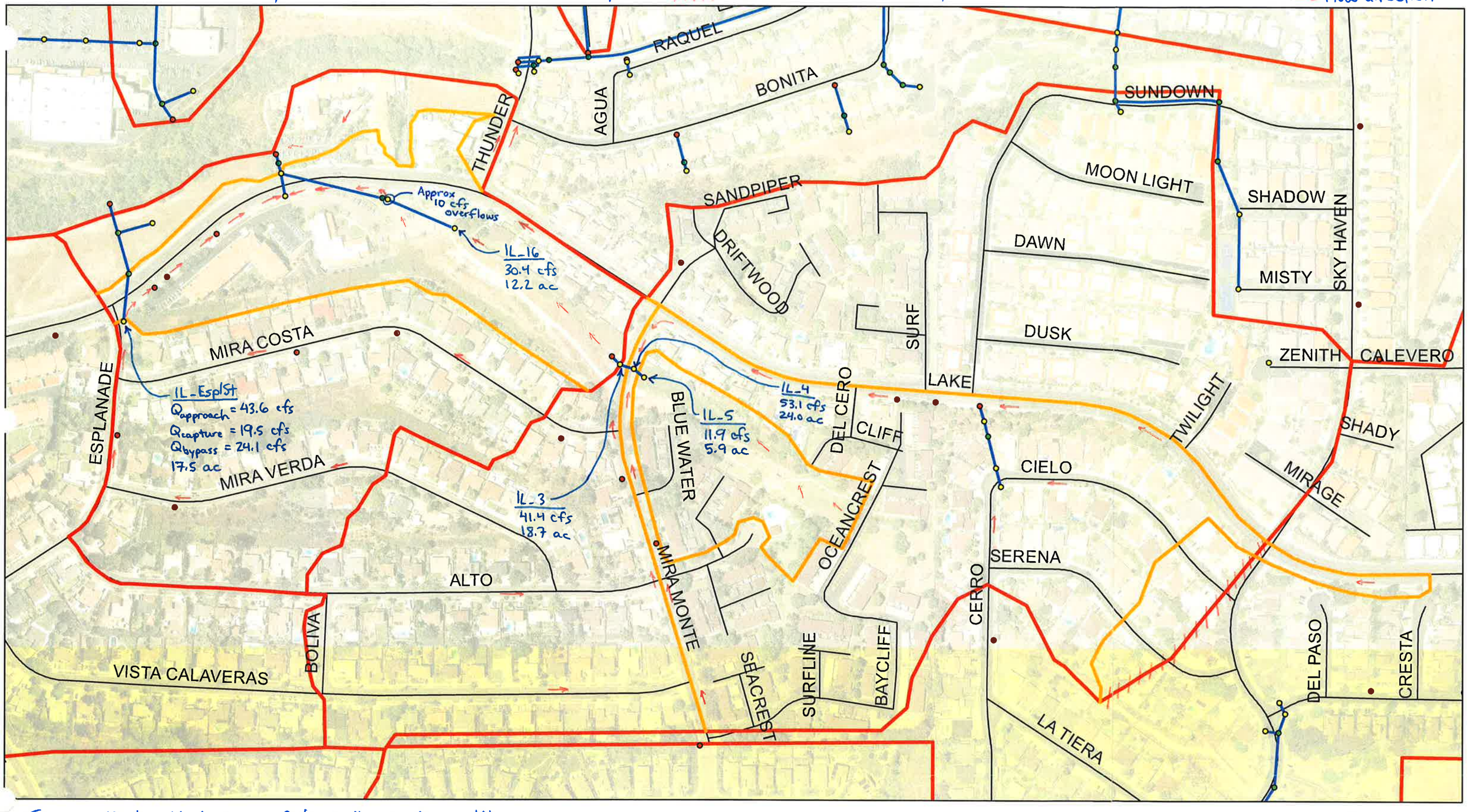


Figure 14.1 - Hydrology Calculations Area 14

Inlet Report

ılet (Bottom of Esplanade St)

Combination Inlet

Location	= On grade
Curb Length (ft)	= 15.00
Throat Height (in)	= 2.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= 1.60
Grate Length (ft)	= 3.00

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 4.00
Gutter Width (ft)	= 1.50
Gutter Slope (%)	= 10.00
Gutter n-value	= 0.016

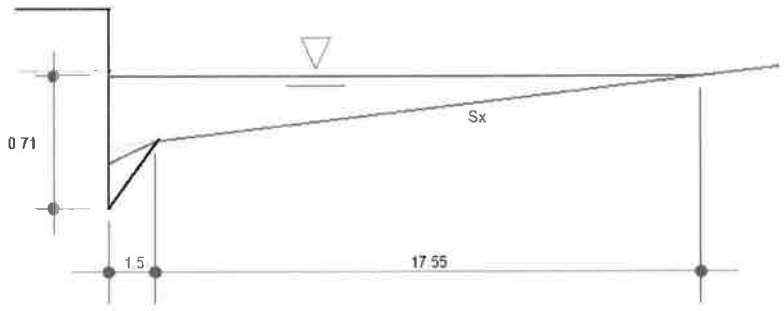
Calculations

Compute by:	Known Q
Q (cfs)	= 43.60

Highlighted

Q Total (cfs)	= 43.60
Q Capt (cfs)	= 19.47
Q Bypass (cfs)	= 24.13
Depth at Inlet (in)	= 8.57
Efficiency (%)	= 45
Gutter Spread (ft)	= 19.05
Gutter Vel (ft/s)	= 11.80
Bypass Spread (ft)	= 15.50
Bypass Depth (in)	= 4.80

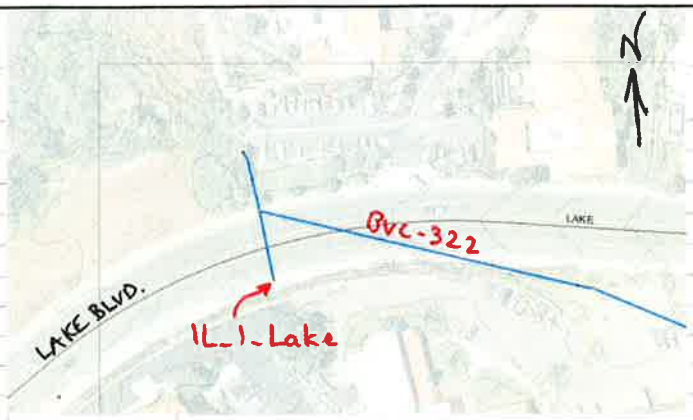
nsions in feet



Inlet Section
Looking downstream

Existing Inlet Analysis

Area 14



Inlet ID	IL_1_Lake	
Plan ID	R-1107	
Type	Sump	
Location	South side of Lake Blvd	
TC Elev (ft)	182.53	
Curb height (ft)	0.500	
a (in)	4	gutter depression
Inlet FL	181.70	
ROW Elev (ft)	182.73	at sump location, assuming 10' horiz at 2% slope from TC
ROW depth (ft)	1.03	at sump location, measured from FL of curb opening
Spill Elev (ft)	183.03	Approx elev at which water spills over street crown and flows north to the sump inlet on the north side of Lake Blvd.
Inlet Capacity (cfs)	36.0	maximum inlet capacity used in xpstorm, all flow above this value will spill to north side of Lake Blvd.
Q100 to Inlet (cfs)	35.0	Peak flow to inlet (24 cfs bypass flow from inlet at bottom of Esplanade plus 11 cfs overflow from storm drain system)
WSEL_100yr (ft)	182.95	100-yr water surface elevation at sump inlet. No dry lanes are available on south side of Lake Blvd, but ponding is contained on the south side of Lake Blvd per R-1107.
As weir:		$Q = C_W * L_W * d^{1.5}$
C_W	3	weir discharge coeff
L_W (ft)	13	weir length = curb opening length
As orifice:		$Q = C_o * A_g * (2*g*(d-h/2))^{0.5}$
h (ft)	0.5	height of curb opening orifice (includes any gutter depression)
_ (ft)	13	length of curb opening orifice (same as weir length above)
A_g (ft^2)	6.5	Clear area of opening
C_o	0.67	Orifice coefficient
g	32.2	ft/sec^2

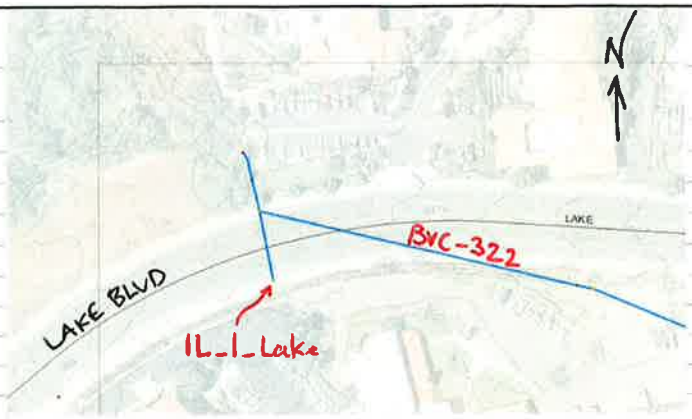
Elev (ft)	d (ft)*	Q_weir (cfs)	Q_orif (cfs)	Q_effective (cfs)	
181.70	0	0.00	0.00	0.00	
181.80	0.1	1.23	0.00	1.23	
181.90	0.2	3.49	0.00	3.49	
182.00	0.3	6.41	0.00	6.41	
182.10	0.4	9.87	0.00	9.87	
182.20	0.5	13.79	0.00	13.79	
182.30	0.6	18.13	20.68	18.13	
182.40	0.7	22.84	23.44	22.84	
182.50	0.8	27.91	25.92	25.92	Top of Curb (TC) Elevation 182.53
182.60	0.9	33.30	28.18	28.18	
182.70	1	39.00	30.27	30.27	
182.80	1.1	44.99	32.22	32.22	
182.90	1.2	51.27	34.06	34.06	
183.00	1.3	57.81	35.81	35.81	
183.10	1.4	64.60	37.48	37.48	
183.20	1.5	71.65	39.07	39.07	
183.30	1.6	78.93	40.61	40.61	
183.40	1.7	86.44	42.08	42.08	
183.50	1.8	94.18	43.51	43.51	

Notes:

*d = depth of flow at curb opening = depth of flow in adjacent gutter plus the gutter depression (a) at the inlet

Proposed Inlet Analysis

Area 14



Inlet ID	IL_1_Lake	
Plan ID	R-1107	
Type	Sump	
Location	South side of Lake Blvd	
TC Elev (ft)	182.53	
Curb height (ft)	0.500	
a (in)	4	gutter depression
Inlet FL	181.70	
ROW Elev (ft)	182.73	at sump location, assuming 10' horiz at 2% slope from TC
ROW depth (ft)	1.03	at sump location, measured from FL of curb opening
Spill Elev (ft)	183.03	Approx elev at which water spills over street crown and flows north to the sump inlet on the north side of Lake Blvd.
Inlet Capacity (cfs)	47.0	maximum inlet capacity used in xpstorm, all flow above this value will spill to north side of Lake Blvd.
Q100 to Inlet (cfs)	35.0	Peak flow to inlet (24 cfs bypass flow from inlet at bottom of Esplanade plus 11 cfs overflow from storm drain system)
WSEL_100yr (ft)	182.60	100-yr water surface elevation at sump inlet. At 182.60 one 10' dry lane is available on the south side of Lake Blvd.
As weir:		$Q = C_W * L_W * d^{1.5}$
C_W	3	weir discharge coeff
L_W (ft)	17	weir length = curb opening length
As orifice:		$Q = C_o * A_g * (2*g*(d-h/2))^{0.5}$
h (ft)	0.5	height of curb opening orifice (includes any gutter depression)
L (ft)	17	length of curb opening orifice (same as weir length above)
A_g (ft^2)	8.5	Clear area of opening
C_o	0.67	Orifice coefficient
g	32.2	ft/sec^2

Elev (ft)	d (ft)*	Q_weir (cfs)	Q_orif (cfs)	Q_effective (cfs)	
181.70	0	0.00	0.00	0.00	
181.80	0.1	1.61	0.00	1.61	
181.90	0.2	4.56	0.00	4.56	
182.00	0.3	8.38	0.00	8.38	
182.10	0.4	12.90	0.00	12.90	
182.20	0.5	18.03	0.00	18.03	
182.30	0.6	23.70	27.04	23.70	
182.40	0.7	29.87	30.66	29.87	
182.50	0.8	36.49	33.89	33.89	Top of Curb (TC) Elevation 182.53
182.60	0.9	43.54	36.85	36.85	
182.70	1	51.00	39.58	39.58	
182.80	1.1	58.84	42.14	42.14	
182.90	1.2	67.04	44.54	44.54	
183.00	1.3	75.59	46.83	46.83	
183.10	1.4	84.48	49.01	49.01	
183.20	1.5	93.69	51.10	51.10	
183.30	1.6	103.22	53.10	53.10	
183.40	1.7	113.04	55.03	55.03	
183.50	1.8	123.16	56.90	56.90	

Notes:

*d = depth of flow at curb opening = depth of flow in adjacent gutter plus the gutter depression (a) at the inlet

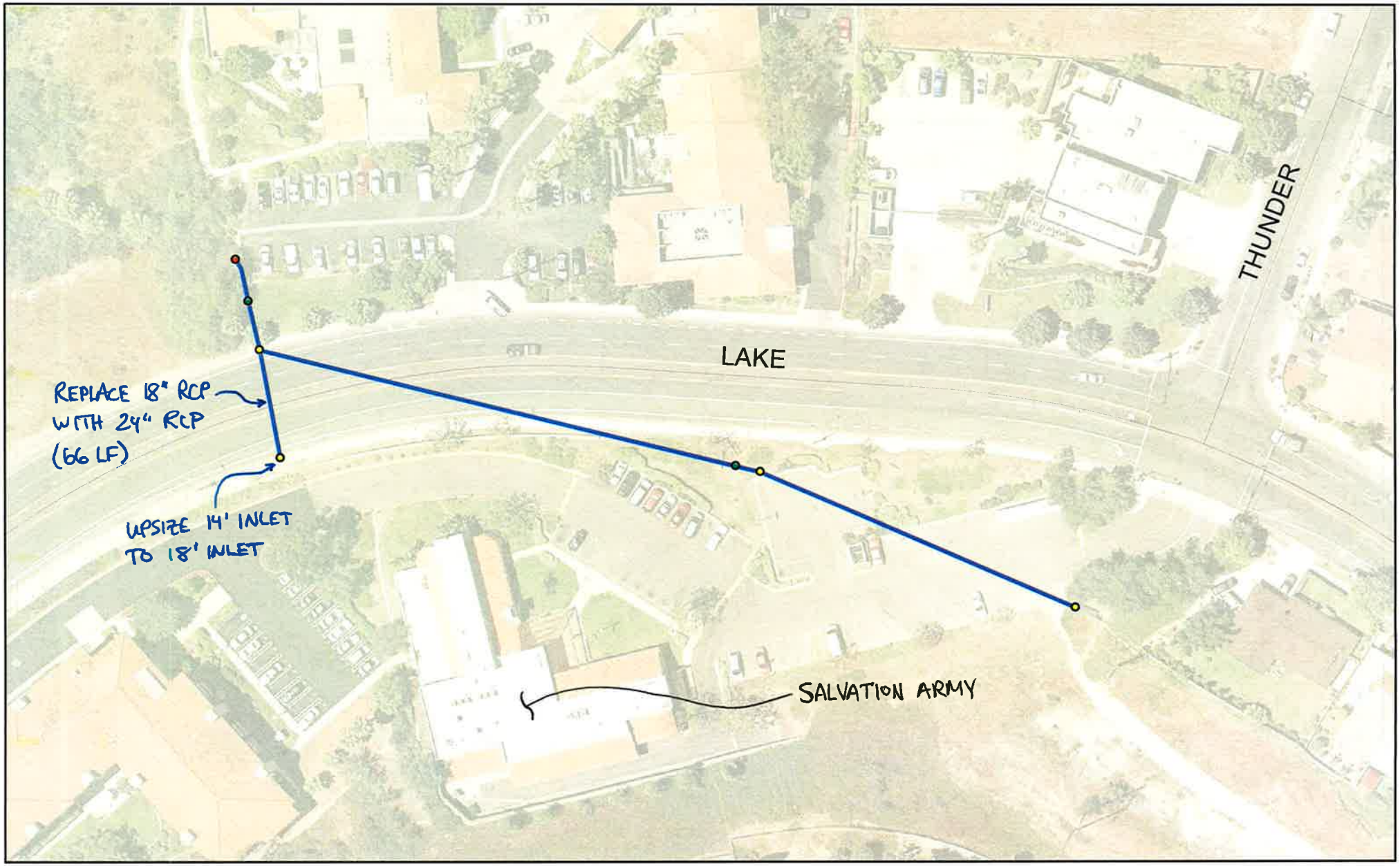


Figure 14.2 Proposed Storm Drains for Area 14

Area 15

Mira Monte Undercrossing South of Lake Blvd.

Hydrologic and Hydraulic Calculations

MPD Supplemental Modeling

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

Project Name.....	MPD Supplemental Modeling
Project No.....	045-17
Date.....	10.8.14
Design by.....	TD
Checked by.....	JD

Project Overview for Area 15

Project Overview

Purpose: Determine storm drain facility adequacy. Facility is considered adequate if at least one lane of traffic is open in each direction (total of two dry lanes). If the drainage system is inadequate, then upsize the storm drain facilities.

As Area 15 contains a sump location, the 100-yr storm event was used for this analysis.

Problem: Model shows inadequate storm drain system at the sump location on Mira Monte Drive. In addition, upstream street flow in both Lake Blvd. and Mira Monte Drive exceeds dry lane criteria.

Q100 Existing Results: Pipes have sufficient capacity for Q100 after tributary area updated. However, inlets are undersized and sump will overflow ROW elevation and spill to open channel on either side of Mira Monte Drive. In addition, upstream street flow in Lake Blvd. and Mira Monte exceeds dry lane criteria.

Q100 Proposed Results: The addition of storm drain facilities in both Lake Drive (24" - 30") and Mira Monte Drive (18" - 24") with two 20-foot curb inlets on each street, will result in sufficient dry lanes for both streets.

AREA 15

MPD Atlas Sheet P

Unique Features:

1) Site visit on 07/31/14 noted ponded water in 36" RCP on east side of Mira Monte Drive (1/3 full at u/s end and 1/2 full at d/s outlet). Ponded water is due to sediment and heavy reeds clogging outlet. Recommend removal of reeds/sediment to maintain full pipe capacity (modeling assumed full pipe capacity - i.e. no blockage).

2) Also noted cracked sidewalk, erosion, and water seepage on both sides of Mira Monte Drive (possible irrigation line leak?).

3) Oceanside provided repairs to the storm drain outlet just west of the sump in Miramonte, in December 2008. These efforts have stabilized a damaged/eroded outlet, but there remains overall system inadequacy based on street flow depths and dry lane criteria, in both Lake Blvd. and Mira Monte Drive.

Results Summary

Mira Monte Drive:

- Upsize existing inlet from 7' to 12' (per Figure 15.2).
- Construct approximately 510 LF of 24" RCP and 40 LF of 18" RCP.
- Construct 21-foot curb inlet at upstream end of 24"/18" storm drain.
- Replace curb outlet with 21-foot curb inlet at upstream end of 24"/18" storm drain.

Lake Blvd:

- Construct approximately 780 LF of 30" RCP.
- Construct approximately 300 LF of 24" RCP.
- Replace curb outlet with 21-foot curb inlet (per figure 15.2).
- Construct 21-foot curb inlet (per figure 15.2).

Hydrology Calculations for Area 15

Purpose: Verify and adjust hydrology as appropriate for Area 15 by the following steps:

1) Subdivide original subbasins from MPD and adjust drainage boundaries based on more detailed info (see Figure 15.1).
2) Based on new subbasins and/or adjusted drainage boundaries from Step 1, assign drainage area to new nodes in XPSTORM model as appropriate if necessary (see Figure 15.1 and Table 15.1).
3) As Area 15 contains a sump location, analyze the 100-yr storm event. Calculate Q100 peak flows for nodes by running XPSTORM model using original Curve Number and Time of Concentration values from the MPD (see Table 15.1 for Q100 flows).

Given:

Subbasin map from MPD.
Hydrologic parameters from MPD required by NRCS Unit Hydrograph method used in XPSTORM model.
As-built construction plans.

Calculation Summary:

Table 15.1 Hydrologic Calculation for Area 15

Original Hydrology from OMPD			Adjusted Hydrology for Supplemental Modeling			
XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	XPSTORM Node ID	Tributary Area (ac)	Q100 (cfs)	Notes
IL_5	78.9	174.7	IL_5	5.4	11.9	Approximately 30 ac of tributary area north of Lake Blvd was removed from the Area 14 storm drain system based on revised subbasin boundaries (yellow highlighted area per Figure 14.1). Also redistributed area to IL_4 and IL_3 on Mira Monte.
			IL_4	24.0	53.1	Area adjusted per Figure 14.1.
			IL_3	18.7	41.4	Area adjusted per Figure 14.1.
***Total**	**78.9**	**174.7**	***Total**	**48.1**	**105.8**	

*Note: total peak flow is the confluenced peak flow at the system outlet (not the sum of reported peaks for each node).

MPD Subbasin Boundary

Revised Subbasin Boundary

Removed Subbasin Boundary

Flow direction

RAQUEL

AGUA

BONITA

THUNDER

SUNDOWN

MOON LIGHT

SHADOW

SKY HAVEN

SANDPIPER

DRIFTWOOD

DAWN

MISTY

SURF

DUSK

ZENITH

CALEVERO

LAKE

TWILIGHT

SHADY

MIRAGE

DEL CERO

CLIFF

CIELO

MIRA COSTA

ESPLANADE

MIRA VERDA

ALTO

SERENA

CERRO

BLUE WATER

MIRAMONTE

OCEANCREST

SEACREST

SURFLINE

BAYCLIFF

BOLIVA

VISTA CALAVERAS

LA TIERA

DEL PASO

CRESTA

About 10 cfs overflows

IL_16
30.4 cfs
12.2 ac

IL_Esplst
$Q_{approach}$ = 43.6 cfs
$Q_{capture}$ = 19.5 cfs
Q_{bypass} = 24.1 cfs
17.5 ac

IL_4
53.1 cfs
24.0 ac

IL_5
11.9 cfs
5.9 ac

IL_3
41.4 cfs
18.7 ac

N

1 in = 250 ft

Figure 15.1 Hydrology Calculations Area 15

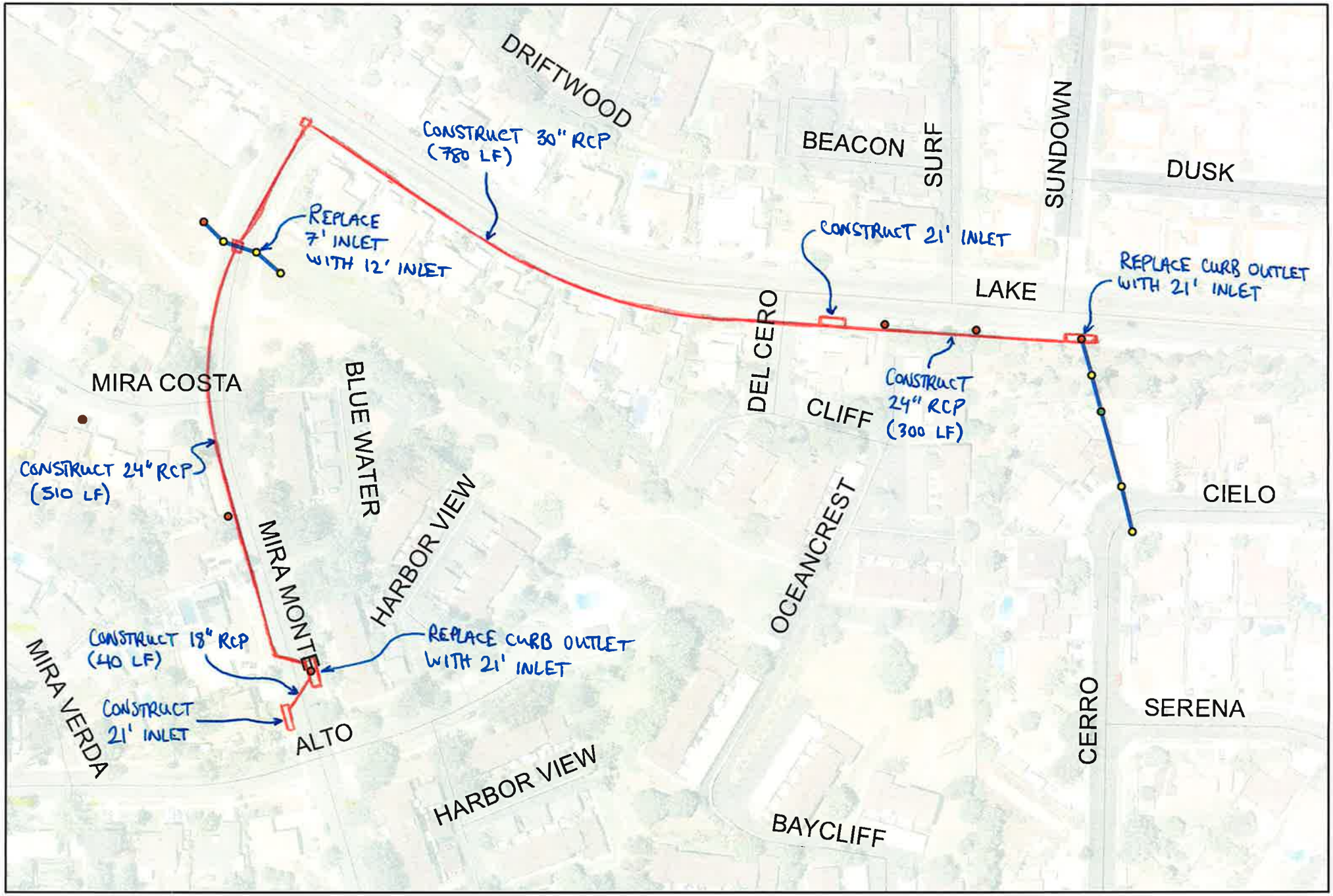


Figure 15.2 Proposed Storm Drains for Area 15