MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY
City of Seal Beach

August 1, 2019

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Appendix

1. BACKGROUND

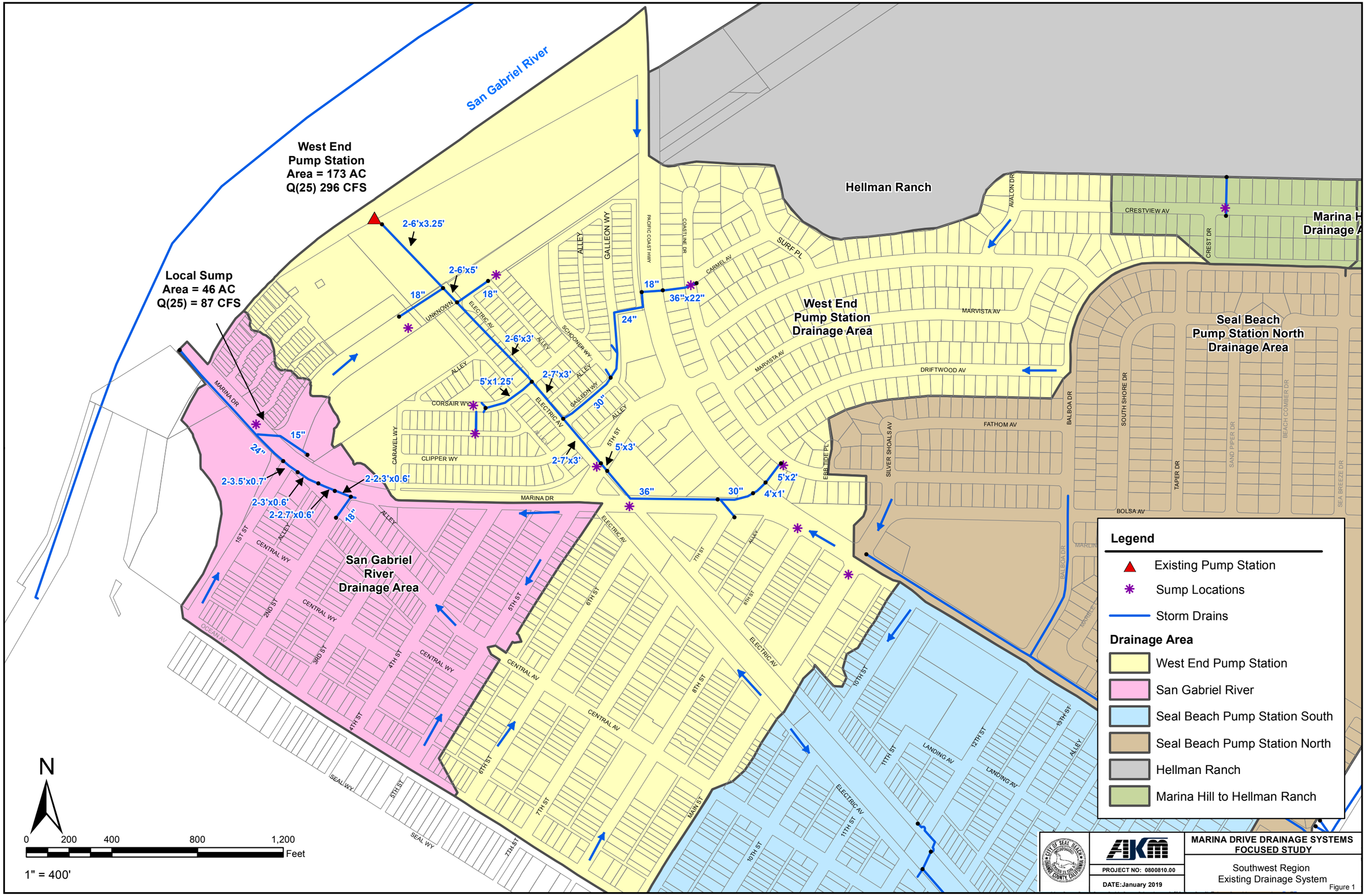
The City of Seal Beach experiences flooding in the West End Pump Station Drainage Area, and the adjacent San Gabriel River Drainage area, which are shown on Figure 1. In addition to being in sump conditions below the levee of San Gabriel River, both of these drainage areas include local sumps. Due to inadequate drainage facilities, flooding has occurred at these sump areas, including along Marina Drive from Pacific Coast Highway to 5th Street. Additionally, some of the runoff from the West End Pump Station Drainage Area that cannot enter the existing storm drain system flows into the San Gabriel River Drainage Area along Marina Drive, exacerbating the flooding in this drainage area.

The City's Master Plan of Drainage updated in 2008 (2008 Master Plan) recommended prioritized capital improvement projects to mitigate the flooding problems resulting from the peak flows of the High Confidence 25-year Storm (City's flood protection criteria). The 2008 Master Plan recommended projects for the West End Pump Station and San Gabriel River Drainage Areas, which are illustrated on Figure 2. Due to limited funding available for drainage system improvements, the City of Seal Beach has been constructing the recommended improvements in phases. The highest priority project was WE1 in the West End Pump Station Drainage area, which was sized as a double 8' (W) x 4.25' (H) reinforced concrete box (RCB). It extended from the intersection of Electric Avenue and Corsair Way to Electric Avenue and Marina Drive. Due to several utility conflicts, high cost of utility relocations required to implement this project, and the narrow width of the street, it was constructed as a double 7' (W) x 3' (H) RCB (*City CIP Project No. SD1201)*. The smaller facility limits the flow that can be conveyed to the West End Pump Station to 250 cfs, which is less than the design flow (296 cfs). This reduction in capacity requires re-evaluation of the 2008 Master Plan recommended capital improvement projects, because there are several other downstream improvements that would be needed within the West End Pump Station Drainage Area to provide the selected flood protection level. These included:

- West End Pump Station No.2 adjacent to the existing West End Pump Station, with an estimated implementation cost of $8.5 million (2008 cost – current cost $10.3 million)
- Storm Drain WE 1-3, a double 5' (W) x 4'-3" (H) RCB along Corsair Way, Electric Avenue and the Eaves Apartments parking area between Corsair Way and the proposed West End Pump Station No.2, with an implementation cost of $2.87 million (current estimated cost $3.46 million)

The total current implementation cost of these facilities is estimated at $13.76 million. As described above, additional storm drains, not included in the 2008 Master Plan Capital Improvement Program (CIP) would be needed to provide the selected flood protection level because of the limitation created by City CIP Project No. SD1201.

The 2008 Master Plan recommended a new pump station in the San Gabriel River Drainage Area (Project SG 2) adjacent to the Marina Community Park (northeast of the Marina Drive - 1st Street intersection) with an implementation cost estimate of $6.5 million, as well as its 42-inch diameter discharge pipe (2008 Master Plan Project SG 2A, $1.08 million). The current estimated cost of these facilities total $9.15 million. Because of the constraints in the West End Pump Station Drainage Area storm drains and the pump station, it may be more advantageous to divert the flows above the capacity of the existing system to the San Gabriel River Drainage Area. Such a diversion will require changes in the capital improvement projects recommended by the 2008 Master Plan for the San Gabriel River Drainage Area.


San Gabriel River
West End Pump Station Area = 173 AC Q(25) 296 CFS
Local Sump Area = 46 AC Q(25) = 87 CFS
Hellman Ranch
West End Pump Station Drainage Area
San Gabriel River Drainage Area
Seal Beach Pump Station North Drainage Area
Marina H Drainage A
2-6'x3.25'
2-6'x5'
18"
UNKNOWN
ELECTRIC AV
2-6'x3'
2-7'x3'
5'x1.25'
CORSAIR WY
30"
24"
36"x22"
5'x3'
5'x2'
4'x1'
36"
30"
15"
24"
2-3.5'x0.7'
2-2-3'x0.6'
2-3'x0.6'
2-2-7'x0.6'
18"
MARINA DR
CLIPPER WY
CARAVEL WY
GALLEON WY
SCHOONER WY
ALLEY
PACIFIC COAST HWY
COASTLINE DR
CARMEL AV
SURF PL
AVALON DR
CRESTVIEW AV
CREST DR
MARVISTA AV
DRIFTWOOD AV
FATHOM AV
BALBOA DR
SOUTH SHORE DR
TAPER DR
SAND PIPER DR
BEACH COMBER DR
SEA BREEZE DR
BOLSA AV
SILVER SHOALS AV
EBB TIDE PL
1ST ST
2ND ST
3RD ST
4TH ST
5TH ST
6TH ST
7TH ST
8TH ST
10TH ST
11TH ST
12TH ST
15TH ST
CENTRAL WY
CENTRAL AV
OCEAN AV
SEAL WY
MAIN ST
LANDING AV
Legend
Existing Pump Station
Sump Locations
Storm Drains
Drainage Area
West End Pump Station
San Gabriel River
Seal Beach Pump Station South
Seal Beach Pump Station North
Hellman Ranch
Marina Hill to Hellman Ranch
N
0
200
400
800
1,200
Feet
1" = 400'
MARINA DRIVE DRAINAGE SYSTEMS FOCUSED STUDY
Southwest Region
Existing Drainage System
PROJECT NO: 0800810.00
DATE:January 2019
Figure 1

San Gabriel River

West End
Pump Station
Upgrade
Area = 173 AC
Q(25) 296 CFS

Future San Gabriel River
Pump Station
Area = 46 AC
Q(25) = 87 CFS

Hellman Ranch

Marina Hill
Drainage Area

West End
Pump Station
Drainage Area

Seal Beach
Pump Station North
Drainage Area

San Gabriel
River
Drainage Area

2-5.25'x4.25'
2-6'x3.25'
2-6'x5'
18"
UNKNOWN
2-6'x3'
18"
24"
36"x22"
5'x1.25'
2-8'x4.25'
30"
51"
48"
36"
2-8x4.25'
5'x2'''
36"
30"
4'x1'''
48"
2x8'x4.25'
42"
36"
2-8'x3.5'
42"
24"
24"
42"
5.5'x2.5'
4'x1'
18"
5'x2'
5'x2'

MARINA DR
CORSAIR WY
CLIPPER WY
CARAVEL WY
GALLEON WY
ALLEY
SCHOONER WY
TREE FRIEND
PACIFIC COAST HWY
COAST LINE DR
CARMEL AV
SURF PL
AVALON DR
CRESTVIEW AV
CREST DR
MARVISTA AV
DRIFTWOOD AV
FATHOM AV
BALBOA DR
SOUTH SHORE DR
SILVER SHOALS AV
EBB TIDE PL
SAND PIPER DR
BEACH COMBER DR
5TH ST
7TH ST
ELECTRIC AV
1ST ST
2ND ST
3RD ST
4TH ST
5TH ST
6TH ST
7TH ST
8TH ST
10TH ST
11TH ST
12TH ST
CENTRAL WY
CENTRAL AV
OCEAN AV
SEAL WY
MAIN ST
LANDING AV

Legend

- Existing Pump Station
- Future Pump Station
- Sump Locations
- Existing Storm Drains
- 2008 Master Plan Recommended Storm Drains

Drainage Area

- West End Pump Station
- San Gabriel River
- Seal Beach Pump Station South
- Seal Beach Pump Station North
- Hellman Ranch
- Marina Hill to Hellman Ranch

N

0 200 400 800 1,200 Feet

1" = 400'

AKM

PROJECT NO: 0800810.00

DATE: January 2019

MARINA DRIVE DRAINAGE SYSTEMS FOCUSED STUDY

Southwest Region 2008 Master Plan Recommended Drainage CIP

Figure 2

2. PURPOSE

The purpose of the Focused Preliminary Design Report is to conduct updated hydrologic and hydraulic studies with High Confidence 25-year Storm peak flows, and develop a concept system to minimize flooding along Marina Drive and connecting streets between 5th Street and Pacific Coast Highway while conveying as much of the flows to West End Pump Station. The purpose of the project includes studies of the San Gabriel River Drainage Area and providing updated capital improvement recommendations for the West End Pump Station and San Gabriel River Drainage Areas.

3. HYDROLOGIC STUDIES AND HYDRAULIC ANALYSES

The hydraulic model of the existing storm drain system was prepared for use in analyzing the existing system, and evaluating various alternatives. The model was prepared in Water Surface Pressure Gradient (WSPG) computer program developed by the Los Angeles County Flood Control District, with High Confidence 25-year Storm peak flows. The total design flow tributary to the West End Pump Station is 296 cfs. The hydraulic analysis results of the existing system showed that the maximum flow that can be delivered to the West End Pump Station is 250 cfs, which would provide a 6-inch freeboard at each catch basin inlet in the tributary area when all recommended improvements are completed. This is less than the 296 cfs required by the City's flood protection criteria. The limitation is due to the smaller size storm drain constructed (double 7' (W) x 3' (H) RCB) on Electric Avenue between Corsair Way and 5th Street, than the 2008 Master Plan recommended size (double 8' (W) x 4.25' (H) RCB) because of several interfering utilities and the narrow street width.

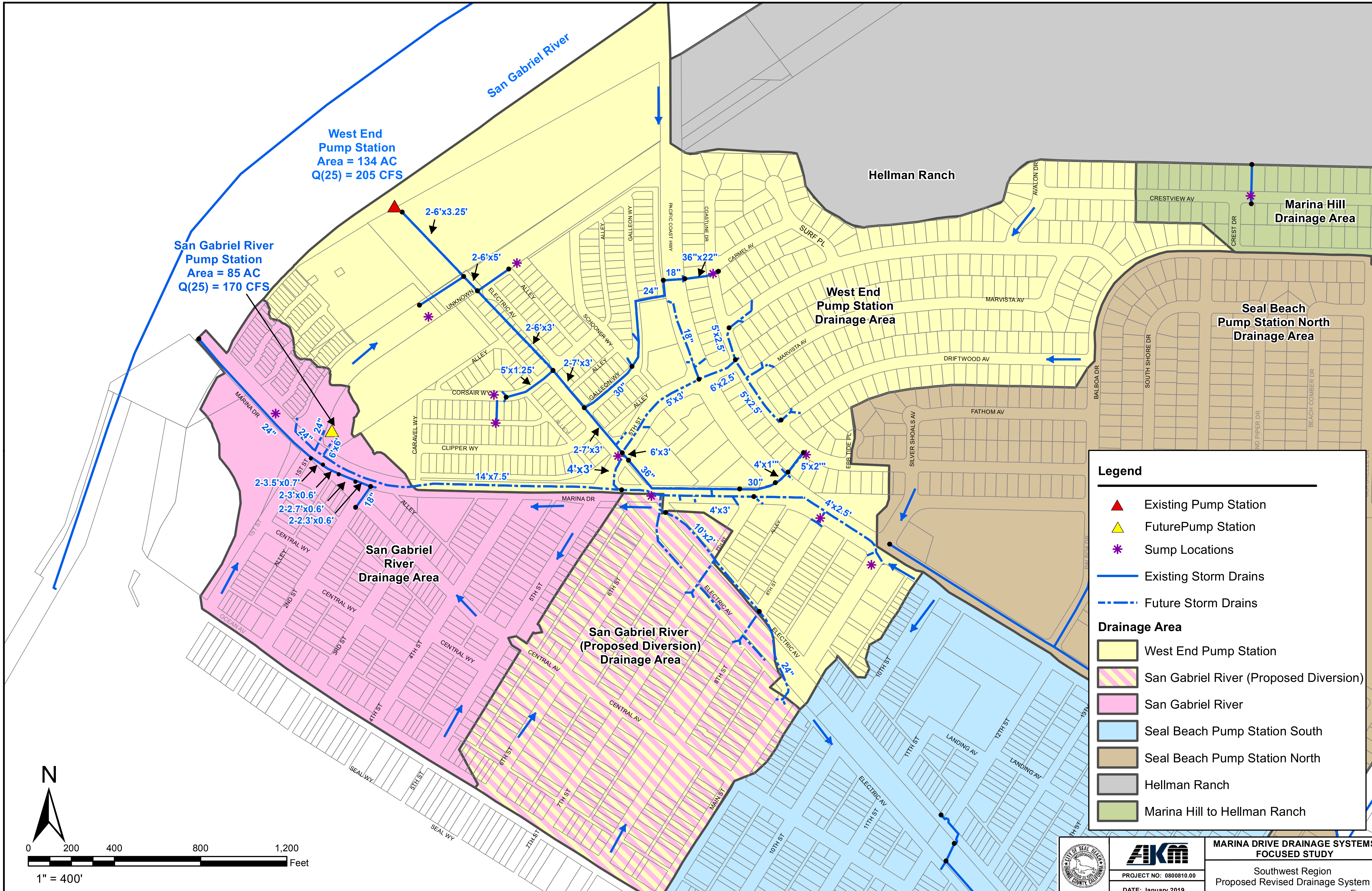
One alternative solution is to convey the remaining flow to the West End Pump Station in storm drains along Marina Drive west of 5th Street, Caravel Way and Corsair Way to Electric Avenue, totaling over 1,900 feet in length. This storm drain was not a part of the 2008 Master Plan. The elevation of the existing storm drain at Electric Avenue and Corsair Way limits the slope of such a new storm drain to less than 0.03%, which is not constructible. Additionally, as described above, facilities with an estimated implementation cost of $13.76 million would have to be constructed to provide flood protection within the West End Pump Station Drainage Area.

Another alternative is to revise the drainage area boundaries by diverting the flows from a portion of the existing West End Pump Station Drainage Area to the San Gabriel River Drainage Area. Table 1 shows the existing drainage areas and the peak flows resulting from High-Confidence 25-year Storm.

Table 1 – 2008 Master Plan Drainage Areas and Peak Flows

Location	Tributary Area	Total Discharge
West End Pump Station	173 acres	296 cfs
San Gabriel River Basin Pump Station	46 acres	87 cfs

Under this alternative, 205 cfs would be conveyed to the West End Pump Station, which is approximately its current capacity. This alternative would result in eliminating future facilities within the West End Pump Station Drainage Area with a current estimated implementation cost of $13.76 million. The revised drainage areas and drainage systems, determined through iterative hydrologic and hydraulic studies conveying 205 cfs to the West End Pump Station, are shown on Figure 3. The portion of the West End Pump Station Drainage Area that will ultimately be diverted to the San Gabriel River Drainage Area is generally located southwesterly of Electric Avenue North


San Gabriel River
West End
Pump Station
Area = 134 AC
Q(25) = 205 CFS
San Gabriel River
Pump Station
Area = 85 AC
Q(25) = 170 CFS
Hellman Ranch
Marina Hill
Drainage Area
West End
Pump Station
Drainage Area
Seal Beach
Pump Station North
Drainage Area
San Gabriel
River
Drainage Area
San Gabriel River
(Proposed Diversion)
Drainage Area
Seal Beach
2-6'x3.25'
2-6'x5'
2-6'x3'
5'x1.25'
2-7'x3'
2-7'x3'
4'x3'
6'x3'
14'x7.5'
36"x22"
18"
24"
30"
36"
5'x2.5'
6'x2.5'
5'x3'
4'x1"
5'x2"
4'x2.5'
4'x3'
10'x2'
24"
6'x6'
18"
2-3.5'x0.7'
2-3'x0.6'
2-2.7'x0.6'
2-2.3'x0.6'
MARINA DR
ELECTRIC AV
CENTRAL WY
CENTRAL AV
OCEAN AV
SEAL WY
PACIFIC COAST HWY
MARVISTA AV
DRIFTWOOD AV
FATHOM AV
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CRESTVIEW AV
CREST DR
AVALON DR
BALBOA DR
SOUTH SHORE DR
SILVER SHOALS AV
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0 200 400 800 1,200 Feet
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MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY
Southwest Region
Proposed Revised Drainage System
Figure 3

between 5th Street and Main Street. The revised drainage areas and the peak flows resulting from High-Confidence 25-year Storm are shown in Table 2.

Table 2 – Revised Tributary Areas and Peak Flows

Location	Tributary Area	Total Discharge
West End Pump Station	134 acres	205 cfs
San Gabriel River Basin Pump Station	85 acres	170 cfs

The change in the drainage area boundaries requires evaluation of the existing and future storm drains under interim and ultimate conditions. The interim condition facilities are formulated to reduce flooding to the extent possible, and provide increasing flood protection levels as various phases of the proposed systems are constructed. The interim conditions also aim to maintain the existing drainage areas until the facilities necessary to handle the diverted flows are constructed within the San Gabriel River Drainage Area.

It is proposed to implement the recommended facilities in seven (7) phases shown on Figure 4 and Exhibit 1 (back pocket). Each phase may be subdivided into smaller phases based upon availability of funding for drainage improvements. Phases 1, 2, 3, 6, and 7 are recommended within the West End Pump Station Drainage Area. The first three phases will reduce flooding along Pacific Coast Highway and Marina Drive, and reduce overflow into the San Gabriel River Drainage Area.

Phases 4 and 5 cover improvements within the San Gabriel River Drainage Area. These facilities have been formulated based upon hydrologic and hydraulic analyses with the diverted flows, and have several possible alternatives. Four (4) alternatives evaluated as part of the Focused Study are described below. Additional studies of the San Gabriel River Drainage Area facilities proposed for Phases 4 and 5 will be necessary, including preliminary design reports, to determine the exact make-up of the storm drains, in-line detention basins, and the pump station.

The proposed Phase 4 and 5 improvements will consist of reinforced concrete box storm drains, catch basins and their lateral reinforced concrete pipes primarily on Marina Drive; a stormwater pump station at the northeasterly of the Marina Drive -1st Street intersection (San Gabriel River Basin Pump Station), and the pump station discharge pipe extending west along 1st Street and north along Marina Drive to San Gabriel River.

One alternative is to convey the entire peak flow of the High Confidence 25-year Storm (170 cfs) to the San Gabriel Basin Pump Station site un-attenuated, and constructing a pump station with 170 cfs capacity. This alternative will require somewhat smaller collecting storm drains but the largest pump station and discharge pipe.

Other alternatives involve constructing the storm drain system on Marina Drive as an in-line detention facility, and constructing the pump station and the discharge pipe for the reduced (attenuated) peak flow. The reduction in peak flow will depend upon the storage volume provided in the in-line detention facility. In this study, three (3) such alternatives were evaluated, each with a 1,350-ft long in-line detention basin on Marina Drive between 5th Street and 1st Street. Hydrologic studies included developing inflow hydrographs utilizing the US Army Corps of Engineers' HEC-1 computer program and routing the hydrographs through three alternative in-line detention basins with various pumping capacities. The summary of the results of these analyses is presented in Table 3.

MARINA DRIVE DRAINAGE SYSTEMS FOCUSED STUDY

RECOMMENDED FACILITIES AND CONSTRUCTION PHASES

Figure 4

1" = 100'
(24"x36")

Table 3 – Marina Drive In-line Detention Basin Alternatives

Alternative	Pump Flow	In-line Detention Basin Dimensions	Storage Volume (ac-ft)
1	70 cfs	14'W x 7.5'H	2.75
2	82 cfs	12'W x 7.5'H	2.36
3	116 cfs	8'W x 7.5'H	1.57

Each alternative provides a minimum freeboard of 0.50 feet at each catch basin in the tributary area.

4. RECOMMENDED IMPROVEMENTS

Preliminary plans and profiles of the recommended improvements were developed based upon the hydrologic and hydraulic studies, elevations and sizes of the existing drainage facilities, and interference of the existing utilities. Due to very shallow cover over the proposed storm drains, it is expected that the existing service laterals to the properties along the storm drain alignments will be relocated. The contingency included in the cost estimates accounts for these relocations, which should be identified during the final design of each facility.

The following sections list the proposed improvements, and include layouts and estimated implementation costs by phase. Preliminary plans and profiles are included in Appendix A.

4.1 Phase 1

This phase consists of:

- 11 feet of transition structure from 15'-7" (W) x 3' (H) RCB to 14'-8" (W) x 3'(H) RCB on 5th Street from the existing double 7'(W) x 3'(H) RCB at Electric Avenue intersection
- 63 feet of single 14'-8" (W) x 3'(H) RCB on 5th Street extending southerly from the transition structure towards Marina Drive
- 58 feet of double 10' (W) and 4'(W) x 3'(H) RCB southerly extension of the above on 5th Street towards Marina Drive
- 210 feet of double 10' (W) and 4'(W) x 3'(H) RCB on 5th Street and Marina Drive to the intersection of Marina Drive and Electric Avenue
- 109 feet of 10' (W) x 2' (H) RCB on Marina Drive and Electric Avenue to 6th Street
- One (1) 28-ft wide catch basin on the south side of Marina Drive west of Electric Avenue with 47 feet of 24-inch lateral connecting to the 10' (W) x 2' (H) RCB on Electric Avenue
- Two (2) 28-ft wide catch basins, on the east and west side of Electric Avenue south of Marina Drive, with 36 feet of 24-inch RCP laterals
- Connecting the existing 18-inch storm drain on Electric Avenue to the new 10' (W) x 2' (H) RCB at northerly extension of 6th Street with a junction structure and 21 feet of 24-inch RCP
- 389 feet of 6'(W) x 3'(H) RCB on Marina Drive from Electric Avenue to west of 7th Street
- 100 feet of 6'(W) x 2.5'(H) RCB on Marina Drive from west to east of 7th Street
- Two (2) 14-ft wide catch basins on the south side of Marina Drive (one east of Electric Avenue, one west of 7th Street) with 50 feet of 24-inch RCP laterals connecting to the 6'(W) x 3'(H) RCB on Marina Drive
- One (1) 28-ft wide catch basin on the south side of Marina Drive east of Electric Avenue with 20 feet of 36-inch RCP lateral connecting to the 6'(W) x 3'(H) RCB on Marina Drive

- One (1) 28.4-ft wide eight (8)-grate grating catch basin on the north side of Marina Drive between Electric Avenue and Pacific Coast Highway with 37 feet of 24-inch RCP lateral connecting to the 6'(W) x 3'(H) RCB on Marina Drive
- One (1) 14-ft wide catch basin on the south side of Marina Drive east of 7th Street with 28 feet of 24-inch RCP lateral connecting to the 6'(W) x 2.5'(H) RCB on Marina Drive
- Connecting the existing 10-ft wide catch basin on the east side of 7th Street south of Marina Drive to the new 6'(W) x 2.5'(H) RCB on Marina Drive.
- Remove the existing 3.5-ft catch basin and construct one (1) 28-ft wide catch basin on the east side of 5th Street north of Electric Avenue with 19 feet of 36-inch RCP lateral connecting to the existing 5'(W) x 3'(H) RCB on 5th Street
- Two (2) 10-ft wide catch basins on east and west side of 5th Street south of Marina Drive with 197 feet of 24-inch RCP laterals connecting to the 10'(W) x 3'(H) RCB on 5th Street

The Phase 1 recommended improvements are shown on Figure 5. Preliminary plan and profile of the Phase 1 facilities are shown on Sheets 2, 3, 5, 6, and 14 in Appendix A.

The 6'(W) x 3'(H) and 6'(W) x 2.5'(H) RCB on Marina Drive will intercept the runoff from a 16-acre tributary area between Pacific Coast Highway and Electric Avenue south of Marina Drive. The existing storm drains (4' (W) x 1' (H) RCB across Pacific Coast Highway, and 30-inch and 36-inch RCP storm drains along the north side of Marina Drive) will collect the runoff from a 9-acre tributary area located north of Pacific Coast Highway. The tributary area to this existing system will be 16 acres less than the existing tributary area, and provide adequate capacity in the existing storm drains.

The 10' (W) x 2' (H) RCB will intercept the runoff from Electric Avenue south of Marina Drive, covering 39 acres, with a High Confidence 25-year Storm peak flow of 85 cfs. Flow that can be collected by the catch basins constructed during Phase 1 will be conveyed to the West End Pump Station collection system until the Phase 5 project is constructed. At that time, this flow is proposed to be diverted to the San Gabriel River Drainage Area.

On 5th Street, the new 28-ft catch basin will intercept the runoff from the east side of 5th Street. The drainage area tributary to the junction with the double 7' (W) x 3' (H) RCB is 35.5 acres, with a High Confidence 25-year Storm peak flow of 65 cfs. However, the entire flow will not enter the system until the Phase 3 and Phase 7 systems are constructed.

The estimated cost of the Phase 1 improvements is $4,466,504 as detailed in Table 4

SEE PHASE 3
FIGURE 7

ELECTRIC AVE.

EXISTING DOUBLE
7'W x 3'H RCB

5TH ST.

36" RCP
(28'CB)

14'-8"W x 3'H RCB

15'W x 7'H RCB

Phase 1

PACIFIC COAST HIGHWAY

SEE PHASE 5
FIGURE 9

4'W x 3'H RCB

24"RCP

10'Wx3'H RCB

MARINA DRIVE

6'W x 3'H RCB

24" RCP

6'W x 2.5'H RCB

SEE PHASE 2
FIGURE 6

24"RCP

18"RCP
(10'CB)

18"RCP
(10'CB)

24"RCP
(28'CB)

10'Wx2'H RCB

24"RCP
(14'CB)

36"RCP
(28'CB)

24"RCP
(14'CB)

24"RCP
(14'CB)

24"RCP
(28'CB)

24"RCP
(28'CB)

5TH ST.

24"RCP

6TH STREET

ELECTRIC AVE.

7TH STREET

SEE PHASE 6
FIGURE 10

SEE PHASE 6
FIGURE 10

PHASE 1
NOT TO SCALE

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MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

PHASE 1 RECOMMENDED STORM DRAIN IMPROVEMENTS

Figure 5

JOB NO.:	0801513.00
DATE:	JAN. 2019

Table 4 - Phase 1 Storm Drain Improvements Cost Estimate

Phase 1 Construction: 5th St., Electric Ave., and Marina Dr.	Type	Quantity	Unit Cost	Cost
5th Street	4'Wx3'H & 10'WX3'H RCB	58	$3,686	$213,759
	14'-8"Wx3'H RCB	63	$3,726	$234,738
	Transition to 15'-7" RCB	11	$3,807	$41,877
	24" RCP	197	$513	$101,061
	36" RCP	19	$635	$12,056
	10' Catch Basin	2	$16,848	$33,696
	28' Catch Basin	1	$37,706	$37,706
	Manhole	1	$12,150	$12,150
Marina Drive @ Electric Ave.	4'Wx3'H & 10'WX3'H RCB	210	$3,686	$773,955
Electric Avenue	10'WX2'H RCB	109	$2,160	$235,440
	24" RCP	104	$513	$53,352
	28' Catch Basin	3	$37,706	$113,117
	Junction	1	$8,100	$8,100
Marina Drive	6'Wx3'H RCB	389	$1,696	$659,588
	6'Wx2.5'H RCB	100	$1,607	$160,700
	8-Grate Catch Basin	1	$22,950	$22,950
	24" RCP	115	$513	$58,995
	36" RCP	20	$635	$12,690
	14' Catch Basin	3	$8,145	$24,435
	28' Catch Basin	1	$37,706	$37,706
	12" Waterline Relocation	160	$810	$129,600
			Total Construction Cost =	**$2,977,669**
			Contingency (20%) =	**$595,534**
			Design and Construction Management (25%) =	**$893,301**
			Grand Total =	**$4,466,504**

4.2 Phase 2

This phase will consist of:

- 787 feet of 6' (W) x 2.5' (H) RCB on Marina Drive, Pacific Coast Highway, and Main Street from east of 7th Street to southwest of Pacific Coast Highway
- 46 feet of 6' (W) x 2' (H) RCB on Main Street extending to the local sump located approximately 220 feet southwesterly of the Pacific Coast Highway centerline.
- Two (2) 10-ft wide catch basins on 8th Street south of Pacific Coast Highway with 78 feet of 24-inch RCP storm drain and 38 feet of 24-inch laterals connecting to the 6' (W) x 2.5' (H) RCB on Pacific Coast Highway
- One (1) 10-ft wide catch basin on the east side of Main Street connecting to the 6' (W) x 2.5' (H) RCB on Main Street with a 22-ft long 24-inch lateral
- One (1) 10-ft wide catch basin on the west side of Main Street connecting to the 6' (W) x 2' (H) RCB on Main Street

The recommended improvements for Phase 2 are shown on Figure 6. They will intercept the runoff from a total area of 8.3 acres (High Confidence 25-year Storm peak flow of 17.9 cfs), which will be

conveyed to the West End Pump Station. Preliminary plan and profile of the Phase 2 facilities are shown on Sheets 6, 7, and 8 in Appendix A.

The estimated cost of the Phase 2 improvements is $2,198,236 as detailed in Table 5

Table 5 - Phase 2 Storm Drain Improvements Cost Estimate

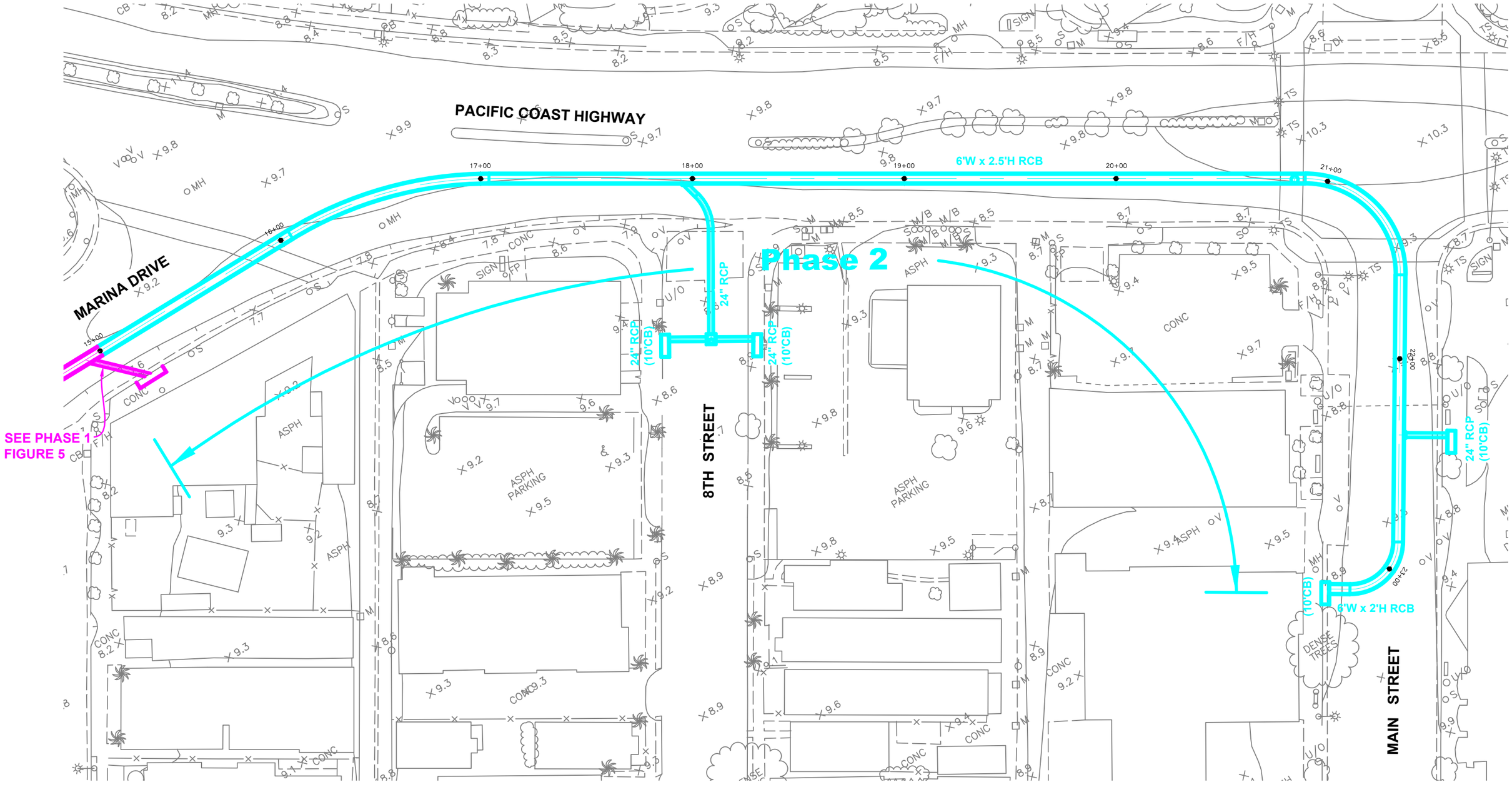
Phase 2 Construction: Marina Dr., PCH, and Main St.	Type	Quantity	Unit Cost	Cost
Marina Drive and Pacific Coast Highway	6'Wx2.5'H RCB	787	$1,607	$1,264,709
Marina Drive, 8th Street, and Main Street	6'Wx2'H RCB	46	$1,350	$62,100
	24" RCP	138	$513	$70,794
	10' Catch Basin	4	$16,848	$67,392
	Manhole / Junctiom	1	$12,150	$12,150
	12" Waterline Relocation	40	$486	$19,440
			Total Construction Cost =	**$1,496,585**
			Contingency (20%) =	**$303,205**
			Design and Construction Management (25%) =	**$379,006**
			Grand Total =	**$2,198,236**

4.3 Phase 3

Phase 3 will consist of:

- 481 feet of 5' (W) x 3' (H) RCB on 5th Street from the existing 5' (W) x 3' (H) RCB to PCH
- One (1) 28-ft wide catch basin on the east side of 5th Street north of Electric Avenue connecting to the 5' (W) x 3' (H) RCB with 12 feet of 36-inch lateral
- 201 feet of 6' (W) x 2.5' (H) RCB on PCH and Marvista Avenue to Coastline Drive
- Two (2) 21-ft wide catch basins on Marvista Avenue north of Pacific Coast Highway connecting to the 6' (W) x 2.5' (H) RCB on Marvista Avenue with 7 feet of 24-inch lateral on east side and 28 feet of 18-inch lateral on west side (smaller lateral due to a shallow 12-inch sewer crossing)
- 70 feet of 5' (W) x 2.5' (H) RCB on Coastline Drive at its intersection with Marvista Avenue
- One (1) 14-ft wide catch basin on the east side of Coastline Drive at its easterly intersection with Marvista Avenue, connecting to the 5' (W) x 2.5' (H) RCB on Coastline Drive with 18 feet of 24-inch lateral
- 478 feet of 18-inch RCP along the west side of Pacific Coast Highway from the southwesterly extension of Carmel Avenue to 5th Street
- One (1) 10-ft wide catch basin on the west side of Pacific Coast Highway at the southwesterly extension of Carmel Avenue and 23 feet of 18-inch lateral connecting to the 18-inch RCP storm drain on Pacific Coast Highway
- One (1) 14-ft wide catch basin on the east side of Pacific Coast Highway north of Marvista Avenue and 59 feet of 18-inch lateral connecting to the 18-inch RCP drain on PCH

The recommended improvements are shown on Figure 7. Preliminary plan and profile of the Phase 3 facilities are shown on Sheets 9, 10 and 15 in Appendix A.



PHASE 2
NOT TO SCALE

AKM	MARINA DRIVE DRAINAGE SYSTEMS FOCUSED STUDY
JOB NO.: 0801513.00	**PHASE 2 RECOMMENDED STORM DRAIN IMPROVEMENTS**
DATE: JAN. 2019	Figure 6

EXISTING DOUBLE
7'W x 3'H RCB

CLIPPER WAY

ELECTRIC AVENUE

GALLEON WAY

SCHOONER WAY

EX. 18"RCP
(28'CB)

5TH STREET

SEE PHASE 1
FIGURE 5

5'W x 3'H RCB

36" RCP
(28'CB)

Phase 3

18" RCP

6'W x 2.5'H RCB

18" RCP
(10'CB)

18" RCP

18" RCP
(14'CB)

18" RCP
(21'CB)

24" RCP
(21'CB)

PACIFIC COAST HIGHWAY

COASTLINE DRIVE

CATALINA AVENUE

SEE PHASE 7
FIGURE 11

5'W x 2.5'H RCB

24" RCP
(14'CB)

SEE PHASE 1
FIGURE 5

SEE PHASE 7
FIGURE 11

PHASE 3
NOT TO SCALE

AKM

JOB NO.: 0801513.00
DATE: JAN. 2019

MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

PHASE 3 RECOMMENDED STORM DRAIN IMPROVEMENTS

Figure 7

The estimated cost of the Phase 3 improvements is $2,574,582 as detailed in Table 6.

At the completion of Phase 3, nearly all the facilities needed to collect and convey the High Confidence 25-year Storm peak flow from the revised drainage area to the West End Pump Station will have been constructed. Only the proposed Phase 7 facilities, and one 250 feet of 24-inch diameter RCP (Master Plan Low Priority Project WE 1-4) will need to be constructed on the south side of 1st Street west of Welcome Lane.

Table 6 - Phase 3 Storm Drain Improvements Cost Estimate

Phase 3 Construction: 5th St., PCH, and Coastline Dr.	Type	Quantity	Unit Cost	Cost
5th St., Pacific Coast Highway, and Coastline Dr.	5'Wx3'H RCB	481	$1,526	$733,766
	6'Wx2.5'H RCB	201	$1,607	$322,907
	5'Wx2.5'H RCB	70	$1,445	$101,115
	18" RCP	28	$473	$13,230
	24" RCP	25	$513	$12,825
	36" RCP	12	$635	$7,614
	14' Catch Basin	1	$21,992	$21,992
	21' Catch Basin	2	$29,214	$58,428
	28' Catch Basin	2	$37,706	$75,411
	8" Waterline Relocation	200	$324	$64,800
Pacific Coast Highway	18" RCP	560	$473	$264,600
	10' Catch Basin	2	$16,848	$33,696
	14' Catch Basin	1	$21,992	$21,992
	Manhole / Junction	2	$10,800	$21,600
			Total Construction Cost =	**$1,753,974**
			Contingency (20%) =	**$355,115**
			Design and Construction Management (25%) =	**$443,894**
			Grand Total =	**$2,574,582**

4.4 Phases 4 and 5:

Phases 4 and 5 will construct the updated CIP for the San Gabriel River Drainage Basin. The proposed revised drainage area increases from 46 acres to 85 acres, and the High Confidence 25-year Storm peak flow increases from 87 cfs to 170 cfs. The proposed improvements will consist of reinforced concrete box storm drains primarily on Marina Drive, a stormwater pump station at the northeasterly of the Marina Drive and 1st Street intersection (San Gabriel River Basin Pump Station), and the pump station discharge pipe extending west along 1st Street and north along Marina Drive to San Gabriel River. The profile of the storm drain on Marina Drive between 5th Street and 1st Street is impacted by two existing gravity sewers. One is an 8-inch sewer located at the Caravel Way crossing, which requires a squash box at this location. The other one is a 21-inch sewer located at the 5th Street crossing, which requires maintaining a shallow box until the proposed storm drain crosses it.

There are several alternatives for this system. One alternative is to convey the entire Expected Value 100-year peak flow of 170 cfs to the pump station site un-attenuated, and constructing a pump station with this capacity. This alternative will require somewhat smaller collecting storm drains but the largest pump station and discharge pipe. Another alternative is to construct the collecting storm drain system as an in-line detention facility, and construct the pump station and the discharge pipe for the reduced (attenuated) peak flow. The reduction in peak flow will depend upon the storage volume provided in the in-line detention facility. A more detailed evaluation, including the preliminary design of the pump station will be required to determine the final facility sizes. In this study, an alternative which provides a reduction in peak flow from 170 cfs to 70 cfs is used, which requires larger collecting storm drains (in-line detention basin) but significantly reduces the pump station size and the discharge pipe. Under these conditions, the following facilities are required:

4.4.1 Phase 4

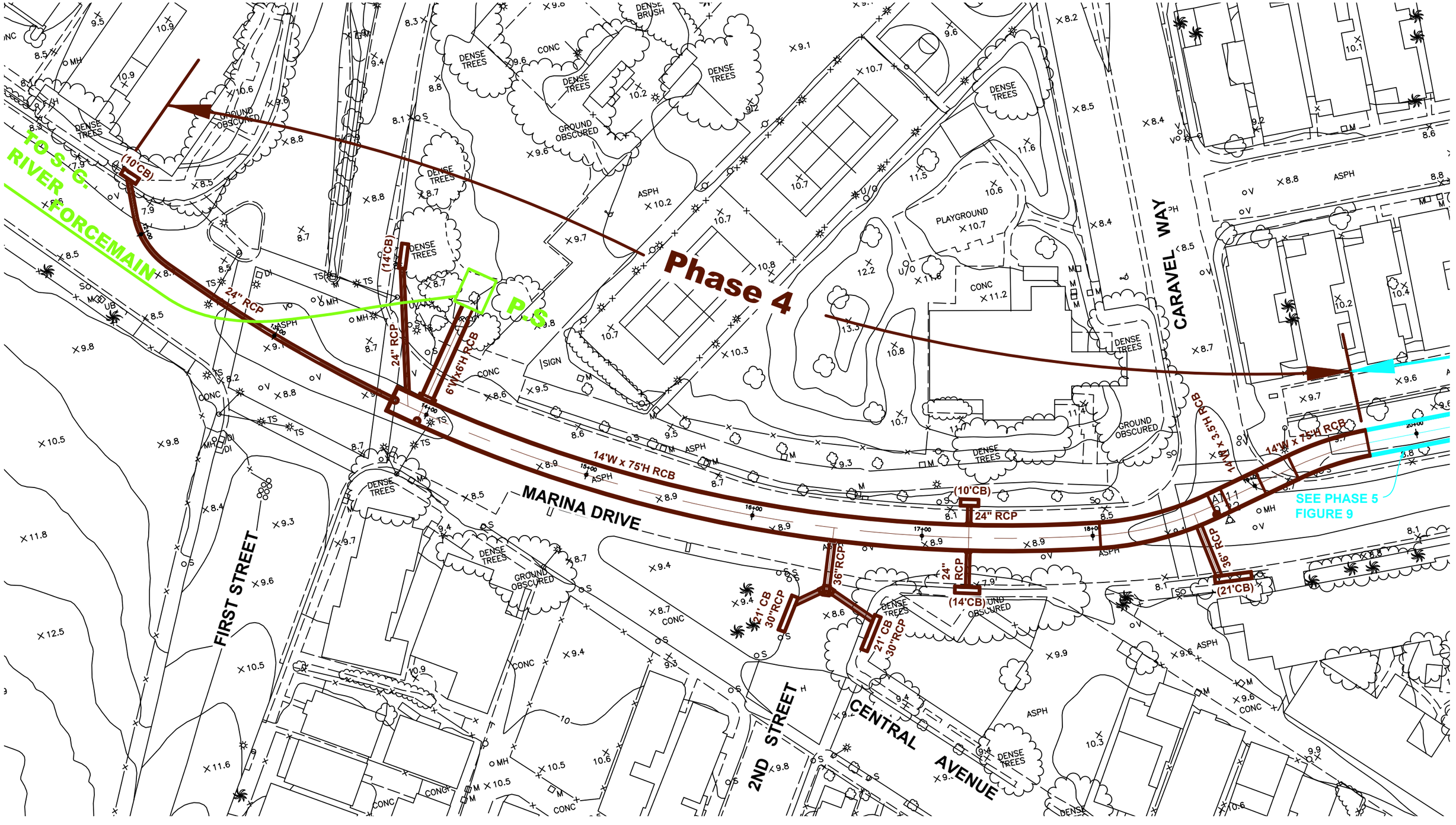
Phase 4 will consist of:

- 570 feet of 14' (W) x 7.5' (H) RCB from east of Caravel Way to 1st Street
- One (1) 21-ft wide catch basin on the south side of Marina Drive at the southerly extension of Caravel Way with 33 feet of 36-inch lateral connecting to the 14' (W) x 7.5' (H) RCB on Marina Drive
- One (1) 10-ft wide catch basin on the north side of Marina Drive west of Caravel Way and 12 feet of 24-inch lateral connecting to the 14' (W) x 7.5' (H) RCB on Marina Drive
- One (1) 14-ft wide catch basin on the south side of Marina Drive west of Caravel Way and 22 feet of 24-inch lateral connecting to the 14' (W) x 7.5' (H) RCB on Marina Drive
- Two (2) 21-ft wide catch basins on 2nd Street south of Marina Drive, 48 feet of 30-inch RCP laterals, and 28 feet of 36-inch connecting to the 14' (W) x 7.5' (H) RCB on Marina Drive
- One 14-ft wide catch basin on the east side of 1st Street north of Marina Drive and 74 feet of 24-inch lateral connecting to the 14' (W) x 7.5' (H) RCB on Marina Drive
- One (1) 10-ft wide catch basin on the north side of Marina Drive west of 1st Street with 213 feet of 24-inch RCP storm drain on Marina Drive connecting to the 14' (W) x 7.5' (H) RCB on the east side of 1st Street
- 23 feet of 14' (W) x 3.5' (H) RCB on Marina Drive south of Caravel Way
- 53 feet of 6' (W) x 6' (H) RCB extending north from the 14' (W) x 7.5' (H) RCB on Marina Drive to the future pump station site at the southeast corner of 1st Street and Marina Drive.
- San Gabriel River Basin Pump Station at the southeast corner of 1st Street and Marina Drive
- San Gabriel River Basin Pump Station discharge pipe on 1st Street and Marina Drive from the pump station to the San Gabriel River

The recommended Phase 4 improvements are shown on Figure 8. Preliminary plan and profile of the Phase 4 facilities are shown on Sheets 11, and 12 in Appendix A.

The estimated cost of the Phase 4 improvements is $26,214,858 as detailed in Table 7

Because of its high implementation cost, Phase 4 will likely be divided into several sub –phases, and may include temporary storm drains and pump stations as interim facilities to provide greater flood protection than the existing systems.



PHASE 4
NOT TO SCALE

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JOB NO.: 0801513.00	**PHASE 4 RECOMMENDED STORM DRAIN IMPROVEMENTS**
DATE: JAN. 2019	Figure 8

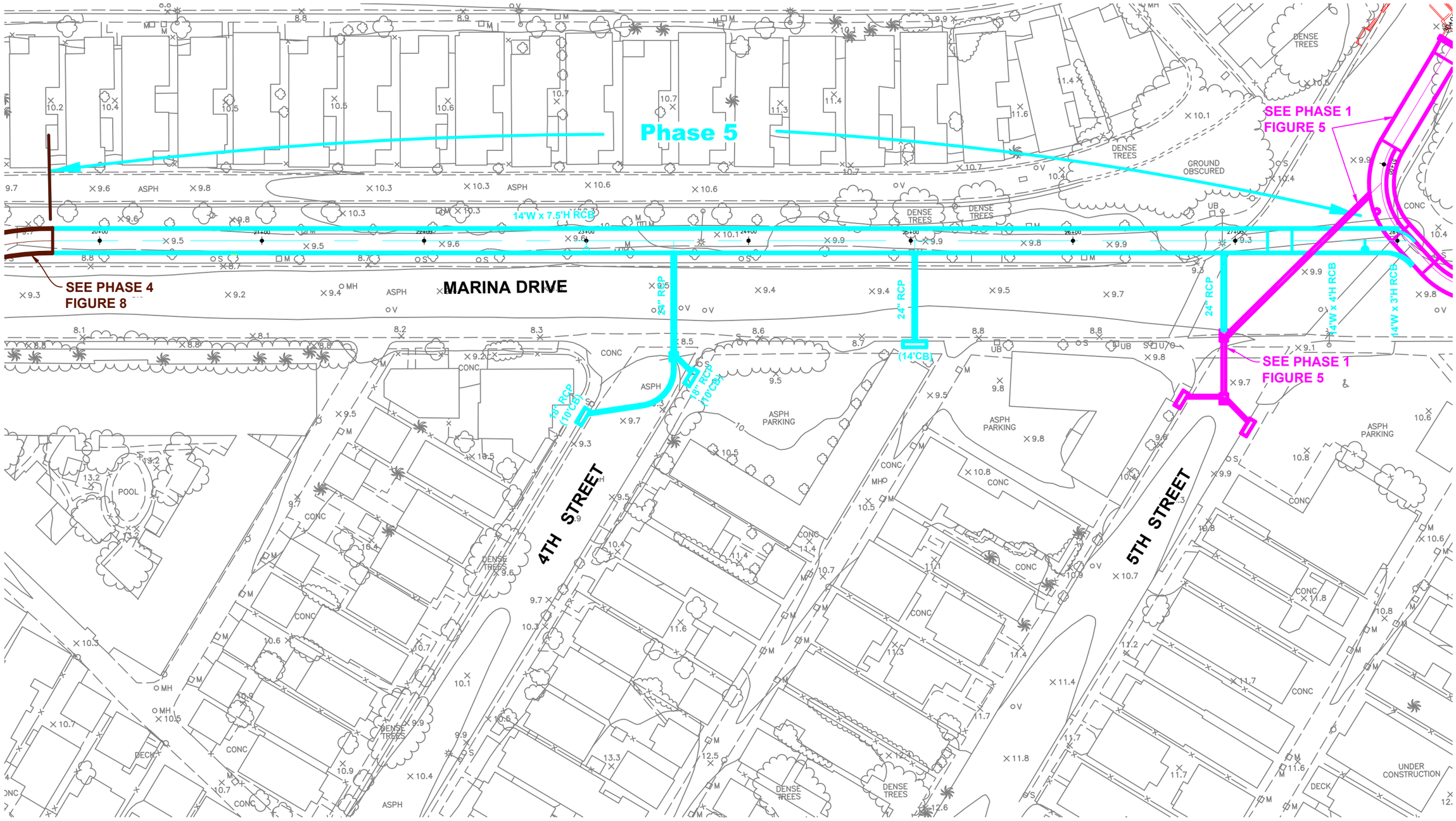
Table 7 - Phase 4 Storm Drain Improvements Construction Cost Estimates				
Phase 4 Construction: Marina Drive	**Type**	**Quantity**	**Unit Cost**	**Sub-Total**
Marina Drive	14'Wx7.5'H RCB	570	$4,847	$2,762,505
	14'Wx3.5'H RCB	23	$3,686	$84,767
	6'Wx6'H RCB	53	$2,160	$114,480
	36" RCP	61	$635	$38,705
	30" RCP	48	$581	$27,864
	24" RCP	321	$513	$164,673
	10' Catch Basin	2	$16,848	$33,696
	14' Catch Basin	2	$21,992	$43,983
	21' Catch Basin	3	$29,214	$87,642
	Manhole / Junction	1	$12,150	$12,150
	Pump Station Discharge Pipe	750	$2,000	$1,500,000
	4" & 12" Waterline Relocations	260	$405	$105,300
Pump Station at First Street / Marina Drive	San Gabriel River Pump Station	1	$10,000,000	$10,000,000
			Total_Sub =	**$14,975,764**
			Contingency (20%) =	**$4,995,153**
			Design and Construction Management (25%) =	**$6,243,941**
			Grand Total =	**$26,214,858**

4.4.2 Phase 5

This phase will divert the runoff from 39 acres of the West End Pump Station Drainage Area to the San Gabriel River Basin Drainage Area at the 10' (W) x 3' (H) RCB at 5th Street and Marina Drive intersection. It will consist of:

- 11 feet of 14' (W) x 3' (H) RCB junction structure on Marina Drive extending west from the 10' (W) x 3' (H) RCB at Marina Drive and Electric Avenue intersection constructed in Phase 1
- 61 feet of 14' (W) x 4' (H) RCB transition from the above 14' (W) x 3' (H) RCB on Marina Drive extending westerly
- 15 feet of transition RCB from the above 14' (W) x 4' (H) RCB and 750 feet of 14' (W) x 7.5' (H) RCB on Marina Drive from west of 5th Street to east of Caravel Way
- Remove and plug ends of the 24-inch RCP constructed in Phase 1 from 5th Street across Marina Drive; construct 49 feet of 24-inch RCP lateral from the Phase 1 manhole to 14'(W) x 7.5'(H) RCB on Marina Drive
- One (1) 14-ft wide catch basin on south side of Marina Drive west of the 4th Street Alley with 56 feet of 24-inch RCP lateral connecting to the 14' (W) x 7.5' (H) RCB on Marina Drive
- Two (2) 10-ft wide catch basins on 4th Street south of Marina Drive, 87 feet of 18-inch laterals, and 63 feet of 24-inch RCP storm drain connecting to the 14' (W) x 7.5' (H) RCB on Marina Drive

The recommended Phase 5 improvements are shown on Figure 9. Preliminary plan and profile of the Phase 5 facilities are shown on Sheets 12, 13, and 14 in Appendix A.



PHASE 5
NOT TO SCALE

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AKM	MARINA DRIVE DRAINAGE SYSTEMS FOCUSED STUDY
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DATE: JAN. 2019	Figure 9

The estimated cost of the Phase 5 improvements is $6,124,694 as detailed in Table 8

Table 8 - Phase 5 Storm Drain Improvements Construction Cost Estimates

Phase 5 Construction: Marina Drive	Type	Quantity	Unit Cost	Sub-Total
Marina Drive	14'Wx7.5'H RCB	750	$4,847	$3,634,875
	14'Wx4'H RCB	61	$2,768	$168,818
	14'Wx3'H RCB	11	$2,633	$28,958
	24" RCP	168	$513	$86,184
	18" RCP	87	$473	$41,108
	10' Catch Basin	2	$16,848	$33,696
	14' Catch Basin	1	$21,992	$21,992
	Manhole / Junction	1	$13,500	$13,500
	RCB Junction / Transition	15	$2,700	$40,500
	Join to Existing RCB	1	$13,500	$13,500
			Total_Sub =	**$4,083,129**
			Contingency (20%) =	**$816,626**
			Design and Construction Management (25%) =	**$1,224,939**
			Grand Total =	**$6,124,694**

4.5 Phase 6

This phase will extend the Phase 1 construction along North Electric Avenue from 6th Street to Main Street. It will consist of:

- One (1) 7-ft wide and one (1) 10-ft wide catch basin on the north side of South Electric Avenue; one (1) 14-ft wide and one (1) 10-ft wide catch basin on the south side of South Electric Avenue between 6th Street Alley and 6th Street; with 43 feet of 18-inch and 104 feet of 24-inch RCP laterals; and 67 feet of 24-inch RCP storm drain on South Electric Avenue and 6th Street connecting to the junction structure constructed in Phase 1
- 278 feet of 10’ (W) x 2’ (H) RCB between 6th Street and 7th Street
- One (1) 14-ft wide catch basin on the north side of North Electric Avenue and 17 feet of 18-inch lateral connecting to the 10’ (W) x 2’ (H) RCB between 6th Street and 7th Street
- One (1) 10-ft wide catch basin on the south side of North Electric Avenue and 4 feet of 18-inch lateral connecting to the 10’ (W) x 2’ (H) RCB between 6th Street and 7th Street
- 161 feet of 4.5’ (W) x 2’ (H) RCB from the 7th Street and South Electric Avenue intersection to North Electric Avenue, connecting to the 10’ (W) x 2’ (H) RCB on North Electric Avenue
- Two (2) 14-ft wide catch basins on 7th Street south of South Electric Avenue, with 42 feet of 18-inch RCP and 37 feet of 24-inch RCP laterals connecting to the 4.5’ (W) x 2’ (H) RCB on South Electric Avenue
- One (1) 14-ft wide catch basin on the south side of South Electric Avenue and 110 feet of 18-inch RCP lateral connecting to the 4.5’ (W) x 2’ (H) RCB on South Electric Avenue
- 371 feet of 6’ (W) x 2’ (H) RCB on North Electric Avenue between 7th Street and 8th Street.

- 178 feet of 4.5' (W) x 2' (H) RCB from 8th Street south of South Electric Avenue to Electric Avenue (north), connecting to the 6' (W) x 2' (H) RCB
- Two (2) 10-ft wide catch basins on 8th Street south of South Electric Avenue and 44 feet of 18-inch RCP laterals connecting to the 4.5' (W) x 2' (H) RCB on 8th Street
- 421 feet of 24-inch RCP storm drain on North Electric Avenue and Electric Avenue between 8th Street and Main Street
- Two (2) 10-ft wide catch basins on Main Street south of Electric Avenue and 57 feet of 18-inch RCP laterals connecting to the 24-inch RCP on Main Street

The recommended improvements are shown on Figure 10. Preliminary plan and profile of the Phase 6 facilities are shown on Sheets 3 and 4 in Appendix A.

As described under Phase 1, Phase 6 will complete all the facilities needed to convey the Expected Value 100-year peak flow from the revised San Gabriel River Drainage Area to the San Gabriel River Basin Pump Station.

The estimated cost of the Phase 6 improvements is $3,277,827 as detailed in Table 9

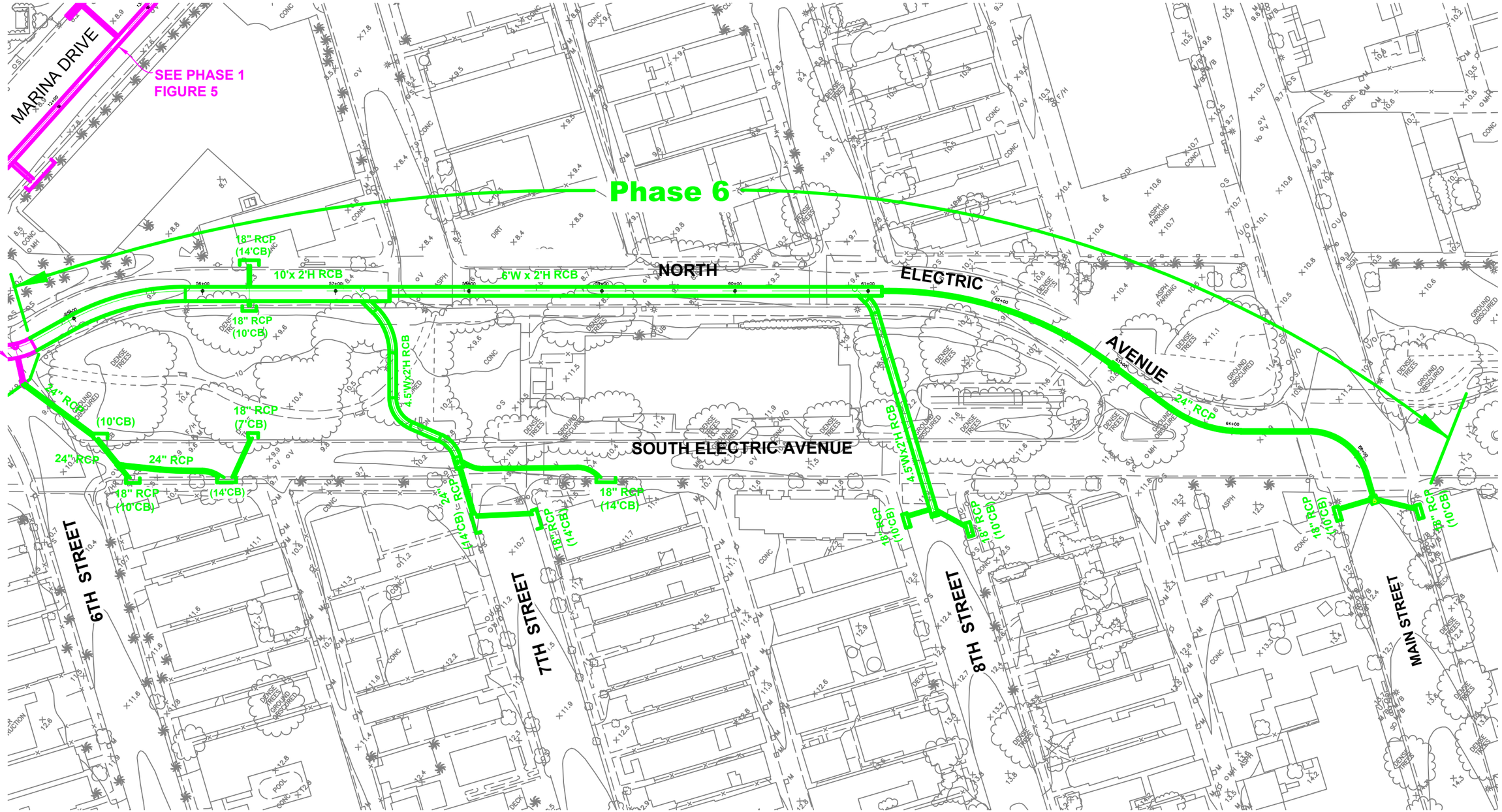
Table 9 - Phase 6 Storm Drain Improvements Cost Estimate

Phase 6 Construction: Electric Ave. and Main St.	**Type**	**Quantity**	**Unit Cost**	**Cost**
Electric Avenue, 6th Street, 7th Street, 8th Street, and Main Street	10'Wx2'H RCB	278	$2,160	$600,480
	6'Wx2'H RCB	371	$1,350	$500,850
	4.5'Wx2'H RCB	339	$986	$334,085
	24" RCP	629	$513	$322,677
	18" RCP	317	$473	$149,783
	7' Catch Basin	1	$13,001	$13,001
	10' Catch Basin	7	$16,848	$117,936
	14' Catch Basin	5	$21,992	$109,958
	Manhole / Transition	3	$12,150	$36,450
	Total Construction Cost =			**$2,185,218**
	Contingency (20%) =			**$437,044**
	Design and Construction Management (25%) =			**$655,565**
	Grand Total =			**$3,277,827**

4.6 Phase 7

Phase 7 will complete the entire collecting storm drain system in the West End Pump Station Drainage Area, with the exception of the 250 feet of 24-inch RCP storm drain (Master Plan Low Priority Project WE 1-4) on the south side of 1st Street west of Welcome Lane. It will consist of:

- 179 feet of 5' (W) x 2.5' (H) RCB on Coastline Drive extending northerly from the 5' (W) x 2.5' (H) RCB on Coastline Drive – Marvista Avenue intersection to Catalina Avenue
- 127 feet of 30-inch RCP storm drain on Catalina Avenue connecting to the 5' (W) x 2.5' (H) RCB on Coastline Drive
- One (1) 28-ft wide catch basin on the north side of Catalina Avenue and 11 feet of 30-inch lateral connecting to the 30-inch RCP storm drain on Catalina Avenue



PHASE 6
NOT TO SCALE

AKM	MARINA DRIVE DRAINAGE SYSTEMS FOCUSED STUDY
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- One (1) 14-ft wide catch basin on the south side of Catalina Avenue and 26 feet of 24-inch lateral connecting to the 30-inch RCP storm drain on Catalina Avenue
- 300 feet of 5' (W) x 2.5' (H) RCB on Coastline Drive extending southerly from Coastline Drive – Marvista Avenue intersection to Driftwood Avenue
- 103 feet of 24-inch RCP storm drain on Marvista Avenue connecting to 5' (W) x 2.5' (H) RCB on Coastline Drive
- Two (2) 14-ft wide catch basins on Marvista Avenue and 5 feet of 18-inch RCP laterals connecting to the 24-inch RCP on Marvista Avenue
- 107 feet of 24-inch RCP storm drain on Driftwood Avenue connecting to 5' (W) x 2.5' (H) RCB on Coastline Drive
- One (1) 14-ft wide and one (1) 10-ft wide catch basin on Driftwood Avenue and 10 feet of 18-inch RCP laterals connecting to the 24-inch RCP storm drain on Driftwood Avenue.

The recommended Phase 7 improvements are shown on Figure 11. Preliminary plan and profile of the Phase 7 facilities are shown on Sheets 15 and 16 in Appendix A.

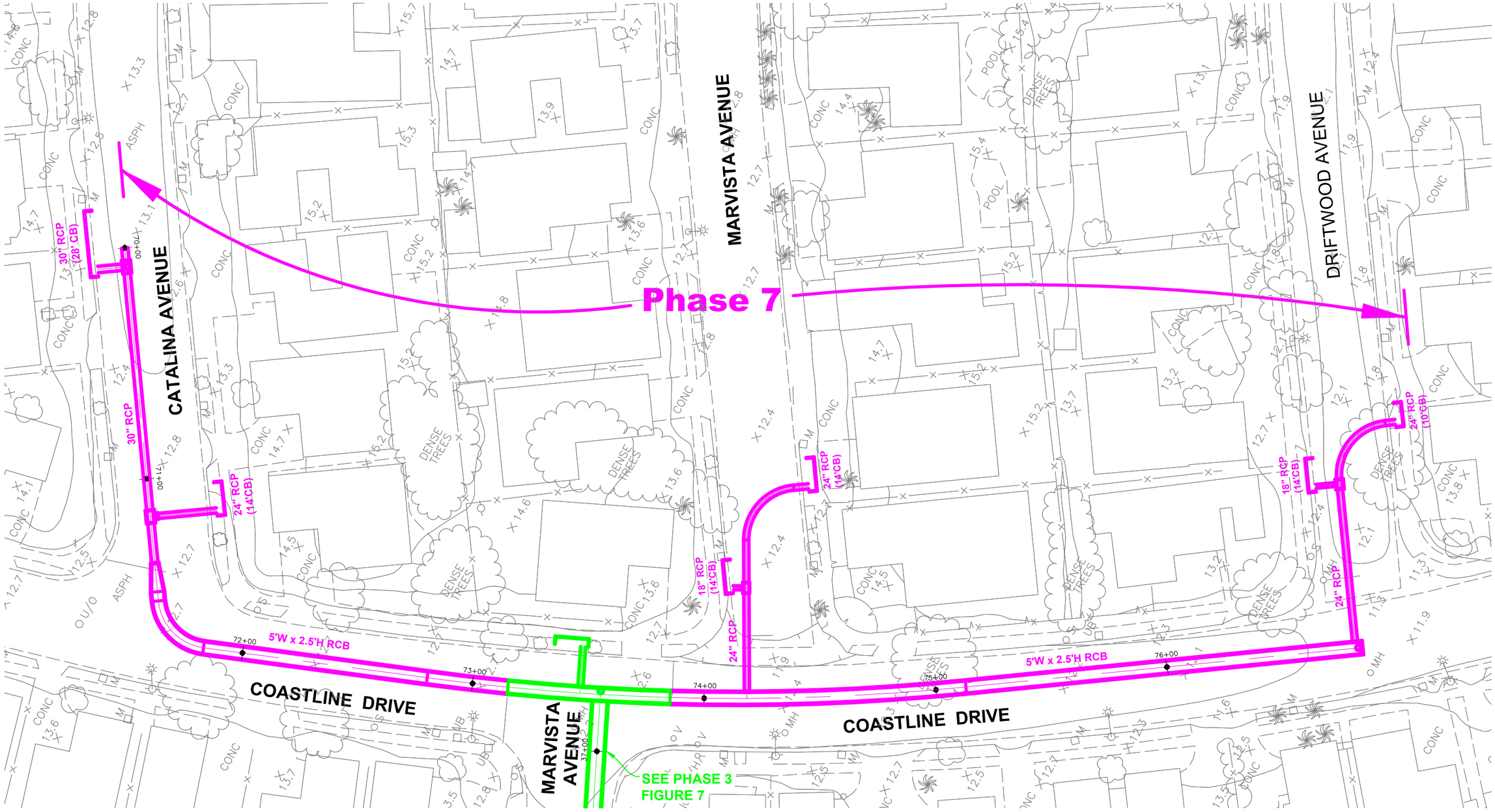
The estimated cost of the Phase 7 improvements is $1,657,199 as detailed in Table 10.

Table 10 - Phase 7 Storm Drain Improvements Cost Estimate

Phase 7 Construction: Coastline Drive	Type	Quantity	Unit Cost	Cost
Coastline Drive, Catalina Avenue, Marvista Avenue, and Driftwood Avenue	5'Wx2.5'H RCB	479	$1,445	$691,916
	30" RCP	138	$581	$80,109
	24" RCP	236	$513	$121,068
	18" RCP	15	$473	$7,088
	10' Catch Basin	1	$16,848	$16,848
	14' Catch Basin	4	$21,992	$87,966
	28' Catch Basin	1	$37,706	$37,706
	Manhole / Junction	4	$12,150	$48,600
	6" Waterline Relocation	50	$270	$13,500
			Total Construction Cost =	**$1,104,800**
			Contingency (20%) =	**$220,960**
			Design and Construction Management (25%) =	**$331,440**
			Grand Total =	**$1,657,199**

5. Caltrans Share of the Drainage System Cost

Pacific Coast Highway is a Caltrans facility. The portion of the highway between Main Street and San Gabriel River is within the West End Pump Station Drainage Area, and drains to various storm drains serving this drainage area, and to the West End Pump Station. Caltrans has not participated in the construction of any of these facilities, although it has benefitted from their use. Therefore, Caltrans should pay its fair share in the existing facilities, as well as the improvements recommended by this Focused Study. It is proposed that cost sharing be in the ratio of Caltrans drainage area to the total recommended revised drainage area tributary to each storm drain.



PHASE 7
NOT TO SCALE

MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

PHASE 7 RECOMMENDED STORM DRAIN IMPROVEMENTS

Figure 11

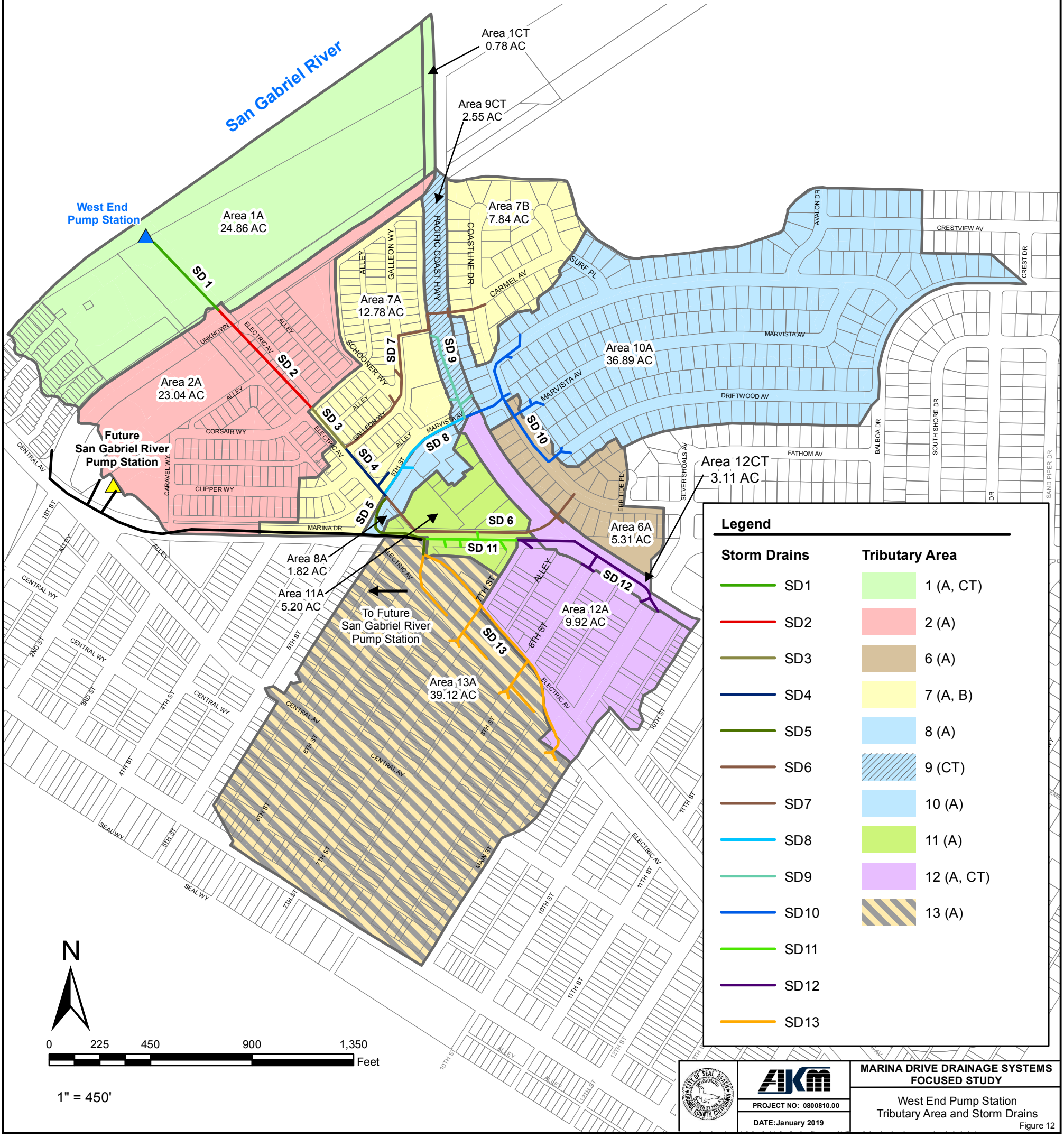
JOB NO.:	0801513.00
DATE:	JAN. 2019

Figure 12 shows the existing as well as the recommended storm drains, and the drainage areas tributary to each. Table 11 includes a list of all the storm drains and the West End Pump Station, along with their implementation cost, participation ratio, and Caltrans share.

Table 11 – Caltrans Cost Participation

Storm Drain Segment/ Pump Station	Location	Total Cost		City of Seal Beach			Caltrans		
			Total Tributary Area (Acres)	Tributary Area (Acres)	% of Total	Cost	Tributary Area (Acres)	% of Total	Cost
West End Pump Station	West End Pump Station	$10,300,000	134.10	127.66	95.20%	$9,805,354	6.44	4.80%	$494,646
SD1	West End PS to 1st Street	$1,366,420	134.10	127.66	95.20%	$1,300,799	6.44	4.80%	$65,621
SD2	Across 1st Street	$440,266	108.46	102.8	96.20%	$423,535	5.66	3.80%	$16,730
SD2	1st Street to Corsair Way	$1,718,020	108.46	102.8	95.50%	$1,640,709	5.66	4.50%	$77,311
SD3	Electric Avenue, Corsair Way to Galleon Way	$1,090,111	85.42	79.76	93.37%	$1,017,879	5.66	6.63%	$72,232
SD4	Electric Avenue, Galleon Way to 5th Street	$1,442,518	64.80	59.14	94.60%	$1,364,622	5.66	5.40%	$77,896
SD5	Electric Avenue, 5th Street to Marina Drive	$2,806,508	18.23	15.12	94.60%	$2,654,957	3.11	5.40%	$151,551
SD6	Existing		5.31	5.31	100%	$0	0	0%	$0
SD7	Coastline Drive and Carmel Avenue		20.62	20.62	100%	$0	0	0%	$0
SD8	5th Street, Electric Avenue to PCH	$1,225,186	41.26	38.71	93.80%	$1,149,224	2.55	6.20%	$75,962
SD9	PCH, Storm Drain Extension	$512,831	2.55	0	0%	$0	2.55	100%	$512,831
SD10	Coastline Drive and Marvista Avenue	$2,452,943	36.89	36.89	100%	$2,452,943	0	0%	$0
SD11	Marina Drive, Electric Avenue to 7th Street	$1,191,814	18.23	15.12	82.90%	$988,014	3.11	17.10%	$203,800
SD12	Marina Drive and 7th Street to PCH and Main Street	$3,277,827	13.03	9.92	76.10%	$2,494,426	3.11	23.90%	$783,401
Total		$27,824,444				$25,292,464			$2,531,980

Storm Drain Segment	Location	City Contributing Areas			Caltrans Contributing Areas			Total AC
		IDs	AC	% of Total	IDs	AC	% of Total	
SD1	West End PS to Dory Way	1A, 2A, 6A, 7A, 7B, 8A, 10A, 11A, 12A	127.66	95.2%	1CT, 9CT, 12CT	6.44	4.8%	134.1
SD2	Electric Ave, Dory Way to Corsair Way	2A, 6A, 7A, 7B, 8A, 10A, 11A, 12A	102.8	94.8%	9CT, 12CT	5.66	5.2%	108.46
SD3	Electric Ave, Corsair Way to galleon Way	6A, 7A, 7B, 8A, 10A, 11A, 12A	79.76	93.4%	9CT, 12CT	5.66	6.6%	85.42
SD4	Electric Ave, Galleon Way to 5th St	6A, 8A, 10A, 11A, 12A	59.14	91.3%	9CT, 12CT	5.66	8.7%	64.8
SD5	Electric Ave, 5th St to Marina Dr.	11A, 12A	15.12	82.9%	12CT	3.11	17.1%	18.23
SD6	Existing	6A	5.31	100.0%	N.A.	0	0.0%	5.31
SD7	Coastline Dr and Carmel Ave	7A, 7B	20.62	100.0%	N.A.	0	0.0%	20.62
SD8	5th St, Electric Ave to PCH	8A, 10A	38.71	93.8%	9CT	2.55	6.2%	41.26
SD9	PCH, Storm Drain Extension	N.A.	0	0.0%	9CT	2.55	100.0%	2.55
SD10	Coastline Dr and Marvista Ave	10A	36.89	100.0%	N.A.	0	0.0%	36.89
SD11	Marina Dr, Electric Ave to 7th St	11A, 12A	15.12	82.9%	12CT	3.11	17.1%	18.23
SD12	Marina Dr and 7th St to PCH and Main	12A	9.92	76.1%	12CT	3.11	23.9%	13.03



MARINA DRIVE DRAINAGE SYSTEMS FOCUSED STUDY

West End Pump Station
Tributary Area and Storm Drains

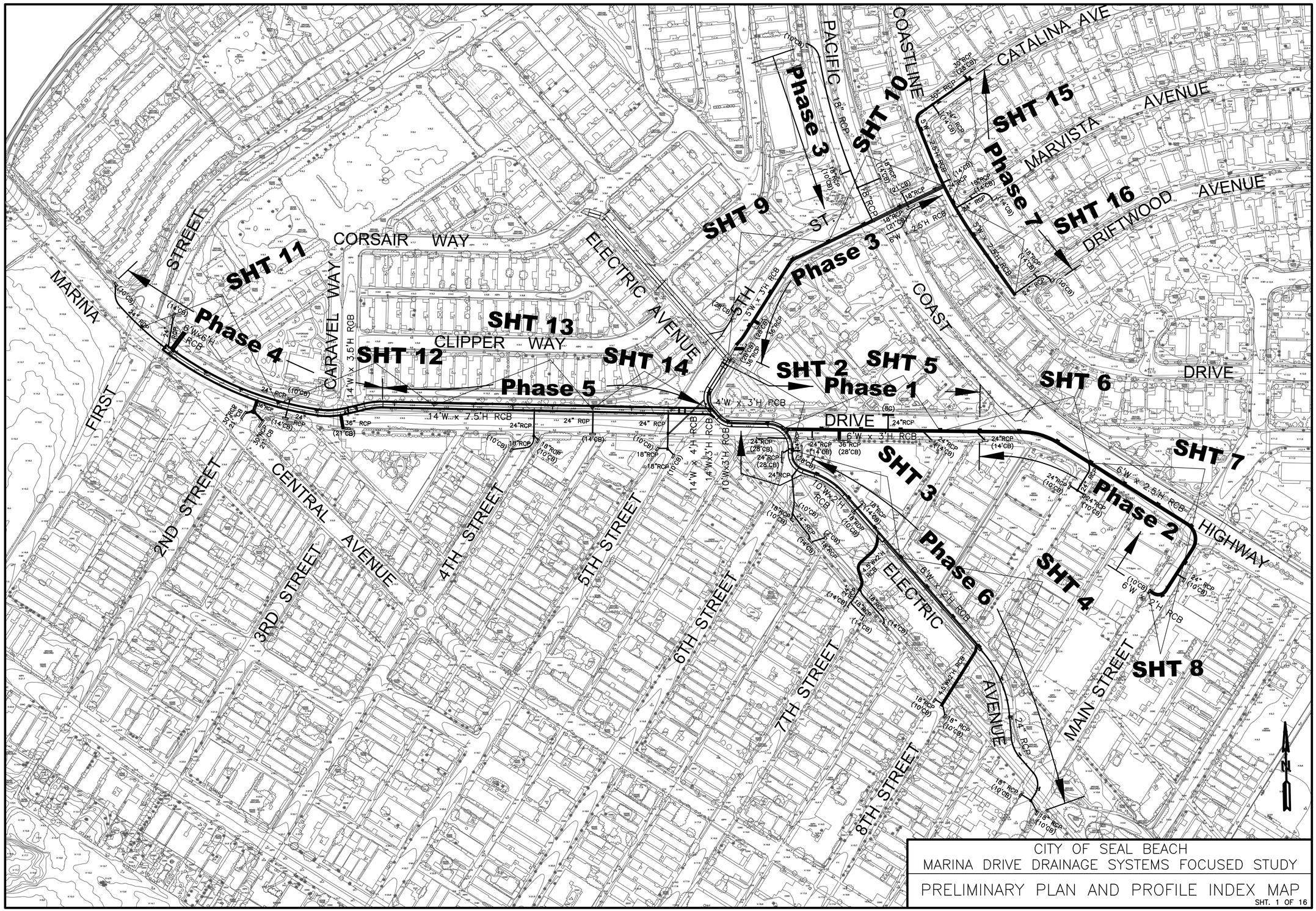
PROJECT NO: 0800810.00

DATE: January 2019

Figure 12

Appendix A

Plan and Profile Sheets for Future Storm Drain Systems



CITY OF SEAL BEACH
MARINA DRIVE DRAINAGE SYSTEMS FOCUSED STUDY

PRELIMINARY PLAN AND PROFILE INDEX MAP

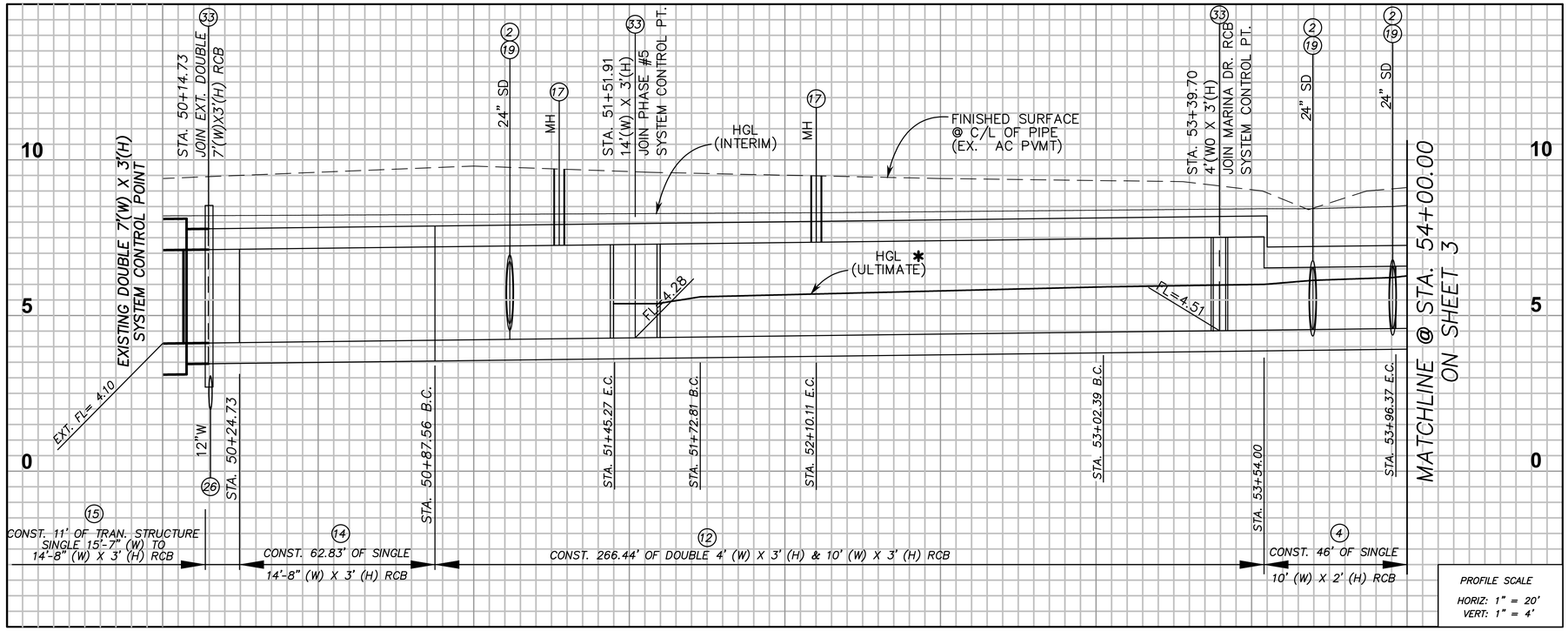
SHT. 1 OF 16

Q_{25} = 86 cfs

(FOR ULTIMATE CONDITION: 65.5 CFS IN 10'x3' RCB WILL BE DIVIDED TO PHASE #5, 26 CFS WILL REMAIN IN 4'x3' RCB)

Q_{25} = 86 cfs

Q_{25} = 65.5 cfs



STORM DRAIN CONSTRUCTION NOTES

NOTE: 1) ALL CURB OPENING CATCH BASINS SHALL BE EQUIPPED WITH AUTOMATIC RETRACTABLE SCREEN AND INSERTED FILTER. STORMWATER BIO-TREATMENT DEVICE; SUCH AS FILTERRA BIO-RETENTION FILTRATION SYSTEM (OR APPROVED EQUIVALENT) SHALL BE CONSTRUCTED ADJACENT TO A CATCH BASIN PER PLAN AND PER CITY APPROVAL. THE SPECIFIC LOCATION OF BIO-SYSTEM SHALL BE APPROVED BY THE CITY DURING CONSTRUCTION.
2) WALL THICKNESS (t_F) ON CATCH BASIN SHALL BE 8-INCH MINIMUM. THE "F" OR "T" VALUES AT MANHOLE OR JUNCTION/TRANSITION STRUCTURES SHALL BE PER PLAN.

(2) — CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).

(4) — CONSTRUCT SINGLE 10'(W) x 2'(H) REINFORCED CONCRETE BOX.

(11) — CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=28'.

(12) — CONSTRUCT DOUBLE 4'(W) X 3'(H) & 10'(W) X 3'(H) REINFORCED CONCRETE BOX.

(14) — CONSTRUCT SINGLE 14'-8"(W) X 3'(H) REINFORCED CONCRETE BOX.

(15) — CONSTRUCT TRANSITION STRUCTURE FROM 15'-7"(W) X 3'(H) TO 14'-8"(W) X 3'(H) REINFORCED CONCRETE BOX FOR JOINING TO THE EXISTING DOUBLE 7'(W) X 3'(H) RCB ON NORTH END, AND JOIN TO DOUBLE 4'(W) X 3'(H) & 10'(W) X 3'(H) RCB ON THE SOUTH END.

(17) — CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.

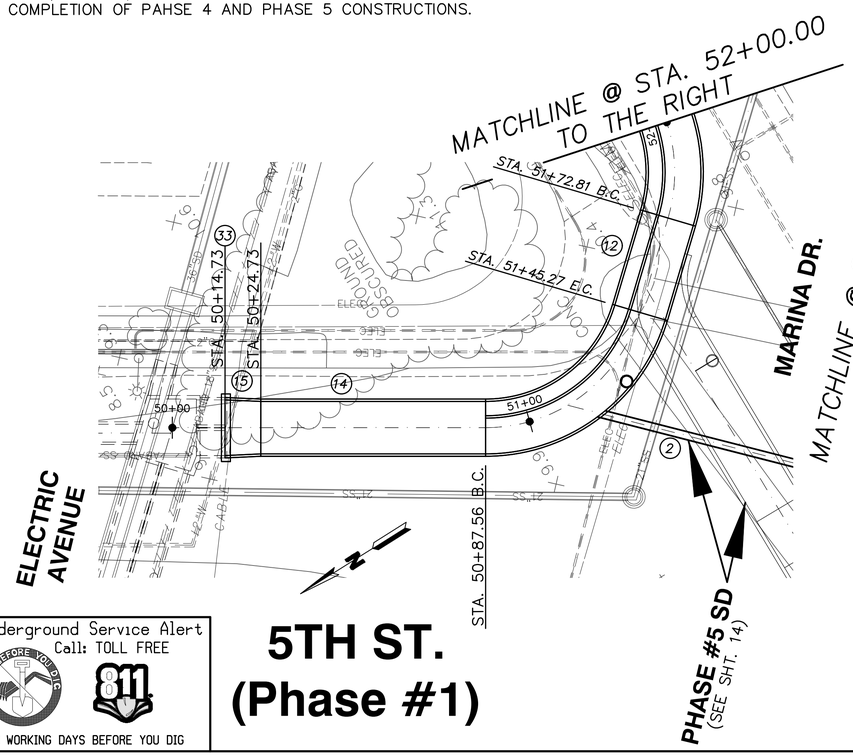
(19) — CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.

(26) — REMOVE AND RECONSTRUCT WATER LINE PER CITY WATER PLANS.

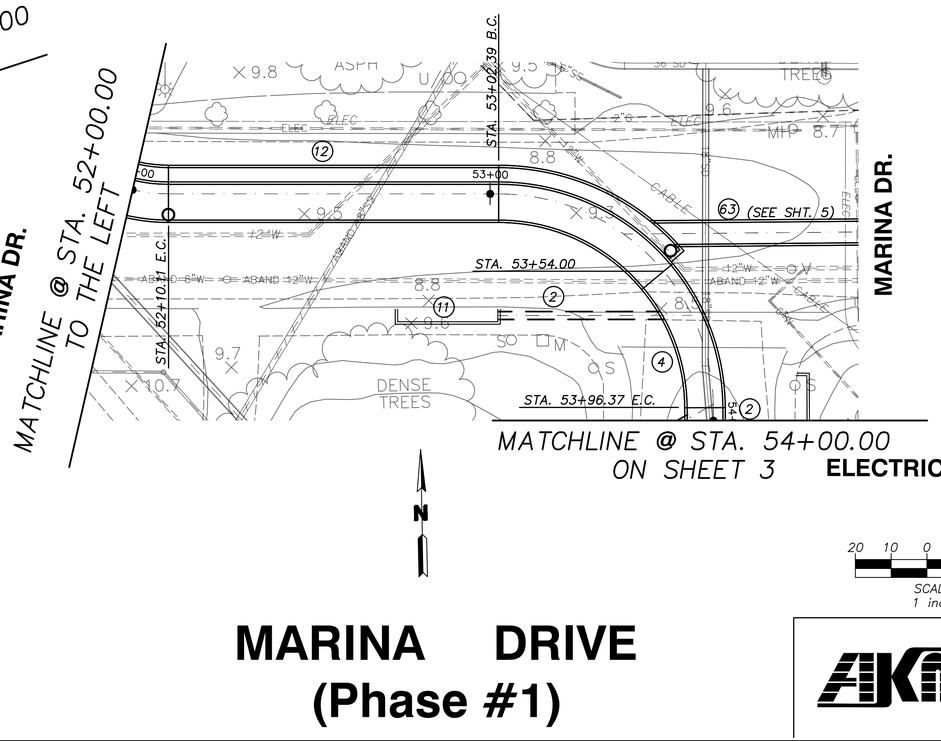
(33) — CONSTRUCT JUNCTION STRUCTURE - RCB TO RCB.

(63) — CONSTRUCT SINGLE 6'(W) x 3'(H) REINFORCED CONCRETE BOX.

✱— HGL (ULTIMATE): UNDER THE CONDITION OF THE COMPLETION OF PAHSE 4 AND PHASE 5 CONSTRUCTIONS.



5TH ST. (Phase #1)



MARINA DRIVE (Phase #1)

GENERAL NOTES:

THE PROPOSED DRAINAGE IMPROVEMENTS PRESENTED HEREIN ARE SHALLOW AND CONSIST PRIMARILY OF REINFORCED CONCRETE BOX. THIS PRELIMINARY DESIGN IS BASED ON THE BEST INFORMATION AVAILABLE, CONSISTING OF CITY AS-BUILT PLANS, UTILITY OWNERS' PLANS, AND SEWER MANHOLE SURVEY DATA.

1). DUE TO THE FACT OF SHALLOW DEPTH OF PUBLIC UTILITIES; SUCH AS GAS, WATER, SEWER, CABLE, TELEPHONE, ELECTRIC, ETC., COORDINATION WITH THE RESPECTIVE UTILITY OWNERS MUST BE CONDUCTED DURING THE FINAL DESIGN STAGE.

2). THE PROPOSED STORM DRAIN SYSTEM PRELIMINARY PRESENTED HEREIN IS CONTROLLED BY THE EXISTING WEST END PUMP STATION MAXIMUM CAPACITY OF ABOUT 205 CFS.

3). SEVERAL STREET LOW POINTS AT ELECTRIC AVENUE, MARINA DRIVE, 5TH STREET, COASTLINE DRIVE, AND PACIFIC COAST HIGHWAY CONTROL THE SIZE AND THE SLOPE OF THE PROPOSED DRAINAGE SYSTEM.

4). THE EXISTING SEWERS AT THE PROPOSED DRAINAGE SYSTEM CROSSINGS SHALL BE PROTECTED IN PLACE. THE EXISTING SEWER SYSTEM WAS CONSTRUCTED IN SHALLOW DEPTH, IT IS EXPECTED THAT SEWER LATERAL (HOUSE CONNECTION) CROSSINGS OF THE PROPOSED STORM DRAIN SYSTEM WILL BE RECONSTRUCTED, PER SPPWC STD. PLAN NO. 223-2.

5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.

NOT FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER — MINGAN JUAN YING — No. C038983 — Exp. 3/31/19 — CIVIL — STATE OF CALIFORNIA

SCALE IN FEET
1 inch = 20 ft

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PROJECT:
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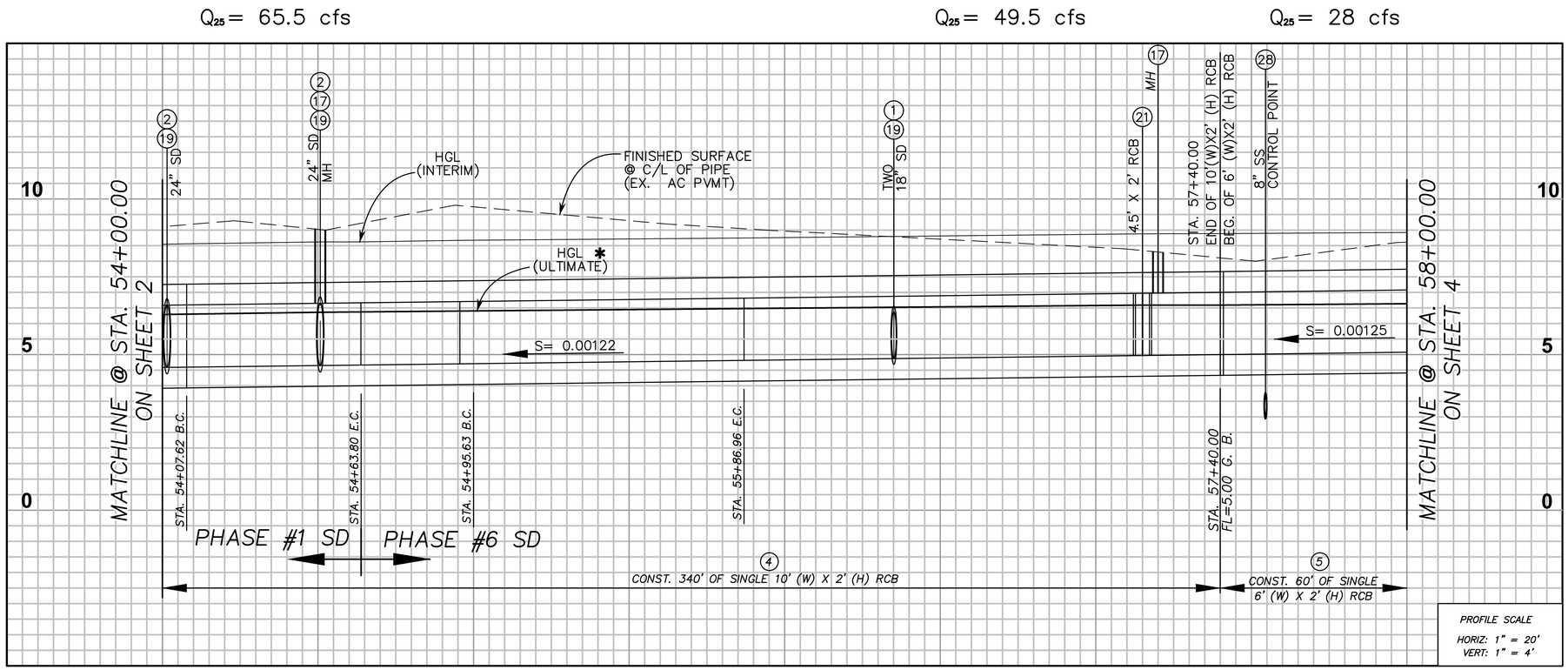
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS FOCUSED STUDY

AKM Consulting Engineers
553 Wald
Irvine, Ca. 92618
(949) 753-7333

TITLE:
5TH STREET / MARINA DRIVE
PHASE #1 IMPROVEMENTS
STA. 50+00 TO STA. 54+00



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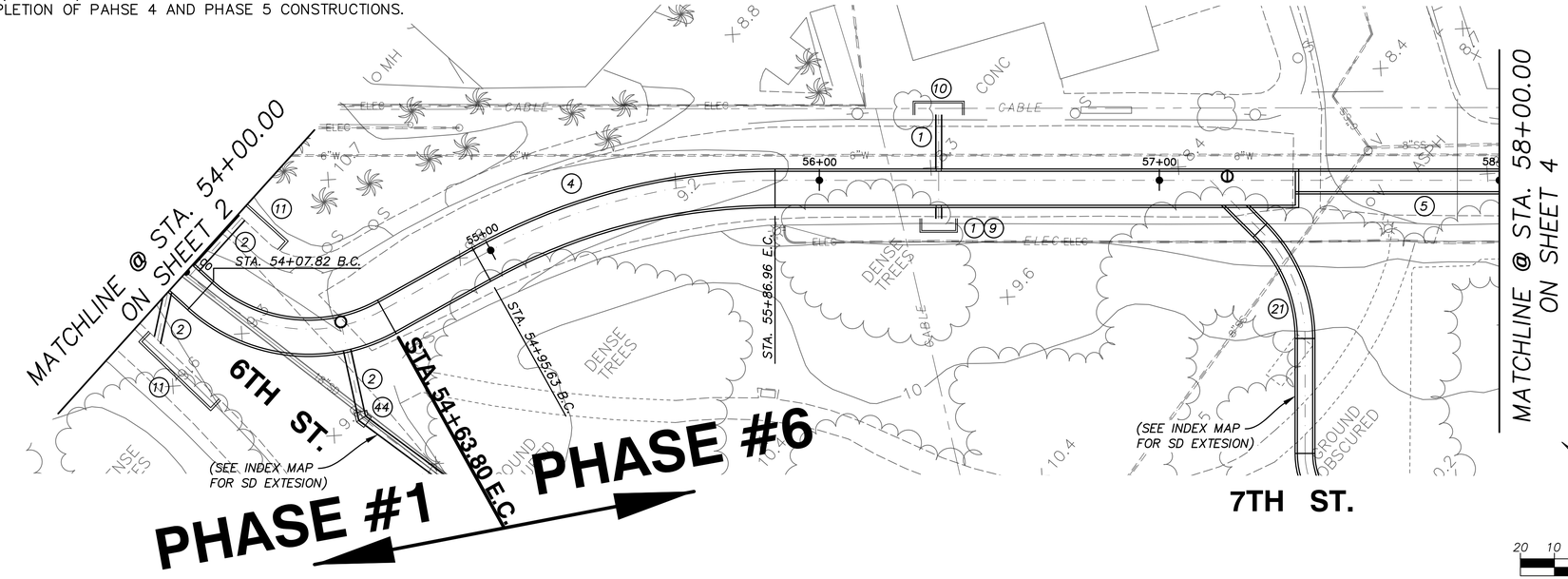

STORM DRAIN CONSTRUCTION NOTES

NOTE: 1) ALL CURB OPENING CATCH BASINS SHALL BE EQUIPPED WITH AUTOMATIC RETRACTABLE SCREEN AND INSERTED FILTER. STORMWATER BIO-TREATMENT DEVICE; SUCH AS FILTERRA BIO-RETENTION FILTRATION SYSTEM (OR APPROVED EQUIVALENT) SHALL BE CONSTRUCTED ADJACENT TO A CATCH BASIN PER PLAN AND PER CITY APPROVAL. THE SPECIFIC LOCATION OF BIO-SYSTEM SHALL BE APPROVED BY THE CITY DURING CONSTRUCTION.
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(1) CONSTRUCT 18-INCH RCP (D-LOAD PER PROFILE).
(2) CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).
(4) CONSTRUCT SINGLE 10'(W) x 2'(H) REINFORCED CONCRETE BOX.
(5) CONSTRUCT SINGLE 6'(W) x 2'(H) REINFORCED CONCRETE BOX.
(9) CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=10'.
(10) CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=14'.
(11) CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=28'.
(17) CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.
(19) CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.
(21) CONSTRUCT SINGLE 4.5'(W) x 2'(H) REINFORCED CONCRETE BOX.
(28) PROTECT EXISTING SEWER FACILITY IN PLACE.
(44) CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN NO. 340-2.

GENERAL NOTES:

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2). THE PROPOSED STORM DRAIN SYSTEM PRELIMINARY PRESENTED HEREIN IS CONTROLLED BY THE EXISTING WEST END PUMP STATION MAXIMUM CAPACITY OF ABOUT 205 CFS.

3). SEVERAL STREET LOW POINTS AT ELECTRIC AVENUE, MARINA DRIVE, 5TH STREET, COASTLINE DRIVE, AND PACIFIC COAST HIGHWAY CONTROL THE SIZE AND THE SLOPE OF THE PROPOSED DRAINAGE SYSTEM.

4). THE EXISTING SEWERS AT THE PROPOSED DRAINAGE SYSTEM CROSSINGS SHALL BE PROTECTED IN PLACE. THE EXISTING SEWER SYSTEM WAS CONSTRUCTED IN SHALLOW DEPTH, IT IS EXPECTED THAT SEWER LATERAL (HOUSE CONNECTION) CROSSINGS OF THE PROPOSED STORM DRAIN SYSTEM WILL BE RECONSTRUCTED, PER SPPWC STD. PLAN NO. 223-2.

5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.

REGISTERED PROFESSIONAL ENGINEER MINGAN JUAN YING No. C038983 Exp. 3/31/19 CIVIL STATE OF CALIFORNIA

20 10 0 20 40
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ELECTRIC AVENUE

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(949) 753-7333

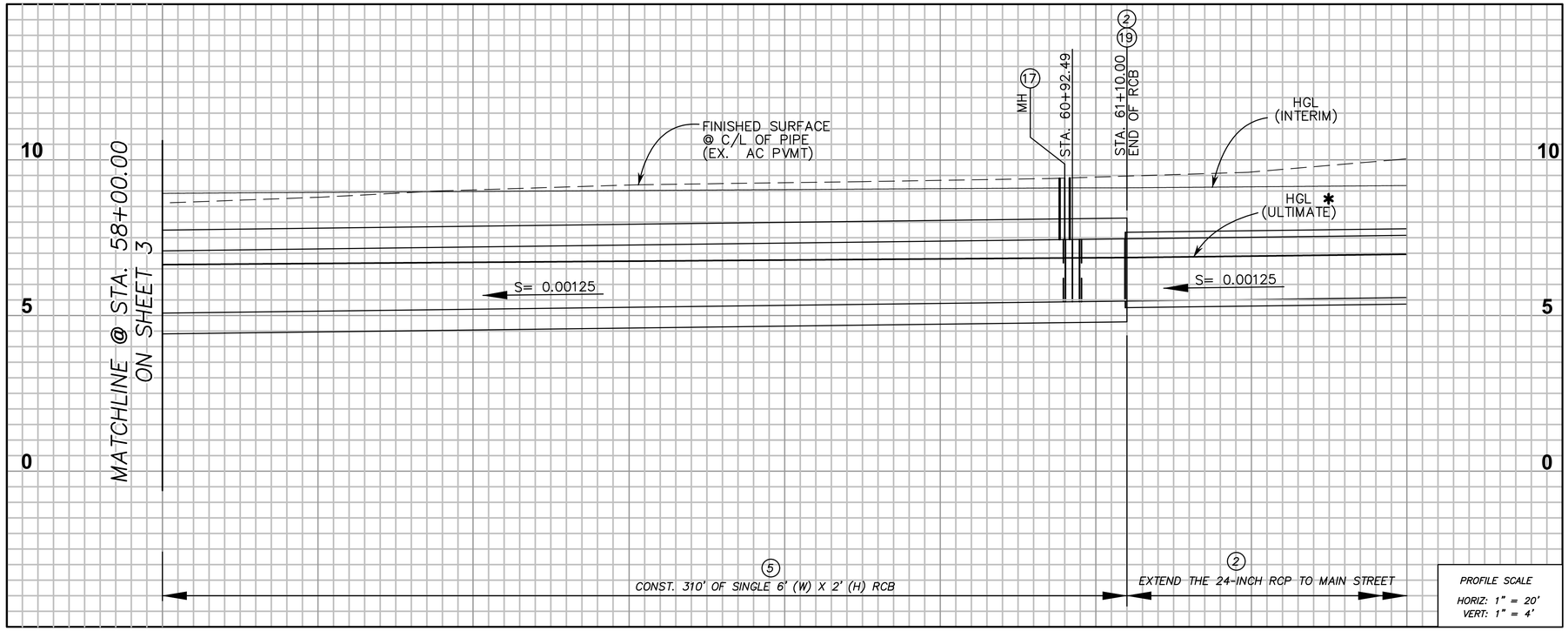
PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

TITLE:
ELECTRIC AVENUE
PHASE #1 AND #6 IMPROVEMENTS

STA. 54+00 TO STA. 58+00

Q_{25} = 28 cfs

Q_{25} = 6.5 cfs



✱— HGL (ULTIMATE): UNDER THE CONDITION OF THE COMPLETION OF PAHSE 4 AND PHASE 5 CONSTRUCTIONS.

STORM DRAIN CONSTRUCTION NOTES

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(2) — CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).

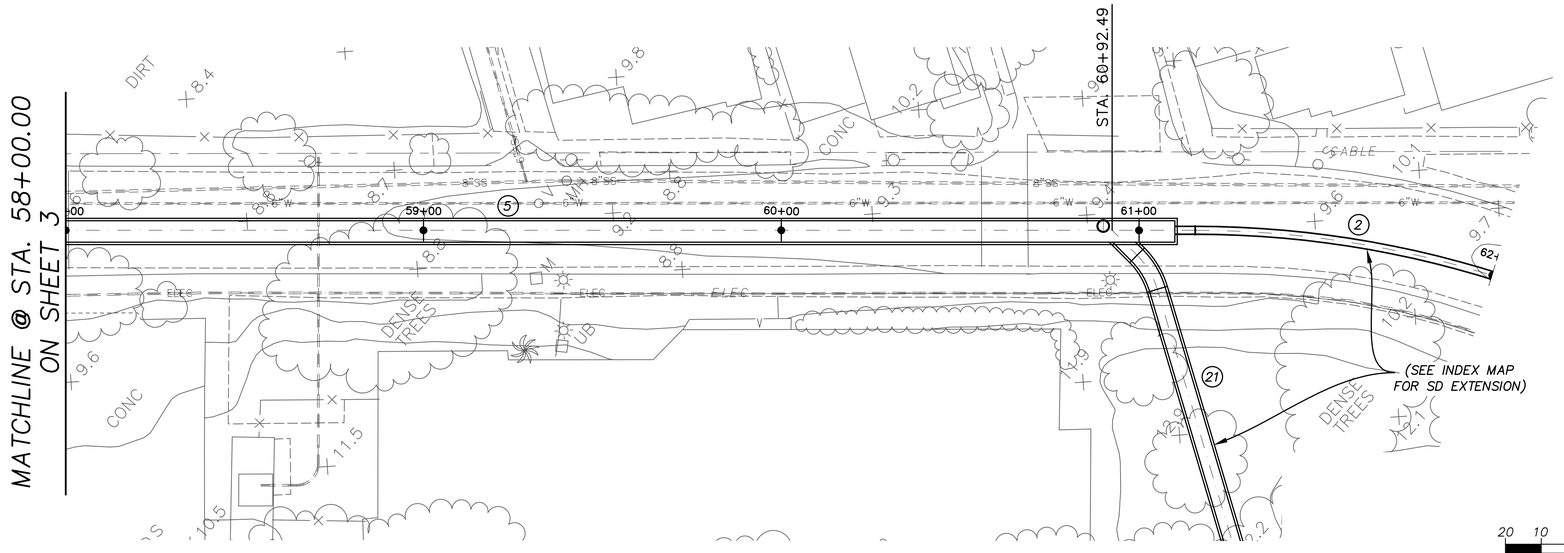
(5) — CONSTRUCT SINGLE 6'(W) x 2'(H) REINFORCED CONCRETE BOX.

(17) — CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.

(19) — CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.

(21) — CONSTRUCT SINGLE 4.5'(W) x 2'(H) REINFORCED CONCRETE BOX.

(33) — CONSTRUCT JUNCTION STRUCTURE - RCB TO RCB.



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5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.

8TH ST.

20 10 0 20 40
SCALE IN FEET
1 inch = 20 ft

REGISTERED PROFESSIONAL ENGINEER
MINGAN JUAN YING
No. C038983
Exp. 3/31/19
CIVIL
STATE OF CALIFORNIA

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ELECTRIC AVENUE (Phase #6)

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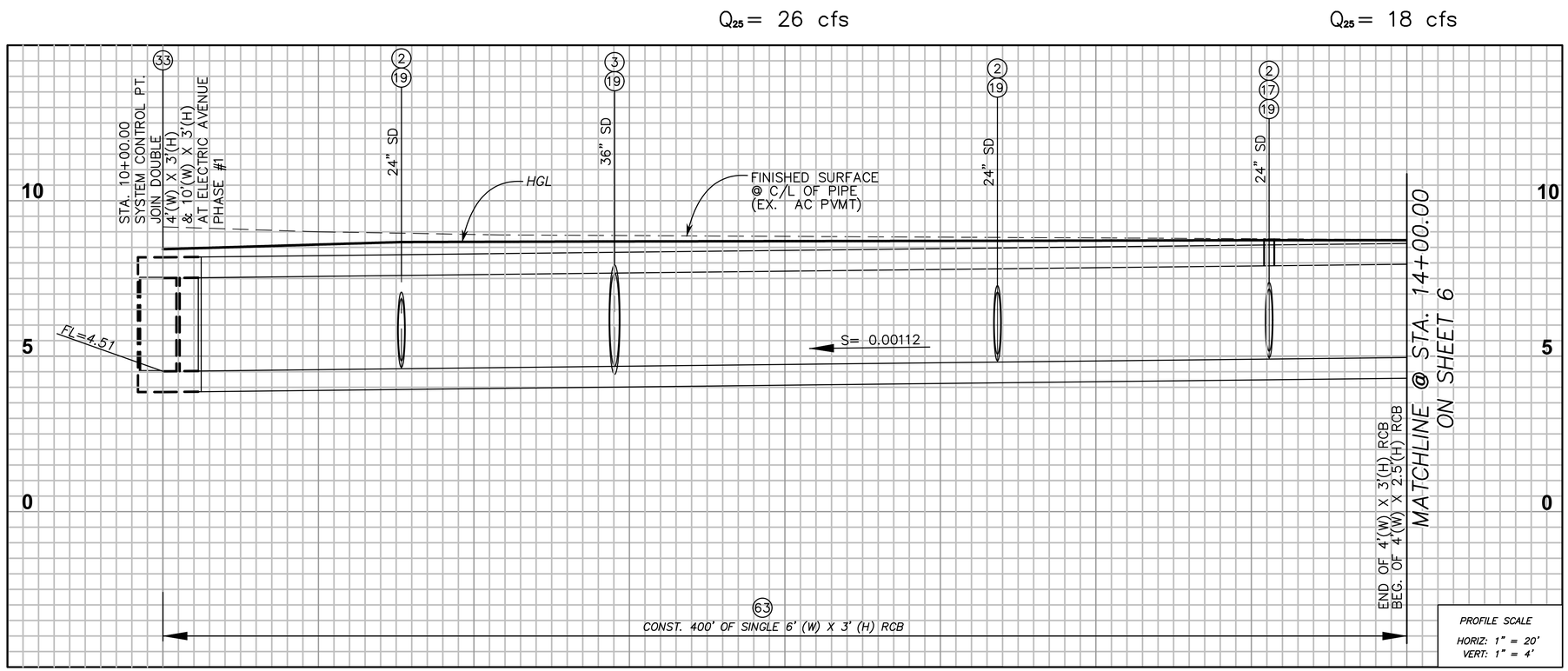
PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

TITLE:
ELECTRIC AVENUE
PHASE #6 IMPROVEMENTS

STA. 58+00 TO STA. 62+00



STORM DRAIN CONSTRUCTION NOTES

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(3) — CONSTRUCT 36-INCH RCP (D-LOAD PER PROFILE).
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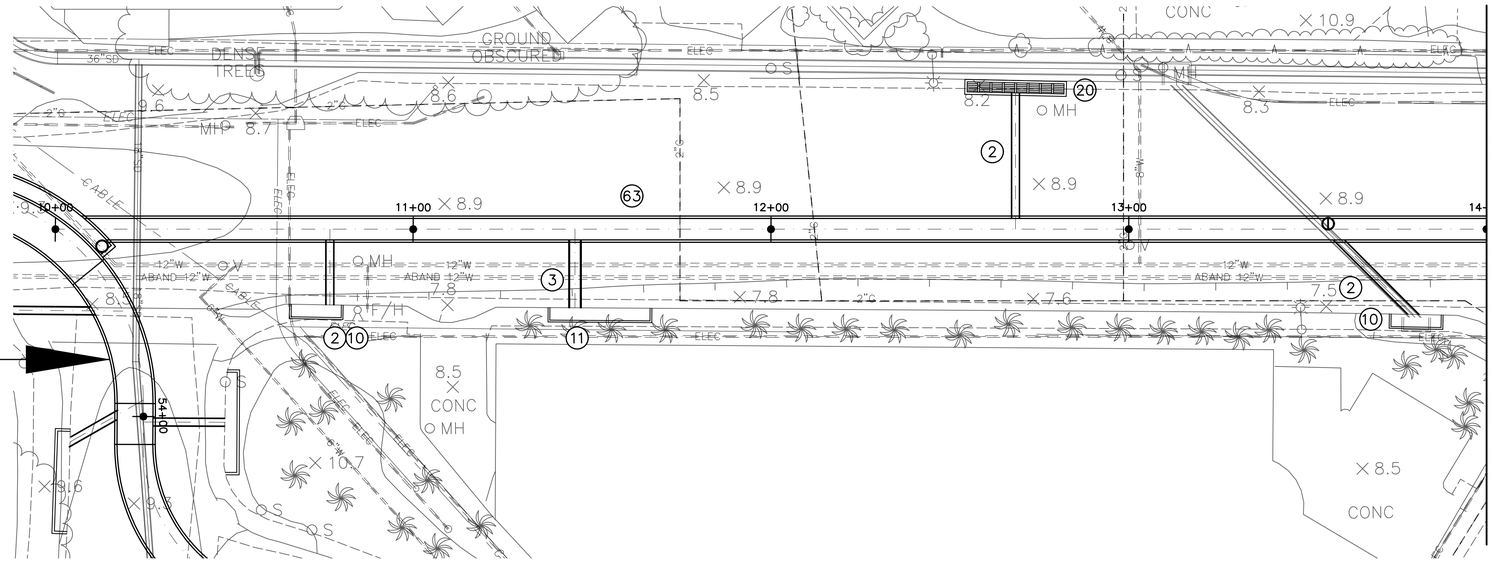
(19) — CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.
(20) — CONSTRUCT 8-GRATING CATCH BASIN - ALLEY (LOMGITUDINAL) PER SPPWC STD. PLAN NO. 304-3.
(33) — CONSTRUCT JUNCTION STRUCTURE - RCB TO RCB.
(63) — CONSTRUCT SINGLE 6'(W) x 3'(H) REINFORCED CONCRETE BOX.



PHASE #1
SD
(SEE SHT. 2)

ELECTRIC AVENUE

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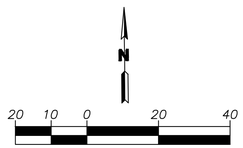
5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.



REGISTERED PROFESSIONAL ENGINEER
MORGAN JUAN YING
No. C038983
Exp. 3/31/19
CIVIL
STATE OF CALIFORNIA

PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

TITLE:
MARINA DRIVE
PHASE #1 IMPROVEMENTS

STA. 10+00 TO STA. 14+00

SHT. 5 OF 16

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MARINA DRIVE (PHASE #1)

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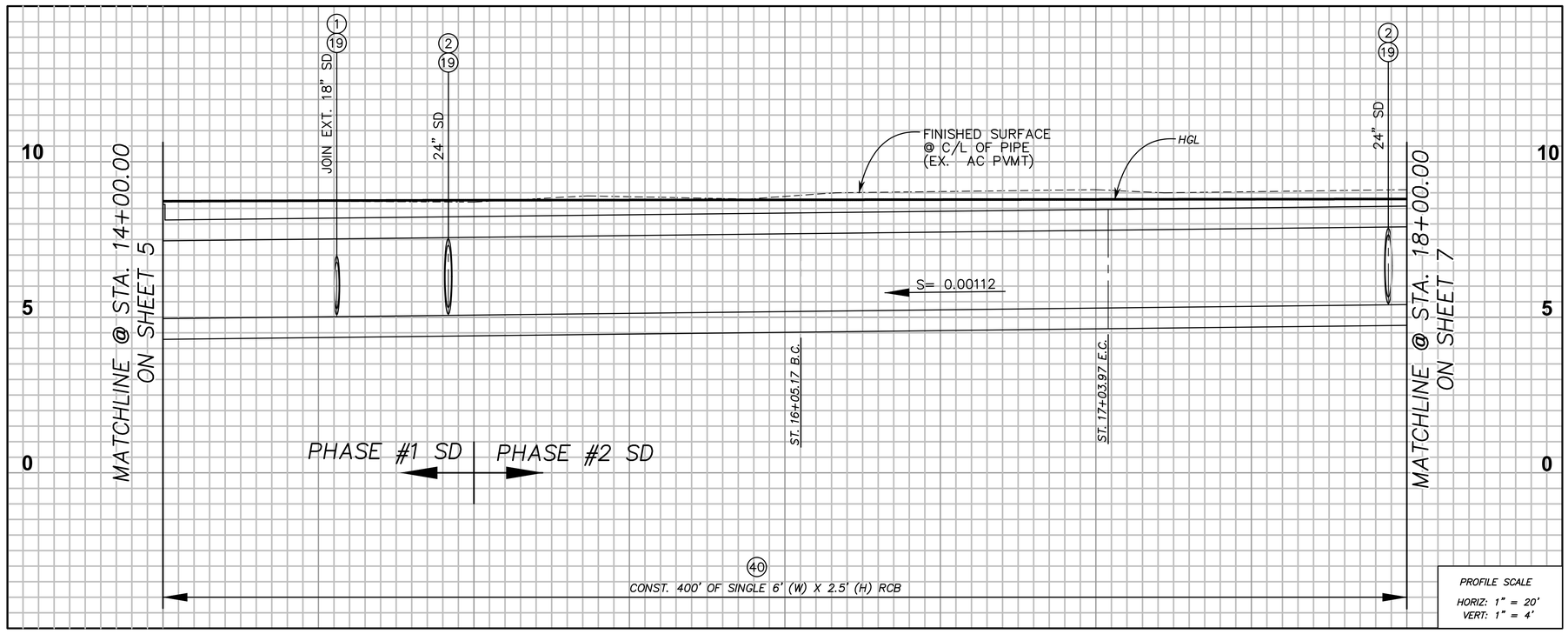

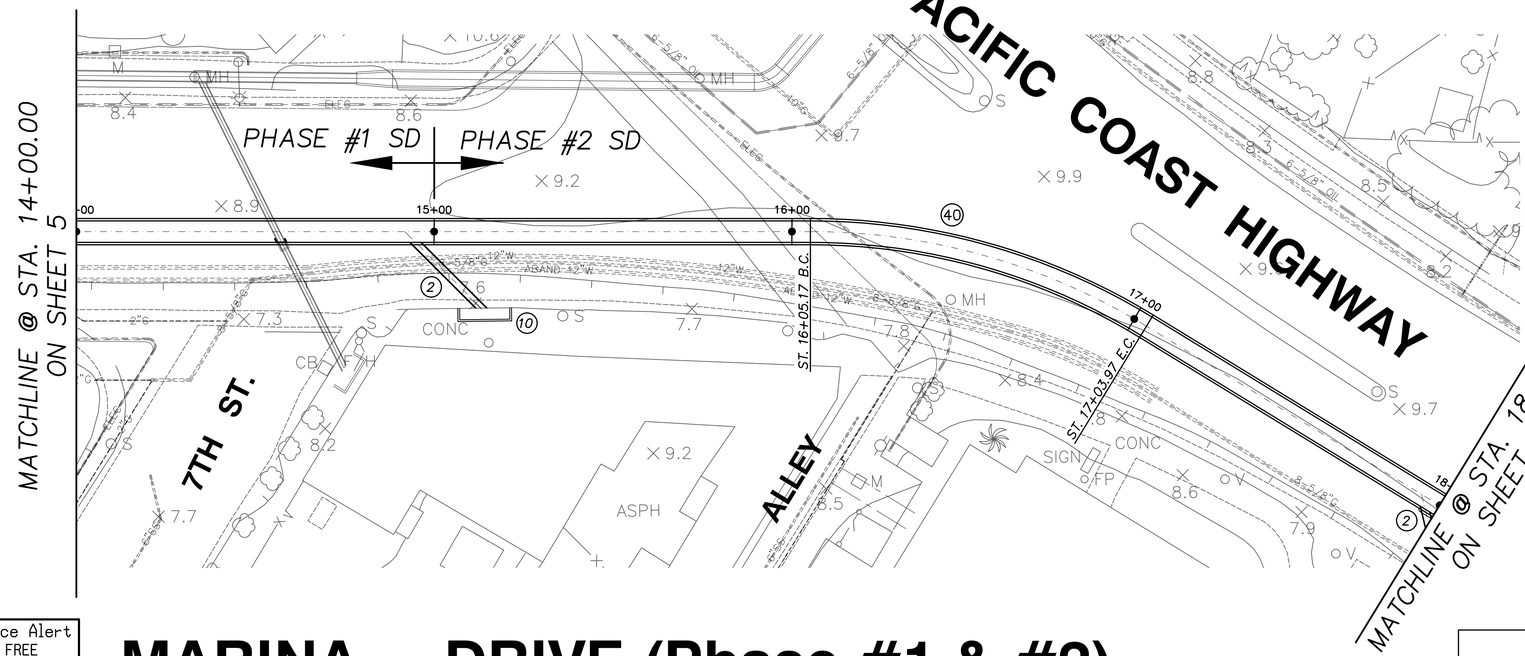

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(10) — CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=14'.
(19) — CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.
(40) — CONSTRUCT SINGLE 6'(W) x 2.5'(H) REINFORCED CONCRETE BOX.

GENERAL NOTES:

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REGISTERED PROFESSIONAL ENGINEER
MORGAN JUAN TYING
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CIVIL
STATE OF CALIFORNIA

N

20 10 0 20 40
SCALE IN FEET
1 inch = 20 ft

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MARINA DRIVE (Phase #1 & #2)

NOT FOR CONSTRUCTION

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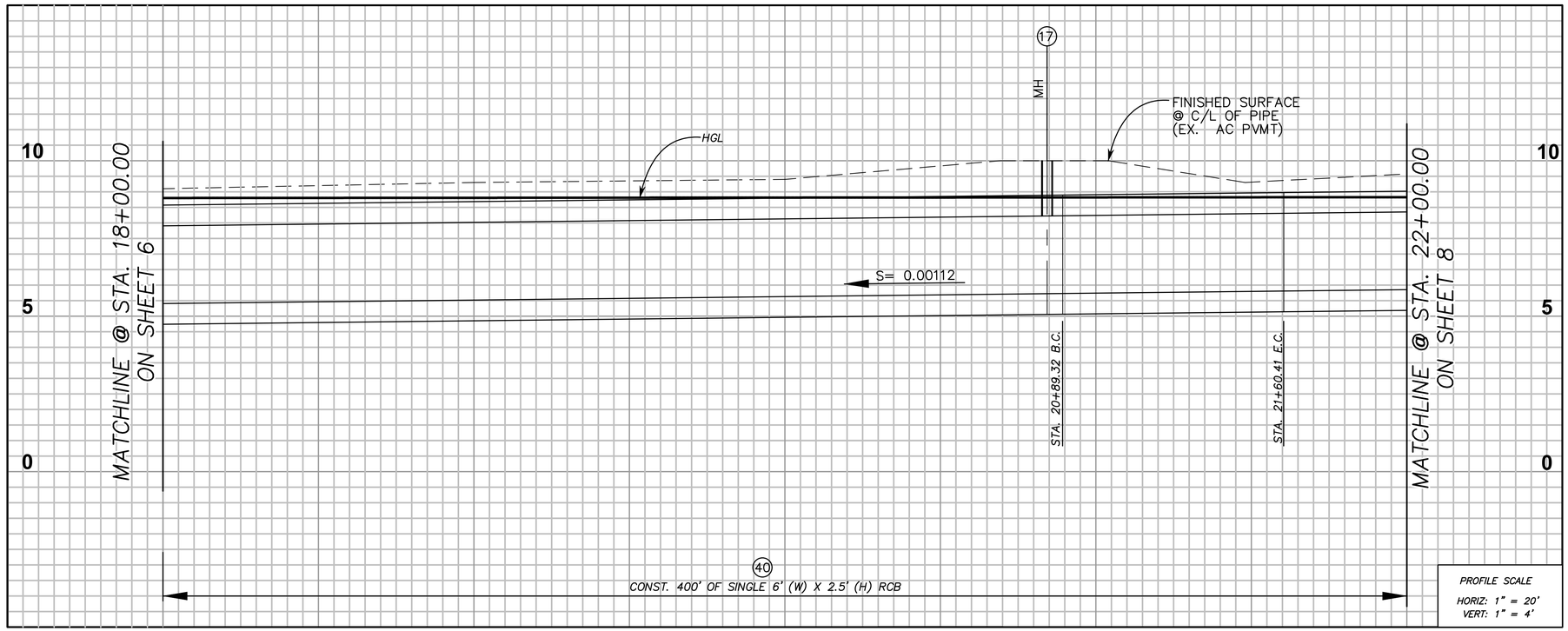
PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

CITY OF SEAL BEACH INCORPORATED ORANGE COUNTY, CALIFORNIA

TITLE:
MARINA DRIVE / PACIFIC COAST HIGHWAY
PHASE #1 AND #2 IMPROVEMENTS

STA. 14+00 TO STA. 18+00

Q_{25} = 10.5 cfs



STORM DRAIN CONSTRUCTION NOTES

NOTE: 1) ALL CURB OPENING CATCH BASINS SHALL BE EQUIPPED WITH AUTOMATIC RETRACTABLE SCREEN AND INSERTED FILTER. STORMWATER BIO-TREATMENT DEVICE; SUCH AS FILTERRA BIO-RETENTION FILTRATION SYSTEM (OR APPROVED EQUIVALENT) SHALL BE CONSTRUCTED ADJACENT TO A CATCH BASIN PER PLAN AND PER CITY APPROVAL. THE SPECIFIC LOCATION OF BIO-SYSTEM SHALL BE APPROVED BY THE CITY DURING CONSTRUCTION.
2) WALL THICKNESS (t_F) ON CATCH BASIN SHALL BE 8-INCH MINIMUM. THE "F" OR "T" VALUES AT MANHOLE OR JUNCTION/TRANSITION STRUCTURES SHALL BE PER PLAN.

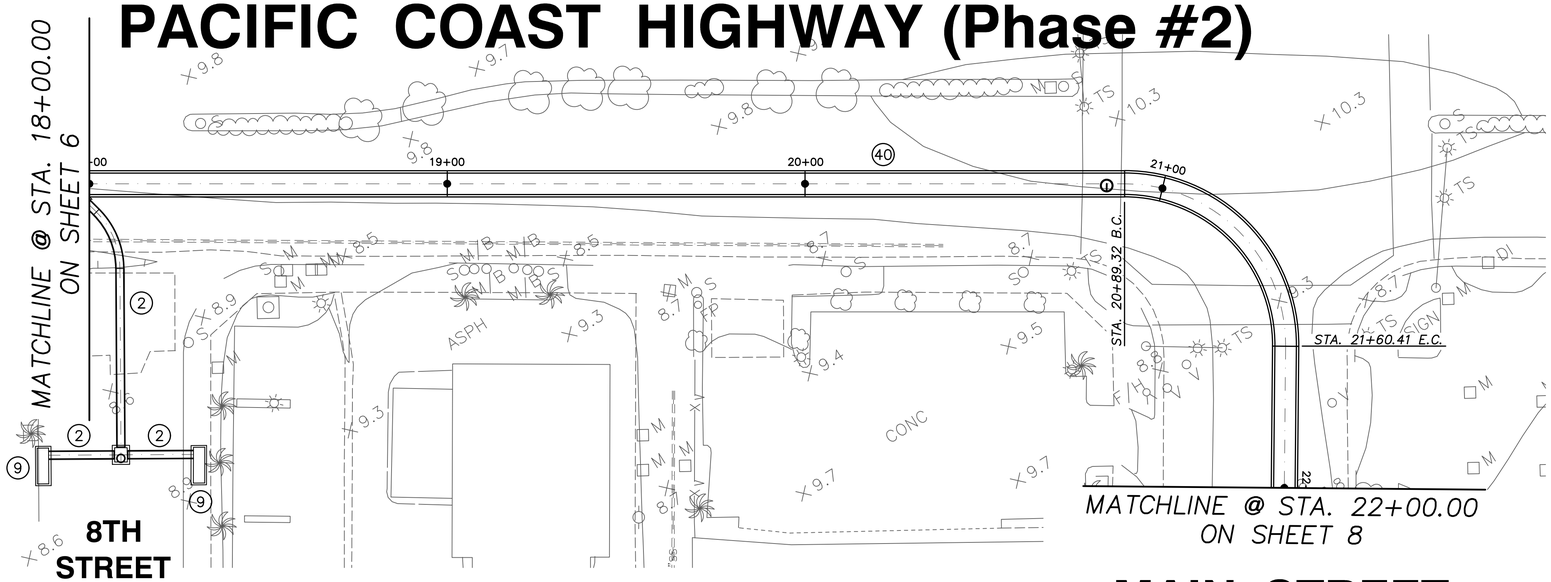
(2) — CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).

(9) — CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=10'.

(17) — CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.

(40) — CONSTRUCT SINGLE 6'(W) x 2.5'(H) REINFORCED CONCRETE BOX.

PACIFIC COAST HIGHWAY (Phase #2)



MAIN STREET

GENERAL NOTES:

THE PROPOSED DRAINAGE IMPROVEMENTS PRESENTED HEREIN ARE SHALLOW AND CONSIST PRIMARILY OF REINFORCED CONCRETE BOX. THIS PRELIMINARY DESIGN IS BASED ON THE BEST INFORMATION AVAILABLE, CONSISTING OF CITY AS-BUILT PLANS, UTILITY OWNERS' PLANS, AND SEWER MANHOLE SURVEY DATA.

1). DUE TO THE FACT OF SHALLOW DEPTH OF PUBLIC UTILITIES; SUCH AS GAS, WATER, SEWER, CABLE, TELEPHONE, ELECTRIC, ETC., COORDINATION WITH THE RESPECTIVE UTILITY OWNERS MUST BE CONDUCTED DURING THE FINAL DESIGN STAGE.

2). THE PROPOSED STORM DRAIN SYSTEM PRELIMINARY PRESENTED HEREIN IS CONTROLLED BY THE EXISTING WEST END PUMP STATION MAXIMUM CAPACITY OF ABOUT 205 CFS.

3). SEVERAL STREET LOW POINTS AT ELECTRIC AVENUE, MARINA DRIVE, 5TH STREET, COASTLINE DRIVE, AND PACIFIC COAST HIGHWAY CONTROL THE SIZE AND THE SLOPE OF THE PROPOSED DRAINAGE SYSTEM.

4). THE EXISTING SEWERS AT THE PROPOSED DRAINAGE SYSTEM CROSSINGS SHALL BE PROTECTED IN PLACE. THE EXISTING SEWER SYSTEM WAS CONSTRUCTED IN SHALLOW DEPTH, IT IS EXPECTED THAT SEWER LATERAL (HOUSE CONNECTION) CROSSINGS OF THE PROPOSED STORM DRAIN SYSTEM WILL BE RECONSTRUCTED, PER SPPWC STD. PLAN NO. 223-2.

5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.

REGISTERED PROFESSIONAL ENGINEER
MORGAN JUAN YING
No. C038983
Exp. 3/31/19
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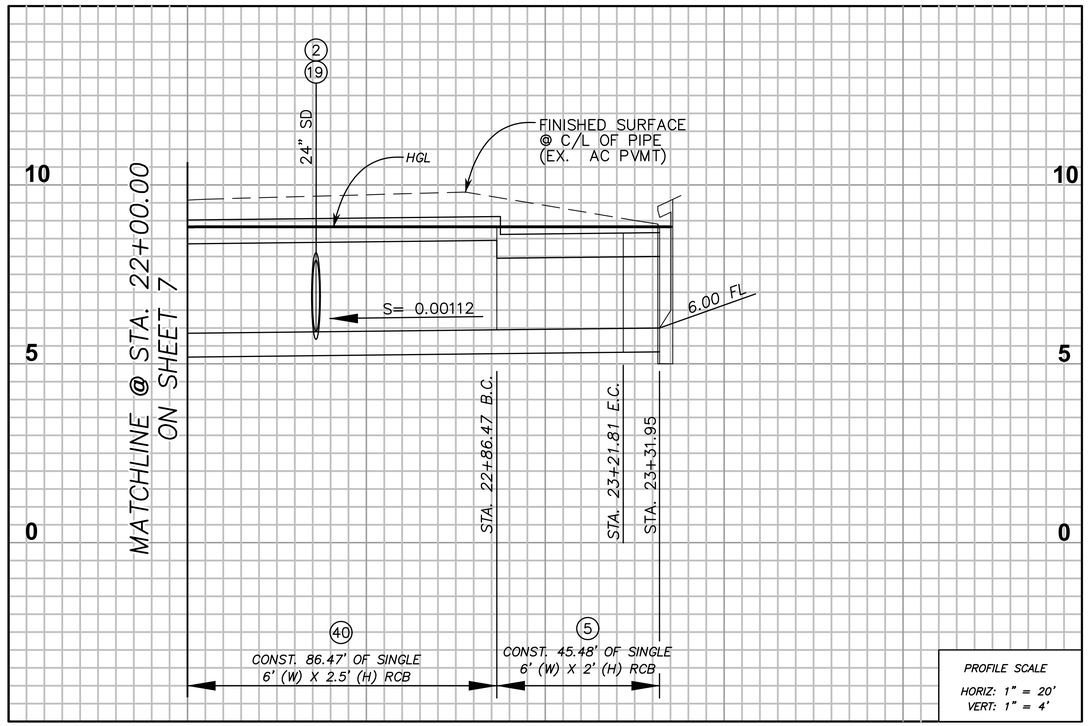
PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

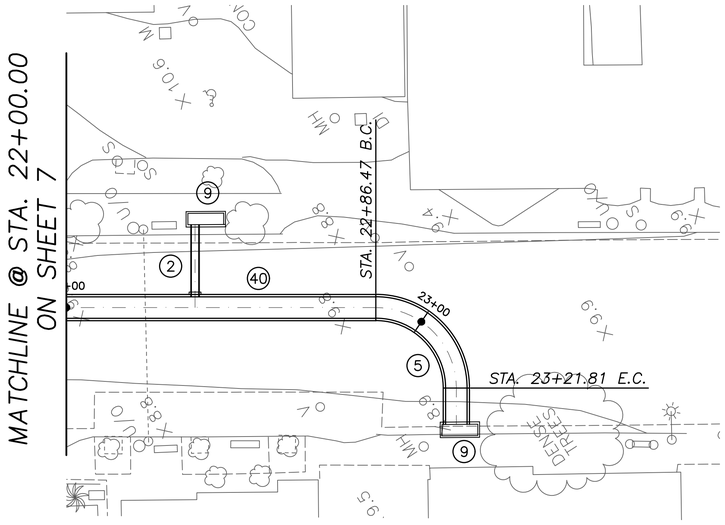
CITY OF SEAL BEACH INCORPORATED AUGUST 22, 1915 ORANGE COUNTY, CALIFORNIA

TITLE:
PACIFIC COAST HIGHWAY / MAIN STREET
PHASE #2 IMPROVEMENTS

STA. 18+00 TO STA. 22+00

Q_{25} = 10.5 cfs





MAIN STREET

STORM DRAIN CONSTRUCTION NOTES

NOTE: 1) ALL CURB OPENING CATCH BASINS SHALL BE EQUIPPED WITH AUTOMATIC RETRACTABLE SCREEN AND INSERTED FILTER. STORMWATER BIO-TREATMENT DEVICE; SUCH AS FILTERRA BIO-RETENTION FILTRATION SYSTEM (OR APPROVED EQUIVALENT) SHALL BE CONSTRUCTED ADJACENT TO A CATCH BASIN PER PLAN AND PER CITY APPROVAL. THE SPECIFIC LOCATION OF BIO-SYSTEM SHALL BE APPROVED BY THE CITY DURING CONSTRUCTION.
2) WALL THICKNESS (t_F) ON CATCH BASIN SHALL BE 8-INCH MINIMUM. THE "F" OR "T" VALUES AT MANHOLE OR JUNCTION/TRANSITION STRUCTURES SHALL BE PER PLAN.

(2) — CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).

(5) — CONSTRUCT SINGLE 6'(W) x 2'(H) REINFORCED CONCRETE BOX.

(9) — CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=10'.

(19) — CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.

(40) — CONSTRUCT SINGLE 6'(W) x 2.5'(H) REINFORCED CONCRETE BOX.

GENERAL NOTES:

THE PROPOSED DRAINAGE IMPROVEMENTS PRESENTED HEREIN ARE SHALLOW AND CONSIST PRIMARILY OF REINFORCED CONCRETE BOX. THIS PRELIMINARY DESIGN IS BASED ON THE BEST INFORMATION AVAILABLE, CONSISTING OF CITY AS-BUILT PLANS, UTILITY OWNERS' PLANS, AND SEWER MANHOLE SURVEY DATA.

1). DUE TO THE FACT OF SHALLOW DEPTH OF PUBLIC UTILITIES; SUCH AS GAS, WATER, SEWER, CABLE, TELEPHONE, ELECTRIC, ETC., COORDINATION WITH THE RESPECTIVE UTILITY OWNERS MUST BE CONDUCTED DURING THE FINAL DESIGN STAGE.

2). THE PROPOSED STORM DRAIN SYSTEM PRELIMINARY PRESENTED HEREIN IS CONTROLLED BY THE EXISTING WEST END PUMP STATION MAXIMUM CAPACITY OF ABOUT 205 CFS.

3). SEVERAL STREET LOW POINTS AT ELECTRIC AVENUE, MARINA DRIVE, 5TH STREET, COASTLINE DRIVE, AND PACIFIC COAST HIGHWAY CONTROL THE SIZE AND THE SLOPE OF THE PROPOSED DRAINAGE SYSTEM.

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5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.

REGISTERED PROFESSIONAL ENGINEER
MORGAN JUAN YING
No. C038983
Exp. 3/31/19
CIVIL
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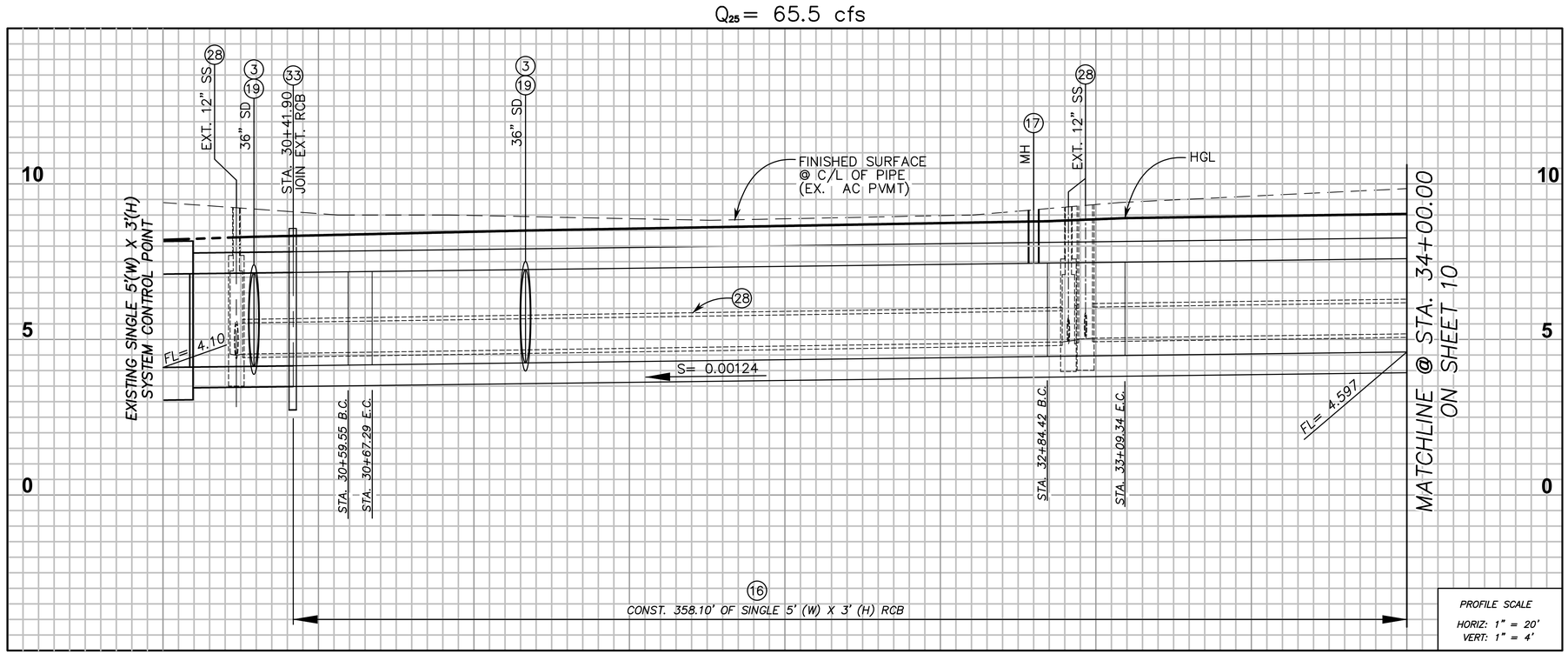
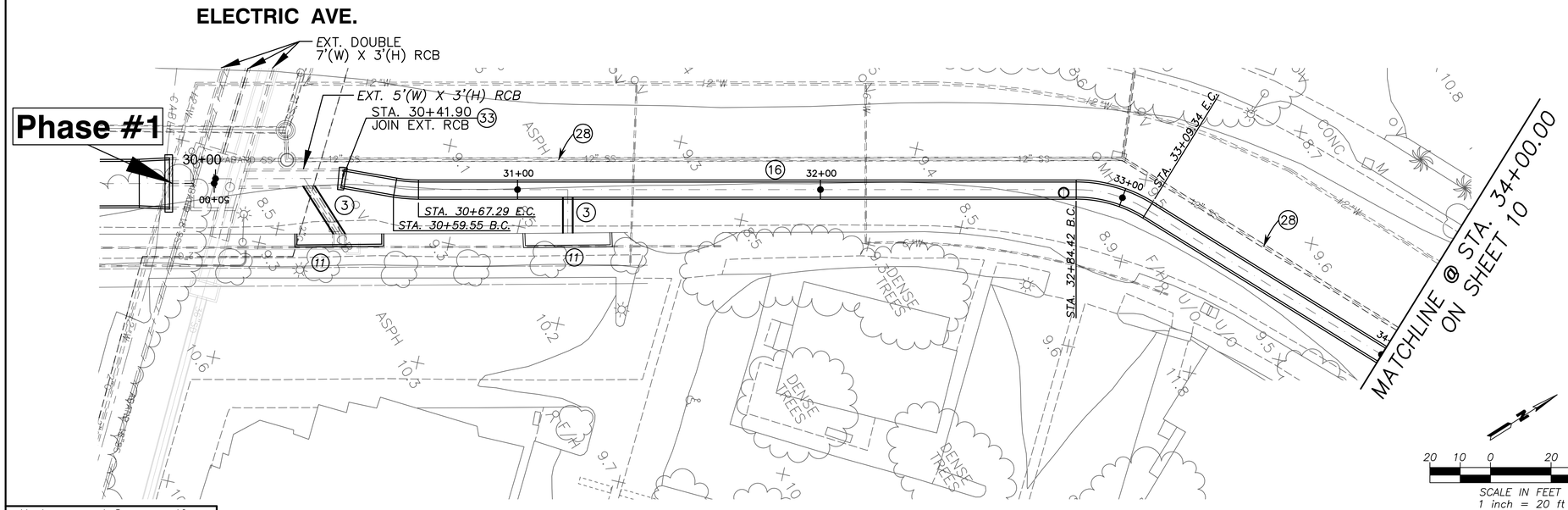
PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

CITY OF SEAL BEACH INCORPORATED AUGUST 22, 1915 ORANGE COUNTY, CALIFORNIA

TITLE:
MAIN STREET
PHASE #2 IMPROVEMENTS

STA. 22+00 TO STA. 24+00





STORM DRAIN CONSTRUCTION NOTES

NOTE: 1) ALL CURB OPENING CATCH BASINS SHALL BE EQUIPPED WITH AUTOMATIC RETRACTABLE SCREEN AND INSERTED FILTER. STORMWATER BIO-TREATMENT DEVICE; SUCH AS FILTERRA BIO-RETENTION FILTRATION SYSTEM (OR APPROVED EQUIVALENT) SHALL BE CONSTRUCTED ADJACENT TO A CATCH BASIN PER PLAN AND PER CITY APPROVAL. THE SPECIFIC LOCATION OF BIO-SYSTEM SHALL BE APPROVED BY THE CITY DURING CONSTRUCTION.
2) WALL THICKNESS (t_F) ON CATCH BASIN SHALL BE 8-INCH MINIMUM. THE "F" OR "T" VALUES AT MANHOLE OR JUNCTION/TRANSITION STRUCTURES SHALL BE PER PLAN.

(3) — CONSTRUCT 36-INCH RCP (D-LOAD PER PROFILE).

(11) — CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=28'.

(16) — CONSTRUCT SINGLE 5'(W) x 3'(H) REINFORCED CONCRETE BOX.

(17) — CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.

(19) — CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.

(28) — PROTECT EXISTING SEWER FACILITY IN PLACE.

(33) — CONSTRUCT JUNCTION STRUCTURE - RCB TO RCB.

GENERAL NOTES:

THE PROPOSED DRAINAGE IMPROVEMENTS PRESENTED HEREIN ARE SHALLOW AND CONSIST PRIMARILY OF REINFORCED CONCRETE BOX. THIS PRELIMINARY DESIGN IS BASED ON THE BEST INFORMATION AVAILABLE, CONSISTING OF CITY AS-BUILT PLANS, UTILITY OWNERS' PLANS, AND SEWER MANHOLE SURVEY DATA.

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5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.

REGISTERED PROFESSIONAL ENGINEER
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FIFTH STREET (Phase #3)

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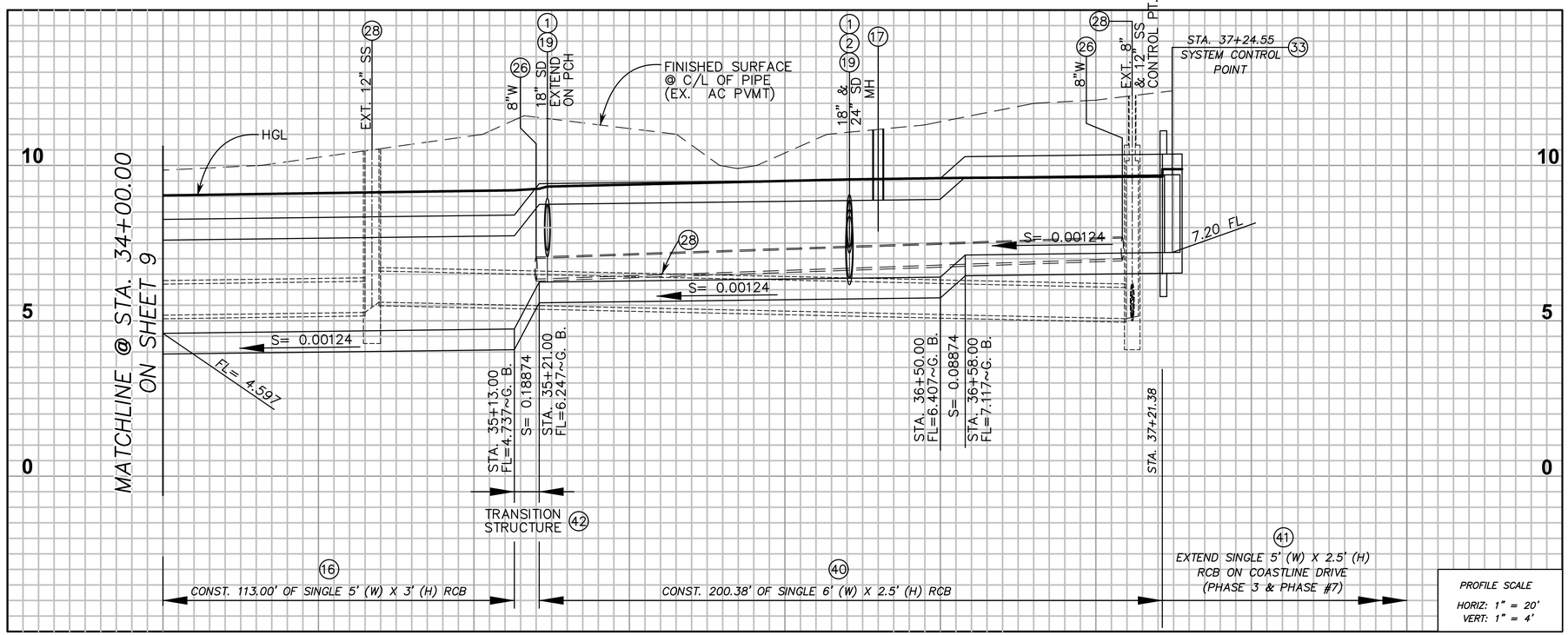
PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

TITLE:
5TH STREET
PHASE #3 IMPROVEMENTS

STA. 30+00 TO STA. 34+00

Q_{25} = 65.5 cfs



STORM DRAIN CONSTRUCTION NOTES

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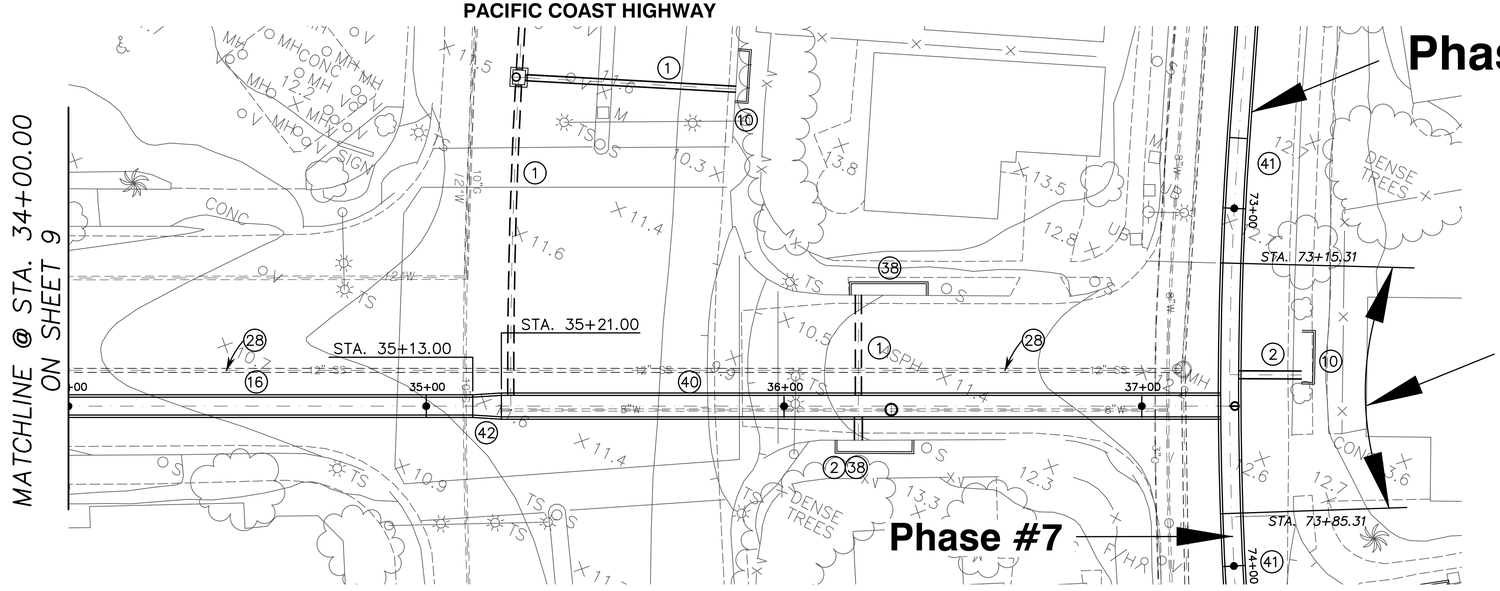
(1) CONSTRUCT 18-INCH RCP (D-LOAD PER PROFILE).
(2) CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).
(10) CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=14'.
(16) CONSTRUCT SINGLE 5'(W) x 3'(H) REINFORCED CONCRETE BOX.
(17) CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.
(19) CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.
(26) REMOVE AND RECONSTRUCT WATER LINE PER CITY WATER PLANS.
(33) CONSTRUCT JUNCTION STRUCTURE - RCB TO RCB.
(38) CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=21'.
(40) CONSTRUCT SINGLE 6'(W) x 2.5'(H) REINFORCED CONCRETE BOX.
(41) CONSTRUCT SINGLE 5'(W) x 2.5'(H) REINFORCED CONCRETE BOX.
(42) CONSTRUCT TRANSITION STRUCTURE SINGLE RCB TO SINGLE RCB PER SPPWC STD. PLAN NO. 341-2.



GENERAL NOTES:

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2). THE PROPOSED STORM DRAIN SYSTEM PRELIMINARY PRESENTED HEREIN IS CONTROLLED BY THE EXISTING WEST END PUMP STATION MAXIMUM CAPACITY OF ABOUT 205 CFS.

3). SEVERAL STREET LOW POINTS AT ELECTRIC AVENUE, MARINA DRIVE, 5TH STREET, COASTLINE DRIVE, AND PACIFIC COAST HIGHWAY CONTROL THE SIZE AND THE SLOPE OF THE PROPOSED DRAINAGE SYSTEM.

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5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.

SCALE IN FEET
1 inch = 20 ft

REGISTERED PROFESSIONAL ENGINEER
MORGAN JUAN YING
No. C038983
Exp. 3/31/19
CIVIL
STATE OF CALIFORNIA

PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

TITLE:
5TH STREET
PHASE #3 IMPROVEMENTS
STA. 34+00 TO STA. 38+00

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FIFTH STREET (Phase #3)

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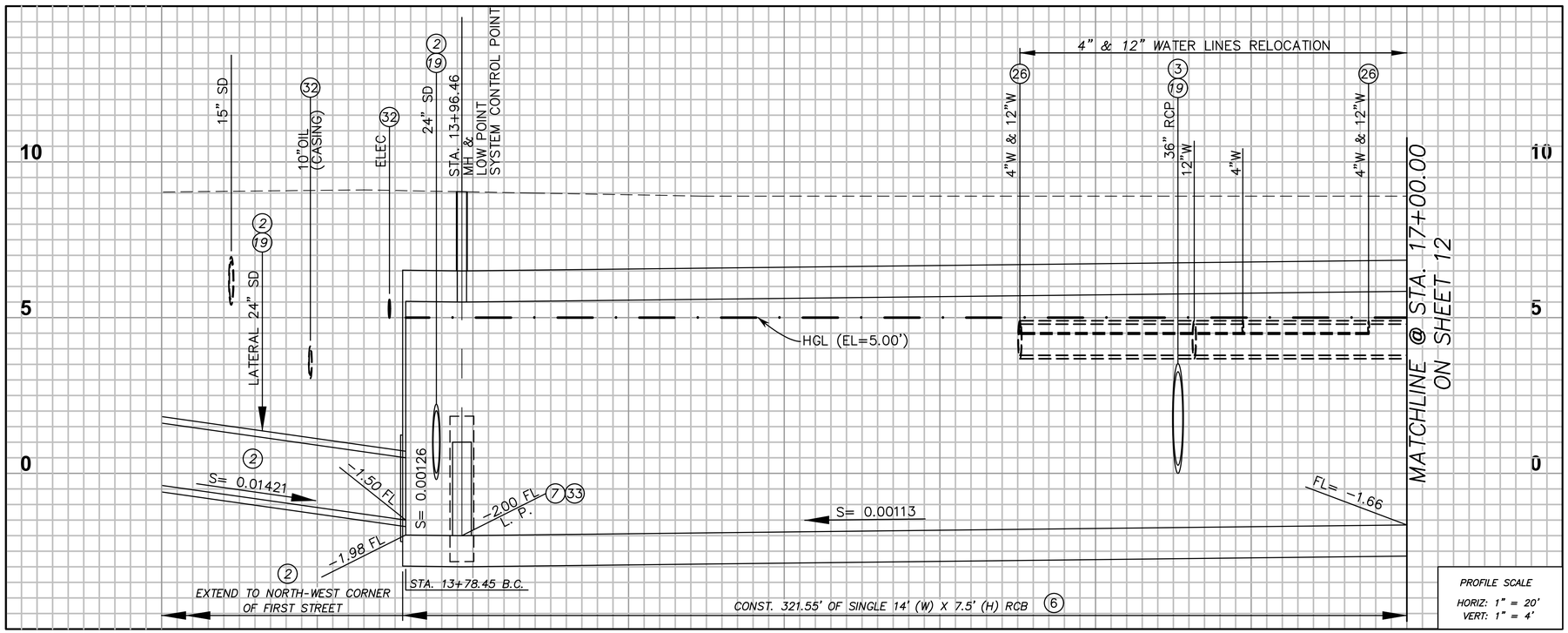

STORM DRAIN CONSTRUCTION NOTES

NOTE: 1) ALL CURB OPENING CATCH BASINS SHALL BE EQUIPPED WITH AUTOMATIC RETRACTABLE SCREEN AND INSERTED FILTER. STORMWATER BIO-TREATMENT DEVICE; SUCH AS FILTERRA BIO-RETENTION FILTRATION SYSTEM (OR APPROVED EQUIVALENT) SHALL BE CONSTRUCTED ADJACENT TO A CATCH BASIN PER PLAN AND PER CITY APPROVAL. THE SPECIFIC LOCATION OF BIO-SYSTEM SHALL BE APPROVED BY THE CITY DURING CONSTRUCTION.
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(2) — CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).
(3) — CONSTRUCT 36-INCH RCP (D-LOAD PER PROFILE).
(6) — CONSTRUCT SINGLE 14'(W) x 7.5'(H) REINFORCED CONCRETE BOX.
(7) — CONSTRUCT SINGLE 6'(W) x 6'(H) REINFORCED CONCRETE BOX.
(17) — CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.
(19) — CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.
(26) — REMOVE AND RECONSTRUCT WATER LINE PER CITY WATER PLANS.
(32) — COORDINATE RELOCATING OF EXISTING UTILITIES BY THEIR RESPECTIVE OWNERS, AND CONDUCT POTHOLING TO VERIFY THE UTILITY'S LOCATION, MATERIAL, AND DEPTH.
(33) — CONSTRUCT JUNCTION STRUCTURE - RCB TO RCB.
(38) — CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=21'.
(39) — CONSTRUCT 30-INCH RCP (D-LOAD PER PROFILE).

PROFILE SCALE
HORIZ: 1" = 20'
VERT: 1" = 4'

GENERAL NOTES:

THE PROPOSED DRAINAGE IMPROVEMENTS PRESENTED HEREIN ARE SHALLOW AND CONSIST PRIMARILY OF REINFORCED CONCRETE BOX. THIS PRELIMINARY DESIGN IS BASED ON THE BEST INFORMATION AVAILABLE, CONSISTING OF CITY AS-BUILT PLANS, UTILITY OWNERS' PLANS, AND SEWER MANHOLE SURVEY DATA.

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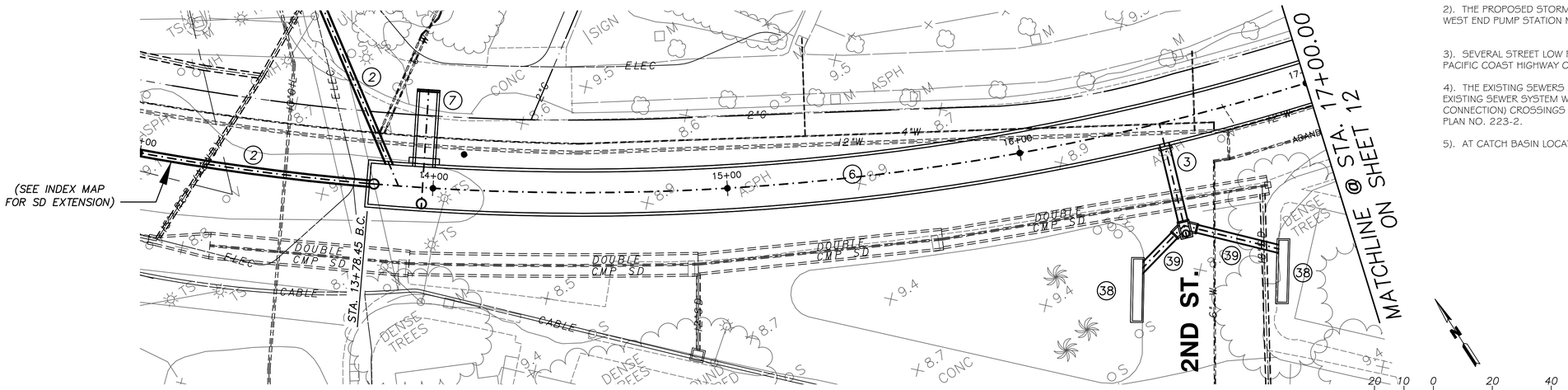
5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.

FIRST STREET



REGISTERED PROFESSIONAL ENGINEER
MINGAN JUAN TYING
No. C038983
Exp. 3/31/19
CIVIL
STATE OF CALIFORNIA

PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS FOCUSED STUDY

TITLE:
MARINA DRIVE
PHASE #4 IMPROVEMENTS
STA. 13+00 TO STA. 17+00

SHT. 11 OF 16

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MARINA DRIVE (PHASE #4)

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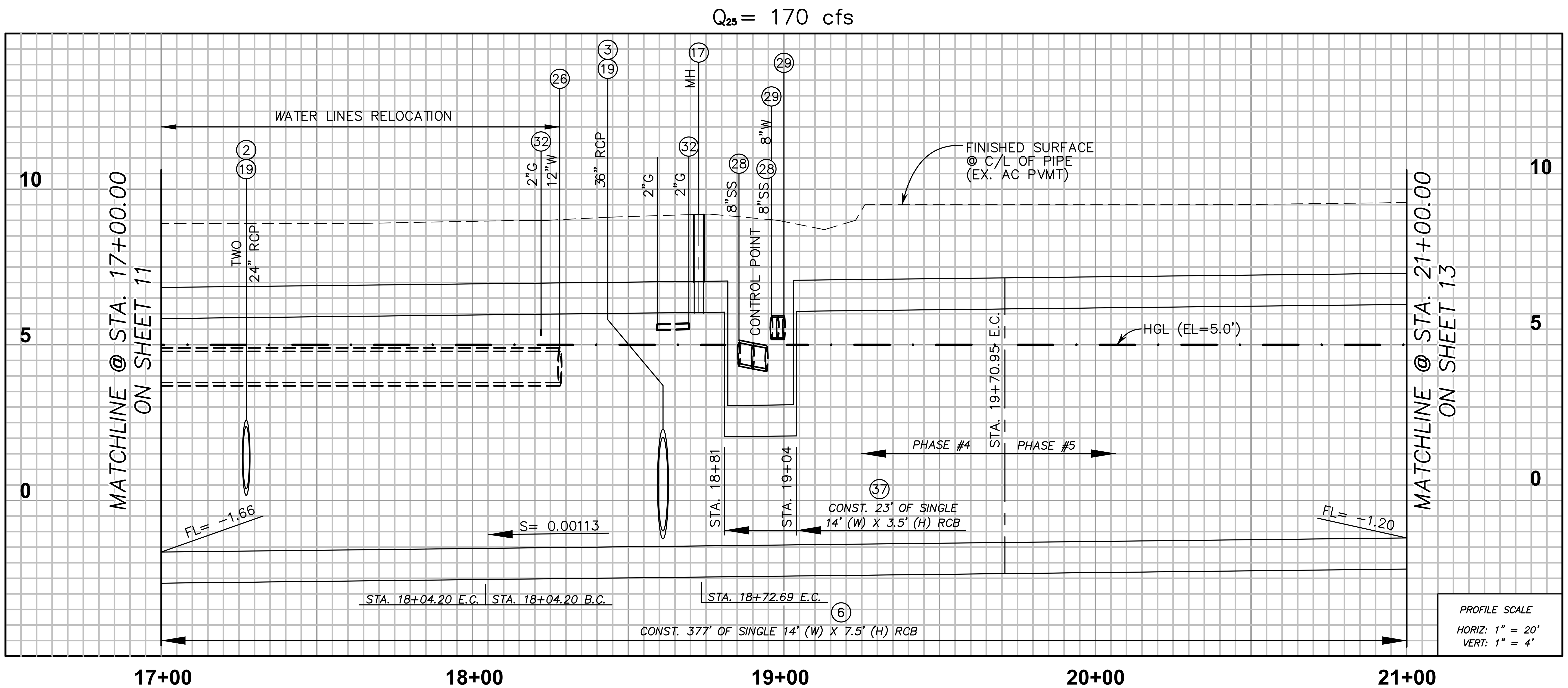

STORM DRAIN CONSTRUCTION NOTES

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(2) CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).

(3) CONSTRUCT 36-INCH RCP (D-LOAD PER PROFILE).

(6) CONSTRUCT SINGLE 14'(W) x 7.5'(H) REINFORCED CONCRETE BOX.

(9) CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=10'.

(10) CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=14'.

(17) CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.

(19) CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.

(26) REMOVE AND RECONSTRUCT WATER LINE PER CITY WATER PLANS.

(28) PROTECT EXISTING SEWER FACILITY IN PLACE.

(29) PROTECT EXISTING WATER FACILITY IN PLACE.

(32) COORDINATE RELOCATION OF EXISTING UTILITIES BY THEIR RESPECTIVE OWNERS, AND CONDUCT POTHOLING TO VERIFY THE UTILITY'S LOCATION, MATERIAL, AND DEPTH.

(37) CONSTRUCT SINGLE 14'(W) x 3.5'(H) REINFORCED CONCRETE BOX.

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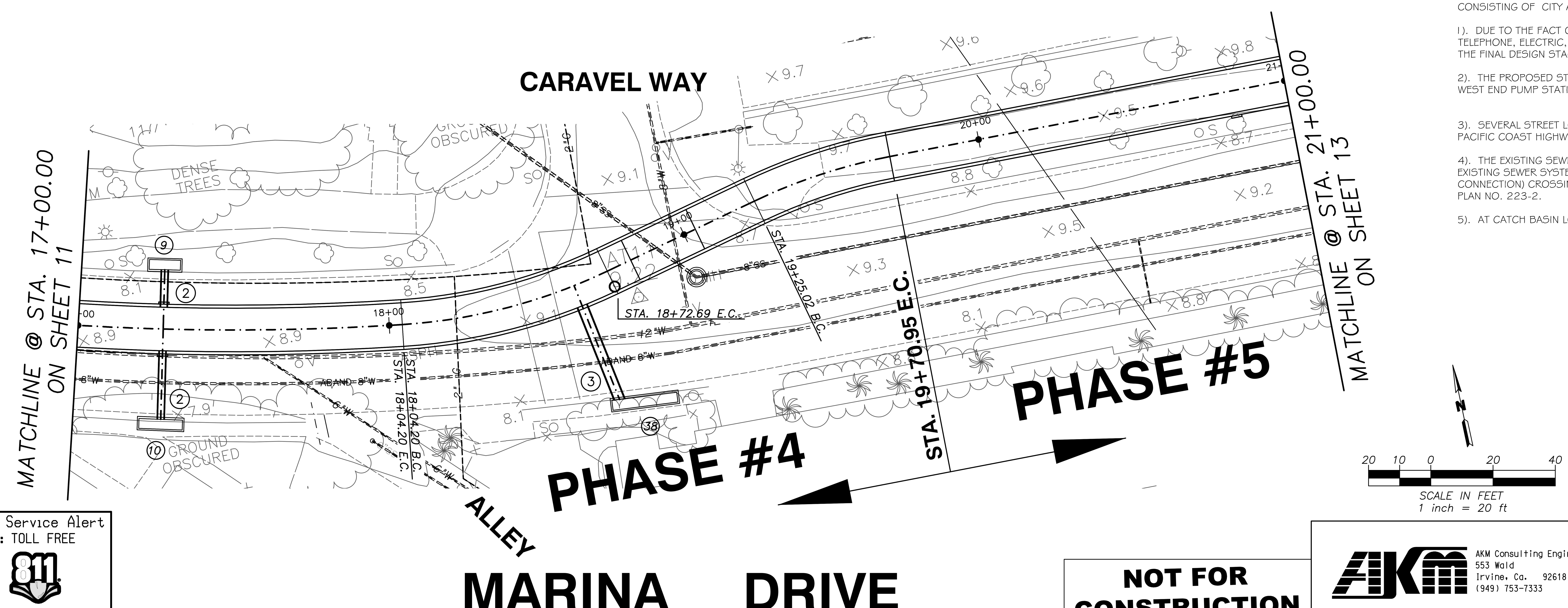
2). THE PROPOSED STORM DRAIN SYSTEM PRELIMINARY PRESENTED HEREIN IS CONTROLLED BY THE EXISTING WEST END PUMP STATION MAXIMUM CAPACITY OF ABOUT 205 CFS.

3). SEVERAL STREET LOW POINTS AT ELECTRIC AVENUE, MARINA DRIVE, 5TH STREET, COASTLINE DRIVE, AND PACIFIC COAST HIGHWAY CONTROL THE SIZE AND THE SLOPE OF THE PROPOSED DRAINAGE SYSTEM.

4). THE EXISTING SEWERS AT THE PROPOSED DRAINAGE SYSTEM CROSSINGS SHALL BE PROTECTED IN PLACE. THE EXISTING SEWER SYSTEM WAS CONSTRUCTED IN SHALLOW DEPTH, IT IS EXPECTED THAT SEWER LATERAL (HOUSE CONNECTION) CROSSINGS OF THE PROPOSED STORM DRAIN SYSTEM WILL BE RECONSTRUCTED, PER SPPWC STD. PLAN NO. 223-2.

5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.



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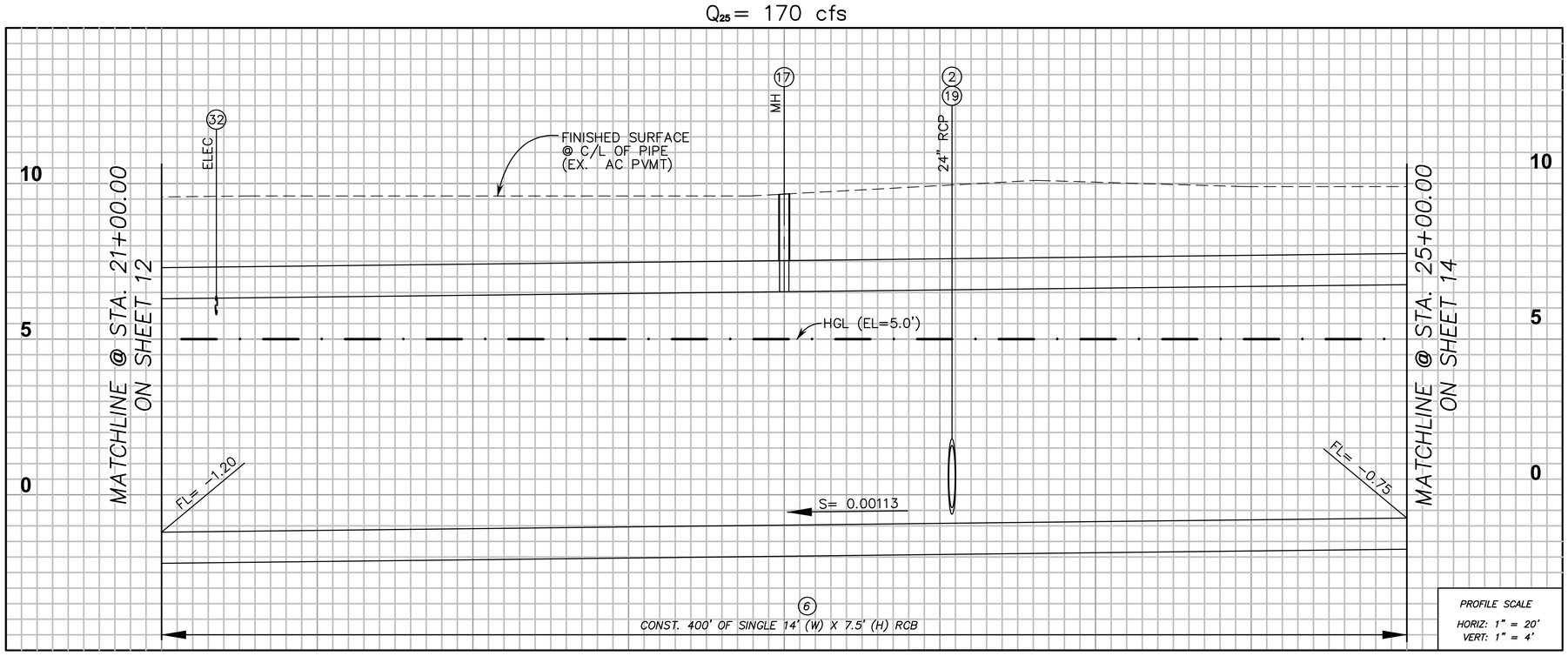
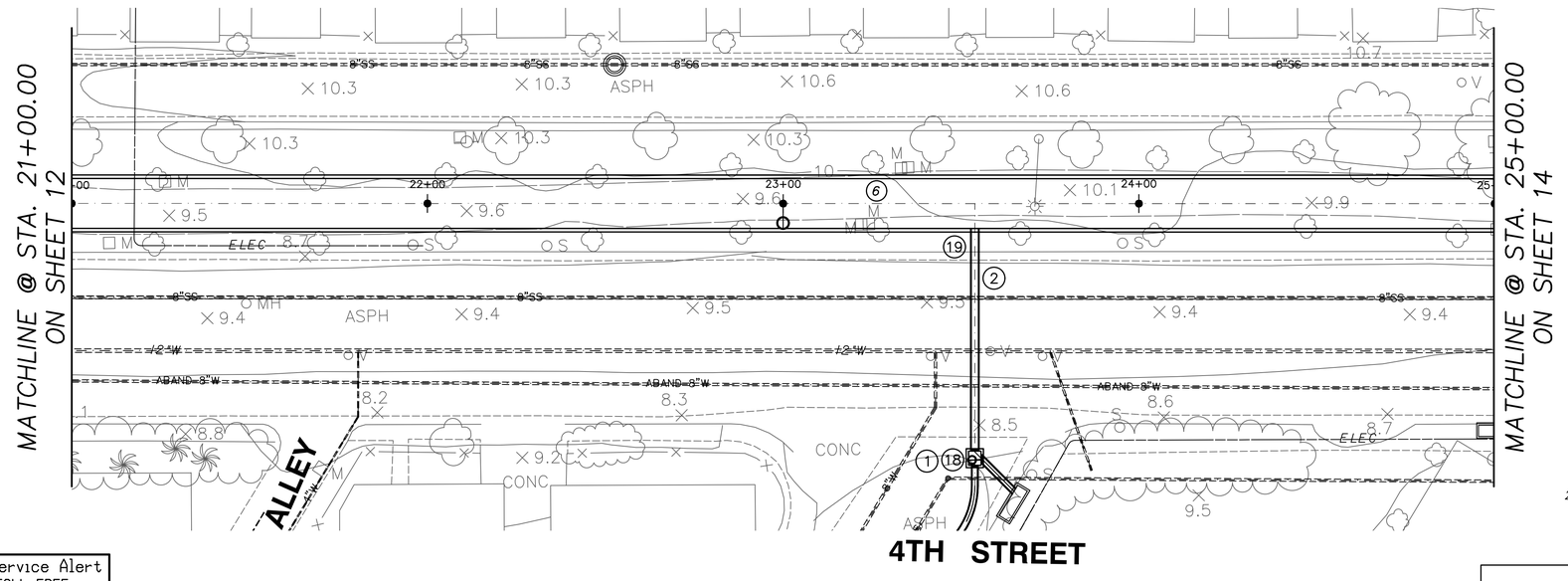
REGISTERED PROFESSIONAL ENGINEER MORGAN JUAN YANG No. C038983 Exp. 3/31/19 CIVIL STATE OF CALIFORNIA

PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

TITLE:
MARINA DRIVE
PHASE #4 AND #5 IMPROVEMENTS

STA. 17+00 TO STA. 21+00





STORM DRAIN CONSTRUCTION NOTES

NOTE: 1) ALL CURB OPENING CATCH BASINS SHALL BE EQUIPPED WITH AUTOMATIC RETRACTABLE SCREEN AND INSERTED FILTER. STORMWATER BIO-TREATMENT DEVICE; SUCH AS FILTERRA BIO-RETENTION FILTRATION SYSTEM (OR APPROVED EQUIVALENT) SHALL BE CONSTRUCTED ADJACENT TO A CATCH BASIN PER PLAN AND PER CITY APPROVAL. THE SPECIFIC LOCATION OF BIO-SYSTEM SHALL BE APPROVED BY THE CITY DURING CONSTRUCTION.
2) WALL THICKNESS (t_F) ON CATCH BASIN SHALL BE 8-INCH MINIMUM. THE "F" OR "T" VALUES AT MANHOLE OR JUNCTION/TRANSITION STRUCTURES SHALL BE PER PLAN.

(1) CONSTRUCT 18-INCH RCP (D-LOAD PER PROFILE).

(2) CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).

(6) CONSTRUCT SINGLE 14'(W) x 7.5'(H) REINFORCED CONCRETE BOX.

(17) CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.

(18) CONSTRUCT MANHOLE PIPE-TO-PIPE PER SPPWC STD. PLAN NO. 321-2 WITH 36" MANHOLE SHAFT WITHOUT REDUCER PER SPPWC STD. PLAN NO. 326-2.

(19) CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.

(32) COORDINATE RELOCATING OF EXISTING UTILITIES BY THEIR RESPECTIVE OWNERS, AND CONDUCT POTHOLING TO VERIFY THE UTILITYS LOCATION, MATERIAL, AND DEPTH.

GENERAL NOTES:

THE PROPOSED DRAINAGE IMPROVEMENTS PRESENTED HEREIN ARE SHALLOW AND CONSIST PRIMARILY OF REINFORCED CONCRETE BOX. THIS PRELIMINARY DESIGN IS BASED ON THE BEST INFORMATION AVAILABLE, CONSISTING OF CITY AS-BUILT PLANS, UTILITY OWNERS' PLANS, AND SEWER MANHOLE SURVEY DATA.

1). DUE TO THE FACT OF SHALLOW DEPTH OF PUBLIC UTILITIES; SUCH AS GAS, WATER, SEWER, CABLE, TELEPHONE, ELECTRIC, ETC., COORDINATION WITH THE RESPECTIVE UTILITY OWNERS MUST BE CONDUCTED DURING THE FINAL DESIGN STAGE.

2). THE PROPOSED STORM DRAIN SYSTEM PRELIMINARY PRESENTED HEREIN IS CONTROLLED BY THE EXISTING WEST END PUMP STATION MAXIMUM CAPACITY OF ABOUT 205 CFS.

3). SEVERAL STREET LOW POINTS AT ELECTRIC AVENUE, MARINA DRIVE, 5TH STREET, COASTLINE DRIVE, AND PACIFIC COAST HIGHWAY CONTROL THE SIZE AND THE SLOPE OF THE PROPOSED DRAINAGE SYSTEM.

4). THE EXISTING SEWERS AT THE PROPOSED DRAINAGE SYSTEM CROSSINGS SHALL BE PROTECTED IN PLACE. THE EXISTING SEWER SYSTEM WAS CONSTRUCTED IN SHALLOW DEPTH, IT IS EXPECTED THAT SEWER LATERAL (HOUSE CONNECTION) CROSSINGS OF THE PROPOSED STORM DRAIN SYSTEM WILL BE RECONSTRUCTED, PER SPPWC STD. PLAN NO. 223-2.

5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.

REGISTERED PROFESSIONAL ENGINEER
MORGAN JUAN YING
No. C038983
Exp. 3/31/19
CIVIL
STATE OF CALIFORNIA

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MARINA DRIVE (PHASE #5)

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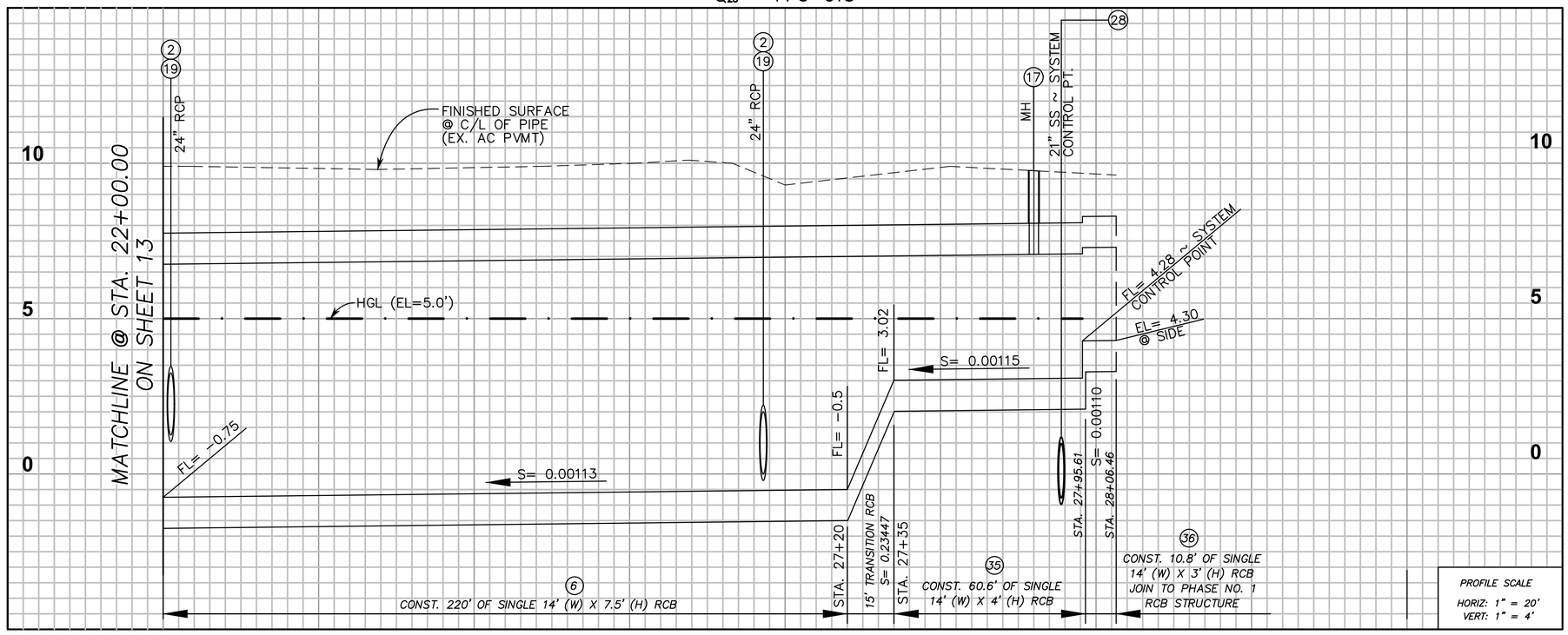
PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

CITY OF SEAL BEACH INCORPORATED AUGUST 22, 1915 ORANGE COUNTY, CALIFORNIA

TITLE:
MARINA DRIVE
PHASE #5 IMPROVEMENTS

STA. 21+00 TO STA. 25+00

Q_{25} = 170 cfs

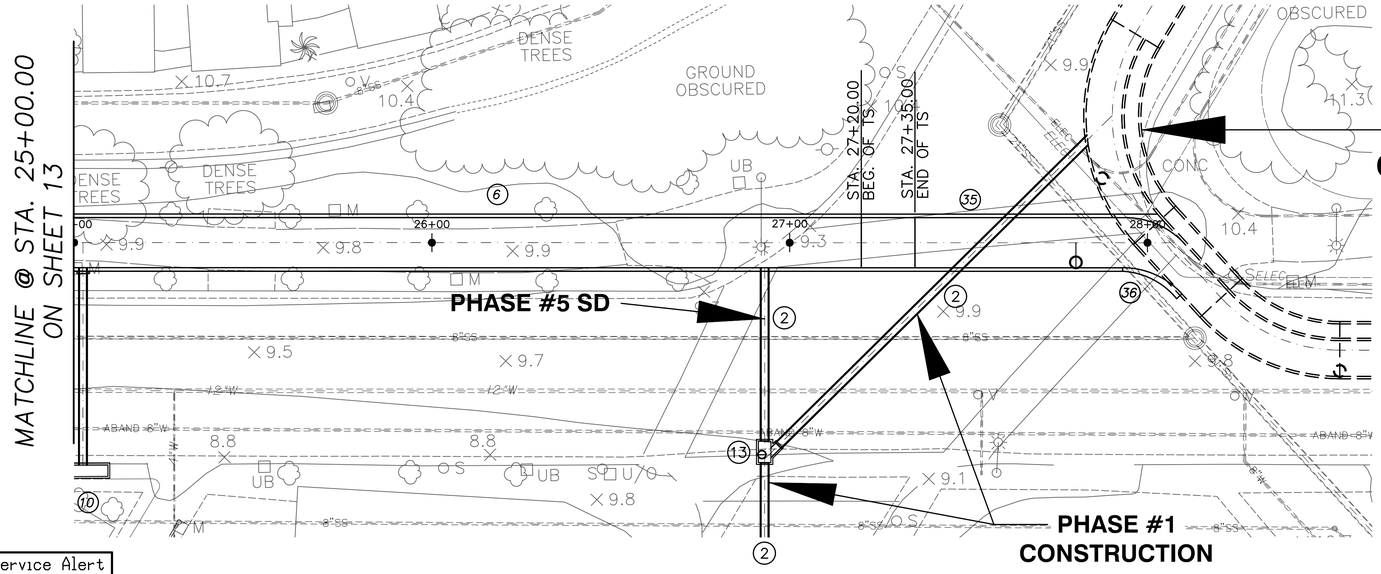


STORM DRAIN CONSTRUCTION NOTES

NOTE: 1) ALL CURB OPENING CATCH BASINS SHALL BE EQUIPPED WITH AUTOMATIC RETRACTABLE SCREEN AND INSERTED FILTER. STORMWATER BIO-TREATMENT DEVICE; SUCH AS FILTERRA BIO-RETENTION FILTRATION SYSTEM (OR APPROVED EQUIVALENT) SHALL BE CONSTRUCTED ADJACENT TO A CATCH BASIN PER PLAN AND PER CITY APPROVAL. THE SPECIFIC LOCATION OF BIO-SYSTEM SHALL BE APPROVED BY THE CITY DURING CONSTRUCTION.
2) WALL THICKNESS (t_F) ON CATCH BASIN SHALL BE 8-INCH MINIMUM. THE "F" OR "T" VALUES AT MANHOLE OR JUNCTION/TRANSITION STRUCTURES SHALL BE PER PLAN.

(2) — CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).
(6) — CONSTRUCT SINGLE 14'(W) x 7.5'(H) REINFORCED CONCRETE BOX.
(10) — CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=14'.
(13) — CONSTRUCT MANHOLE PIPE-TO-PIPE PER SPPWC STD. PLAN NO. 322-2.
(17) — CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.
(19) — CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.
(28) — PROTECT EXISTING SEWER FACILITY IN PLACE.
(35) — CONSTRUCT SINGLE 14'(W) x 4'(H) REINFORCED CONCRETE BOX.
(36) — CONSTRUCT SINGLE 14'(W) x 3'(H) REINFORCED CONCRETE BOX.

5TH STREET



GENERAL NOTES:

THE PROPOSED DRAINAGE IMPROVEMENTS PRESENTED HEREIN ARE SHALLOW AND CONSIST PRIMARILY OF REINFORCED CONCRETE BOX. THIS PRELIMINARY DESIGN IS BASED ON THE BEST INFORMATION AVAILABLE, CONSISTING OF CITY AS-BUILT PLANS, UTILITY OWNERS' PLANS, AND SEWER MANHOLE SURVEY DATA.

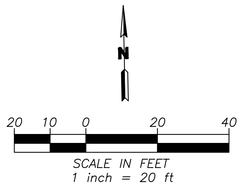
1). DUE TO THE FACT OF SHALLOW DEPTH OF PUBLIC UTILITIES; SUCH AS GAS, WATER, SEWER, CABLE, TELEPHONE, ELECTRIC, ETC., COORDINATION WITH THE RESPECTIVE UTILITY OWNERS MUST BE CONDUCTED DURING THE FINAL DESIGN STAGE.

2). THE PROPOSED STORM DRAIN SYSTEM PRELIMINARY PRESENTED HEREIN IS CONTROLLED BY THE EXISTING WEST END PUMP STATION MAXIMUM CAPACITY OF ABOUT 205 CFS.

3). SEVERAL STREET LOW POINTS AT ELECTRIC AVENUE, MARINA DRIVE, 5TH STREET, COASTLINE DRIVE, AND PACIFIC COAST HIGHWAY CONTROL THE SIZE AND THE SLOPE OF THE PROPOSED DRAINAGE SYSTEM.

4). THE EXISTING SEWERS AT THE PROPOSED DRAINAGE SYSTEM CROSSINGS SHALL BE PROTECTED IN PLACE. THE EXISTING SEWER SYSTEM WAS CONSTRUCTED IN SHALLOW DEPTH, IT IS EXPECTED THAT SEWER LATERAL (HOUSE CONNECTION) CROSSINGS OF THE PROPOSED STORM DRAIN SYSTEM WILL BE RECONSTRUCTED, PER SPPWC STD. PLAN NO. 223-2.

5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.



REGISTERED PROFESSIONAL ENGINEER
MORGAN JUAN YING
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MARINA DRIVE (PHASE #1 & #5)

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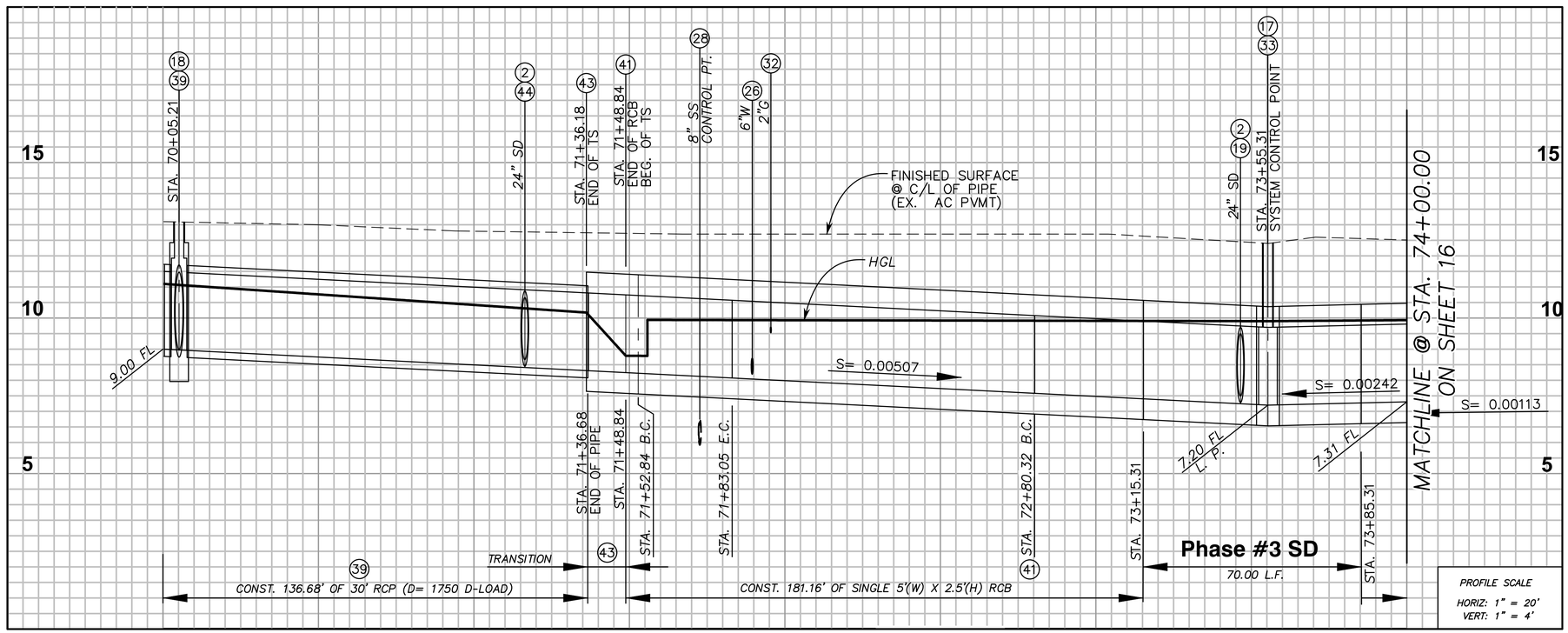
PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

CITY OF SEAL BEACH INCORPORATED AUGUST 22, 1915 ORANGE COUNTY, CALIFORNIA

TITLE:
MARINA DRIVE
PHASE #1 AND #5 IMPROVEMENTS
STA. 25+00 TO STA. 29+00

SHT. 14 OF 16



STORM DRAIN CONSTRUCTION NOTES

NOTE: 1) ALL CURB OPENING CATCH BASINS SHALL BE EQUIPPED WITH AUTOMATIC RETRACTABLE SCREEN AND INSERTED FILTER. STORMWATER BIO-TREATMENT DEVICE; SUCH AS FILTERRA BIO-RETENTION FILTRATION SYSTEM (OR APPROVED EQUIVALENT) SHALL BE CONSTRUCTED ADJACENT TO A CATCH BASIN PER PLAN AND PER CITY APPROVAL. THE SPECIFIC LOCATION OF BIO-SYSTEM SHALL BE APPROVED BY THE CITY DURING CONSTRUCTION.
2) WALL THICKNESS (t_F) ON CATCH BASIN SHALL BE 8-INCH MINIMUM. THE "F" OR "T" VALUES AT MANHOLE OR JUNCTION/TRANSITION STRUCTURES SHALL BE PER PLAN.

(2) CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).
(10) CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=14'.
(11) CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=28'.
(17) CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.
(18) CONSTRUCT MANHOLE PIPE -TO-PIPE PER SPPWC STD. PLAN NO. 321-2, AND WITH 36-INCH MANHOLE SHAFT WITHOUT REDUCER PER SPPWC STD. PLAN NO. 326-2.
(19) CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.
(23) PLUG STORM DRAIN PIPE END WITH CLASS "560-C-3250" CONCRETE.
(26) REMOVE AND RECONSTRUCT WATER LINE PER CITY WATER PLANS.
(28) PROTECT EXISTING SEWER FACILITY IN PLACE.
(32) COORDINATE RELOCATING OF EXISTING UTILITIES BY THEIR RESPECTIVE OWNERS, AND CONDUCT POTHOLING TO VERIFY THE UTILITY'S LOCATION, MATERIAL, AND DEPTH.
(33) CONSTRUCT JUNCTION STRUCTURE - RCB TO RCB.
(39) CONSTRUCT 30-INCH RCP (D-LOAD PER PROFILE).
(40) CONSTRUCT SINGLE 6'(W) x 2.5'(H) REINFORCED CONCRETE BOX.
(41) CONSTRUCT SINGLE 5'(W) x 2.5'(H) REINFORCED CONCRETE BOX.
(43) CONSTRUCT TRANSITION STRUCTURE RCB TO PIPE PER SPPWC STD. PLAN NO. 342-2.
(44) CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN NO. 340-2.

GENERAL NOTES:

THE PROPOSED DRAINAGE IMPROVEMENTS PRESENTED HEREIN ARE SHALLOW AND CONSIST PRIMARILY OF REINFORCED CONCRETE BOX. THIS PRELIMINARY DESIGN IS BASED ON THE BEST INFORMATION AVAILABLE, CONSISTING OF CITY AS-BUILT PLANS, UTILITY OWNERS' PLANS, AND SEWER MANHOLE SURVEY DATA.

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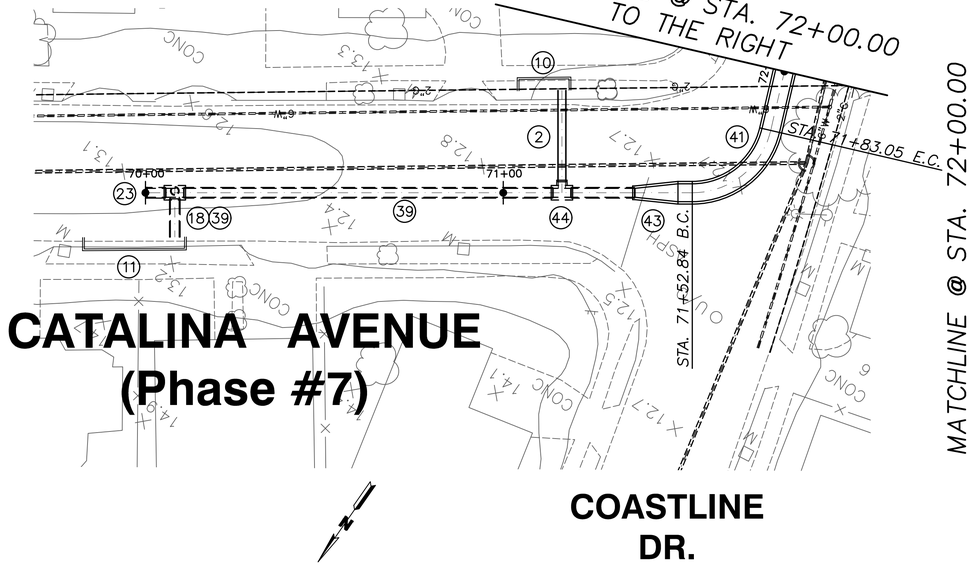
2). THE PROPOSED STORM DRAIN SYSTEM PRELIMINARY PRESENTED HEREIN IS CONTROLLED BY THE EXISTING WEST END PUMP STATION MAXIMUM CAPACITY OF ABOUT 205 CFS.

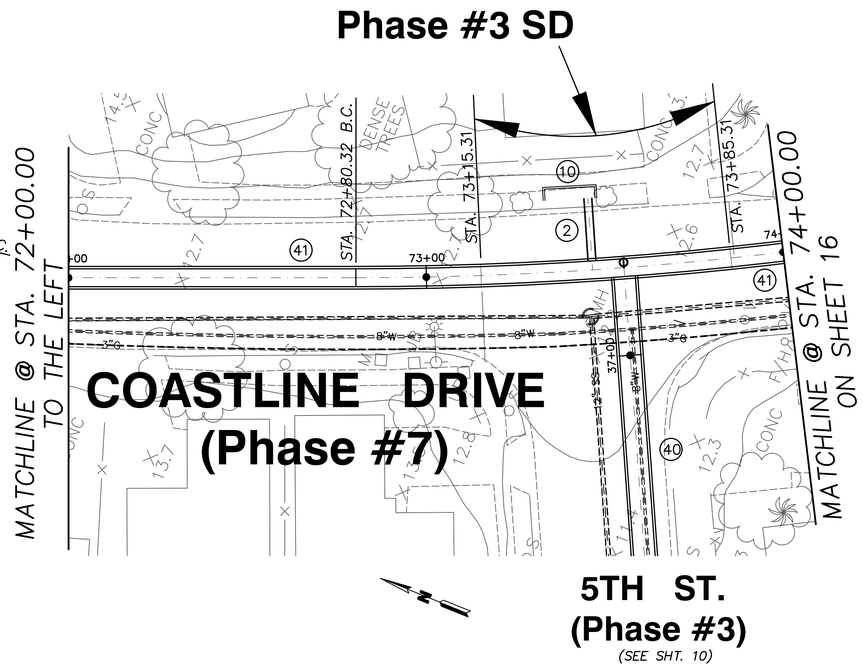
3). SEVERAL STREET LOW POINTS AT ELECTRIC AVENUE, MARINA DRIVE, 5TH STREET, COASTLINE DRIVE, AND PACIFIC COAST HIGHWAY CONTROL THE SIZE AND THE SLOPE OF THE PROPOSED DRAINAGE SYSTEM.

4). THE EXISTING SEWERS AT THE PROPOSED DRAINAGE SYSTEM CROSSINGS SHALL BE PROTECTED IN PLACE. THE EXISTING SEWER SYSTEM WAS CONSTRUCTED IN SHALLOW DEPTH, IT IS EXPECTED THAT SEWER LATERAL (HOUSE CONNECTION) CROSSINGS OF THE PROPOSED STORM DRAIN SYSTEM WILL BE RECONSTRUCTED, PER SPPWC STD. PLAN NO. 223-2.

5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.



COASTLINE DR.



5TH ST. (Phase #3)
(SEE SHT. 10)

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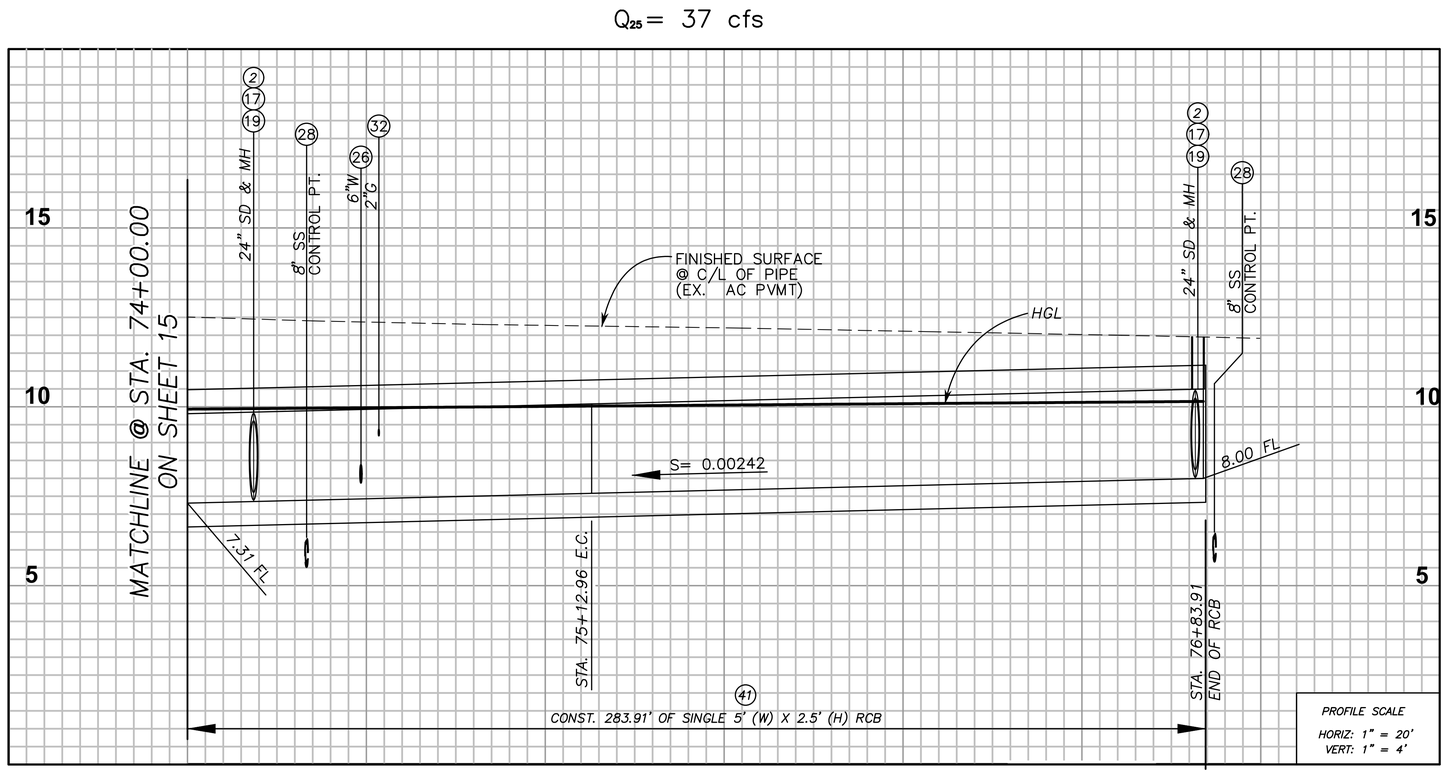
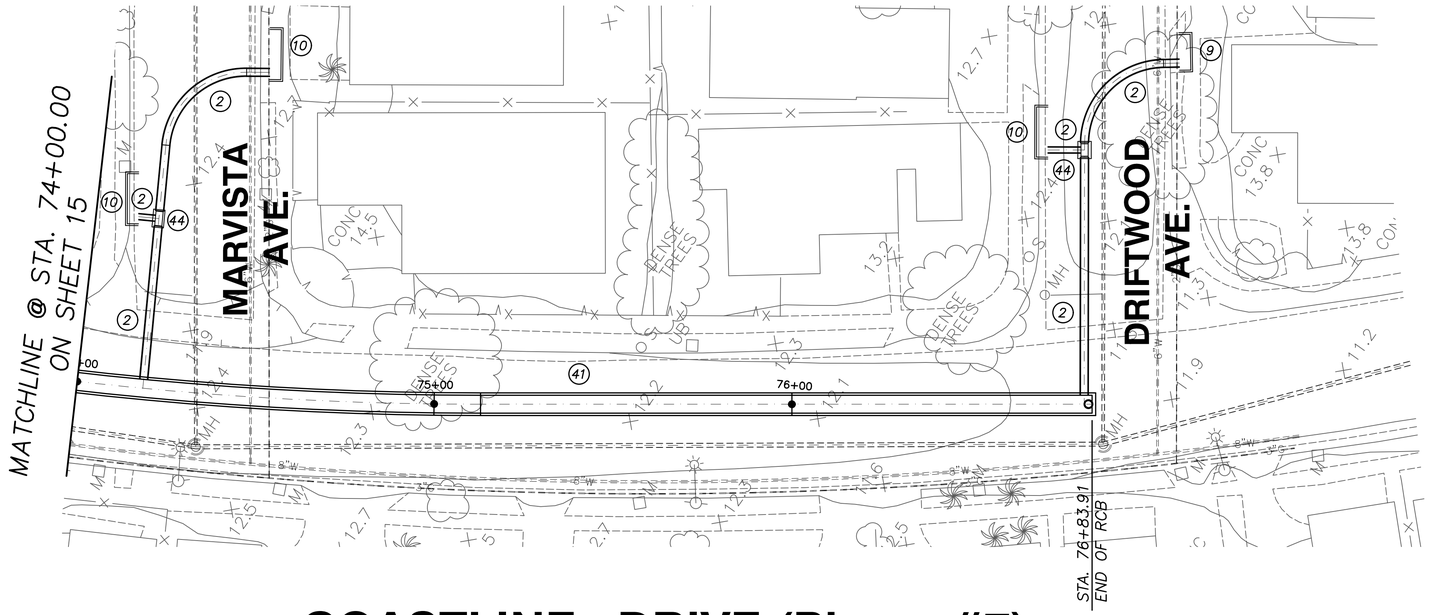
PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

TITLE:
CATALINA AVENUE / COASTLINE DRIVE
PHASE #3 & #7 IMPROVEMENTS
STA. 70+00 TO STA. 74+00





COASTLINE DRIVE (Phase #7)

STORM DRAIN CONSTRUCTION NOTES

NOTE: 1) ALL CURB OPENING CATCH BASINS SHALL BE EQUIPPED WITH AUTOMATIC RETRACTABLE SCREEN AND INSERTED FILTER. STORMWATER BIO-TREATMENT DEVICE; SUCH AS FILTERRA BIO-RETENTION FILTRATION SYSTEM (OR APPROVED EQUIVALENT) SHALL BE CONSTRUCTED ADJACENT TO A CATCH BASIN PER PLAN AND PER CITY APPROVAL. THE SPECIFIC LOCATION OF BIO-SYSTEM SHALL BE APPROVED BY THE CITY DURING CONSTRUCTION.
2) WALL THICKNESS (t_F) ON CATCH BASIN SHALL BE 8-INCH MINIMUM. THE "F" OR "T" VALUES AT MANHOLE OR JUNCTION/TRANSITION STRUCTURES SHALL BE PER PLAN.

(2) — CONSTRUCT 24-INCH RCP (D-LOAD PER PROFILE).
(9) — CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=10'.
(10) — CONSTRUCT CURB OPENING CATCH BASIN PER SPPWC STD. PLAN NO. 300-3, W=14'.
(17) — CONSTRUCT 36-INCH BOX STORM DRAIN CONCRETE MANHOLE WITHOUT REDUCER PER SPPWC STD. PLAN NO. 323-2.
(19) — CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER SPPWC STD. PLAN NO. 333-2.
(26) — REMOVE AND RECONSTRUCT WATER LINE PER CITY WATER PLANS.
(28) — PROTECT EXISTING SEWER FACILITY IN PLACE.
(32) — COORDINATE RELOCATING OF EXISTING UTILITIES BY THEIR RESPECTIVE OWNERS, AND CONDUCT POTHOLING TO VERIFY THE UTILITY'S LOCATION, MATERIAL, AND DEPTH.
(41) — CONSTRUCT SINGLE 5'(W) x 2.5'(H) REINFORCED CONCRETE BOX.
(44) — CONSTRUCT TRANSITION STRUCTURE PIPE TO PIPE PER SPPWC STD. PLAN NO. 340-2.

GENERAL NOTES:

THE PROPOSED DRAINAGE IMPROVEMENTS PRESENTED HEREIN ARE SHALLOW AND CONSIST PRIMARILY OF REINFORCED CONCRETE BOX. THIS PRELIMINARY DESIGN IS BASED ON THE BEST INFORMATION AVAILABLE, CONSISTING OF CITY AS-BUILT PLANS, UTILITY OWNERS' PLANS, AND SEWER MANHOLE SURVEY DATA.

1). DUE TO THE FACT OF SHALLOW DEPTH OF PUBLIC UTILITIES; SUCH AS GAS, WATER, SEWER, CABLE, TELEPHONE, ELECTRIC, ETC., COORDINATION WITH THE RESPECTIVE UTILITY OWNERS MUST BE CONDUCTED DURING THE FINAL DESIGN STAGE.

2). THE PROPOSED STORM DRAIN SYSTEM PRELIMINARY PRESENTED HEREIN IS CONTROLLED BY THE EXISTING WEST END PUMP STATION MAXIMUM CAPACITY OF ABOUT 205 CFS.

3). SEVERAL STREET LOW POINTS AT ELECTRIC AVENUE, MARINA DRIVE, 5TH STREET, COASTLINE DRIVE, AND PACIFIC COAST HIGHWAY CONTROL THE SIZE AND THE SLOPE OF THE PROPOSED DRAINAGE SYSTEM.

4). THE EXISTING SEWERS AT THE PROPOSED DRAINAGE SYSTEM CROSSINGS SHALL BE PROTECTED IN PLACE. THE EXISTING SEWER SYSTEM WAS CONSTRUCTED IN SHALLOW DEPTH, IT IS EXPECTED THAT SEWER LATERAL (HOUSE CONNECTION) CROSSINGS OF THE PROPOSED STORM DRAIN SYSTEM WILL BE RECONSTRUCTED, PER SPPWC STD. PLAN NO. 223-2.

5). AT CATCH BASIN LOCATION, LOCAL DEPRESSION SHALL BE CONSTRUCTED PER SPPWC STD. PLAN NO. 313-3.

REGISTERED PROFESSIONAL ENGINEER
MORGAN JUAN YING
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PROJECT:
CITY OF SEAL BEACH
PUBLIC WORKS DEPARTMENT
MARINA DRIVE DRAINAGE SYSTEMS
FOCUSED STUDY

TITLE:
COASTLINE DRIVE
PHASE #7 IMPROVEMENTS

STA. 74+00 TO STA. 77+00