PRELIMINARY DRAINAGE STUDY

CASTLEROCK

CITY OF SAN DIEGO, CALIFORNIA

VESTING TENTATIVE MAP/
REZONE SITE DEVELOPMENT PERMIT/
PLANNED DEVELOPMENT PERMIT

PROJECT NO. 10046
W.O. NO. 42-1653

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Section 1: Introduction

This updated Preliminary Drainage Study has been prepared and considered part of the supporting documents for the Castlerock project. The Development Permits for this project include a Vesting Tentative Map, a Rezone Site Development Permit and Planned Development Permit for 283 single-family dwelling units and 147 multi family detached dwelling units. The project site is approximately 203 acres in size and is located within the East Elliott Community Plan area. The project is located on the north side of Mast Boulevard, along the easterly boundary of the City of San Diego adjacent to the City of Santee. Refer to the attached Vicinity Map, Appendix A, for project location.

Section 2: Existing Conditions

2.1 Existing Conditions Description

The project area is presently undeveloped natural land. Existing single-family residential use abuts the project on the east. A high school is adjacent to the project on the south across Mast Boulevard. These areas are located in the City of Santee. Currently, large offsite areas drain to the project from the north and west. Nine existing hydrology basins were analyzed to estimate the amount of runoff draining through the project. Runoff is collected on the southerly and easterly subdivision boundary at various inlets and headwalls. Storm water collected along the easterly project boundary is piped through the existing residential subdivision to Sycamore Channel which runs north to south along the westerly side of Santee Lakes. The Sycamore Channel empties into the San Diego River approximately 1 mile south of the project. Storm water collected along the southerly boundary of the project is piped through the high school site or piped within Mast Boulevard and outfalls into the San Diego River located approximately 1 mile to the south. Estimated existing flow draining south to Mast Boulevard is identified on the Mast Boulevard Extension Improvement Plans, Dwg. No. 91-090.

2.2 Existing Conditions Analysis

The storm drain facilities east of the project were constructed per Tentative Map's: 2078-1, 2814-2, 3054-5, 3054-6, 2964-3, and 3676-1. Please refer to the existing hydrology exhibit for drainage basin definitions. Refer to the attached existing hydrology maps for particulars.

Basin No. 1
No potential flooding problems identified for the existing condition. The existing 24" pipe shown on the Mast Boulevard Extension Project Plans, Drawing No. 91-090, estimate a design flow of Q_{100} = 47.3 cfs which is greater than the calculated flow of Q_{100} = 26.6 cfs presented in this study. The hydraulic modeling of this system shows that a portion is under pressure with the hydraulic grade line (HGL) being as much as 2.5' above the crown of the pipe.

Basin No. 2
No potential flooding problems identified for the existing condition. The existing 48" pipe shown on the Mast Boulevard extension project plans, Drawing No. 91-090, has an estimated design flow capacity of Q_{100} = 173.8 cfs which is greater than the calculated flow of Q_{100} = 150.0 cfs presented in the study. The hydraulic modeling of this system shows that portions are under pressure with the HGL being 0.28' above the crown of the pipe.

Basin No. 3
No potential flooding problems were identified for this system. Refer to T.M. 2078-1 and T.M. 2814-2 for construction plans for these drainage facilities. The existing 27" pipe shown on 2578-1, Sheet 8 of 8, has a capacity of 45.4 cfs which is greater than the flow of Q_{100} = 35.8 cfs presented in this study. The hydraulic modeling of this system shows that portions are under pressure with the HGL being 0.89' above the crown of the pipe.

Basin No. 4
For the existing conditions, potential street flooding was identified at New Seabury Drive. Refer to the hydraulic calculations in this study. These facilities were constructed per T.M. 3054-5 and T.M. 2964.3. The hydraulic modeling of this system shows that portions are under pressure with the HGL being 2.7' above the crown of the pipe.

Basin No. 5
For the existing conditions, potential street flooding was identified at Medina Drive. Refer to attached hydraulic calculations. These facilities were constructed per T.M. 3054-6. The hydraulic modeling of this system shows that portions are under pressure with the HGL being 2.05' above the crown of the pipe.

Basin No. 6
No potential flooding problems were identified for this system constructed per T.M. 3054-6. The existing 33" pipe shown in the plans per TM 3054-6 has a capacity of 91.4 cfs, which is greater than the flow of Q_{100} = 71.0 cfs presented in this study. The hydraulic modeling of this system shows that portions are under pressure with the HGL being 4.36' above the crown of the pipe.

Basin No. 7
For the existing conditions, potential street flooding was identified at two locations along this system. One area is at Medina Drive and the other area is at Pebble Beach Drive. Refer to T.M. 3676-1 and 3054-6 for construction plans for these facilities. The hydraulic modeling of this system shows that portions are under pressure with the HGL being 12.23' above the crown of the pipe.

Basin No. 8
No potential flooding problems were identified for the double 72" pipe system constructed per T.M. 3676-1. The existing double 72" pipe system shown in the plans per T.M. 3676-1 have a capacity of 1,783.6 cfs, which is greater than the flow of Q_{100} = 469.8 cfs presented in this study.

Basin No. 30
No potential problems identified for the existing condition. The existing 24" pipe shown on the Mast Boulevard extension project plans, Drawing No. 91-090, has an estimated flow design capacity of Q_{100} = 19.6 cfs which is greater than the calculated flow of Q_{100} = 14.0 cfs presented in the study. The hydraulic modeling of this system shows that portions are under pressure with the HGL being 0.28' above the crown of the pipe.

Hydraulic calculations were performed to account for a backwater condition of drainage into the Sycamore Channel.

Table 1. Existing Peak Flows (100-yr Storm Event)

Basin	Estimated Peak Flow at Sub-boundary (cfs)	Contributing Offsite Developed Area Estimated Peak Flows (cfs) (Basins 9-29)	Estimated Peak flow at Sycamore Channel (cfs)
1	26.6	0	N/A(1)
2	150.0	0	N/A(1)
3	35.8	32.3	35.8+32.3 = **68.1**
4	47.5	19.4	47.5+19.4 = **66.9**
5	20.3	20.4	20.3+20.4 = **40.7**
6	71.0	3.3	71.0+3.3 = **74.2**
7	26.6	20.3	26.6+20.3 = **46.9**
8	469.8	6.9	469.8+6.9 = **476.7**
30	14.0	0	N/A(1)

(1) Drainage flows to inlet structures along Mast Boulevard and discharges west of street.

Note: Refer to Appendix B for supporting existing hydraulic calculations and reference drawings for Basins 1-8 & 30.

2.3 Existing Conditions Summary

The analysis shows that in the existing conditions basins 2, 3, 5, and 7 have downstream facilities that are undersized. As a result, some pipes flow under pressure and areas have been identified for possible street flooding.

Section 3: Proposed Conditions

3.1 Proposed Conditions Description

The Castlerock project consists of 283 single-family dwelling units and 147 multi family lots along with public streets, recreation areas and open space areas. The site is approximately 192-acres in size. New storm drain facilities will be constructed per City public standards as part of this project. Offsite drainage will be collected in inlets or headwalls and storm water will be routed through the project to existing collection points identified in section 2.2. Upstream offsite drainage areas were analyzed as existing conditions land use, because these areas are located within the City of San Diego MHPA area only one dwelling unit per lot is allowed per the General Plan. This land use designation does not require an increase in the coefficient of runoff utilizing the Rational Method for analysis. Refer to the attached development hydrology maps for more information.

3.2 Proposed Conditions Analysis

Basin 1
No potential flooding problems were identified for this study area. No change in peak flow is expected for the developed conditions. In addition, the existing 24" pipe in Mast Boulevard, per Dwg. No. 91-090, has the capacity (Q_{100} = 47.3 cfs) to convey the estimated flow of Q_{100} = 24.6 cfs.

Basin 2
No potential flooding problems were identified for this proposed basin. The existing 48" pipe shown on the Mast Boulevard extension project plans, Drawing No. 91-090 has the capacity (Q_{100} = 173.8 cfs) to convey the estimated flow of Q_{100} = 166.5 cfs.

Basin 3
No potential flooding problems were identified for the developed condition. There is a calculated increase in estimated flow of 51.1 percent, or 18.3 cfs from existing to proposed conditions. (Q_{100} = 35.8 cfs vs. Q_{100} = 54.1 cfs, respectively). Due to the increase in post-development flow rates, it is proposed that a detention basin be provided to maintain pre-development peak flows. The required storage volume can be provided via a detention pond of 15,993 FT^3 or 316 LF of 48" pipes or an equivalent volume of other underground storage devices.

Basin 4
There will be an increase in estimated peak flow for the developed condition in comparison to the existing condition of 27.6 percent, or 13.1 cfs, (Q_{100} = 60.6 cfs vs. Q_{100} = 47.5 cfs, respectively). Therefore, the potential street flooding identified for the existing condition would be exacerbated without some form of mitigation and the reduction of developed peak flows. The implementation of on-site detention is proposed to resolve the expected additional adverse affects. On site detention can reduce the downstream hydraulic grade line and the potential for street flooding indicated in the existing condition analysis. The developers may choose to provide conventional detention basins or other underground storage devices for this project to achieve the same

effect. The required storage volume can be provided via a detention pond of 9,357 FT^3 or 186 LF of 48" pipe or an equivalent volume or other underground devices.

Basin 5

There is an increase in estimated peak flow for the developed condition versus the existing condition of 30.5 percent, or 8.9 cfs, (Q_{100} = 29.2 cfs vs. Q_{100} = 20.3 cfs, respectively). This condition would increase the potential flooding at Medina Drive previously identified. The implementation of on-site detention is proposed to resolve the expected adverse affects caused by this increase in flow. On-site detention will mitigate the increase in flow for the developed project by reducing the peak flow at the subdivision boundary to less than existing conditions. The required detention for this basin is 10,125 CF which will be provided by 202 LF of 48" concrete pipes. The developers may choose to provide conventional detention basins or other underground storage devices for this project to achieve the same effect.

Basins 6

No potential flooding problems were identified for the developed condition. There is an increase in estimated developed peak flow in comparison to existing peak flow of 23.2 percent, or 16.5 cfs. (Q_{100} = 87.5 cfs vs. Q_{100} = 71.0 cfs, respectively). The implementation of on-site detention is proposed to maintain pre-development peak flows. The required storage volume can be provided via a detention structure capable of storing 17,074 FT^3. This can be achieved by installing 340 LF of 48" pipes. The developers may choose to provide conventional detention basins or other underground storage devices for this project to achieve the same effect.

Basins 7

There is an existing condition potential for flooding identified in this study at Medina Drive and Pebble Beach Drive. There is an increase in estimated developed peak flow in comparison to existing peak flow of 61.3 percent or, 16.3 cfs (Q_{100} = 42.9 cfs vs. Q_{100} = 26.6 cfs, respectively). It is proposed that on-site detention be provided to maintain pre-development peak flows. Required storage volume can be provided via 33,589 FT^3 or 428 LF of 60" pipes or an equivalent volume of other underground storage devices. The developer may elect to construct conventional detention basis or other underground storage devices such as pipe storage to mitigate the increase in developed flow. Although the developed flow has been reduced significantly with the proposed on-site detention, there still the potential of flooding at Pebble Beach Drive. The flooding is related to the estimated flood elevation within Sycamore Channel and the back water affect caused by the channel. This potential flooding problem cannot be mitigated by this project.

Basin 8

No potential flooding problems were identified for this basin. The existing double 72" pipe system shown in the plans per T.M. 3676-1 has the capacity to convey the estimated flow of Q_{100} = 480.7 cfs. A large diameter storm drain system will run through the proposed development to route flows from the large upstream offsite basin to the dual offsite 72" pipes. The area of proposed development in this basin is small in comparison to the remaining natural areas (25.9 acre vs. 550.3 acre, respectively). During a storm event, the runoff associated with the developed area will already have traveled through the proposed storm drain system and exited the site before the large amount of natural runoff reaches the project boundary. The capacity of the existing dual 72" pipes at 75% is

1059 cfs, while the proposed development causes 480.7 cfs of runoff. Therefore, the existing pipes are adequate and no detention is required.

Basin 30
No potential flooding problems were identified for this basin. The existing 24" pipe in Mast Boulevard extension project plans, Drawing No. 91-090 has the capacity (Q_{100} = 19.6 cfs) to convey the estimated flow of Q_{100} = 14.8 cfs.

Note: Refer to Appendix B for supporting proposed hydraulic calculations for Basins 1-8 & 30. Refer to the Proposed Hydrology Map at the end of this report for approximate location of storage facilities.

3.3 Proposed Conditions Conclusion

Basin 1
The project proposes no change to Basin 1.

Basins 2, 8, and 30
The calculations presented in this study result in an increase in estimated runoff as a result of the project development. Despite the increase at the concentration points for Basins 2, 8, and 30 the flow rates calculated do not exceed the design capacity of the existing drainage facilities. Therefore, no mitigation is required as existing facilities are adequately sized to accept flows.

Basins 3-7
The increased flow rates discharging from Basins 3-7 will require onsite mitigation measures within the development boundaries. This is because the existing drainage facilities downstream do not have capacity to handle the increase in flow. With no mitigation, a surcharge condition would cause additional street flooding east of the project limits. Therefore, flows from the basins will be mitigated by conventional above ground detention basins to limit proposed flows to the existing outflow. Properly designed underground storage is also an option for the developer.

Hydraulic calculations were performed to determine what effect the project drainage would have on the existing storm drain facilities. As mentioned above, some of the downstream facilities may not have adequate capacity to convey estimated peak flows during existing conditions. Therefore, the proposed storm drain system has been preliminarily designed to mitigate the negative impacts as a result of the development to prevent potential flooding downstream. Below is a summary of developed peak flows for the 100-yr storm event.

Table 2. Developed Condition Peak Flows (100-Year Storm Event)

Basin	Estimated Peak Flow at Sub-Boundary (cfs) (w/o Detention)	Estimated Peak Flow at Sub-Boundary (cfs) (w/Detention)	Contributing Offsite Developed Area Estimated Peak Flows (cfs) (Basins 9-29)	Estimated Peak flow at Sycamore Channel (cfs)
1	24.6	24.6[1]	N/A[2]	N/A[3]
2	166.5	166.5[1]	N/A[2]	N/A[3]
3	54.1	35.1	32.3	35.1+32.3 = **67.4**
4	60.6	49.9	19.4	49.9+19.4 = **69.3**
5	29.2	17.0	20.4	17.0+20.4 = **37.4**
6	87.5	70.1	3.3	70.1+3.3 = **73.4**
7	42.9	12.6	20.3	12.6+20.3 = **32.9**
8	480.7	480.7[1]	6.9	480.7+6.9 = **487.6**
30	14.8	14.8[1]	N/A[2]	N/A[3]

(1) No detention required.
(2) Basins 9-29 do not contribute flow to Basins 1, 2, or 30.
(3) Drainage flows to inlet structures along Mast Boulevard and discharges west of street.

Section 4: Analysis Criteria

Hydrology calculations contained in this report to estimate the peak storm water runoff rates are based on the modified rational method. The pipe sizing was based on Manning's equation and the criteria contained in the City of San Diego Drainage Manual. Other criteria used in this report are summarized as follows:

1. Design Storm: 100-year interval
2. Times of concentration are based on the urban area over land time of flow curves in Appendix I of the City of San Diego Drainage Manual.
3. Runoff Coefficients: C values are based on Table 2 of Appendix I of the City of San Diego Drainage Manual.
4. Rainfall Intensity: Intensities are based on the rainfall intensity-duration-frequency curves for the County of San Diego according to Appendix I of the City of San Diego Drainage Manual.

Below is a summary of downstream discharge rates at the subdivision boundary as a result of the development.

Section 5: Flow Summary

Table 3. Runoff Flow Summary Table_ (100-Year Storm Event)

Basin	1	2	30	3	4	5	6	7	8	Total
Pipe System	A_1	A_2	B	C	D	E	F	G	H	
Existing Peak Flows (CFS)	26.6	150.0	14.0	35.8	47.5	20.3	71.0	26.6	469.8	**861.6**
Developed Peak Flow (CFS)	24.6	166.5	14.8	54.1	60.6	29.2	87.5	42.9	480.7	**946.1**
Developed Peak Flow (CFS) w/Onsite Detention	24.6(2)	166.5(2)	14.8(2)	35.1	49.9	17.0	70.1	12.6	480.7(2)	**871.3**

(1) No change in existing to proposed hydrology.
(2) No proposed detention.

See Appendix A and B for existing condition calculations and Appendix C and D for proposed condition calculations.

Section 6: Detention Volume Analysis

Table 4. Storage Volume Summary

Basin	Inflow (cf)	Outflow (cf)	Storage (cf)	Peak Factor	Required Storage (cf)
1	21,402	23,142			N/A(1)
2	222,777	216,000			N/A(1)
3	45,444	32,650	12,794	1.25	**15,993**
4	53,086	45,600	7,486	1.25	**9,357**
5	24,178	16,078	8,100	1.25	**10,125**
6	86,079	72,420	13,659	1.25	**17,074**
7	47,619	20,748	26,871	1.25	**33,589**
8	1,095,996	1,042,956			N/A(1)
30	17,138	12,600			N/A(1)

(1) No detention required as existing drainage facilities have capacity to accept increase in flow.

Section 7: Hydromodification Analysis

7.1 Hydromodification Criteria

Per San Diego Water Board Order No. R9-2007-001, "Waste Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4) Draining the Watersheds of the County of San Diego," the copermitees were required to implement a Hydromodification Management Plan (HMP). The final HMP was approved July 14, 2010. The purpose of the HMP is "...to manage increases in runoff discharge rates and durations from all priority development projects, where such increased rates and durations are likely to cause increased erosion of channel beds and banks, sediment

pollution generation, or other impacts to beneficial uses and stream habitat due to increased erosive force."

Per the final hydromodification management criteria developed for San Diego County, which is applicable to all Priority Development Projects, results of a hydromodification management analysis must adhere to the following criteria:

- For flow rates between the pre-project floe threshold and the pre-project 10-year runoff event, the post project discharge rates, and durations may not deviate above the pre-project discharge rates and durations by more than 10 percent over more than 10 of the length of the flow duration curve.

- Lower flow thresholds may be determined using the HMP Decision Matrix along with a critical flow calculator and channel screening tools developed by the Southern California Coastal Water Research Project (SCCWRP). These methods identify lower flow thresholds for a range of channel conditions. The critical flow calculator recommends a lower value of $0.1Q_2$, $0.3Q_2$, or $0.5Q_2$ dependent on the receiving channel material and dimensions. This value will be compared to the channel susceptibility rating (High, Medium, or Low) as determined from the SCCWRP screening tools to determine the final lower flow threshold.

- The lower flow threshold may alternately be determined be determined as 10 percent of the pre-project 2-year runoff event, or $0.1Q_2$. This approach, which is outlined in the HMP Decision Matrix, is available if the project applicant chooses not to complete the channel screening analysis.

7.2 Hydromodification Analysis

Drainage basins 1, 2, and 30 discharge into concrete stormwater pipes within Mast Blvd. The runoff is carried approximately 1 mile south and discharges into the San Diego River. The remainder of the drainage basins (3-8) discharge into concrete storm water pipes in the adjacent residential development. These systems carry the runoff approximately 0.25 miles east to discharge into the Sycamore Channel. The Sycamore Channel then carries the drainage approximately 0.5 miles south where it eventually discharges into the San Diego River.

Both underground concrete storm water pipes and the Sycamore channel qualify as "hardened conveyance systems," and are thus exempt from flow hydromodification requirements per the HMP. Further, all project runoff ultimately converges with the San Diego River, less than 1 mile from the porject. Per table 6-1 of the HMP, the San Diego River from the outfall to the Pacific Ocean to confluence with San Vicente Creek is exempt from flow hydromodification requirements. This exempt range includes outfall points associated with this project as the San Vicente Creek is approximately 5 miles upstream of the project and the Pacific Ocean is approximately 17.5 miles downstream.

Section 8: Water Quality

Water Quality and Low Impact Development (LID) issues have been analyzed and addressed in the Water Quality Technical Report dated October 22, 2010.

Section 9: Conclusion

This Preliminary Drainage Study has been prepared to identify existing and proposed drainage conditions and analyze the potential impacts of the development. Existing peak flow rates at points of concentration for Basins 3-7 will increase as the result of the development. However, with the use of detention basins or underground storage devices such as concrete vaults or pipe detention the developed runoff will be limited to the pre developed rate for events up to the 100-yr storm. Basins 2, 8, and 30 experience a 9.5%, 2.6%, and 7.9% increase in flow respectively. However, these basins will not require detention as the downstream facilities are appropriately sized to accept the increase in estimated flow without surcharging for the 100-year storm event. Hydraulic calculations included in this report substantiate these statements.

As discussed in Section 7 of this report, all downstream drainage facilities for this project are exempt from floe hydromodification requirements. In addition, the project proposes to maintain the 100-year existing flow for basins 3-7, approximately 75% of the project site. As a result it is not anticipated that the proposed project will not produce any adverse effects on the downstream facilities or receiving waters.

The proposed drainage facilities to be constructed as part of this development will mitigate the potential impacts of the Castlerock Development for the areas identified in this study. This study is not intended for construction purposes; a final drainage study shall be prepared and submitted to the City for approval with the Final Public Grading Plans for the Castlerock project.

Section 10: References

- *City of San Diego Drainage Design Manual*, April 1984
- *California Regional Water Quality Control Board*, Municipal Separate Storm Sewer Systems Permit Regulations, Order No. R9-2007-0001, January 24, 2007
- *Final HydroModification Plan for the County of San Diego*, Brown and Caldwell, December 29, 2009

CASTLEROCK
DEVELOPED HYDROLOGY MAP

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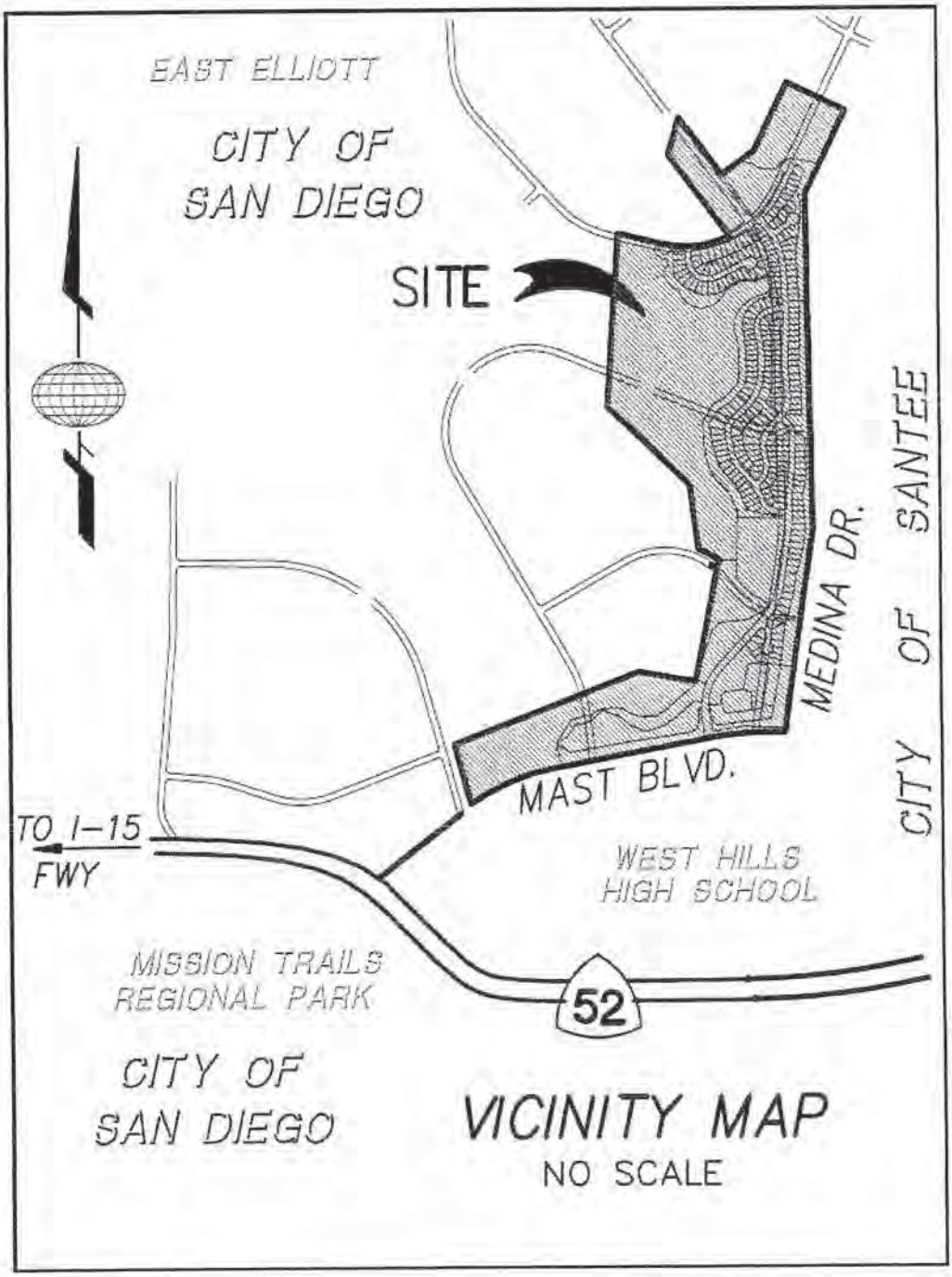
DATE 10/26/10

APPENDIX A

APPENDIX A
VICINITY MAP



APPENDIX B

APPENDIX B
EXISTING HYDROLOGY CALCULATIONS

FLOW TO DRAINAGE SYSTEM 'B'

Drainage Diagram for EXISTING BASIN 30
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/28/2006

Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 30: FLOW TO DRAINAGE SYSTEM 'B' Runoff Area=6.200 ac Runoff Depth=0.56"
Tc=15.0 min C=0.75 Runoff=14.00 cfs 0.289 af

Total Runoff Area = 6.200 ac Runoff Volume = 0.289 af Average Runoff Depth = 0.56"

Subcatchment BASIN 30: FLOW TO DRAINAGE SYSTEM 'B'

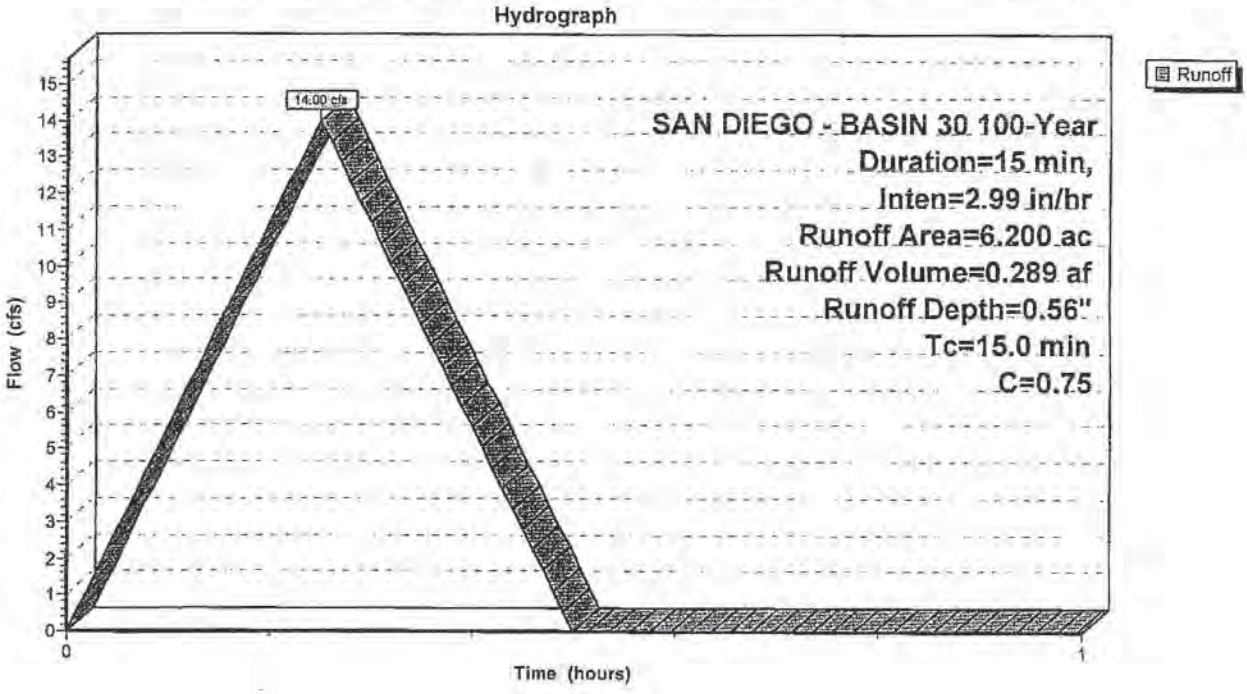
Runoff = 14.00 cfs @ 0.25 hrs, Volume= 0.289 af, Depth= 0.56"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 30 100-Year Duration=15 min, Inten=2.99 in/hr

Area (ac)	C	Description
6.200	0.75	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, TIME OF CONCENTRATION

Subcatchment BASIN 30: FLOW TO DRAINAGE SYSTEM 'B'



FLOW TO DRAINAGE SYSTEM 'B'

Drainage Diagram for EXISTING BASIN 30
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/28/2006
HydroCAD® 7.00 s/n 000000 © 1986-2003 Applied Microcomputer Systems

Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 30: FLOW TO DRAINAGE SYSTEM 'B' Runoff Area=6.200 ac Runoff Depth=0.56"
Tc=15.0 min C=0.75 Runoff=14.00 cfs 0.289 af

Total Runoff Area = 6.200 ac Runoff Volume = 0.289 af Average Runoff Depth = 0.56"

Subcatchment BASIN 30: FLOW TO DRAINAGE SYSTEM 'B'

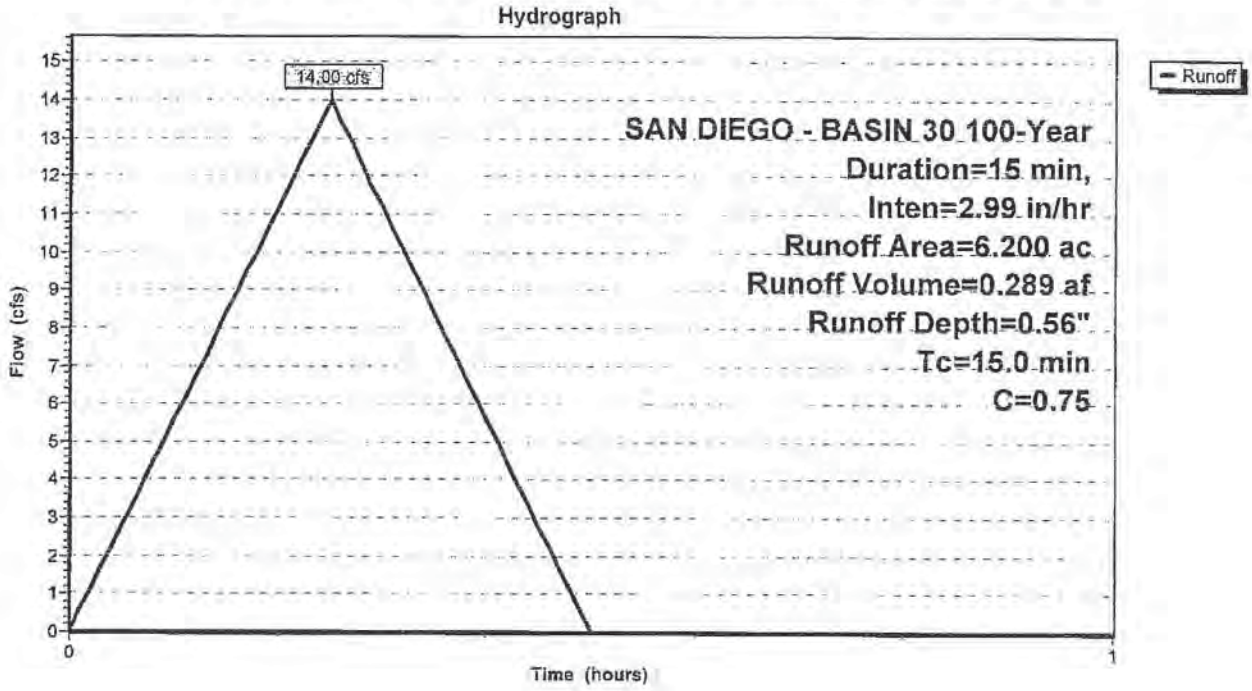
Runoff = 14.00 cfs @ 0.25 hrs, Volume= 0.289 af, Depth= 0.56"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 30 100-Year Duration=15 min, Inten=2.99 in/hr

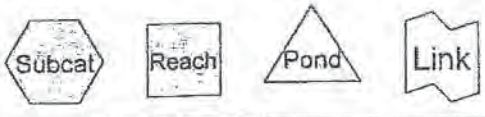
Area (ac)	C	Description
6.200	0.75	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, TIME OF CONCENTRATION

Subcatchment BASIN 30: FLOW TO DRAINAGE SYSTEM 'B'



FLOW TO DRAINAGE SYSTEM 'C'



Drainage Diagram for BASIN 3
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/25/2006
HydroCAD® 7.00 s/n 000000 © 1986-2003 Applied Microcomputer Systems

Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 3: TO SYSTEM C Runoff Area=26.500 ac Runoff Depth=0.33"
Tc=15.2 min C=0.45 Runoff=35.79 cfs 0.739 af

Total Runoff Area = 26.500 ac Runoff Volume = 0.739 af Average Runoff Depth = 0.33"

Subcatchment 3: TO SYSTEM C

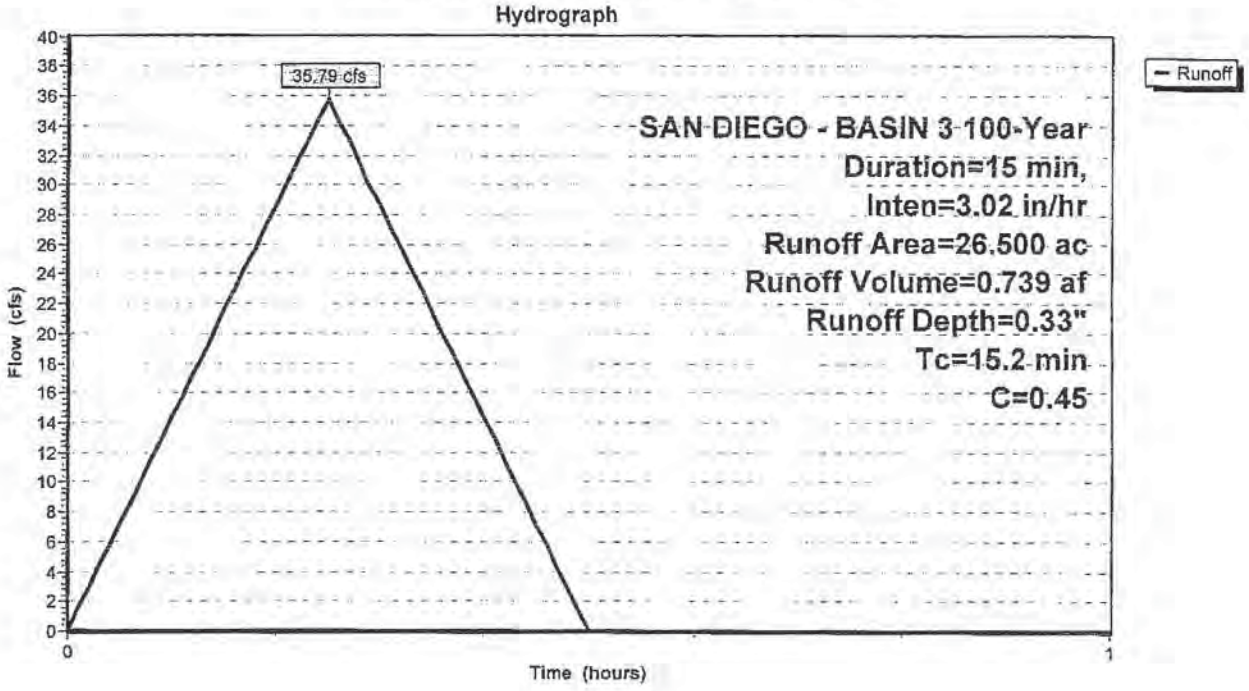
Runoff = 35.79 cfs @ 0.25 hrs, Volume= 0.739 af, Depth= 0.33"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 3 100-Year Duration=15 min, Inten=3.02 in/hr

Area (ac)	C	Description
26.500	0.45	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2					Direct Entry, TIME OF CONCENTRATION

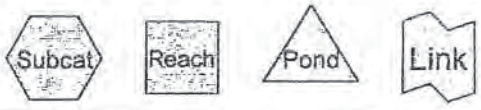
Subcatchment 3: TO SYSTEM C



Hydrograph for Subcatchment 3: TO SYSTEM C

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	0.00	0.52	0.00
0.01	1.43	0.53	0.00
0.02	2.86	0.54	0.00
0.03	4.29	0.55	0.00
0.04	5.73	0.56	0.00
0.05	7.16	0.57	0.00
0.06	8.59	0.58	0.00
0.07	10.02	0.59	0.00
0.08	11.45	0.60	0.00
0.09	12.88	0.61	0.00
0.10	14.32	0.62	0.00
0.11	15.75	0.63	0.00
0.12	17.18	0.64	0.00
0.13	18.61	0.65	0.00
0.14	20.04	0.66	0.00
0.15	21.47	0.67	0.00
0.16	22.91	0.68	0.00
0.17	24.34	0.69	0.00
0.18	25.77	0.70	0.00
0.19	27.20	0.71	0.00
0.20	28.63	0.72	0.00
0.21	30.06	0.73	0.00
0.22	31.50	0.74	0.00
0.23	32.93	0.75	0.00
0.24	34.36	0.76	0.00
0.25	**35.79**	0.77	0.00
0.26	34.36	0.78	0.00
0.27	32.93	0.79	0.00
0.28	31.50	0.80	0.00
0.29	30.06	0.81	0.00
0.30	28.63	0.82	0.00
0.31	27.20	0.83	0.00
0.32	25.77	0.84	0.00
0.33	24.34	0.85	0.00
0.34	22.91	0.86	0.00
0.35	21.47	0.87	0.00
0.36	20.04	0.88	0.00
0.37	18.61	0.89	0.00
0.38	17.18	0.90	0.00
0.39	15.75	0.91	0.00
0.40	14.32	0.92	0.00
0.41	12.88	0.93	0.00
0.42	11.45	0.94	0.00
0.43	10.02	0.95	0.00
0.44	8.59	0.96	0.00
0.45	7.16	0.97	0.00
0.46	5.73	0.98	0.00
0.47	4.29	0.99	0.00
0.48	2.86	1.00	0.00
0.49	1.43		
0.50	0.00		
0.51	0.00		

FLOW TO DRAINAGE SYSTEM 'D'



Drainage Diagram for EXISTING BASIN 4
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/25/2006
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Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 4: FLOW TO DRAINAGE BASIN 'D' Runoff Area=36.400 ac Runoff Depth=0.32"
Tc=16.0 min C=0.45 Runoff=47.50 cfs 0.981 af

Total Runoff Area = 36.400 ac Runoff Volume = 0.981 af Average Runoff Depth = 0.32"

Subcatchment BASIN 4: FLOW TO DRAINAGE BASIN 'D'

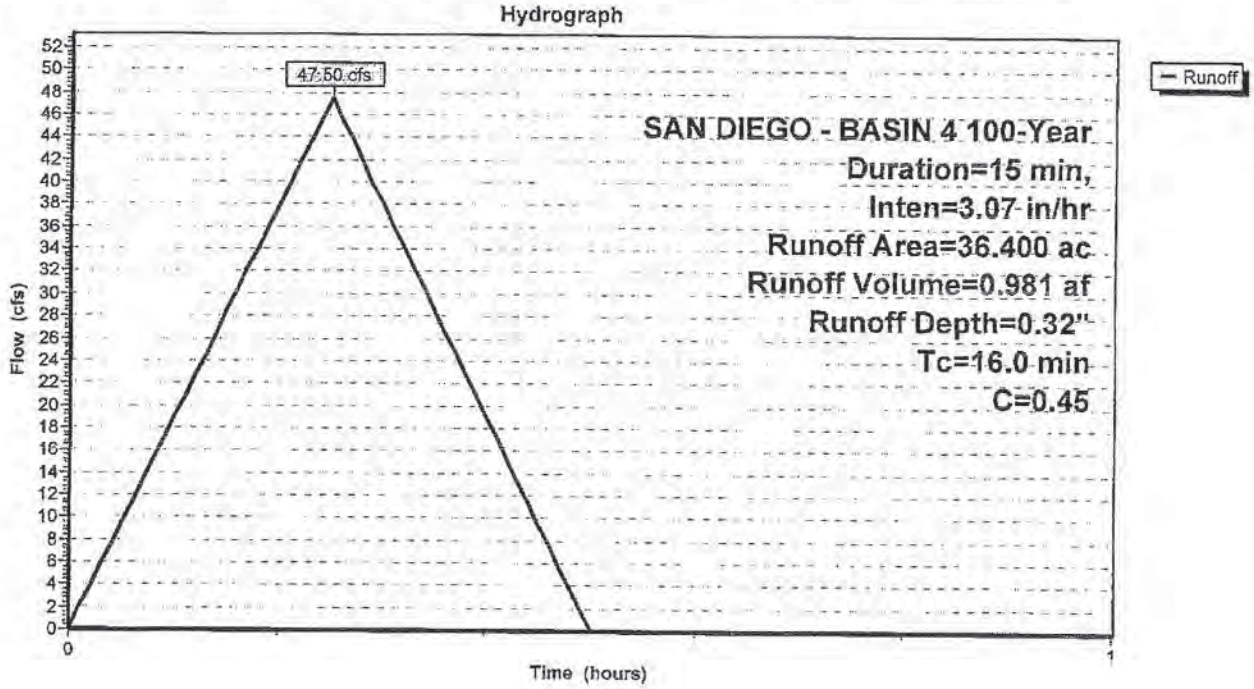
Runoff = 47.50 cfs @ 0.25 hrs, Volume= 0.981 af, Depth= 0.32"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 4 100-Year Duration=15 min, Inten=3.07 in/hr

Area (ac)	C	Description
36.400	0.45	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0					Direct Entry, TIME OF CONCENTRATION

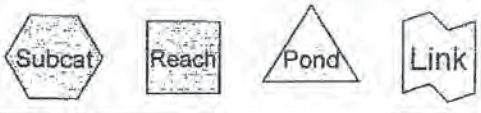
Subcatchment BASIN 4: FLOW TO DRAINAGE BASIN 'D'



Hydrograph for Subcatchment BASIN 4: FLOW TO DRAINAGE BASIN 'D'

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	0.00	0.52	0.00
0.01	1.90	0.53	0.00
0.02	3.80	0.54	0.00
0.03	5.70	0.55	0.00
0.04	7.60	0.56	0.00
0.05	9.50	0.57	0.00
0.06	11.40	0.58	0.00
0.07	13.30	0.59	0.00
0.08	15.20	0.60	0.00
0.09	17.10	0.61	0.00
0.10	19.00	0.62	0.00
0.11	20.90	0.63	0.00
0.12	22.80	0.64	0.00
0.13	24.70	0.65	0.00
0.14	26.60	0.66	0.00
0.15	28.50	0.67	0.00
0.16	30.40	0.68	0.00
0.17	32.30	0.69	0.00
0.18	34.20	0.70	0.00
0.19	36.10	0.71	0.00
0.20	38.00	0.72	0.00
0.21	39.90	0.73	0.00
0.22	41.80	0.74	0.00
0.23	43.70	0.75	0.00
0.24	45.60	0.76	0.00
0.25	**47.50**	0.77	0.00
0.26	45.60	0.78	0.00
0.27	43.70	0.79	0.00
0.28	41.80	0.80	0.00
0.29	39.90	0.81	0.00
0.30	38.00	0.82	0.00
0.31	36.10	0.83	0.00
0.32	34.20	0.84	0.00
0.33	32.30	0.85	0.00
0.34	30.40	0.86	0.00
0.35	28.50	0.87	0.00
0.36	26.60	0.88	0.00
0.37	24.70	0.89	0.00
0.38	22.80	0.90	0.00
0.39	20.90	0.91	0.00
0.40	19.00	0.92	0.00
0.41	17.10	0.93	0.00
0.42	15.20	0.94	0.00
0.43	13.30	0.95	0.00
0.44	11.40	0.96	0.00
0.45	9.50	0.97	0.00
0.46	7.60	0.98	0.00
0.47	5.70	0.99	0.00
0.48	3.80	1.00	0.00
0.49	1.90		
0.50	0.00		
0.51	0.00		

FLOW TO DRAINAGE SYSTEM 'E'



Drainage Diagram for EXISTING BASIN 5
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/25/2006
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Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 5: FLOW TO DRAINAGE BASIN 'E' Runoff Area=14.100 ac Runoff Depth=0.31"
Tc=13.2 min C=0.45 Runoff=20.30 cfs 0.368 af

Total Runoff Area = 14.100 ac Runoff Volume = 0.368 af Average Runoff Depth = 0.31"

Subcatchment BASIN 5: FLOW TO DRAINAGE BASIN 'E'

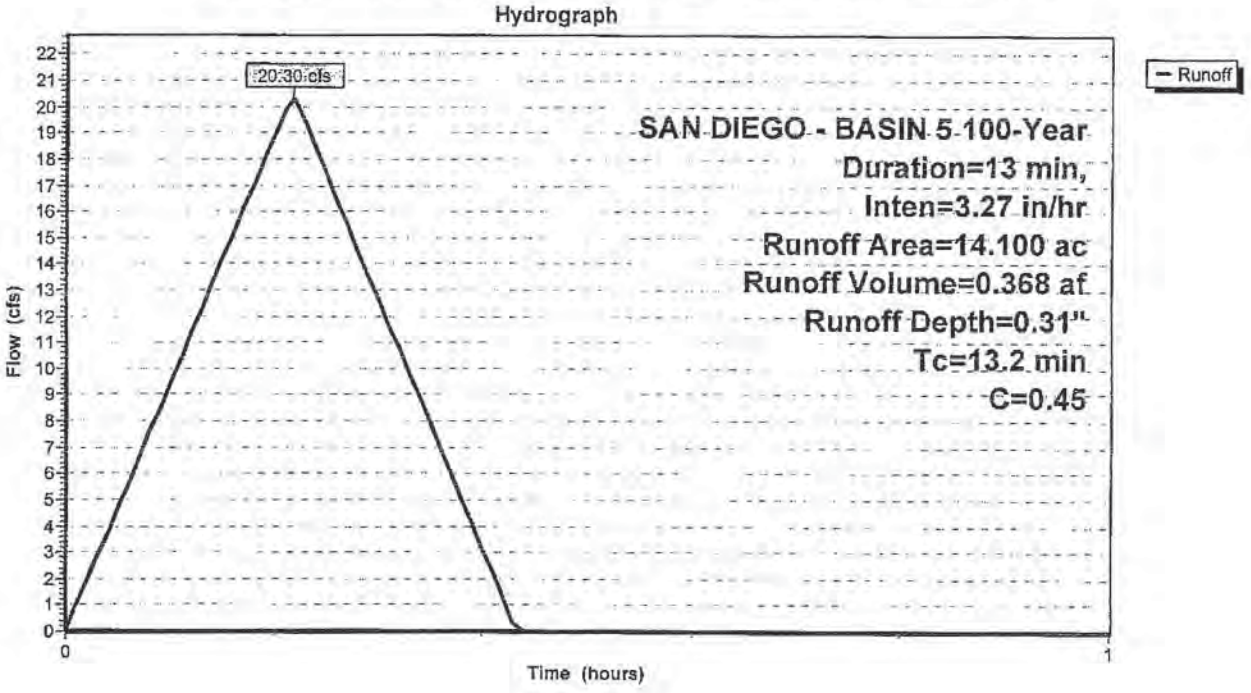
Runoff = 20.30 cfs @ 0.22 hrs, Volume= 0.368 af, Depth= 0.31"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 5 100-Year Duration=13 min, Inten=3.27 in/hr

Area (ac)	C	Description
14.100	0.45	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2					Direct Entry, TIME OF CONCENTRATION

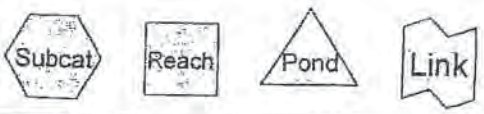
Subcatchment BASIN 5: FLOW TO DRAINAGE BASIN 'E'



Hydrograph for Subcatchment BASIN 5: FLOW TO DRAINAGE BASIN 'E'

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	0.00	0.52	0.00
0.01	0.95	0.53	0.00
0.02	1.90	0.54	0.00
0.03	2.85	0.55	0.00
0.04	3.80	0.56	0.00
0.05	4.75	0.57	0.00
0.06	5.70	0.58	0.00
0.07	6.65	0.59	0.00
0.08	7.60	0.60	0.00
0.09	8.55	0.61	0.00
0.10	9.50	0.62	0.00
0.11	10.45	0.63	0.00
0.12	11.40	0.64	0.00
0.13	12.35	0.65	0.00
0.14	13.30	0.66	0.00
0.15	14.25	0.67	0.00
0.16	15.19	0.68	0.00
0.17	16.14	0.69	0.00
0.18	17.09	0.70	0.00
0.19	18.04	0.71	0.00
0.20	18.99	0.72	0.00
0.21	19.94	0.73	0.00
0.22	**20.26**	0.74	0.00
0.23	19.31	0.75	0.00
0.24	18.36	0.76	0.00
0.25	17.41	0.77	0.00
0.26	16.46	0.78	0.00
0.27	15.51	0.79	0.00
0.28	14.56	0.80	0.00
0.29	13.61	0.81	0.00
0.30	12.66	0.82	0.00
0.31	11.71	0.83	0.00
0.32	10.76	0.84	0.00
0.33	9.81	0.85	0.00
0.34	8.86	0.86	0.00
0.35	7.91	0.87	0.00
0.36	6.96	0.88	0.00
0.37	6.01	0.89	0.00
0.38	5.06	0.90	0.00
0.39	4.12	0.91	0.00
0.40	3.17	0.92	0.00
0.41	2.22	0.93	0.00
0.42	1.27	0.94	0.00
0.43	0.32	0.95	0.00
0.44	0.00	0.96	0.00
0.45	0.00	0.97	0.00
0.46	0.00	0.98	0.00
0.47	0.00	0.99	0.00
0.48	0.00	1.00	0.00
0.49	0.00		
0.50	0.00		
0.51	0.00		

FLOW TO DRAINAGE SYSTEM 'F'



Drainage Diagram for EXISTING BASIN 6
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/25/2006
HydroCAD® 7.00 s/n 000000 © 1986-2003 Applied Microcomputer Systems

Subcatchment BASIN 6: FLOW TO DRAINAGE BASIN 'F'

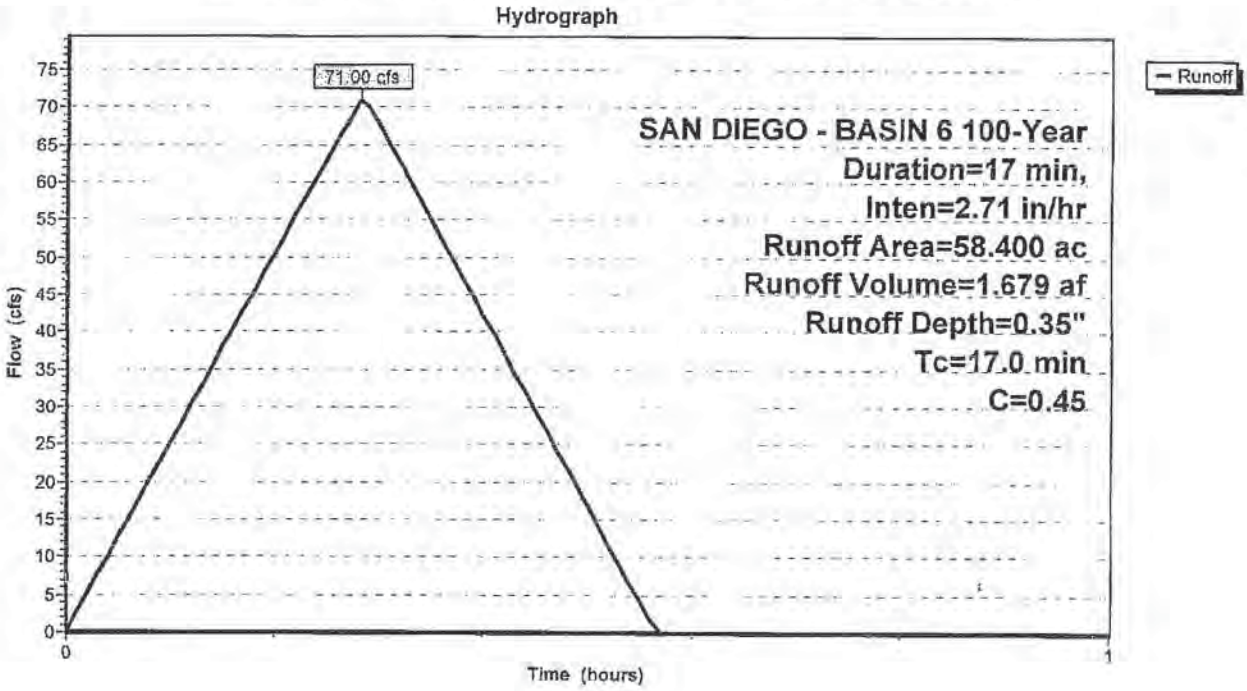
Runoff = 71.00 cfs @ 0.28 hrs, Volume= 1.679 af, Depth= 0.35"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 6 100-Year Duration=17 min, Inten=2.71 in/hr

Area (ac)	C	Description
58.400	0.45	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0					Direct Entry, TIME OF CONCENTRATION

Subcatchment BASIN 6: FLOW TO DRAINAGE BASIN 'F'



Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

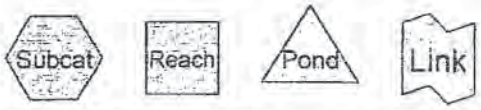
Subcatchment BASIN 6: FLOW TO DRAINAGE BASIN 'F' Runoff Area=58.400 ac Runoff Depth=0.35"
Tc=17.0 min C=0.45 Runoff=71.00 cfs 1.679 af

Total Runoff Area = 58.400 ac Runoff Volume = 1.679 af Average Runoff Depth = 0.35"

Hydrograph for Subcatchment BASIN 6: FLOW TO DRAINAGE BASIN 'F'

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	0.00	0.52	11.81
0.01	2.53	0.53	9.28
0.02	5.06	0.54	6.75
0.03	7.60	0.55	4.22
0.04	10.13	0.56	1.69
0.05	12.66	0.57	0.00
0.06	15.19	0.58	0.00
0.07	17.72	0.59	0.00
0.08	20.25	0.60	0.00
0.09	22.79	0.61	0.00
0.10	25.32	0.62	0.00
0.11	27.85	0.63	0.00
0.12	30.38	0.64	0.00
0.13	32.91	0.65	0.00
0.14	35.44	0.66	0.00
0.15	37.98	0.67	0.00
0.16	40.51	0.68	0.00
0.17	43.04	0.69	0.00
0.18	45.57	0.70	0.00
0.19	48.10	0.71	0.00
0.20	50.64	0.72	0.00
0.21	53.17	0.73	0.00
0.22	55.70	0.74	0.00
0.23	58.23	0.75	0.00
0.24	60.76	0.76	0.00
0.25	63.29	0.77	0.00
0.26	65.83	0.78	0.00
0.27	68.36	0.79	0.00
0.28	**70.89**	0.80	0.00
0.29	70.05	0.81	0.00
0.30	67.51	0.82	0.00
0.31	64.98	0.83	0.00
0.32	62.45	0.84	0.00
0.33	59.92	0.85	0.00
0.34	57.39	0.86	0.00
0.35	54.86	0.87	0.00
0.36	52.32	0.88	0.00
0.37	49.79	0.89	0.00
0.38	47.26	0.90	0.00
0.39	44.73	0.91	0.00
0.40	42.20	0.92	0.00
0.41	39.66	0.93	0.00
0.42	37.13	0.94	0.00
0.43	34.60	0.95	0.00
0.44	32.07	0.96	0.00
0.45	29.54	0.97	0.00
0.46	27.01	0.98	0.00
0.47	24.47	0.99	0.00
0.48	21.94	1.00	0.00
0.49	19.41		
0.50	16.88		
0.51	14.35		

FLOW TO DRAINAGE SYSTEM 'G'



Drainage Diagram for EXISTING BASIN 7
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/25/2006

Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 7: FLOW TO DRAINAGE BASIN 'G' Runoff Area=18.500 ac Runoff Depth=0.31"
Tc=13.0 min C=0.45 Runoff=26.60 cfs 0.483 af

Total Runoff Area = 18.500 ac Runoff Volume = 0.483 af Average Runoff Depth = 0.31"

Subcatchment BASIN 7: FLOW TO DRAINAGE BASIN 'G'

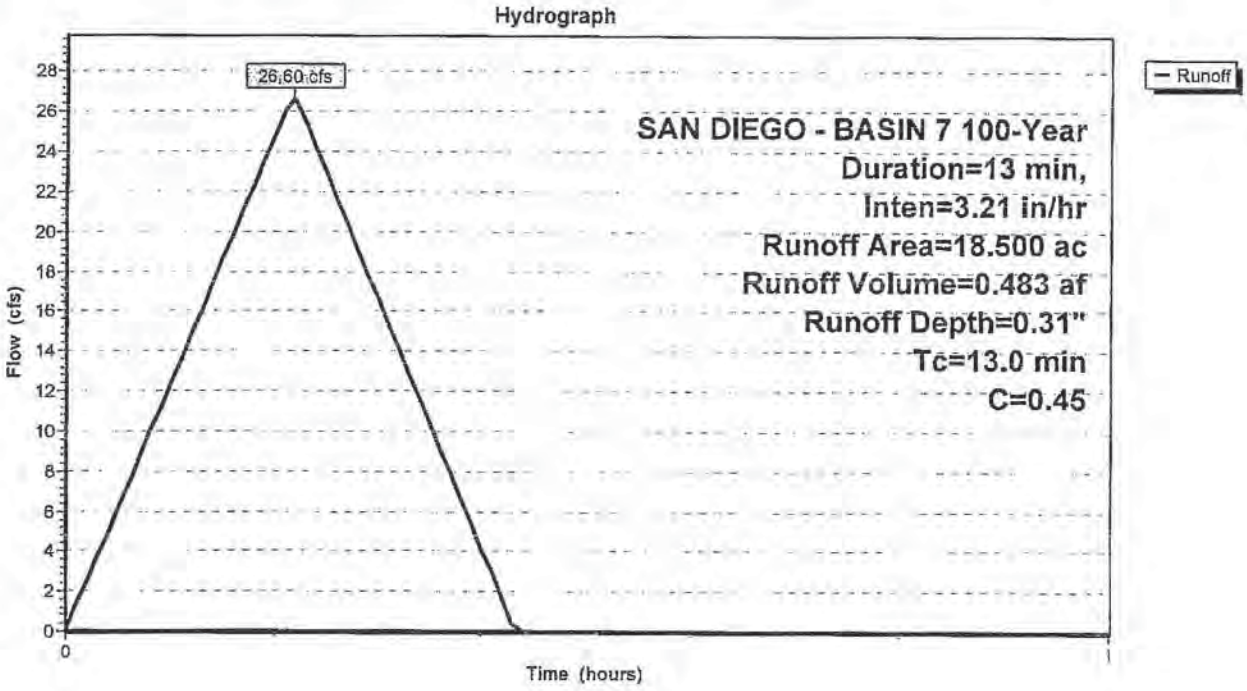
Runoff = 26.60 cfs @ 0.22 hrs, Volume= 0.483 af, Depth= 0.31"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 7 100-Year Duration=13 min, Inten=3.21 in/hr

Area (ac)	C	Description
18.500	0.45	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0					Direct Entry, TIME OF CONCENTRATION

Subcatchment BASIN 7: FLOW TO DRAINAGE BASIN 'G'



Hydrograph for Subcatchment BASIN 7: FLOW TO DRAINAGE BASIN 'G'

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	0.00	0.52	0.00
0.01	1.24	0.53	0.00
0.02	2.49	0.54	0.00
0.03	3.73	0.55	0.00
0.04	4.98	0.56	0.00
0.05	6.22	0.57	0.00
0.06	7.47	0.58	0.00
0.07	8.71	0.59	0.00
0.08	9.96	0.60	0.00
0.09	11.20	0.61	0.00
0.10	12.44	0.62	0.00
0.11	13.69	0.63	0.00
0.12	14.93	0.64	0.00
0.13	16.18	0.65	0.00
0.14	17.42	0.66	0.00
0.15	18.67	0.67	0.00
0.16	19.91	0.68	0.00
0.17	21.16	0.69	0.00
0.18	22.40	0.70	0.00
0.19	23.65	0.71	0.00
0.20	24.89	0.72	0.00
0.21	26.13	0.73	0.00
0.22	**26.55**	0.74	0.00
0.23	25.30	0.75	0.00
0.24	24.06	0.76	0.00
0.25	22.82	0.77	0.00
0.26	21.57	0.78	0.00
0.27	20.33	0.79	0.00
0.28	19.08	0.80	0.00
0.29	17.84	0.81	0.00
0.30	16.59	0.82	0.00
0.31	15.35	0.83	0.00
0.32	14.10	0.84	0.00
0.33	12.86	0.85	0.00
0.34	11.62	0.86	0.00
0.35	10.37	0.87	0.00
0.36	9.13	0.88	0.00
0.37	7.88	0.89	0.00
0.38	6.64	0.90	0.00
0.39	5.39	0.91	0.00
0.40	4.15	0.92	0.00
0.41	2.90	0.93	0.00
0.42	1.66	0.94	0.00
0.43	0.41	0.95	0.00
0.44	0.00	0.96	0.00
0.45	0.00	0.97	0.00
0.46	0.00	0.98	0.00
0.47	0.00	0.99	0.00
0.48	0.00	1.00	0.00
0.49	0.00		
0.50	0.00		
0.51	0.00		

FLOW TO DRAINAGESYSTEM 'H'

Drainage Diagram for EXISTING BASIN 8
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/25/2006

Time span=0.00-1.50 hrs, dt=0.01 hrs, 151 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 8: FLOW TO DRAINAGE BASIN 'H' Runoff Area=580.000 ac Runoff Depth=0.50"
Tc=37.0 min C=0.45 Runoff=469.81 cfs 24.057 af

Total Runoff Area = 580.000 ac Runoff Volume = 24.057 af Average Runoff Depth = 0.50"

Subcatchment BASIN 8: FLOW TO DRAINAGE BASIN 'H'

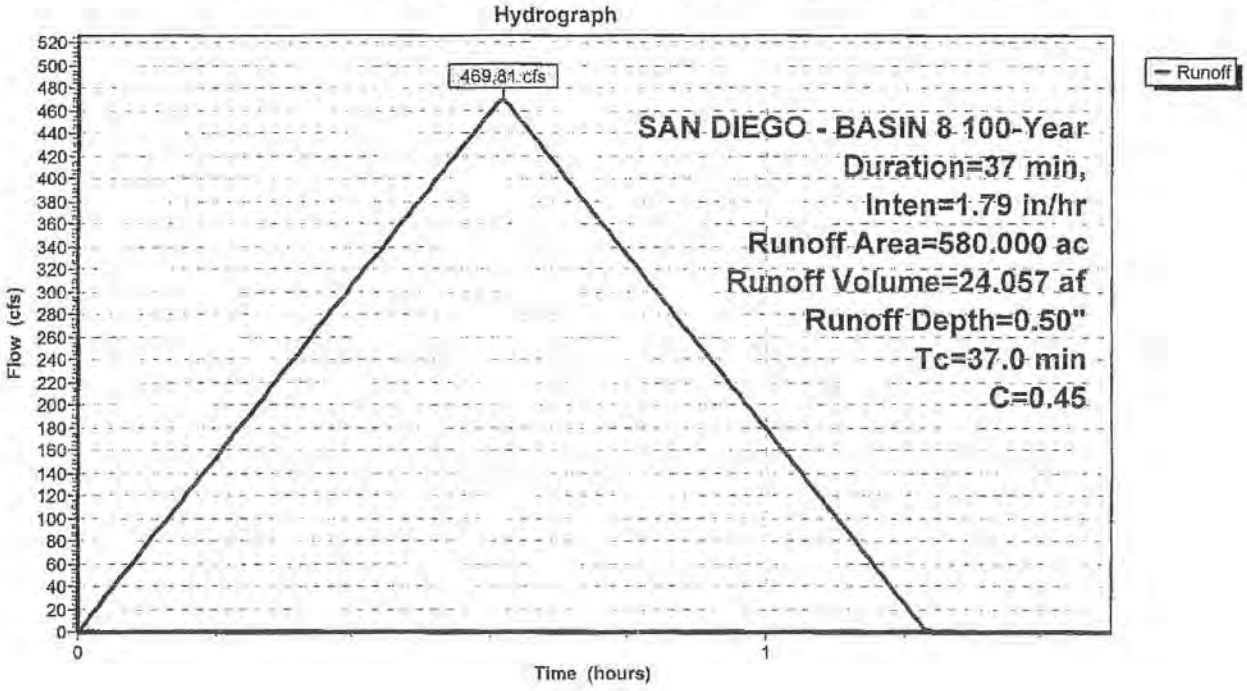
Runoff = 469.81 cfs @ 0.62 hrs, Volume= 24.057 af, Depth= 0.50"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.50 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 8 100-Year Duration=37 min, Inten=1.79 in/hr

Area (ac)	C	Description
580.000	0.45	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.0					Direct Entry, TIME OF CONCENTRATION

Subcatchment BASIN 8: FLOW TO DRAINAGE BASIN 'H'



Hydrograph for Subcatchment BASIN 8: FLOW TO DRAINAGE BASIN 'H'

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	0.00	0.52	398.05	1.04	147.99
0.01	7.65	0.53	405.70	1.05	140.34
0.02	15.31	0.54	413.36	1.06	132.68
0.03	22.96	0.55	421.01	1.07	125.03
0.04	30.62	0.56	428.67	1.08	117.37
0.05	38.27	0.57	436.32	1.09	109.72
0.06	45.93	0.58	443.97	1.10	102.06
0.07	53.58	0.59	451.63	1.11	94.41
0.08	61.24	0.60	459.28	1.12	86.75
0.09	68.89	0.61	466.94	1.13	79.10
0.10	76.55	0.62	**469.49**	1.14	71.44
0.11	84.20	0.63	461.84	1.15	63.79
0.12	91.86	0.64	454.18	1.16	56.13
0.13	99.51	0.65	446.53	1.17	48.48
0.14	107.17	0.66	438.87	1.18	40.83
0.15	114.82	0.67	431.22	1.19	33.17
0.16	122.48	0.68	423.56	1.20	25.52
0.17	130.13	0.69	415.91	1.21	17.86
0.18	137.79	0.70	408.25	1.22	10.21
0.19	145.44	0.71	400.60	1.23	2.55
0.20	153.09	0.72	392.94	1.24	0.00
0.21	160.75	0.73	385.29	1.25	0.00
0.22	168.40	0.74	377.63	1.26	0.00
0.23	176.06	0.75	369.98	1.27	0.00
0.24	183.71	0.76	362.32	1.28	0.00
0.25	191.37	0.77	354.67	1.29	0.00
0.26	199.02	0.78	347.01	1.30	0.00
0.27	206.68	0.79	339.36	1.31	0.00
0.28	214.33	0.80	331.71	1.32	0.00
0.29	221.99	0.81	324.05	1.33	0.00
0.30	229.64	0.82	316.40	1.34	0.00
0.31	237.30	0.83	308.74	1.35	0.00
0.32	244.95	0.84	301.09	1.36	0.00
0.33	252.61	0.85	293.43	1.37	0.00
0.34	260.26	0.86	285.78	1.38	0.00
0.35	267.92	0.87	278.12	1.39	0.00
0.36	275.57	0.88	270.47	1.40	0.00
0.37	283.23	0.89	262.81	1.41	0.00
0.38	290.88	0.90	255.16	1.42	0.00
0.39	298.53	0.91	247.50	1.43	0.00
0.40	306.19	0.92	239.85	1.44	0.00
0.41	313.84	0.93	232.19	1.45	0.00
0.42	321.50	0.94	224.54	1.46	0.00
0.43	329.15	0.95	216.88	1.47	0.00
0.44	336.81	0.96	209.23	1.48	0.00
0.45	344.46	0.97	201.57	1.49	0.00
0.46	352.12	0.98	193.92	1.50	0.00
0.47	359.77	0.99	186.27		
0.48	367.43	1.00	178.61		
0.49	375.08	1.01	170.96		
0.50	382.74	1.02	163.30		
0.51	390.39	1.03	155.65		

APPENDIX C

APPENDIX C
EXISTING HYDRAULIC CALCULATIONS
(Basins 1-8 & 30)

EXISTING BASINS 1, 2, & 30
(Flow to Mast Boulevard)

BASIN 1 - 100-YR STORM EVENT

Q_{100} = 26.6 cfs (EXISTING)

Q_{100} = 26.6 cfs (PROPOSED)

EXISTING DESIGN FLOW PER CITY OF SANTEE MAST BLVD. EXTENSION PROJECT DWG. NO. 91-090 (24" RCP)

Q = 47.3 cfs > 26.6 OK ✓

BASIN 2 - 100-YR STORM EVENT

Q_{100} = 150.0 cfs (EXISTING)

Q_{100} = 164.3 cfs (PROPOSED)

in 48" RCP IS 173.8

EXISTING DESIGN FLOW PER 91-090 IS

Q = 173.8 > 164.3 OK ✓

BASIN 30 - 100-YR STORM EVENT

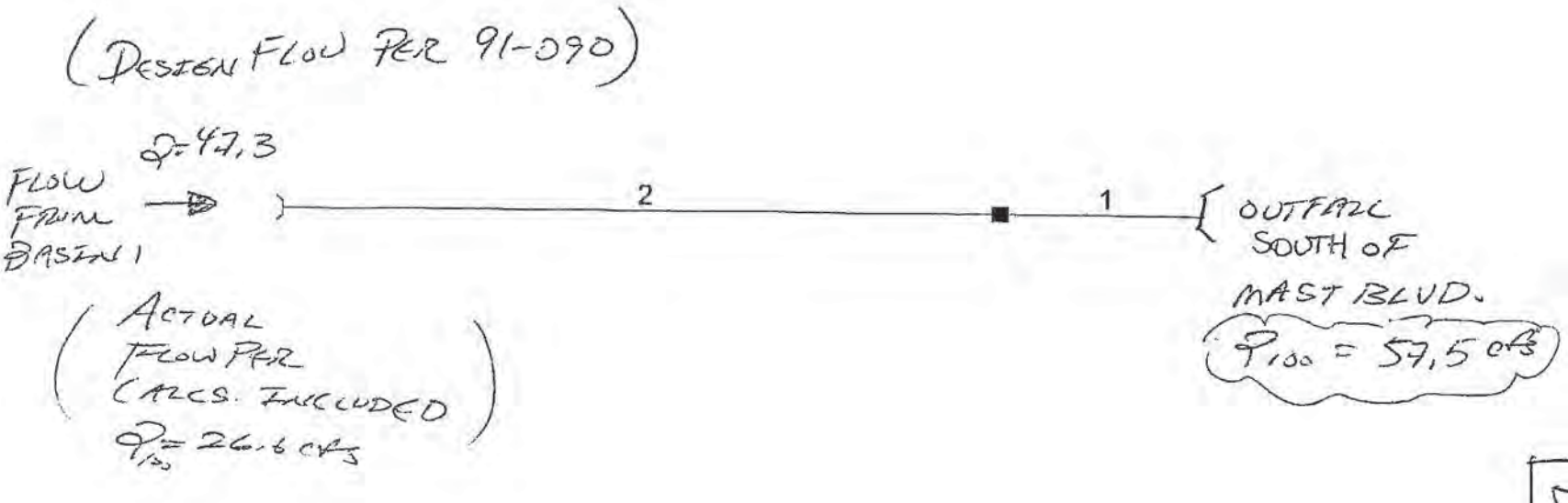
Q_{100} = 14.0 cfs (EXISTING)

Q_{100} = 15.1 cfs (PROPOSED)

EXISTING DESIGN FLOW IN 24" RCP PER 91-092 IS 19.6 cfs.

Q = 19.6 > 15.1 OK ✓

Hydraflow Plan View



Project file: castle1.stm	IDF file: citysd.IDF	No. Lines: 2	09-28-2006

Hy[illegible]iflow Storm Sewer Inventory Rep[illegible]

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	31.8	-180.0	Curb	10.20	0.00	0.00	0.0	402.50	5.67	404.30	24	Cir	0.013	0.50	418.86	
2	1	113.2	0.0	Hdwl	47.30	0.00	0.00	0.0	404.62	4.40	409.60	24	Cir	0.013	1.00	412.60	

Project File: castle1.stm | IDF File: citysd.IDF | Total number of lines: 2 | Date: 09-28-2006

Hydraflow Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1		57.50	24 c	31.8	402.50	404.30	5.669	404.50*	406.55*	2.60	End
2		47.30	24 c	113.2	404.62	409.60	4.398	409.16*	414.11*	3.52	1

Project File: castle1.stm	IDF File: citysd.IDF	Total No. Lines: 2	Run Date: 09-28-2006

NOTES: c = circular; e = elliptical; b = box; Return period = 100 Yrs.; * Indicates surcharge condition.

Hyd. Flow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	31.8	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	57.50	53.85	18.30	24	5.67	404.30	402.50	406.55	404.50	418.86	405.00	
2	1	113.2	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	47.30	47.43	15.06	24	4.40	409.60	404.62	414.11	409.16	412.60	418.86	

Project File: castle1.stm | IDF File: citysd.IDF | Total number of lines: 2 | Run Date: 09-28-2006

NOTES: Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 -- X = Ln(Tc)(min); Return period = 100 Yrs. ; Initial tailwater elevation = 404.50 (ft)

Hy[illegible]flow Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	depth (ft)	spread (ft)	depth (ft)	spread (ft)	Dep (in)	
1		10.20*	0.00	10.20	0.00	Curb	6.0	8.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.50	8.77	0.47	8.77	0.33	Off
2		47.30*	0.00	47.30	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.00	0.00	0.00	0.00	0.0	1

Project File: castle1.stm | I-D-F File: citysd.IDF | Total number of lines: 2 | Run Date: 09-28-2006

NOTES: Inlet N-Values = 0.015 ; Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 – X = Inlet time (min); Return period = 100 Yrs. ; * Indicates Known Q added

Hy[illegible]iflow FL-DOT Report

Line No	To Line	Type of struc	n - value	Len	Drainage Area C1 = 0.2 C2 = 0.5 C3 = 0.9			Time of conc	Time of flow in sect	Inten (I)	Total CA	Add Q / Total flow	Inlet elev	Elev of HGL / Elev of Crown / Elev of Invert			Rise Span	HGL Pipe	Actual Full Flow		Date: 09-28-2006 / Frequency: 100 yrs / Project: castle1.stm
					Increment (ac)	Sub-total (ac)	Sum CA					Q		Up	Down	Fall	Size	Slope	Vel	Cap	
				(ft)				(min)	(min)	(in/hr)		(cfs)	(ft)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)	Line description
1	End	Curb	0.013	31.8	0.00 0.00	0.00 0.00	0.00 0.00	0.13	0.03	0.0	0.00	57.50	418.86	406.30 404.30	404.50 402.50	2.05 1.80	24 Cir	5.67	17.14	53.85	
2	1	Hdwl	0.013	113.2	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.13	0.0	0.00	47.30	412.60	411.60 409.60	406.62 404.62	4.96 4.98	24 Cir	4.40	15.10	47.43	

NOTES: Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 -- X = Ln(Tc)(min) (In/hr) ; Time of flow in section is based on full flow.; Initial tailwater elevation = 404.50 (ft)

Hyd flow Hydraulic Grade Line Compu tions

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
	(in)	(cfs)									(ft)											(K)	(ft)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
1	24	57.50	402.50	404.50	2.00	3.14	18.31	5.21	409.71	6.466	31.8	404.30	406.55	2.00	3.14	18.30	5.21	411.76	6.463	6.465	2.053	0.50	2.60
2	24	47.30	404.62	409.16	2.00	3.14	15.06	3.53	412.68	4.375	113	409.60	414.11	2.00	3.14	15.06	3.52	417.64	4.374	4.374	4.954	1.00	3.52

Project File: castle1.stm | IDF File: citysd.IDF | Total number of lines: 2 | Run Date: 09-28-2006

NOTES: Initial tailwater elevation = 404.5 (ft) , * Normal depth assumed., ** Critical depth assumed.

Hy[illegible]flow HGL Computation Procedur[illegible]

General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is assumed at the upstream end.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the assumed hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

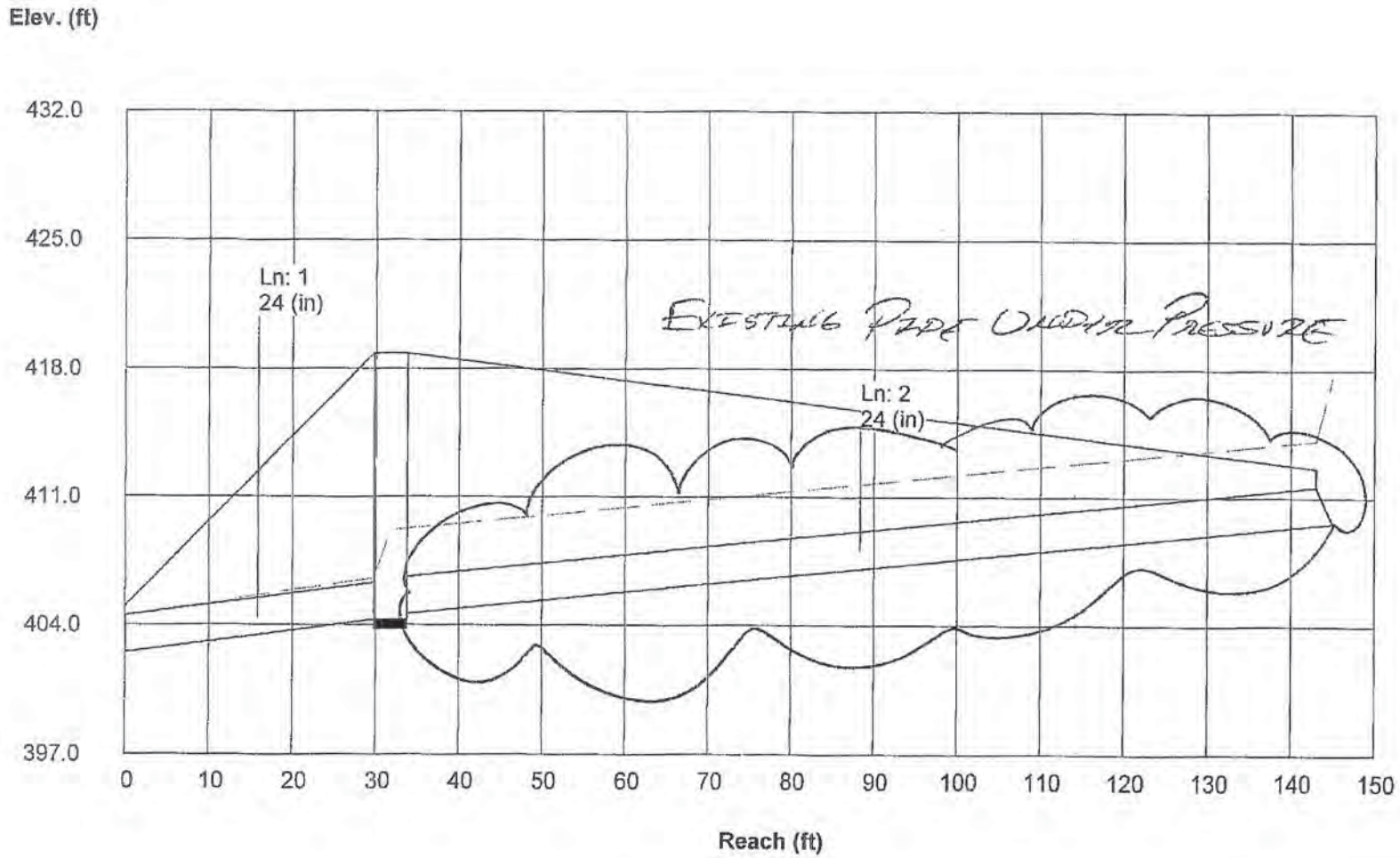
Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. Equals Col. 23 x Col. 18. This amount is added to the upstream HGL and used as the starting HGL for the next upstream line(s).

* Normal depth assumed.
** Critical depth assumed.

St[illegible]n Sewer Profile

Pro[illegible]: castle1.stm



CURB RETURN PROFILES

SCALES: HORIZ. 1"=40' VERT. 1"=4'

PROFILE: M

SCALES: HORIZ 1"=

NOTE: 2% CROWN SLOPE

APN 366-081-10

APN 366-081-18

BASIN T

BROW DITCH PER STD D-75, TYPE 'D' W=3.0', D=1.5'
Q100 = 21.7 CFS
V100 = 9.8 FPS

CHANGE "A"

LIMIT OF WORK

CENTERLINE DATA

NOTE: ALL WORK MORE THAN 13' S'LY OF CENT

420 ℄ LINE

MATCH LINE SEE SHT. 13

420.88 112+75

420.45 113+00

113+54 (77' RT) CURTAIN WALL PER D-38

419.38 113+50 E.V.C.

113+59 MAST BLVD ℄ 5' TYPE "B" C.I. TOP=418.86 6"Ø O.P.=413.38 12"Ø O.P.=413.38

114+09 REMOVE END CAP & CONNECT TO EXIST. 12" P.V.C. PER P.D.M.W.D. TIME REQ.

114+52.70 (EXIST.) ℄ 5' TYPE "B" C.I. TOP=416.50 416.38 114+75 B.V.C.

CHANGE "A"

-2.40%

115+70 EL. 414.72 409.72 B.O.P.: 12" PVC 408.72 B.O.P.: 6" PVC

116+45 LOW POINT 12" P.V.C. (B.O.P.: 409.6) 6" P.V.C. B.O.P.: 405.20

CHANGE "A"

℄ 5' TYPE 'B' C.I. TOP = 413.87 118+49.42 EXIST.

117+00 409.68 BOTTOM 12" P.V.C.

414.68 117+25 E.V.C. 409.68 B.O.P.= 12" P.V.C. 408.68 B.O.P.= 6" P.V.C.

415.46 118+00

EXIST. BOTTOM OF 12" P.V.C. CL 150

INSTALL 12" PVC CL150

6.0' 5.0'

6'Ø B.O.P.: 414.88 12'Ø B.O.P.: 415.88

EXISTING 24" CMP TO BE REMOVED

ELEV. TO BE VERIFIED IN FIELD

HGL

6.0 5.0 -0.16% 4.7 0.1% 5.0 6.0

EXIST. 24" R.C.P. @ 0.48% Q100 = 13.1 CFS

EXIST. 24" RCP @ 0.48% Q100 = 11.3 CFS V100 = 5.9 FPS

4.72% 4.37%

CHANGE "A"

CHANGE "A"

404.30 I.E. (OUT) ℄ 24" R.C.P.

404.79 I.E. (IN) (404.91) INSTALL CONC. COLLAR AT ℄ PT PER D-62

23.73'~24" R.C.P. @ 0.48% CL 1350-D

(405.24 I.E.) (OUT)

(405.57 I.E.) (IN)

12" PVC B.O.P. 411.74 114+60.20 12" x 12" x 6" "T" 114+54 ℄ MAST BLVD. 419.28

113+25 (70.00' LT) 1 WING TYPE HEADWALL PER D-34 TOP 412.60

41' 31' 10'

413.3 B.O.P. 6" P.V.C.

20%

113+54 ℄ TYPE "B" INLET TOP=418.86

113+54 (77' RT) ℄ STRAIGHT TYPE HDWLL PER D-32 TOP = 405.5

ROCK SLOPE PROTECTION (SEE PLAN BELOW)

409.60 I.E. 113.24'~24" RCP @ 4.4% CL-1350-D Q100 = 47.3 CFS V100 = 17.2 fps

404.62 I.E. (IN) 404.79 ℄ 24" RCP

404.30 I.E. (OUT)

402.50 I.E.

CHANGE "A"

31.75'~24" RCP @ 5.7% CL 1350-D Q100 = 57.5 CFS V100 = 19.3 FPS

116+45 LOW PT. 6" PVC B.O.P.= 405.20

S.D. @ 113+54

SCALES: HORIZ. 1"=40' VERT. 1"=8'

116+49.42 INSTALL ℄ 5' TYPE 'B' C.I. TOP 413.87

116+49.42 ℄ MAST BLVD. 414.25

REMOVE EXIST. PLUG & INSTALL CONC. COLLAR PER D-62

116+49.42 EXIST. ℄ 5' TYPE 'B' C.I. TOP = 413.87

31' 13' 3' MIN.

409.6 BOT. 12" P.V.C.

Q = 7.4 CFS V = 6.4 FPS

54.25'~18" RCP @ 1.0% CL 1350-D

405.3 BOP 6" PVC (407.08 I.E.)

I.E. 407.62 (OUT)

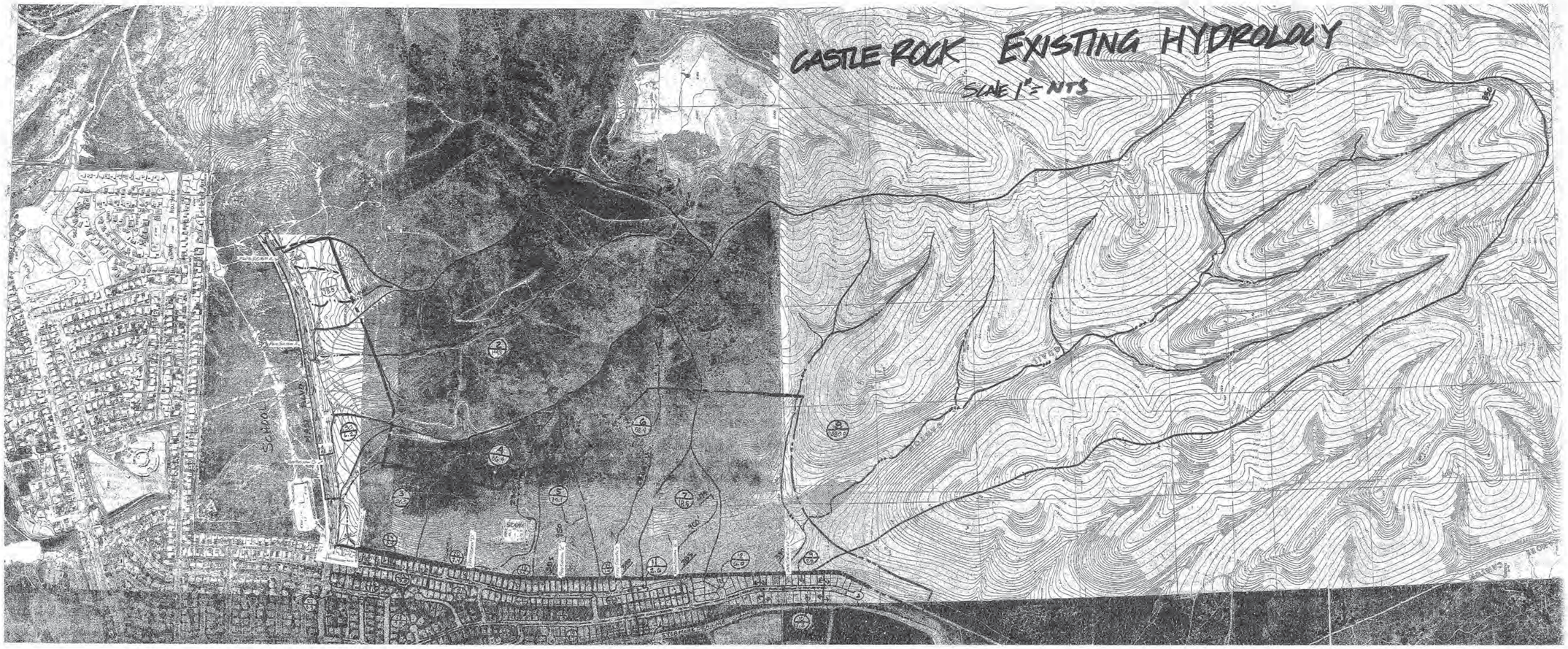
ELEV. TO BE VERIFIED (406.80 I.E.) (IN)

S.D. @ 116+49.42

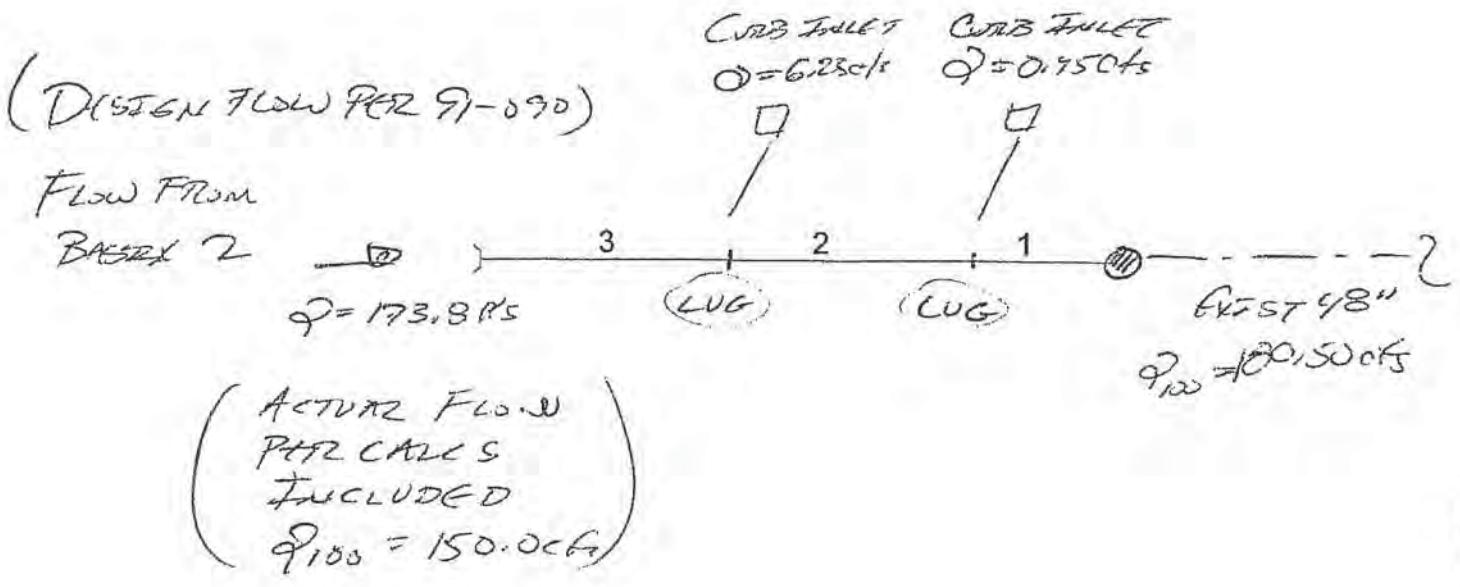
SCALES: HORIZ. 1"=40, VERT. 1"=8'

113 114 115 116 117 118

SEE END OF REPORT FOR 200' SCALE MAP



Hydraflow Plan View



Project file: castle2.stm	IDF file: citysd.IDF	No. Lines: 3	09-28-2006

H, aflow Storm Sewer Inventory Rep. .

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	32.0	-180.0	None	0.45	0.00	0.00	0.0	405.03	2.34	405.78	48	Cir	0.013	0.15	415.40	
2	1	102.0	0.0	None	6.25	0.00	0.00	0.0	405.78	2.37	408.20	48	Cir	0.013	0.15	415.40	
3	2	33.8	0.0	Hdwl	173.80	0.00	0.00	0.0	408.20	2.37	409.00	48	Cir	0.013	1.00	414.00	

Project File: castle2.stm | IDF File: citysd.IDF | Total number of lines: 3 | Date: 09-28-2006

Hydraflow Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1		180.5	48 c	32.0	405.03	405.78	2.344	409.03	409.56	0.50	End
2		180.1	48 c	102.0	405.78	408.20	2.373	410.06	411.98	0.50	1
3		173.8	48 c	33.8	408.20	409.00	2.370	412.48	412.93	3.00	2

Project File: castle2.stm	IDF File: citysd.IDF	Total No. Lines: 3	Run Date: 09-28-2006

NOTES: c = circular; e = elliptical; b = box; Return period = 100 Yrs.; * Indicates surcharge condition.

Hy .flow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	32.0	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	180.5	219.9	14.52	48	2.34	405.78	405.03	409.56	409.03	415.40	415.40	
2	1	102.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	180.1	221.3	14.49	48	2.37	408.20	405.78	411.98	410.06	415.40	415.40	
3	2	33.8	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	173.8	221.2	13.86	48	2.37	409.00	408.20	412.93	412.48	414.00	415.40	

Project File: castle2.stm | IDF File: citysd.IDF | Total number of lines: 3 | Run Date: 09-28-2006

NOTES: Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 – X = Ln(Tc)(min); Return period = 100 Yrs. ; Initial tailwater elevation = 409.03 (ft)

Hydraflow Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	depth (ft)	spread (ft)	depth (ft)	spread (ft)	Dep (in)	
1		0.45*	6.25	0.00	6.70	None	6.0	8.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.00	0.00	0.00	0.00	0.33	Off
2		6.25*	0.00	0.00	6.25	None	6.0	6.00	0.00	4.00	2.00	0.000	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.33	1
3		173.80*	0.00	173.80	0.00	Hdwl	6.0	6.00	0.00	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.33	2

Project File: castle2.stm | I-D-F File: citysd.IDF | Total number of lines: 3 | Run Date: 09-28-2006

NOTES: Inlet N-Values = 0.015 ; Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 -- X = inlet time (min); Return period = 100 Yrs. ; * Indicates Known Q added

H, aflow FL-DOT Report

Line No	To Line	Type of struc	n - value	Len	Drainage Area (C1 = 0.2, C2 = 0.5, C3 = 0.9)			Time of conc	Time of flow in sect	Inten (I)	Total CA	Add Q / Total flow	Inlet elev	Elev of HGL / Elev of Crown / Elev of Invert			Rise Span	HGL Pipe	Actual Full Flow		Date: 09-28-2006 Frequency: 100 yrs Project: castle2.stm
					Increment (ac)	Sub-total (ac)	Sum CA					Q		Up	Down	Fall	Size	Slope	Vel	Cap	
				(ft)				(min)	(min)	(in/hr)		(cfs)	(ft)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)	Line description
1	End	None	0.013	32.0	0.00 0.00	0.00 0.00	0.00 0.00	0.16	0.04	0.0	0.00	180.5	415.40	409.78 405.78	409.03 405.03	0.53 0.75	48 Cir	2.34	17.50	219.9	
2	1	None	0.013	102.0	0.00 0.00	0.00 0.00	0.00 0.00	0.04	0.12	0.0	0.00	180.1	415.40	412.20 408.20	409.78 405.78	1.92 2.42	48 Cir	2.37	17.61	221.3	
3	2	Hdwl	0.013	33.8	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.04	0.0	0.00	173.8	414.00	413.00 409.00	412.20 408.20	0.45 0.80	48 Cir	2.37	17.60	221.2	

NOTES: Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 – X = Ln(Tc)(min) (in/hr) ; Time of flow in section is based on full flow.; Initial tailwater elevation = 409.03 (ft)

Hy flow Hydraulic Grade Line Compu tions

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
	(in)	(cfs)									(ft)												
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
1	48	180.5	405.03	409.03	4.00	12.56	14.37	3.21	412.24	1.580	32.0	405.78	409.56	3.78**	12.30	14.68	3.35	412.91	1.366	1.473	N/A	0.15	0.50
2	48	180.1	405.78	410.06	4.00	12.56	14.33	3.19	413.26	1.572	102	408.20	411.98	3.78**	12.30	14.64	3.33	415.31	1.359	1.465	N/A	0.15	0.50
3	48	173.8	408.20	412.48	4.00	12.56	13.83	2.98	415.46	1.465	33.8	409.00	412.93	3.93	12.51	13.89	3.00	415.93	1.316	1.390	0.469	1.00	3.00

Project File: castle2.stm | IDF File: citysd.IDF | Total number of lines: 3 | Run Date: 09-28-2006

NOTES: Initial tailwater elevation = 409.03 (ft), * Normal depth assumed., ** Critical depth assumed.

Hydraflow HGL Computation Procedure

General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is assumed at the upstream end.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the assumed hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

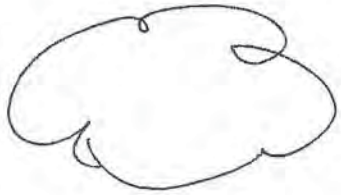
Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

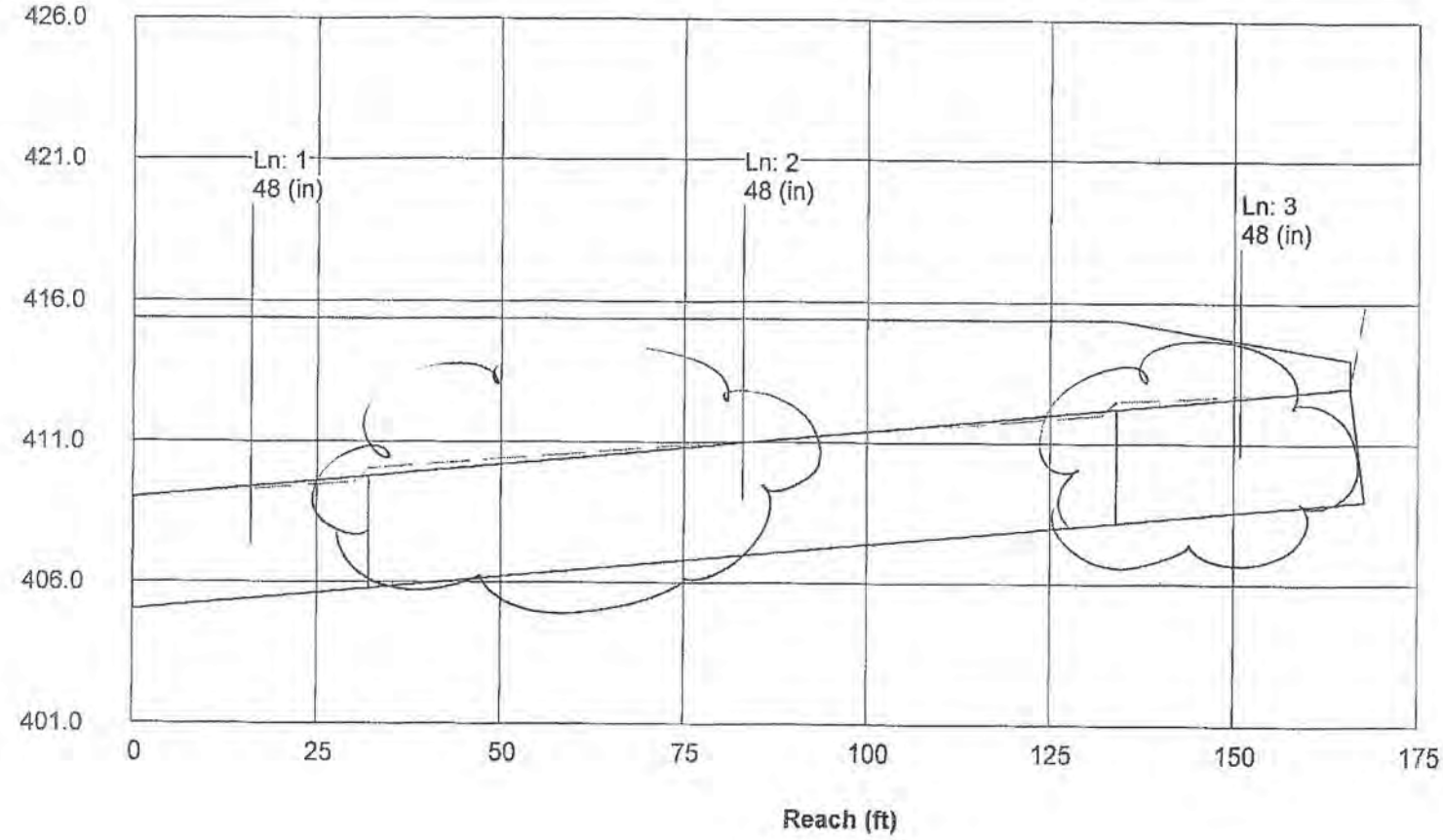
Col. 23 The junction loss coefficient (K).

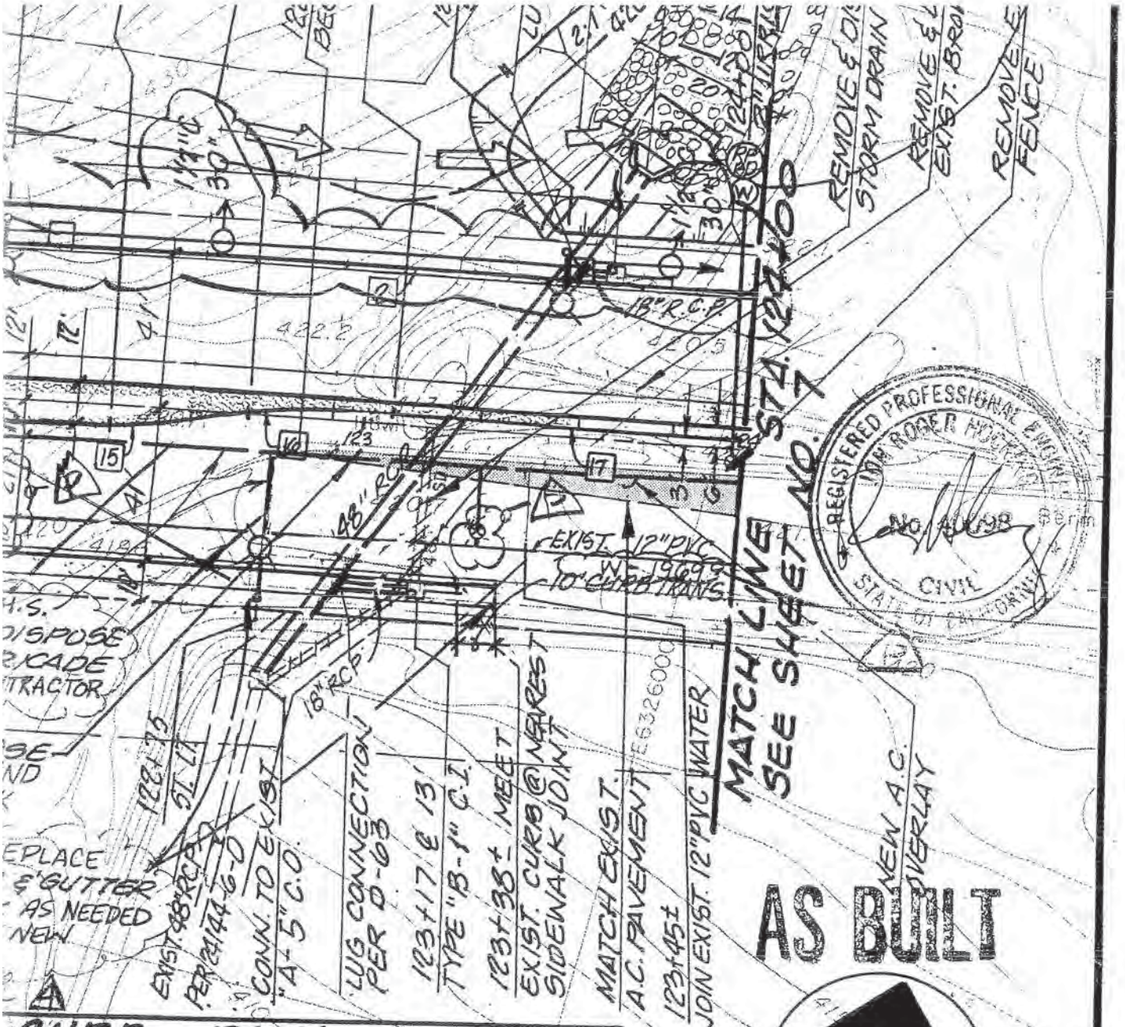
Col. 24 Minor loss. Equals Col. 23 x Col. 18. This amount is added to the upstream HGL and used as the starting HGL for the next upstream line(s).

* Normal depth assumed.
** Critical depth assumed.



EXISTING PIPE UNDER PRESSURE





CURB DATA

	RADIUS	LENGTH	REMARKS
"	150.00	36.84'	6" TYPE "B" CURB
"E		92.89'	"
"E		370.0±	6" TYPE "G" CURB
5"	1859.00'	21.41'	"
5"	30.00'	40.83'	"
3"	30.00'	54.93'	"
"	1859.00'	332.81'	"
6"	30.00'	47.86'	"
6"	60.00'	27.84'	"
"	30.00'	61.78'	"
"	1859.00'	251.64'	"

BASIN 2

W.O. NO. CIP 90-01

SANTEE ENGINEERING DEPARTMENT

: STA. 112+00 TO 124+00

BOULEVARD EXTENSION PROJECT

Drawing No. 91-082

Sheet 6 of 68

J.N. 10508.00

ENTERLINE TO BE DONE BY G.H.S. CONTRACTOR

REMOVE EXIST. 12" P.V.C. AS NEEDED

4

JOIN EXISTING 12" P.V.C.

PROPOSED ℄ GRADE

+1.04%

119+00 416.50 ℄ ELEV.

417.54 120+00

418.58 121+00

419.62 122+00

122+89 ± 420.66

123+00

123+45 ±

421.70 124+00

422.74 125+00

6.0' RECLAIMED

INSTALL 12" PVC

5.0'

6.0

412.0± B.P.

REMOVE EXIST. 48" R.C.P.

406.4± I.E. ℄ 48" R.C.P.

BOTTOM OF EXIST. 12" P.V.C. WATER MAIN W.O. 1969

50 POTABLE WATER MAIN

BOTTOM 6" P.V.C. CL-150 RECLAIMED WATER MAIN

12" PVC BOP 411.4
118+90.85
12"x12"x6" "T"

PROFILE: MAST BLVD.

SCALES: HORIZ. 1"=40, VERT. 1"=8'

123+17 ℄ 18' TYPE 'B-1' C.I. TOP = 420.46

123+62 ℄ 18' TYPE 'B-1' C.I. TOP = 420.88

BASIN 2

123+87 (72' LT.) ℄ WING TYPE HEADWALL TOP = 414.00

123+30 6"x6" TEE 415.00 B.O.P. 12"x6" TEE 416.00

123+45± 416.1± B.O.P. MEET EXIST.

123+22 ℄ MAST BLVD. 420.83

36.5

10'

123+78.52 (70.51' RT.) EXISTING MANH. TYPE 'A-5' C.O. (RIM = 415.4±)

414.98 B.O.P. 6" P.V.C.

122+78.52 EXISTING MANH. (RIM = 415.4±)

℄ B.O.P. = 417.52

10" P.O.P. = 418.50

REMOVE EXIST. HD AND 10'

415.7 B.O.P. 12" P.V.C.

EXIST. GR

EXIST. 48" R.C.

Q100 = 1

V100 = 2

Plan = 120 S

— 420 —

— 410 —

— 400 —

CHANGE "A"

EXIST. 18" RCP @ 1.0% CL 1350-D BY OTHERS

CONC. LUG CONN. PER D-63.

HGL

PROVIDE 1' MIN. CLR.

(406.47) IE (OUT)

1' MIN. CLR.

407.72 SPRINGLINE 48" R.C.P.

405.72 IE ℄ 48" R.C.P.

412.00 I.E. (OUT)

19.55'~18" R.C.P. @ 25.00% CL-1350-D

Q100 = 4.5 C.F.S.

V100 = 18.2 F.P.S.

S.D. @ 123+17

SCALES: HORIZ. 1"=40', VERT. 1"=8'

CHANGE "A"

CONC. LUG CONN. PER D-63.

HGL

EXIST. GRADE

ROCK PROTECTION

Q100 = 173.8 C.F.S.

Q100 = 5.9 F.P.S.

V100 = 20.8 F.P.S.

10.85'~18" R.C.P. @ 27.00% CL-1350-D

410.20 SPRING LINE

408.20 IE ℄ 48" R.C.P.

412.40 I.E.

S.D. @ 123+62

SCALES: HORIZ. 1"=40', VERT. 1"=8'

HGL

409.00 I.E.

167.74'~48" R.C.P. @ 2.37% 2.42% CL-1350-D

Q100 = 180.05 C.F.S.

V100 = 19.8 F.P.S.

7 EXIST. 12" P.V.C. TO BE REMOVED

410.20 I.E. SPRINGLINE 18" R.C.P. LUG CONN. PER D-63

407.72 I.E. SPRINGLINE 18" R.C.P. LUG CONN. PER D-63

405.03 I.E. (IN)

404.61 I.E. (OUT)

33.75 51' 51'

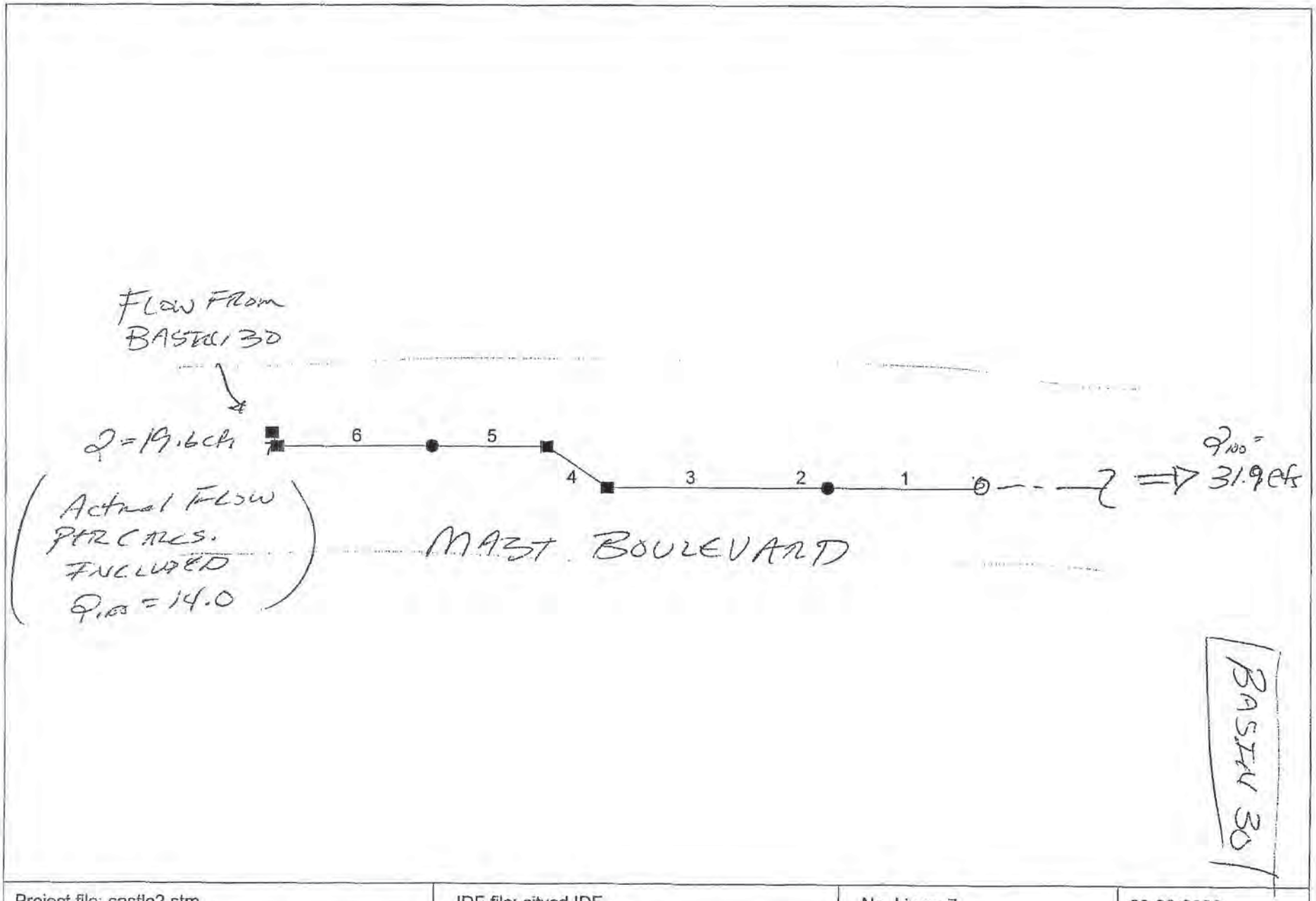
S.D. @ 123+27

SCALES: HORIZ. 1"=40', VERT. 1"=8'

BASIN #2

119 120 121 122 123 124 125

Hydraflow Plan View



Project file: castle2.stm	IDF file: citysd.IDF	No. Lines: 7	09-28-2006

Hy[illegible]aflow Storm Sewer Inventory Repo[illegible]

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	180.9	-180.0	MH	1.85	0.00	0.00	0.0	355.20	8.00	369.67	24	Cir	0.013	0.15	376.18	
2	1	70.0	0.0	None	1.85	0.00	0.00	0.0	370.00	5.24	373.67	24	Cir	0.013	0.15	381.08	
3	2	197.0	0.0	Curb	2.65	0.00	0.00	0.0	373.67	5.24	384.00	24	Cir	0.013	1.10	392.66	
4	3	91.8	37.0	Curb	2.65	0.00	0.00	0.0	384.33	1.81	385.99	24	Cir	0.013	1.10	395.25	
5	4	138.9	-37.0	MH	0.00	0.00	0.00	0.0	386.33	7.97	397.40	24	Cir	0.013	0.15	404.30	
6	5	186.9	0.0	Curb	3.30	0.00	0.00	0.0	397.78	6.22	409.40	24	Cir	0.013	1.25	416.89	
7	6	20.0	71.0	Genr	19.60	0.00	0.00	0.0	409.73	11.35	412.00	24	Cir	0.013	1.00	418.00	

Project File: castle2.stm | IDF File: citysd.IDF | Total number of lines: 7 | Date: 09-28-2006

Hydraflow Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1		31.90	24 c	180.9	355.20	369.67	7.998	357.20	371.56	0.25	End
2		30.05	24 c	70.0	370.00	373.67	5.243	371.81	375.54	0.23	1
3		28.20	24 c	197.0	373.67	384.00	5.244	375.76	385.84	1.49	2
4		25.55	24 c	91.8	384.33	385.99	1.809	387.33*	388.50*	1.13	3
5		22.90	24 c	138.9	386.33	397.40	7.973	389.63	399.09	0.15	4
6		22.90	24 c	186.9	397.78	409.40	6.217	399.25	411.09	1.26	5
7		19.60	24 c	20.0	409.73	412.00	11.350	412.36	413.57	0.86	6

Project File: castle2.stm	IDF File: citysd.IDF	Total No. Lines: 7	Run Date: 09-28-2006

NOTES: c = circular; e = elliptical; b = box; Return period = 100 Yrs.; * Indicates surcharge condition.

Hy flow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	180.9	0.00	0.00	0.00	0.00	0.00	0.0	1.5	0.0	31.90	63.96	10.27	24	8.00	369.67	355.20	371.56	357.20	376.18	363.51	
2	1	70.0	0.00	0.00	0.00	0.00	0.00	0.0	1.4	0.0	30.05	51.79	9.94	24	5.24	373.67	370.00	375.54	371.81	381.08	376.18	
3	2	197.0	0.00	0.00	0.00	0.00	0.00	0.0	1.0	0.0	28.20	51.79	9.16	24	5.24	384.00	373.67	385.84	375.76	392.66	381.08	
4	3	91.8	0.00	0.00	0.00	0.00	0.00	0.0	0.8	0.0	25.55	30.42	8.13	24	1.81	385.99	384.33	388.50	387.33	395.25	392.66	
5	4	138.9	0.00	0.00	0.00	0.00	0.00	0.0	0.5	0.0	22.90	63.86	7.68	24	7.97	397.40	386.33	399.09	389.63	404.30	395.25	
6	5	186.9	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	22.90	56.40	8.67	24	6.22	409.40	397.78	411.09	399.25	416.89	404.30	
7	6	20.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	19.60	76.20	6.83	24	11.35	412.00	409.73	413.57	412.36	418.00	416.89	

Project File: castle2.stm | IDF File: citysd.IDF | Total number of lines: 7 | Run Date: 09-28-2006

NOTES: Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 -- X = Ln(Tc)(min); Return period = 100 Yrs. ; Initial tailwater elevation = 357.20 (ft)

H, . aflow Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	depth (ft)	spread (ft)	depth (ft)	spread (ft)	Dep (in)	
1		1.85*	1.85	0.00	3.70	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
2		1.85*	0.00	0.00	1.85	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	1
3		2.65*	0.00	2.65	0.00	Curb	6.0	6.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.30	4.83	0.27	4.83	0.33	2
4		2.65*	0.00	2.65	0.00	Curb	6.0	16.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.20	2.87	0.17	2.87	0.33	3
5		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	4
6		3.30*	0.00	3.30	0.00	Curb	6.0	13.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.25	3.82	0.22	3.82	0.33	5
7		19.60*	0.00	19.60	0.00	Genr	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.080	0.050	0.000	0.20	2.80	0.20	2.80	0.0	6

Project File: castle2.stm | I-D-F File: citysd.IDF | Total number of lines: 7 | Run Date: 09-28-2006

NOTES: Inlet N-Values = 0.015 ; Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 -- X = Inlet time (min); Return period = 100 Yrs. ; * Indicates Known Q added

Hydraflow FL-DOT Report

Line No	To Line	Type of struc	n-value	Len	Drainage Area (C1 = 0.2, C2 = 0.5, C3 = 0.9)			Time of conc	Time of flow in sect	Inten (I)	Total CA	Add Q / Total flow	Inlet elev	Elev of HGL / Elev of Crown / Elev of Invert			Rise / Span	HGL / Pipe	Actual / Full Flow		Date: 09-28-2006 / Frequency: 100 yrs / Project: castle2.stm
					Increment (ac)	Sub-total (ac)	Sum CA					Q		Up	Down	Fall	Size	Slope	Vel	Cap	
				(ft)				(min)	(min)	(in/hr)		(cfs)	(ft)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)	Line description
1	End	MH	0.013	180.9	0.00 0.00	0.00 0.00	0.00 0.00	1.47	0.30	0.0	0.00	31.90	376.18	371.67 369.67	357.20 355.20	14.36 14.47	24 Cir	8.00	20.36	63.96	
2	1	None	0.013	70.0	0.00 0.00	0.00 0.00	0.00 0.00	1.35	0.12	0.0	0.00	30.05	381.08	375.67 373.67	372.00 370.00	3.73 3.67	24 Cir	5.24	16.48	51.79	
3	2	Curb	0.013	197.0	0.00 0.00	0.00 0.00	0.00 0.00	0.99	0.37	0.0	0.00	28.20	392.66	386.00 384.00	375.67 373.67	10.07 10.33	24 Cir	5.24	16.49	51.79	
4	3	Curb	0.013	91.8	0.00 0.00	0.00 0.00	0.00 0.00	0.80	0.19	0.0	0.00	25.55	395.25	387.99 385.99	386.33 384.33	1.17 1.66	24 Cir	1.81	9.68	30.42	
5	4	MH	0.013	138.9	0.00 0.00	0.00 0.00	0.00 0.00	0.48	0.32	0.0	0.00	22.90	404.30	399.40 397.40	388.33 386.33	9.46 11.07	24 Cir	7.97	20.33	63.86	
6	5	Curb	0.013	186.9	0.00 0.00	0.00 0.00	0.00 0.00	0.05	0.43	0.0	0.00	22.90	416.89	411.40 409.40	399.78 397.78	11.85 11.62	24 Cir	6.22	17.95	56.40	
7	6	Genr	0.013	20.0	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.05	0.0	0.00	19.60	418.00	414.00 412.00	411.73 409.73	1.21 2.27	24 Cir	11.35	24.25	76.20	

NOTES: Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 -- X = Ln(Tc)(min); (in/hr) ; Time of flow in section is based on full flow.; Initial tailwater elevation = 357.20 (ft)

Hy[illegible]flow Hydraulic Grade Line Compu[illegible]ions

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
	(In)	(cfs)									(ft)											(K)	(ft)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
1	24	31.90	355.20	357.20	2.00	3.14	10.16	1.60	358.80	1.990	181	369.67	371.56	1.89**	3.07	10.37	1.67	373.23	1.720	1.855	N/A	0.15	0.25
2	24	30.05	370.00	371.81	1.81	2.99	10.04	1.57	373.38	1.546	70.0	373.67	375.54	1.87**	3.05	9.85	1.51	377.04	1.526	1.536	N/A	0.15	0.23
3	24	28.20	373.67	375.76	2.00	3.14	8.98	1.25	377.02	1.555	197	384.00	385.84	1.84**	3.02	9.34	1.36	387.19	1.351	1.453	N/A	1.10	1.49
4	24	25.55	384.33	387.33	2.00	3.14	8.13	1.03	388.36	1.277	91.8	385.99	388.50	2.00	3.14	8.13	1.03	389.53	1.276	1.276	1.171	1.10	1.13
5	24	22.90	386.33	389.63	2.00	3.14	7.29	0.83	390.46	1.026	139	397.40	399.09	1.69**	2.84	8.07	1.01	400.11	0.970	0.998	N/A	0.15	0.15
6	24	22.90	397.78	399.25	1.47	2.47	9.27	1.34	400.58	1.300	187	409.40	411.09	1.69**	2.84	8.07	1.01	412.11	0.970	1.135	N/A	1.25	1.26
7	24	19.60	409.73	412.36	2.00	3.14	6.24	0.61	412.96	0.751	20.0	412.00	413.57	1.57**	2.64	7.42	0.86	414.42	0.819	0.785	N/A	1.00	0.86

Project File: castle2.stm | IDF File: citysd.IDF | Total number of lines: 7 | Run Date: 09-28-2006

NOTES: Initial tailwater elevation = 357.2 (ft) , * Normal depth assumed., ** Critical depth assumed.

H, aflow HGL Computation Procedu.

General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is assumed at the upstream end.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the assumed hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

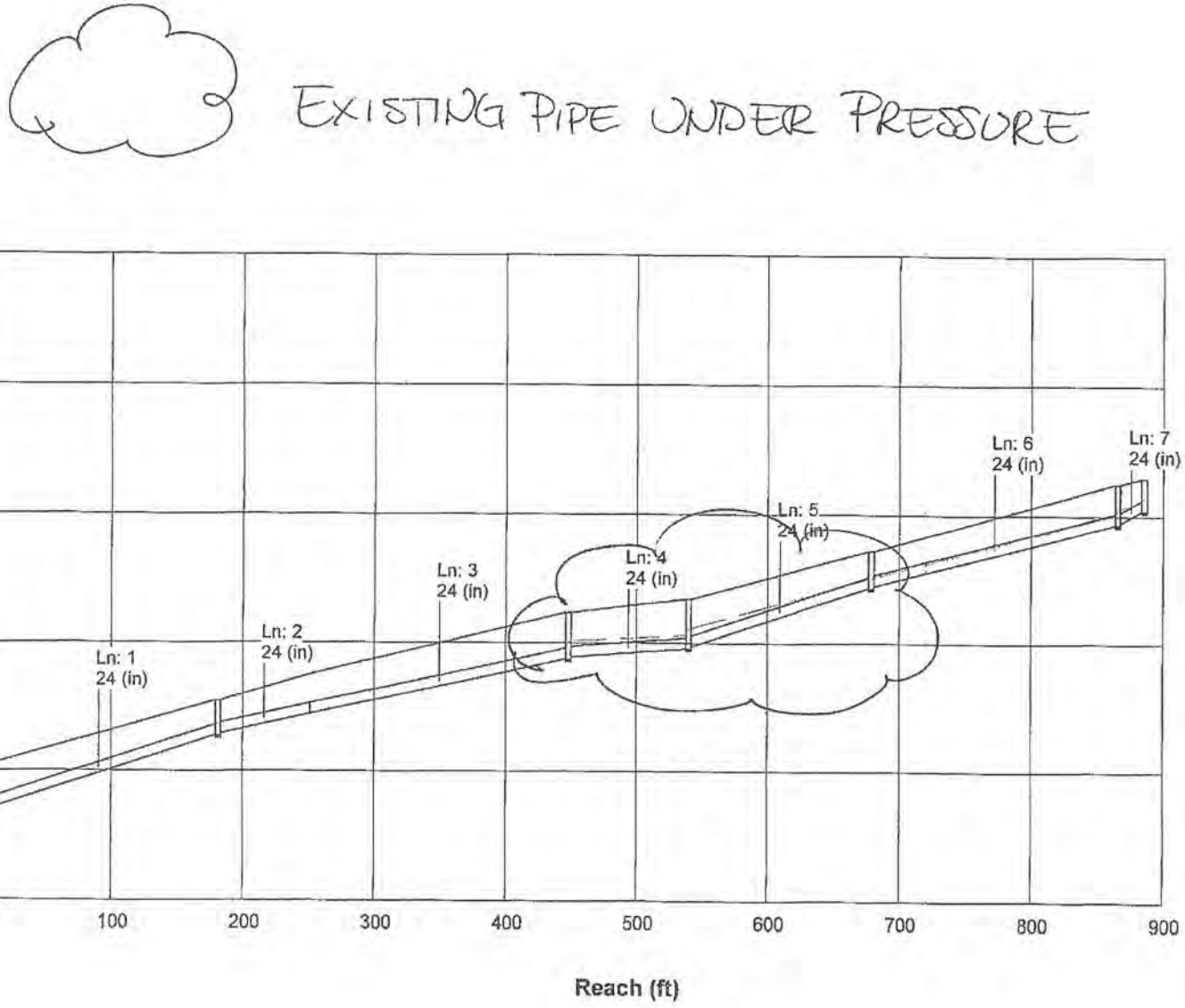
Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. Equals Col. 23 x Col. 18. This amount is added to the upstream HGL and used as the starting HGL for the next upstream line(s).

* Normal depth assumed.
** Critical depth assumed.


EXISTING PIPE UNDER PRESSURE
Elev. (ft)
459.0
435.0
411.0
387.0
363.0
339.0
Ln: 1
24 (in)
Ln: 2
24 (in)
Ln: 3
24 (in)
Ln: 4
24 (in)
Ln: 5
24 (in)
Ln: 6
24 (in)
Ln: 7
24 (in)
0
100
200
300
400
500
600
700
800
900
Reach (ft)

PROFILE: MEDINA DRIVE

SCALES: HORIZ. 1"=40', VERT. 1"=8'

PROFILE: ST. ANDREWS DR.

SCALES: HORIZ. 1"=40', VERT. 1"=8'

PROFILE: MAST BLVD.

SCALES: HORIZ. 1"=40', VERT. 1"=8'

PROFILE: WIGWAM COURT

SCALES: HORIZ. 1"=40', VERT. 1"=8'

S.D. @ 140+05

S.D. @ 143+30 & 149+74.98

S.D. @ 146+44.27

MATCH LINE STA. 151+00.00
SEE SHEET NO. 17
WSR-2459

SEE SHEET WSR-2457
MATCH LINE STA. 139+20

CAUTION!!! 8" MIN. COVER REQUIRED OVER EXIST. 8" A.C.P. CONTRACTOR TO NOTIFY P.D.M.W.D. PRIOR TO EXCAVATION AND SHALL EXERCISE CAUTION DURING EXCAVATION.

CAUTION!! EXIST. ELECT. TRENCH.

CAUTION!! CONTRACTOR TO VERIFY COVER OVER PIPE PRIOR TO EXCAVATION AND SHALL EXERCISE CAUTION DURING CONSTRUCTION.

CAUTION: MAINTAIN 6" MIN.

* NOTE: CONTRACTOR TO NOTIFY P.D.M.W.D. BEFORE EXCAVATING OVER 10" A.C. AND 6" A.C. WATER AND SHALL EXERCISE CAUTION DURING EXCAVATION.

BOTTOM NEW 6" P.V.C. CL. 150 POTABLE WATER MAIN

CAUTION!

3' MIN. COVER REQUIRED OVER EXIST. 12" & 8" A.C.P. WATER LINE. CONTRACTOR TO NOTIFY P.D.M.W.D. PRIOR TO EXCAVATION AND SHALL EXERCISE CAUTION DURING EXCAVATION. SEE GENERAL NOTES NO. 3 & 4 AND WATER NOTES NO. 3 & 4 ON SHEET NO. 2

STORM DRAIN DATA

NO.	DELTA / BRG.	RADIUS	LENGTH	REMARKS
(1)	N22°51'52"W		20.00'	24" R.C.P. CL-1350-D
(2)	Δ=34°47'52"	45.00'	27.33'	" " "
(3)	Δ=05°40'43"	1810.00'	179.57'	" " "
(4)	Δ=03°45'54"	1810.00'	105.80'	" " "
(5)	N88°10'16"E		33.05'	" " "
(6)	N21°09'35"W		91.78'	" " "**

** WATER TIGHT JOINTS

STORM DRAIN DATA (CONTINUATION)

NO.	DELTA / BRG.	RADIUS	LENGTH	REMARKS
(7)	Δ 35°14'51"	45.00'	27.68'	24" R.C.P. CL-1350-D
(8)	N 81°48'40"W		239.32'	" " "
(9)	N 08°11'20"E		4.26'	18" R.C.P. CL-1350-D
(10)	N 81°48'40"W		180.92'	30" R.C.P. CL-1350-D
(11)	Δ=03°55'23"	1435.00'	98.26'	" " "
(12)	Δ=07°04'56"	1435.00'	177.38'	30" R.C.P. CL-1350-D

* EXIST. 10" WATER MAIN MAY BE TAKEN OUT OF SERVICE BETWEEN STATION 147+13± AND 166+00 AFTER THESE VALVES ARE INSTALLED AND APPROVAL IS GIVEN BY P.D.M.W.D.

WATER DATA

NO.	DELTA / BRG.	RADIUS	LENGTH	REMARKS
(1)	Δ=10°11'09"	1565.00'	278.22'	6" P.V.C. CL-150
(2)	N79°29'28"W		299.58'	" " "
(3)	N 81°48'40"W		327.19'	" " "
(4)	Δ=1°09'54"	1425.00'	277.68'	" " "
(5)	N81°48'40"W		92.19'	12" P.V.C. CL.150
(6)	Δ=11°09'54"	1410.00'	274.76'	" " "
(7)	N01°49'24"E		48.00'	6" P.V.C. CL.150

℄ DATA

NO.	DELTA/BRG.	RADIUS	LENGTH	REMARKS
(1)	Δ=13°39'23"	1575.00'	375.45'	℄
(2)	N81°48'40"W		531.74'	"
(3)	Δ=11°09'54"	1400.00'	272.81'	"

PLAN: MAST BLVD.

FOR OTHER IMPROVEMENTS IN THIS AREA SEE SHEETS 8 & 9

DETAIL: MODIFIED TYPE "F" CATCH BASIN
NO SCALE

SCALE: 1"=40'

NOTES

(1.) CONTRACTOR TO KEEP EXIST. WATERLINES IN SERVICE AT ALL TIMES. USE EXTREME CAUTION WHEN WORKING OVER EX. MAIN.

(2.) P.D.M.W.D. TO ADJUST ALL EXISTING M.H.'s, C.O.'s, F.H.'s, VALVE BOX LIDS & WATER SERVS. TO FINISH GRADE.

(3.) EXIST. 10" A.C.P. POTABLE WATER MAIN TO BE REPLACED W/ 12" P.V.C. CL.150. SEE PROFILE FOR NEW VERTICAL LOCATION.

P.D.M.W.D
RECORD DRAWING
INSPECTOR J.P.
INS. 100% DATE: 9-13-93
UPDATED BY: J.E.C.
DATE: 7-8-93

W.O. NO. CIP 90-01

P&D Technologies
401 West "A" Street, Suite 2500
San Diego, CA 92101 619-232-4466
An Employee Owned Company

CONSTRUCTION RECORD	REFERENCES	Date	By	REVISIONS	App'd
Contractor		5-24-91	PWD	A BID ADDENDUM	
Inspector		10-4-91	PWD	A PDMWD REQ'D MOD.	
Date Completed		1-21-93	H.E.A.	A RECORD DWG.	

BENCH MARK: STANDARD STREET SURVEY MONUMENT STAMPED LS 2783 PER MAP 6244. CENTERLINE INTERSECTION MAST BOULEVARD AND PEBBLE BEACH DRIVE. DATUM: R.O.S. 11280 G.P.S. PT. 2024. ELEV. 349.60

SCALE: Horizontal 1"=40', Vertical 1"=4'

Office ____ Field ____ Traffic ____

Designed By D.H./DC | Drawn By DSE | Checked By S.D.M.

Plans Prepared Under Supervision Of JON ROGER HOCKING Date 3-31-91
R.C.E. No. 40098 Expires 3-31-94

REVIEWED 5/3/91 DATE
By Conor P. Lee SENIOR CIVIL ENGINEER
R.C.E. No. ____ Expires ____

ACCEPTED 5/2/91 DATE
By James A. Jacobsen III ASSISTANT DIRECTOR OF PUBLIC WORKS
R.C.E. No. 18765 Expires 3/31/93

CITY OF SANTEE ENGINEERING DEPARTMENT
WATER MAIN AND STORM DRAIN: STA. 139+20 TO STA. 151+00
MAST BOULEVARD EXTENSION PROJECT

Drawing No. 91-092
Sheet 16 of 68

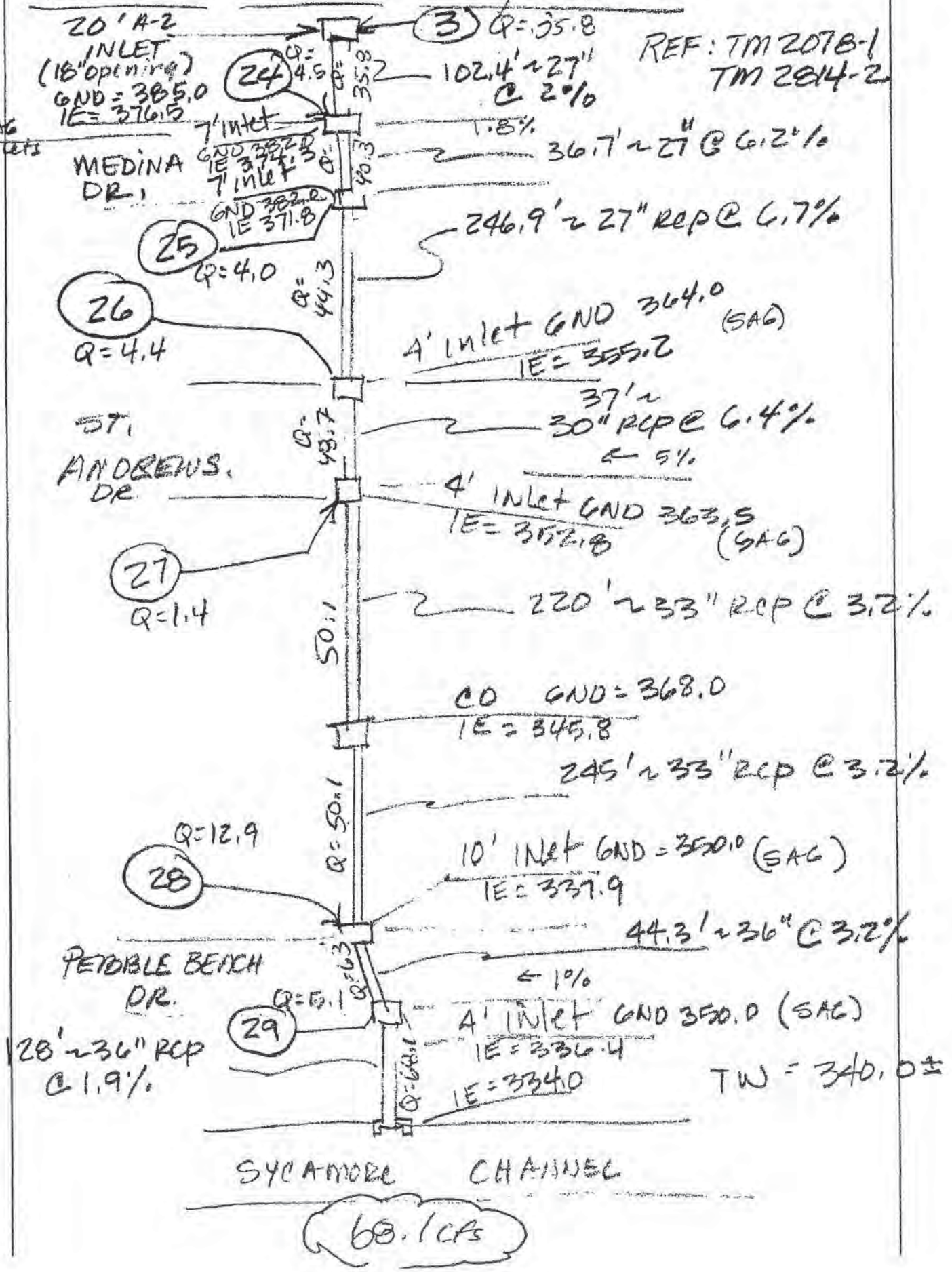
2514

WSR 2459 JN 10508.00

EXISTING BASIN 3

CASTLE ROCK - FLOW DIAGRAM 6666.0

BASIN 3 - EXISTING 100 YR STORM



CASTLEROCK | | 6666.0

PRELIMINARY HYDRAULIC ANALYSIS OF EXISTING PIPE CAPACITY

- 36" pipe @ 1.9% K = 666.9

  $Q_{CAP} = (666.9)(.019)^{1/2} = 91.9 > 68.1$ ✓OK

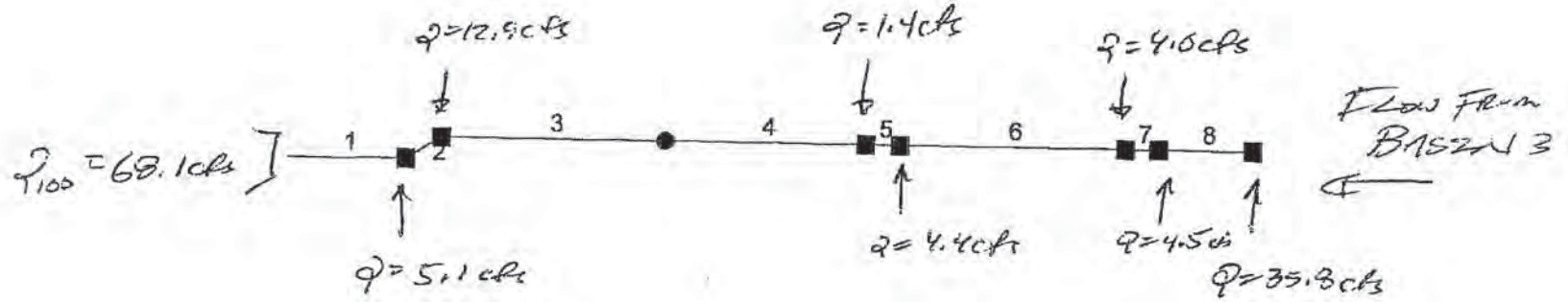
- 33" @ 3.2% K = 528.7

  $Q_{CAP} = (528.7)(.032)^{1/2} = 94.6 > 50.1$ ✓OK

- 27" @ 2% K = 309.7

  $Q_{CAP} = (309.7)(.02)^{1/2} = 43.8 < 35.8$

draflow Plan View



CASTLE ROCK - BASIN 3
HYDROLOGIC CALC'S
100YR. STORM

Project file: castle3.stm	IDF file: citysd.IDF	No. Lines: 8	06-27-2003

Hy[illegible]aflow Storm Sewer Inventory Repc

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	128.0	0.0	Curb	5.10	0.00	0.00	0.0	334.00	1.87	336.40	36	Cir	0.013	0.70	350.00	
2	1	44.3	-30.0	Curb	12.90	0.00	0.00	0.0	336.40	3.39	337.90	36	Cir	0.013	0.70	350.00	
3	2	245.0	30.0	MH	0.00	0.00	0.00	0.0	337.90	3.22	345.80	33	Cir	0.013	0.15	368.00	
4	3	220.0	0.0	Curb	1.40	0.00	0.00	0.0	345.80	3.18	352.80	33	Cir	0.013	0.50	363.50	
5	4	37.0	0.0	Curb	4.40	0.00	0.00	0.0	352.80	6.49	355.20	30	Cir	0.013	0.50	364.00	
6	5	246.9	0.0	Curb	4.00	0.00	0.00	0.0	355.20	6.72	371.80	27	Cir	0.013	0.50	382.00	
7	6	36.7	0.0	Curb	4.50	0.00	0.00	0.0	371.80	6.81	374.30	27	Cir	0.013	0.50	382.00	
8	7	102.4	0.0	Curb	35.80	0.00	0.00	0.0	374.30	2.15	376.50	27	Cir	0.013	1.00	385.00	

Project File: castle3.stm | IDF File: citysd.IDF | Total number of lines: 8 | Date: 09-25-2006

Hydraflow Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (In)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1		68.10	36 c	128.0	334.00	336.40	1.875	337.00	339.04	1.17	End
2		63.00	36 c	44.3	336.40	337.90	3.386	340.20	340.43	1.07	1
3		50.10	33 c	245.0	337.90	345.80	3.224	341.50	348.11	0.21	2
4		50.10	33 c	220.0	345.80	352.80	3.182	348.31	355.11	0.69	3
5		48.70	30 c	37.0	352.80	355.20	6.487	355.80	357.49	0.83	4
6		44.30	27 c	246.9	355.20	371.80	6.723	358.32	373.94	1.00	5
7		40.30	27 c	36.7	371.80	374.30	6.812	374.94	376.40	0.85	6
8		35.80	27 c	102.4	374.30	376.50	2.148	377.25	378.53	1.40	7

Project File: castle3.stm	IDF File: citysd.IDF	Total No. Lines: 8	Run Date: 09-25-2006

NOTES: c = circular; e = elliptical; b = box; Return period = 100 Yrs.; * Indicates surcharge condition.

Hyd flow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	128.0	0.00	0.00	0.00	0.00	0.00	0.0	1.7	0.0	68.10	91.32	9.99	36	1.87	336.40	334.00	339.04	337.00	350.00	342.00	
2	1	44.3	0.00	0.00	0.00	0.00	0.00	0.0	1.6	0.0	63.00	122.7	9.41	36	3.39	337.90	336.40	340.43	340.20	350.00	350.00	
3	2	245.0	0.00	0.00	0.00	0.00	0.00	0.0	1.1	0.0	50.10	94.96	8.93	33	3.22	345.80	337.90	348.11	341.50	368.00	350.00	
4	3	220.0	0.00	0.00	0.00	0.00	0.00	0.0	0.7	0.0	50.10	94.33	9.11	33	3.18	352.80	345.80	355.11	348.31	363.50	368.00	
5	4	37.0	0.00	0.00	0.00	0.00	0.00	0.0	0.6	0.0	48.70	104.5	10.13	30	6.49	355.20	352.80	357.49	355.80	364.00	363.50	
6	5	246.9	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	44.30	80.29	11.24	27	6.72	371.80	355.20	373.94	358.32	382.00	364.00	
7	6	36.7	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	40.30	80.82	10.29	27	6.81	374.30	371.80	376.40	374.94	382.00	382.00	
8	7	102.4	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	35.80	45.39	9.24	27	2.15	376.50	374.30	378.53	377.25	385.00	382.00	

Project File: castle3.stm | IDF File: citysd.IDF | Total number of lines: 8 | Run Date: 09-25-2006

NOTES: Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 -- X = Ln(Tc)(min); Return period = 100 Yrs. ; Initial tailwater elevation = 337.00 (ft)

Hy[illegible]nflow Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	depth (ft)	spread (ft)	depth (ft)	spread (ft)	Dep (in)	
1		5.10*	0.00	5.10	0.00	Curb	6.0	4.00	0.00	0.00	0.00	Sag	1.50	0.090	0.020	0.000	0.54	21.93	0.47	21.93	0.33	Off
2		12.90*	0.00	12.90	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	1.50	0.090	0.020	0.000	0.55	22.17	0.47	22.17	0.33	1
3		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	2
4		1.40*	0.00	1.40	0.00	Curb	6.0	4.00	0.00	0.00	0.00	Sag	1.50	0.090	0.020	0.000	0.31	10.02	0.23	10.02	0.33	3
5		4.40*	0.00	4.40	0.00	Curb	6.0	4.00	0.00	0.00	0.00	Sag	1.50	0.090	0.020	0.000	0.54	21.59	0.46	21.59	0.33	4
6		4.00*	0.00	4.00	0.00	Curb	6.0	7.00	0.00	0.00	0.00	Sag	1.50	0.090	0.020	0.000	0.42	15.81	0.34	15.81	0.33	5
7		4.50*	0.00	4.50	0.00	Curb	6.0	7.00	0.00	0.00	0.00	Sag	1.50	0.090	0.020	0.000	0.45	17.11	0.37	17.11	0.33	6
8		35.80*	0.00	35.80	0.00	Curb	18.0	20.00	0.00	0.00	0.00	Sag	1.50	0.090	0.020	0.000	0.81	35.38	0.74	35.38	0.33	7

Project File: castle3.stm | I-D-F File: citysd.IDF | Total number of lines: 8 | Run Date: 09-25-2006

NOTES: Inlet N-Values = 0.015 ; Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 -- X = Inlet time (min); Return period = 100 Yrs. ; * Indicates Known Q added

Hy[illegible]flow FL-DOT Report

Line No	To Line	Type of struc	n - value	Len	Drainage Area C1 = 0.2 C2 = 0.5 C3 = 0.9			Time of conc	Time of flow in sect	Inten (I)	Total CA	Add Q / Total flow	Inlet elev	Elev of HGL / Elev of Crown / Elev of Invert			Rise Span	HGL Pipe	Actual Full Flow		Date: 09-25-2006 Frequency: 100 yrs Project: castle3.stm
					Increment (ac)	Sub-total (ac)	Sum CA					Q		Up	Down	Fall	Size	Slope	Vel	Cap	
				(ft)				(min)	(min)	(in/hr)		(cfs)	(ft)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)	Line description
1	End	Curb	0.013	128.0	0.00 0.00	0.00 0.00	0.00 0.00	1.68	0.22	0.0	0.00	68.10	350.00	339.40 336.40	337.00 334.00	2.04 2.40	36 Cir	1.87	12.92	91.32	
2	1	Curb	0.013	44.3	0.00 0.00	0.00 0.00	0.00 0.00	1.60	0.08	0.0	0.00	63.00	350.00	340.90 337.90	339.40 336.40	0.23 1.50	36 Cir	3.39	17.36	122.7	
3	2	MH	0.013	245.0	0.00 0.00	0.00 0.00	0.00 0.00	1.12	0.48	0.0	0.00	50.10	368.00	348.55 345.80	340.65 337.90	6.61 7.90	33 Cir	3.22	15.99	94.96	
4	3	Curb	0.013	220.0	0.00 0.00	0.00 0.00	0.00 0.00	0.68	0.43	0.0	0.00	50.10	363.50	355.55 352.80	348.55 345.80	6.79 7.00	33 Cir	3.18	15.88	94.33	
5	4	Curb	0.013	37.0	0.00 0.00	0.00 0.00	0.00 0.00	0.62	0.06	0.0	0.00	48.70	364.00	357.70 355.20	355.30 352.80	1.69 2.40	30 Cir	6.49	21.28	104.5	
6	5	Curb	0.013	246.9	0.00 0.00	0.00 0.00	0.00 0.00	0.25	0.37	0.0	0.00	44.30	382.00	374.05 371.80	357.45 355.20	15.62 16.60	27 Cir	6.72	20.19	80.29	
7	6	Curb	0.013	36.7	0.00 0.00	0.00 0.00	0.00 0.00	0.19	0.06	0.0	0.00	40.30	382.00	376.55 374.30	374.05 371.80	1.46 2.50	27 Cir	6.81	20.33	80.82	
8	7	Curb	0.013	102.4	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.19	0.0	0.00	35.80	385.00	378.75 376.50	376.55 374.30	1.28 2.20	27 Cir	2.15	11.42	45.39	

NOTES: Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 -- X = Ln(Tc)(min) (in/hr) ; Time of flow in section is based on full flow.; Initial tailwater elevation = 337.00 (ft)

Hyd flow Hydraulic Grade Line Compu ions

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
	(In)	(cfs)									(ft)											(K)	(ft)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
1	36	68.10	334.00	337.00	3.00	7.07	9.64	1.44	338.44	1.043	128	336.40	339.04	2.64**	6.58	10.35	1.67	340.70	0.940	0.991	N/A	0.70	1.17
2	36	63.00	336.40	340.20	3.00	7.07	8.91	1.24	341.44	0.893	44.3	337.90	340.43	2.53**	6.36	9.91	1.53	341.96	0.850	0.872	N/A	0.70	1.07
3	33	50.10	337.90	341.50	2.75	5.94	8.44	1.11	342.60	0.898	245	345.80	348.11	2.31**	5.32	9.41	1.38	349.49	0.862	0.880	N/A	0.15	0.21
4	33	50.10	345.80	348.31	2.51	5.69	8.80	1.20	349.52	0.782	220	352.80	355.11	2.31**	5.32	9.41	1.38	356.49	0.862	0.822	N/A	0.50	0.69
5	30	48.70	352.80	355.80	2.50	4.91	9.92	1.53	357.33	1.411	37.0	355.20	357.49	2.29**	4.71	10.34	1.66	359.15	1.227	1.319	N/A	0.50	0.83
6	27	44.30	355.20	358.32	2.25	3.98	11.14	1.93	360.25	2.048	247	371.80	373.94	2.14**	3.91	11.34	2.00	375.94	1.774	1.911	N/A	0.50	1.00
7	27	40.30	371.80	374.94	2.25	3.98	10.14	1.60	376.54	1.695	36.7	374.30	376.40	2.10**	3.86	10.44	1.70	378.09	1.464	1.579	N/A	0.50	0.85
8	27	35.80	374.30	377.25	2.25	3.98	9.01	1.26	378.51	1.337	102	376.50	378.53	2.03**	3.78	9.48	1.40	379.93	1.174	1.256	N/A	1.00	1.40

Project File: castle3.stm | IDF File: citysd.IDF | Total number of lines: 8 | Run Date: 09-25-2006

NOTES: Initial tailwater elevation = 337 (ft) , * Normal depth assumed., ** Critical depth assumed.

Hydraflow HGL Computation Procedure

General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is assumed at the upstream end.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the assumed hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

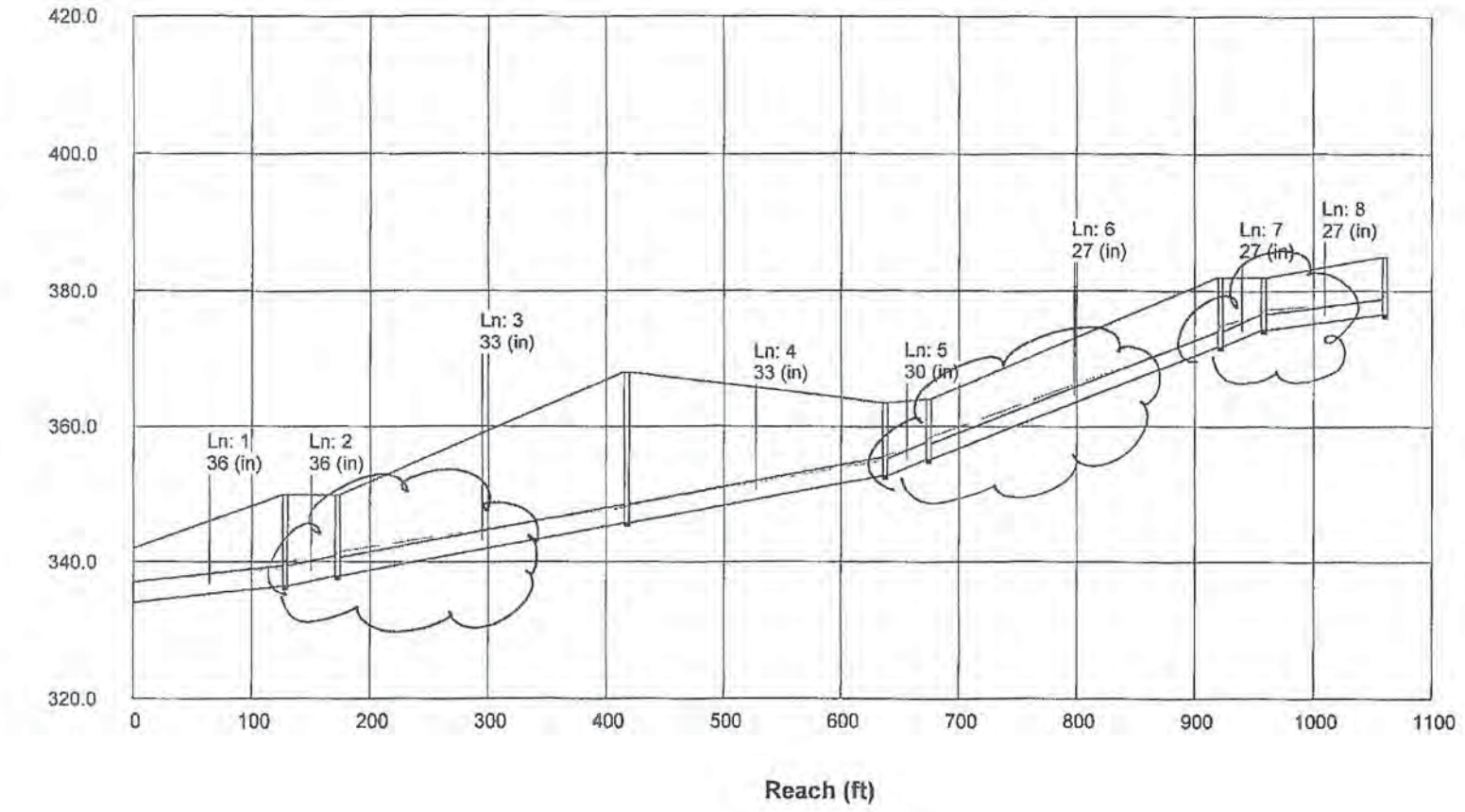
Col. 24 Minor loss. Equals Col. 23 x Col. 18. This amount is added to the upstream HGL and used as the starting HGL for the next upstream line(s).

* Normal depth assumed.
** Critical depth assumed.

St n Sewer Profile

Proj. stle3.stm

EXISTING PIPE UNDER PRESSURE



PROFILE: MEDINA DRIVE

SCALE: HOR. 1" = 40'
VERT. 1" = 8'

1.80%

4.32%

W'LY GROUND LINE

W'LY

383.18 | 382.92 | 16+85.5 | 382.86 | 382.87 | 16+77.57 | 383.02 | 383.37 | 383.9 | 384.4

382.39 | 16+95.57 | 382.03 | 382.04 | 382.44 | 16+67.57

380 370

380.50' TOP OF CREATE 376.47 376.47 3.5' 27" A.C.P.

SUBD. BNDY.

Exist 27" R.C.P. per T.M. 2708-1 Sht. 8 of 8

5.35'

6.65'

Exist. 12' Drain. Ease.

82 83 84 85

Make Conn. to Exist Pipe

16+75.57 16+82.22 ℄ 7' "K" Inlet

38.88' 27" R.C.P. 72.43' 33' 12' Drain. Ease. 69.57 13.58'

F.H. FL. EL. 388.13 178.22'

8.00' Outlets: 1-4" 1-2½" 349.83' 6" V.C. DRIVE

36.67' 27" A.C.P.

8.00' 177.57'

16+06 15+37

66.00' 72.43' 69.57' 69.00' 37.00'

15+00 See Sheet No 3 WS-1059

MATCH LINE

16+81.57 ℄ 7' "K" Inlet 102.41' 27" A.C.P.

12' Drain. Ease. 6'

P.C.C. Ditch per Grading Plan Nº L-5607

20' Mod. Type "A-2" Inlet (Inlet Opening to be 18"; H-0")

SUBD. BNDY.

4.15 380.60 Gut. 380.50 Grate 380.60 Gut.

79 80 81

19+47 18+81 18+14 17+48

Street Light

36-06578 5' 79+19 36-06562 5' 36-06734 5' 17+64

33' 8" G.V. 24' 11'

66.00' 67.00' 66.00'

408.68' 750.65' 8" A.C.

243' 6" V.C.

409.33'

17+57 M.H. #6

134 133 132 131 130 129 128

19+46 18+78 18+14 17+48 16+06 15+37

36-06603 5' 18+94 36-06643 5' 18+52 36-06735 5' 17+64 36-06779 5' 17+21 36-06839 5' 16+60 36-06923 5' 15+77

68.00' 64.00' 66.00' 72.43' 69.57' 69.00' 37.00'

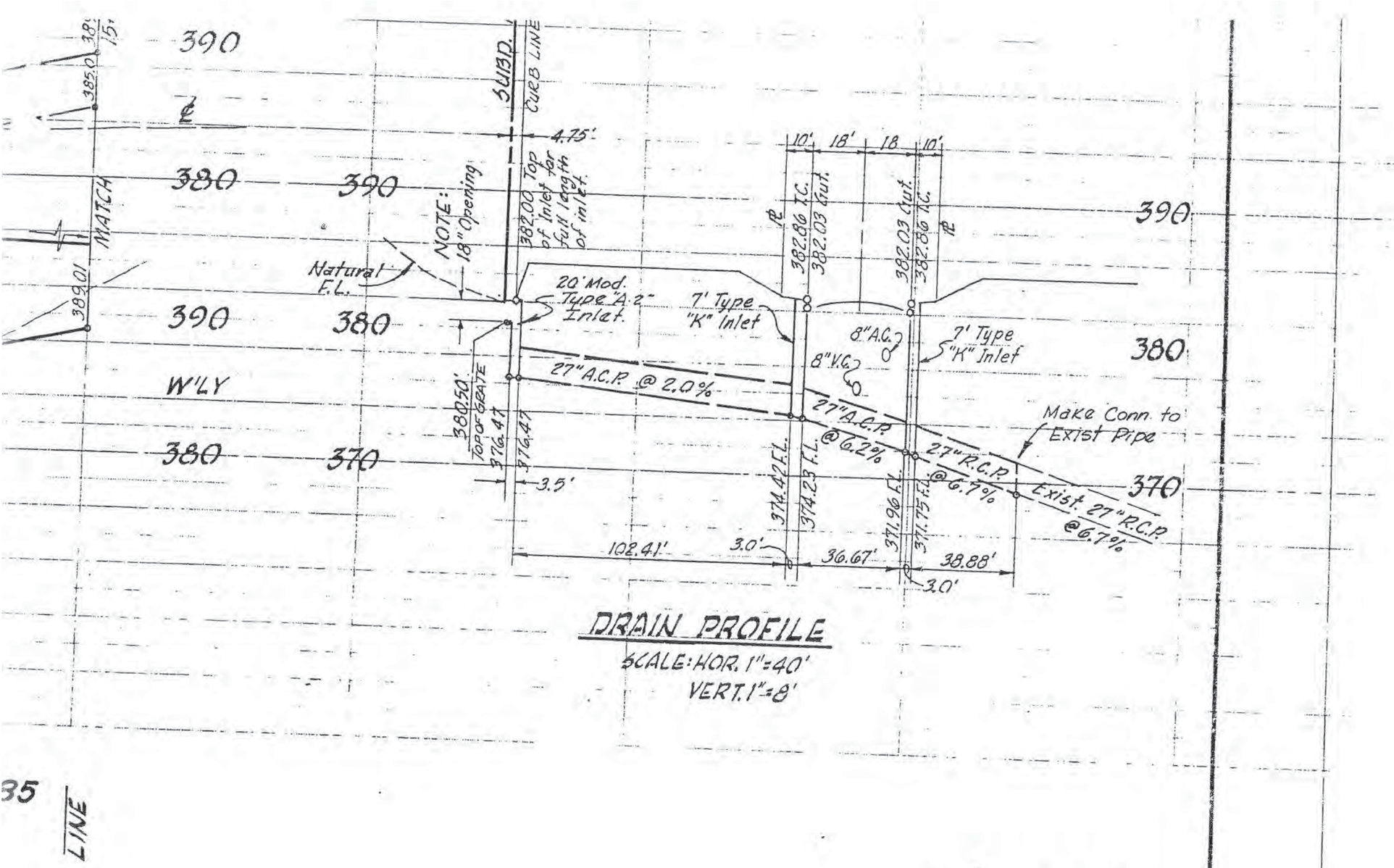
Street Light

1" = 40'

Ref 2814-2

BASIN 3

No	Description	REVISED BY	Da
A/2	As-built sewer & water laterals Up date services	R.C.	1-14-



DRAIN PROFILE

SCALE: HOR. 1"=40'
VERT. 1"=8'

Ref 2814-2

BENCH MARK

Description: 2" Brass Plug

Location: In Stairway Landing N.E. Cor. Santee Sewage Treatment Plant Control Bldg

Record From: T.M. 2060 per Sht. No 2

Elev.: 324.74 Datum: U.S.G.S.

PRIVATE CONTRACT

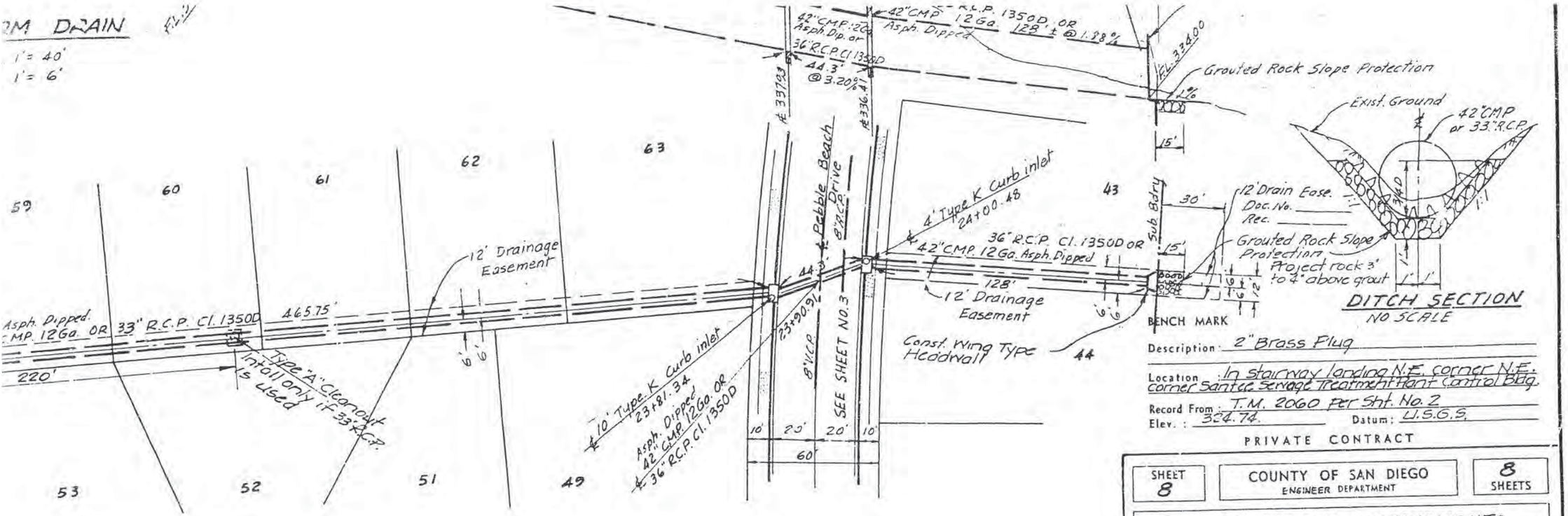
SHEET 4	COUNTY OF SAN DIEGO ENGINEERING DEPARTMENT	5 SHEETS

PLANS FOR THE IMPROVEMENT OF

Boxes 3

RM DRAIN

1" = 40'
1" = 6'



BENCH MARK

Description: 2" Brass Plug

Location: In stairway landing N.E. corner N.E. corner Santee Sewage Treatment Plant Control Bldg.

Record From: T.M. 2060 Per Sht. No. 2

Elev.: 324.74. Datum: U.S.G.S.

PRIVATE CONTRACT

SHEET 8	COUNTY OF SAN DIEGO ENGINEER DEPARTMENT	8 SHEETS

PLANS FOR THE IMPROVEMENTS IN AND ADJACENT TO
CARLTON COUNTRY CLUB MANOR UNIT No. 1
STORM DRAIN

Recommended for Approval: R. Spencer, Subdivision Eng.

Approved: D. K. Speer, County Engineer

Engineer of Work: Clayland Smith 7/5/68 R. C. E. 7454

Checked by: RSB

Approval Date: 8-9-68

T.M. 2708-1

FILE NO.

COUNTY APPROVED CHANGES

No.	Description	Approved By	Date

PLAN: STORM DRAIN

SCALE: 1" = 40'

LAWRENCE · FOGG · SMITH AND ASSOCIATES
CONSULTING CIVIL ENGINEERS
[illegible] LA MESA, CALIF. 92041 [illegible]

DR. BY WAI
CK. BY J.P.L.
PROJ. ENGR.
C.E. 7454

#877

#877

NITT
e the
1047.

8" V.C.P.

with
e
1047.

thus:

thus:

with

plans.

N.E. corner N.E.
Plant Control Bldg.
eet No. 2
U.S.G.S.
CT

IEGO | 8 SHEETS

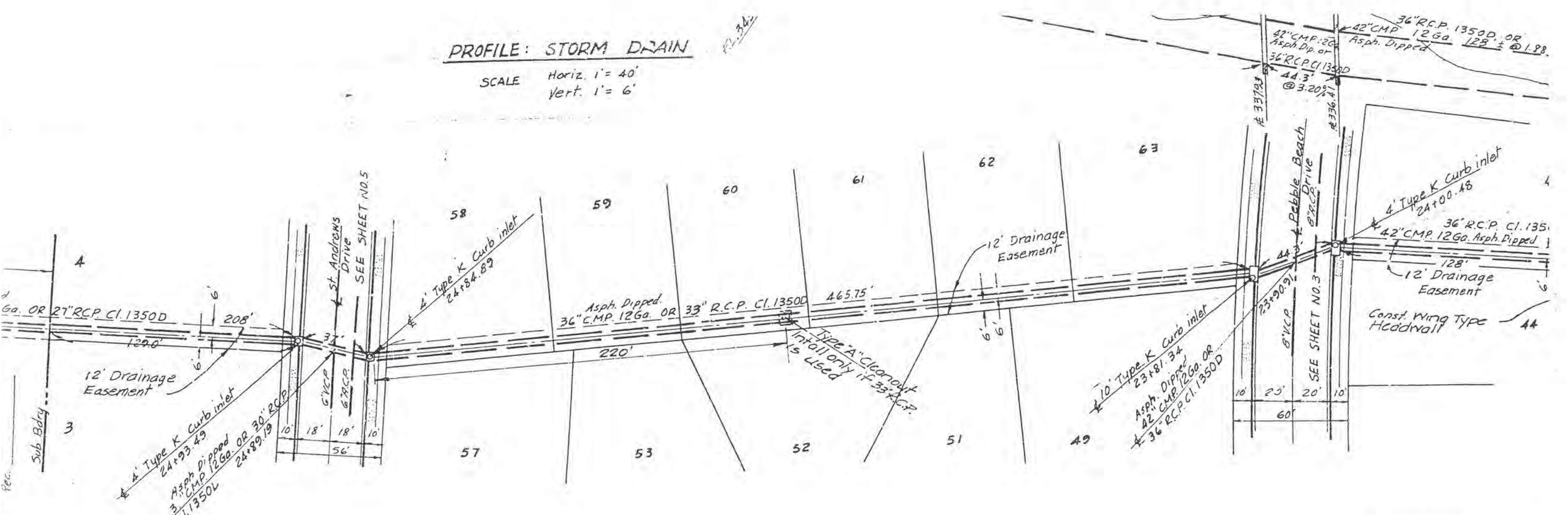
ROVEMENTS
NT TO
CLUB MANOR

Speer
UNTY ENGINEER

M.2708-1

PROFILE: STORM DRAIN

SCALE Horiz. 1" = 40'
Vert. 1" = 6'



PLAN: STORM DRAIN

SCALE: 1" = 40'

LAWRENCE · FOGG · SMITH AND ASSOCIATES
CONSULTING CIVIL ENGINEERS

DR. BY NAI
CK. BY J.P.L.
PROJ. ENGR.
C.E. 7454 #877

COUNTY APPROVED CHANGES

No.	Description	Approved By	Date

Ref. 2708-1 #077

Ref 2708-1

Finished Grade

℄ Type "A" Cleanout Install only if 33" R.C.P. is used

Exist. Ground

OR 33" R.C.P. Cl. 1350D

465.75' @ 3.2%

Fl. 345.79

M DRAIN

1" = 40'

1" = 6'

370

360

350

℄ Pebble Beach Dr. 23+90.91

126.35'

Sub. Bdry

350.75 T.C.

350.75 T.C.

24.91 G

24.91 G

10' Type K Curb Inlets

8" A.C.P.

4' Type "K" Inlet

8" V.C.P.

42" CMP. 12Ga Asph. Dip. or 36" R.C.P. Cl. 1350D 44.3' @ 3.20%

42" CMP 12 Ga Asph. Dipped 128'± @ 1.88%±

36" R.C.P. 1350D OR

Const. U-Type Headwall

Fl. 336.00

Grouted Rock Slope Protection

1%

℄ 337.93

℄ 336.41

15'

Pebble Beach Drive

63

62

61

60

43

4' Type K Curb Inlet 24+00.48

36" R.C.P. Cl. 1350D OR 42" CMP. 12Ga. Asph. Dipped 128'

12' Drainage Easement

30'

12' Drain Ease. Doc. No. Rec.

Grouted Rock Slope Protection Project rock 3' to 4" above grout

DITCH SECTION NO SCALE

Exist. Ground

42" CMP or 33" R.C.P.

3:1

1:1

1'-1'

6" 6" 12"

BENCH MARK

Description 2" Brass Plug

Const. Wing Type

Asph. Dipped. MP. 12Ga. OR 33" R.C.P. Cl. 1350D 465.75'

12' Drainage Easement

Pebble Beach Drive 8" R.C.P.

℄ 23+90.91

ET NO. 3

inlet

with these plans. .s, and Special

Limit of Grading

15:1

plans.

with of the No 1042.

8" V.C.P.

with the No. 1042.

n thus:

vn thus:

Ref 2708-1

79'± | Sub. Bdry | 122.0' | ℄

20%

208' 33" C.M.P. 14ga. Asph. Dipped or 27" R.C.P. cl. 1350-D

6.72%

℄ St. Andrews Dr. 24+89.19

220'

Finished Grade

℄ Type "A" Cleanout Install only if 33" R.C.P. is used

364.59 T.C.

364.0 T.C.

363.76 G

363.24 G

4' Type K Cb. Inlets

6" A.C.P.

6" V.C.P.

Exist. Ground

℄ 355.20

37@6½"

℄ 352.83

36" C.M.P. 12ga. Asph. Dipped OR 33" R.C.P. Cl. 1350D

Asph. Dipped 36" C.M.P. 12 Ga. OR 30" R.C.P. Cl. 1350 D

Fl. 345.79

465.75' @ 3.2%

℄ Pebble Beach Dr. 23+20.91

350.75 T.C.

350.25 T.C.

10' Type K Curb Inlets

8" A.C.P

4' Type "K" Inlet

8" V.C.P.

36" R.C.P.

42" C.M.P. 12 Ga. Asph. Dipped

42" C.M.P. 12 Ga. Asph. Dipped

36" R.C.P. Cl. 1350D

44.3' @ 3.20%

℄ 337.33

℄ 336.41

PROFILE: STORM DRAIN

SCALE Horiz. 1" = 40'
Vert. 1" = 6'

58 | 59 | 60 | 61 | 62 | 63

100.00'

4

Asph. Dipped 33" C.M.P. 12Ga. OR 27" RCP Cl. 1350D

208'

℄ St. Andrews Drive

SEE SHEET NO.5

4' Type K Curb inlet 24+84.89

Asph. Dipped 36" C.M.P. 12Ga. OR 33" R.C.P. Cl. 1350D 465.75'

12' Drainage Easement

℄ Pebble Beach Drive

SEE SHEET NO.3

4' Type K Cu... 24+00...

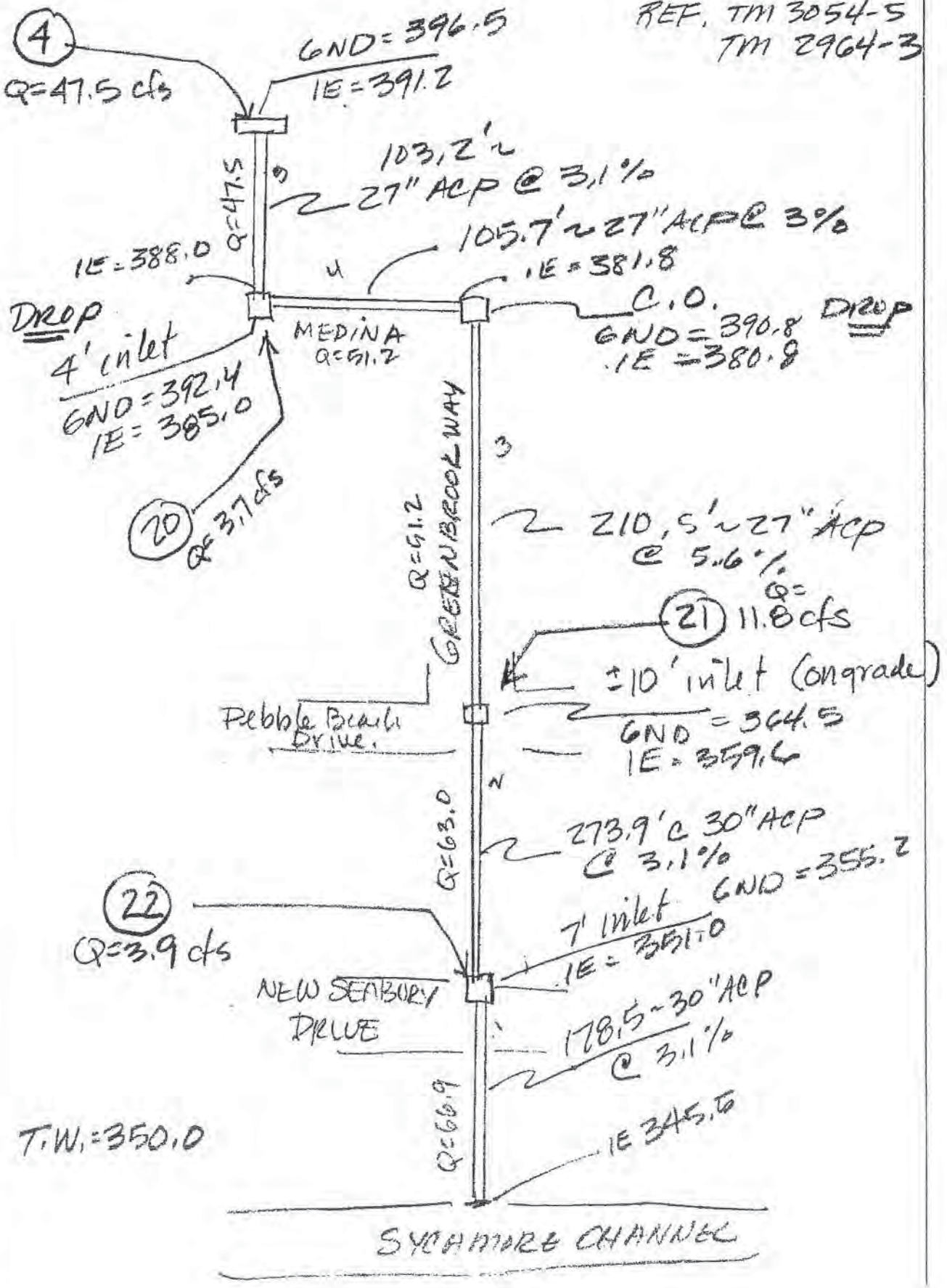
42" C.M.P. 12 Ga.

12' Drain... Easeme...

Const. Wing ... Headwall

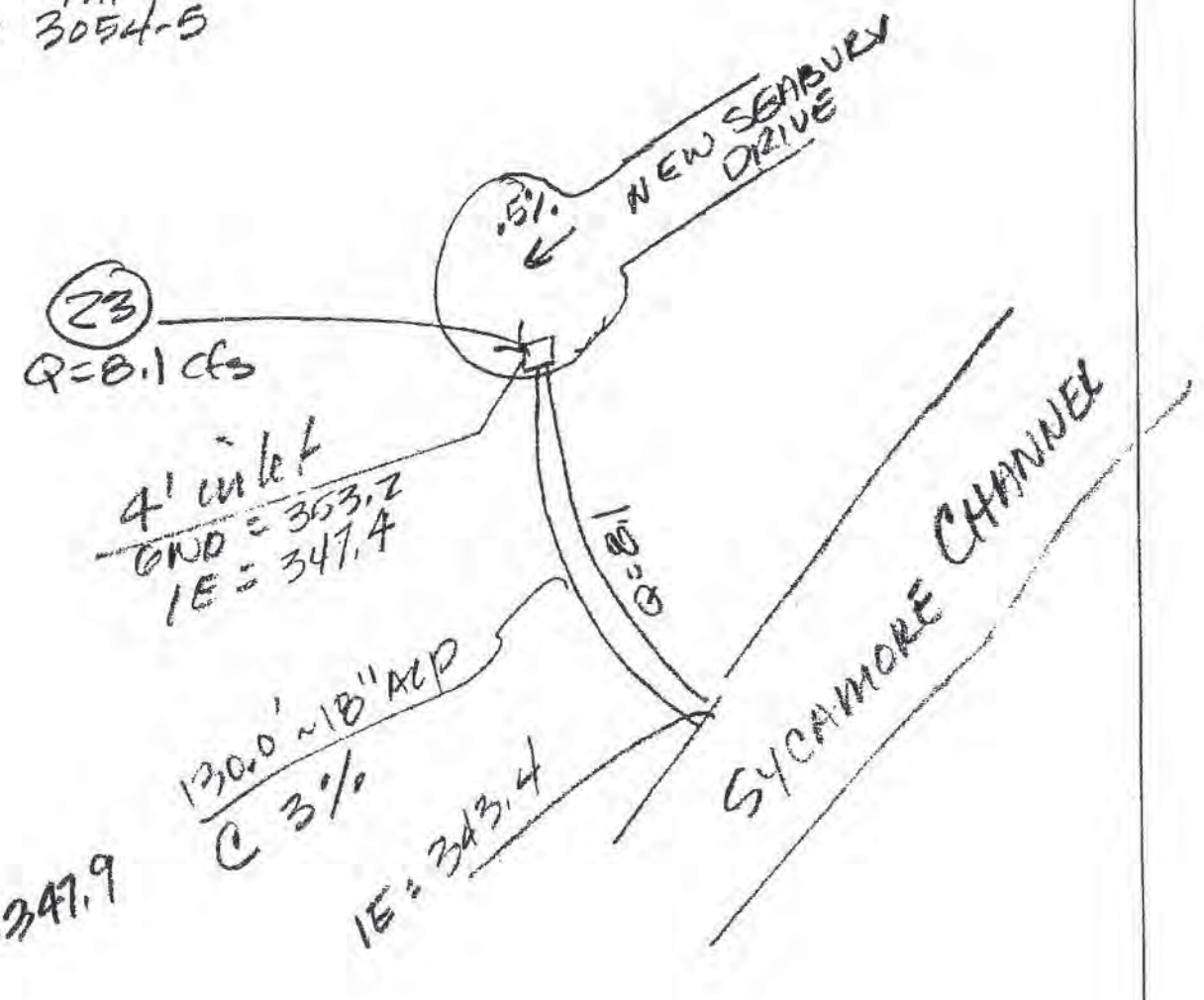
EXISTING BASIN 4

BASIN 4 - EXISTING 100 yr. STORM



BASIN 4 - CONT'd.

REF: TM 3054-5



PRELIMINARY HYDRAULIC CAPACITY ANALYSIS

BASIN 4 - Cont'd.

$Q = KS^{1/2}$

$K = 309.7$

- CAPACITY 27" @ 3% IS:

$$Q_{CAP} = (309.7)(03)^{1/2} = 53.6 > 51.2 \quad \text{OK}$$

- CAPACITY 27" @ 5.6% IS:

$$Q_{CAP} = (309.7)(056)^{1/2} = 73.3 > 51.2 \quad \text{OK}$$

- CAPACITY OF 30" @ 3.1% IS:

$K = 410.1$

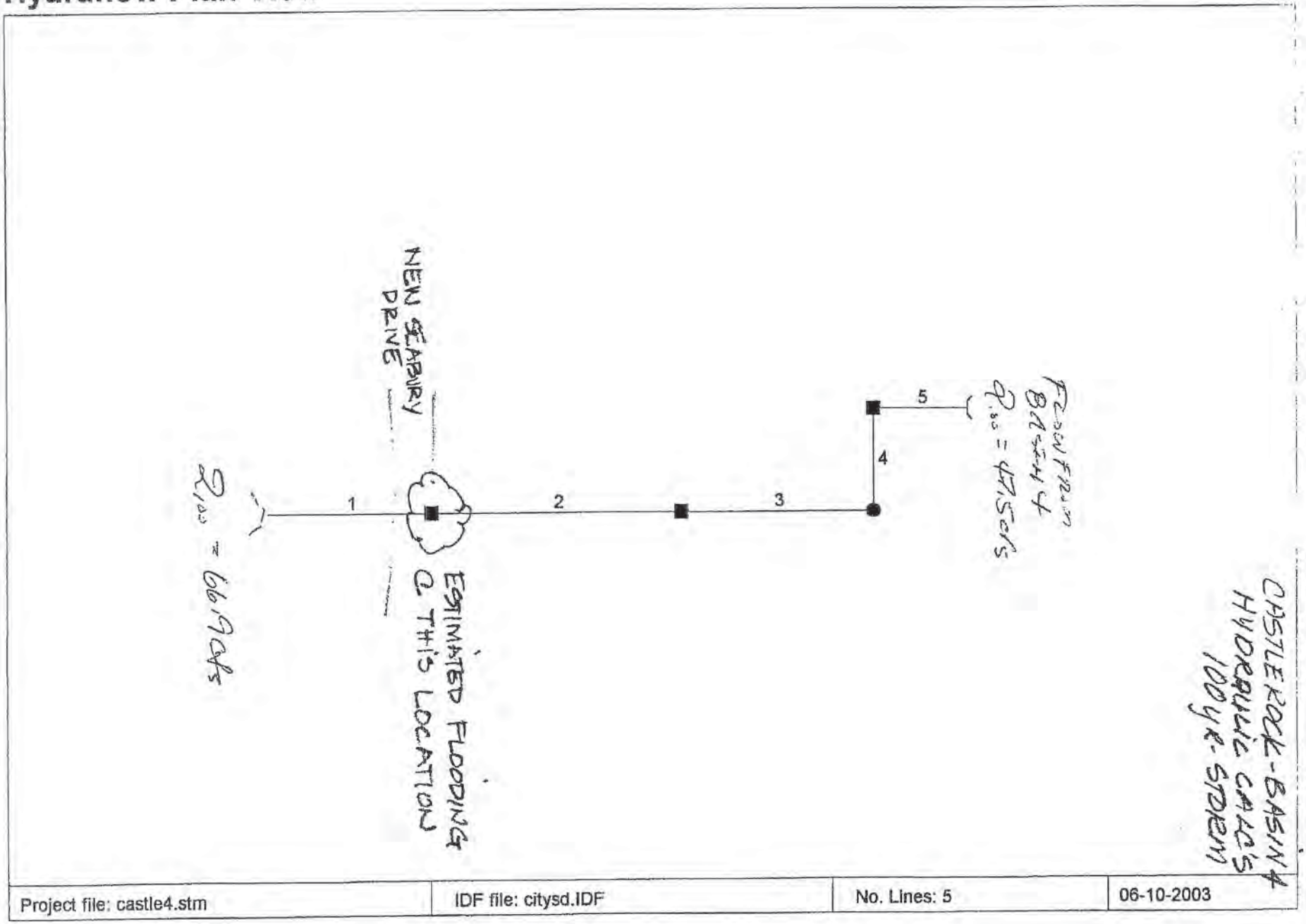
$$Q_{CAP} = (410.1)(031)^{1/2} = 72.2 > 66.9 \quad \text{OK}$$

$K = 105.0$

- CAPACITY OF 18" @ 3% IS:

$$Q_{CAP} = (105)(031)^{1/2} = 18.5 > 8.1 \quad \text{OK}$$

Hydraflow Plan View



Project file: castle4.stm	IDF file: citysd.IDF	No. Lines: 5	06-10-2003

Hydraflow Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1		66.90	30 c	178.5	345.50	351.00	3.081	350.00*	354.75*	1.44	End
2		63.00	30 c	273.9	351.00	359.60	3.140	356.20*	362.66*	1.28	1
3		51.20	27 c	210.5	359.60	380.80	10.071	363.94	382.99	2.62	2
4		51.20	27 c	105.7	380.80	385.00	3.974	385.61*	388.50*	3.87	3
5		47.50	27 c	103.2	385.00	391.20	6.008	392.36*	394.79*	2.22	4

Project File: castle4.stm	IDF File: citysd.IDF	Total No. Lines: 5	Run Date: 06-15-2003

NOTES: c = circular; e = elliptical; b = box; Return period = 100 Yrs.; * Indicates surcharge condition.

Hydraflow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	178.5	0.00	0.00	0.00	0.00	0.00	0.0	0.9	0.0	66.90	71.99	13.63	30	3.08	351.00	345.50	354.75	350.00	355.20	357.00	
2	1	273.9	0.00	0.00	0.00	0.00	0.00	0.0	0.6	0.0	63.00	72.67	12.84	30	3.14	359.60	351.00	362.66	356.20	364.50	355.20	← Flow line
3	2	210.5	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	51.20	98.27	12.93	27	10.07	380.80	359.60	382.99	363.94	390.80	364.50	
4	3	105.7	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	51.20	61.73	12.88	27	3.97	385.00	380.80	388.50	385.61	392.40	390.80	
5	4	103.2	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	47.50	75.90	11.95	27	6.01	391.20	385.00	394.79	392.36	396.50	392.40	

Project File: castle4.stm | IDF File: citysd.IDF | Total number of lines: 5 | Run Date: 06-15-2003

NOTES: Intensity = 0.0000 + 0.0000(X) + 0.0000(X)^2 + 0.0000(X)^3 -- X = Ln(Tc)(min); Return period = 100 Yrs. ; Initial tailwater elevation = 350.00 (ft)

Hydraflow Hydraulic Grade Line Computations

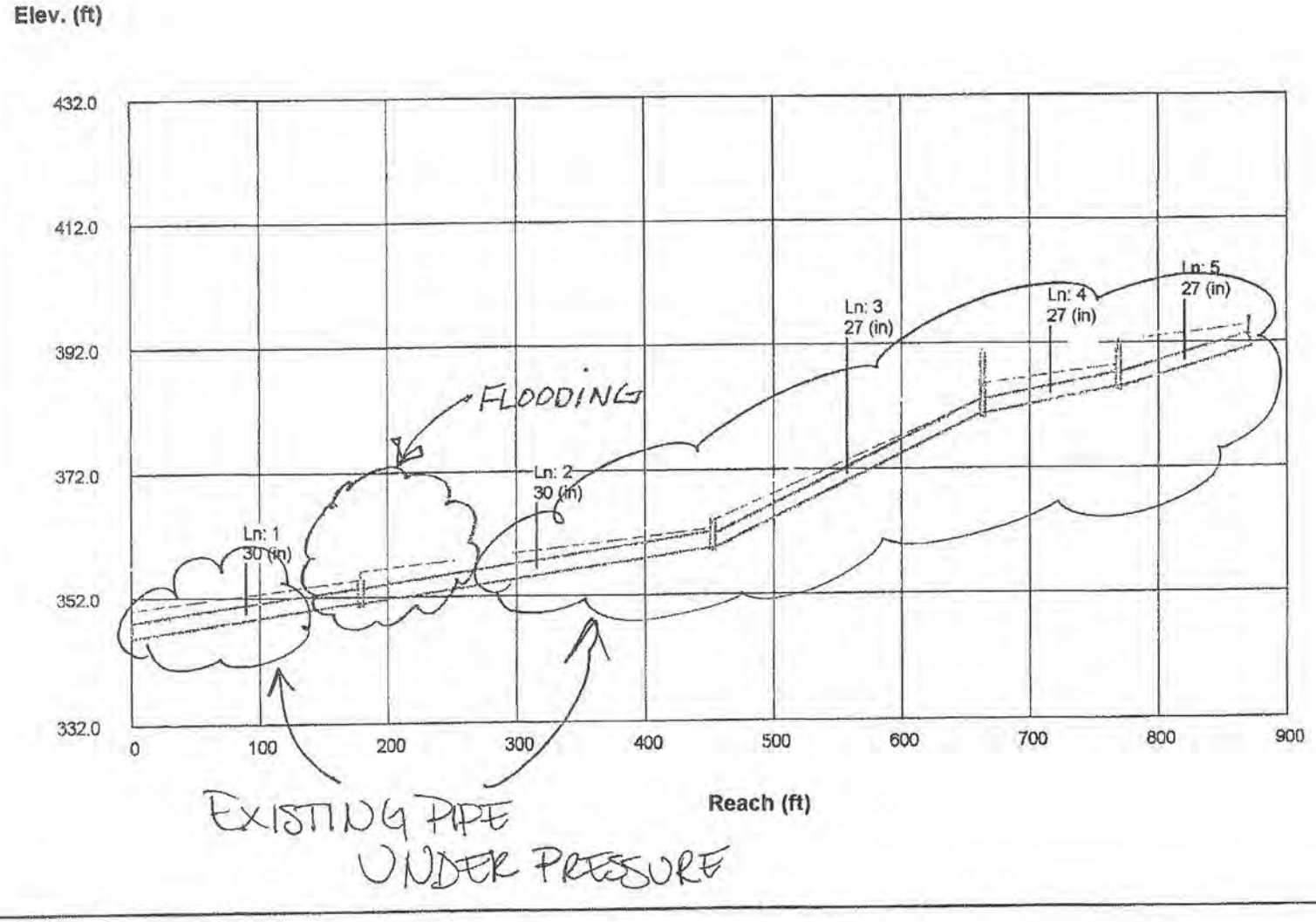
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	30	66.90	345.50	350.00	2.50	4.91	13.63	2.89	352.89	2.662	179	351.00	354.75	2.50	4.91	13.63	2.89	357.64	2.661	2.662	4.751	0.50	1.44
2	30	63.00	351.00	356.20	2.50	4.91	12.84	2.56	358.76	2.361	274	359.60	362.66	2.50	4.91	12.83	2.56	365.22	2.360	2.360	6.465	0.50	1.28
3	27	51.20	359.60	363.94	2.25	3.98	12.88	2.58	366.52	2.735	211	380.80	382.99	2.19**	3.94	12.98	2.62	385.61	2.414	2.574	N/A	1.00	2.62
4	27	51.20	380.80	385.61	2.25	3.98	12.88	2.58	388.19	2.735	106	385.00	388.50	2.25	3.98	12.88	2.58	391.08	2.734	2.735	2.890	1.50	3.87
5	27	47.50	385.00	392.36	2.25	3.98	11.95	2.22	394.58	2.354	103	391.20	394.79	2.25	3.98	11.95	2.22	397.01	2.353	2.354	2.429	1.00	2.22

Project File: castle4.stm | IDF File: citysd.IDF | Total number of lines: 5 | Run Date: 06-15-2003

NOTES: Initial tailwater elevation = 350 (ft) , * Normal depth assumed., ** Critical depth assumed.

Sto..n Sewer Profile

Proj. fi.. ..asue4.stm

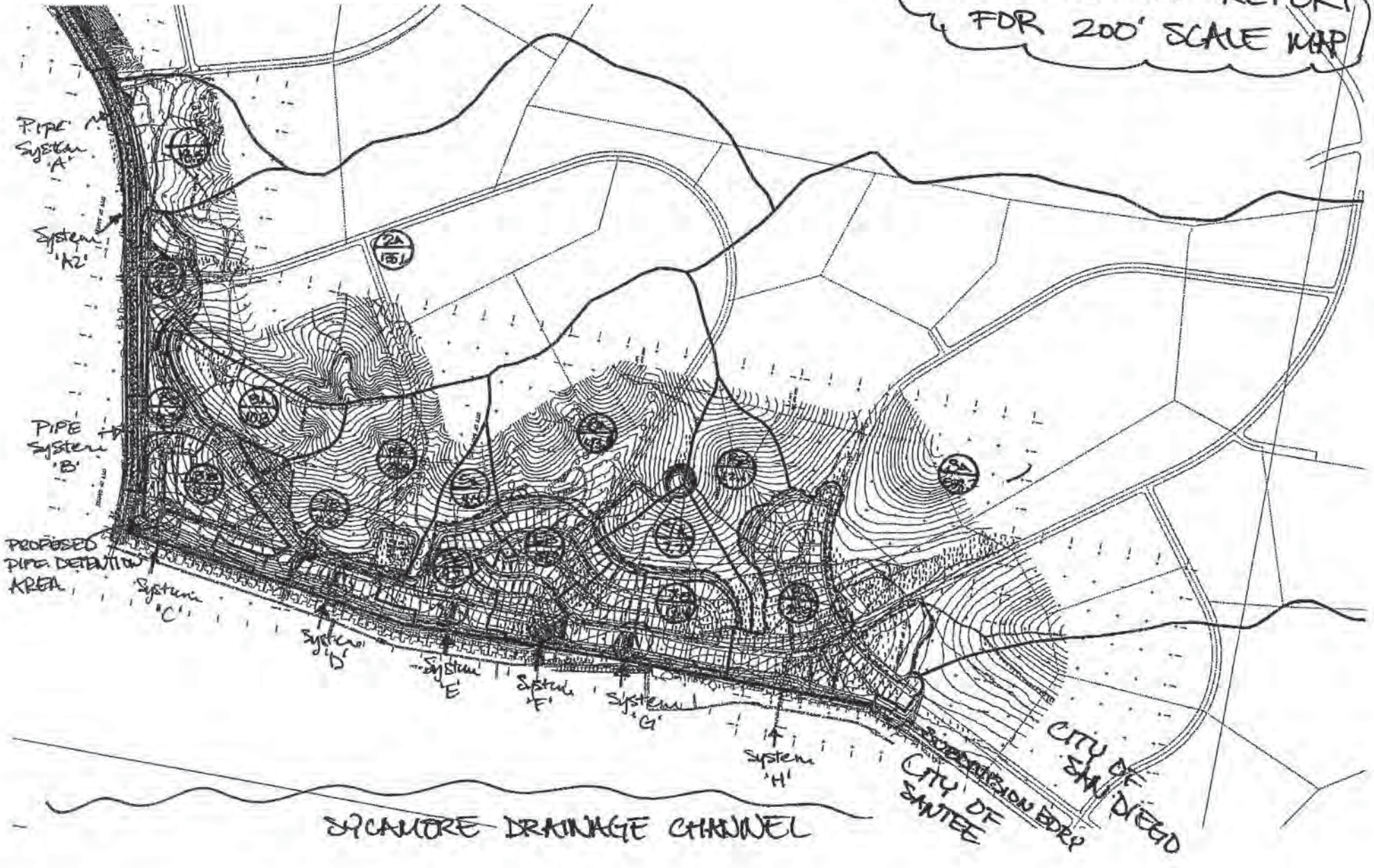


APPENDIX D

APPENDIX D
DEVELOPED HYDROLOGY CALCULATIONS
(Basins 1-8 & 30)

CASTLEROCK
DEVELOPED HYDROLOGY MAP (NTS)

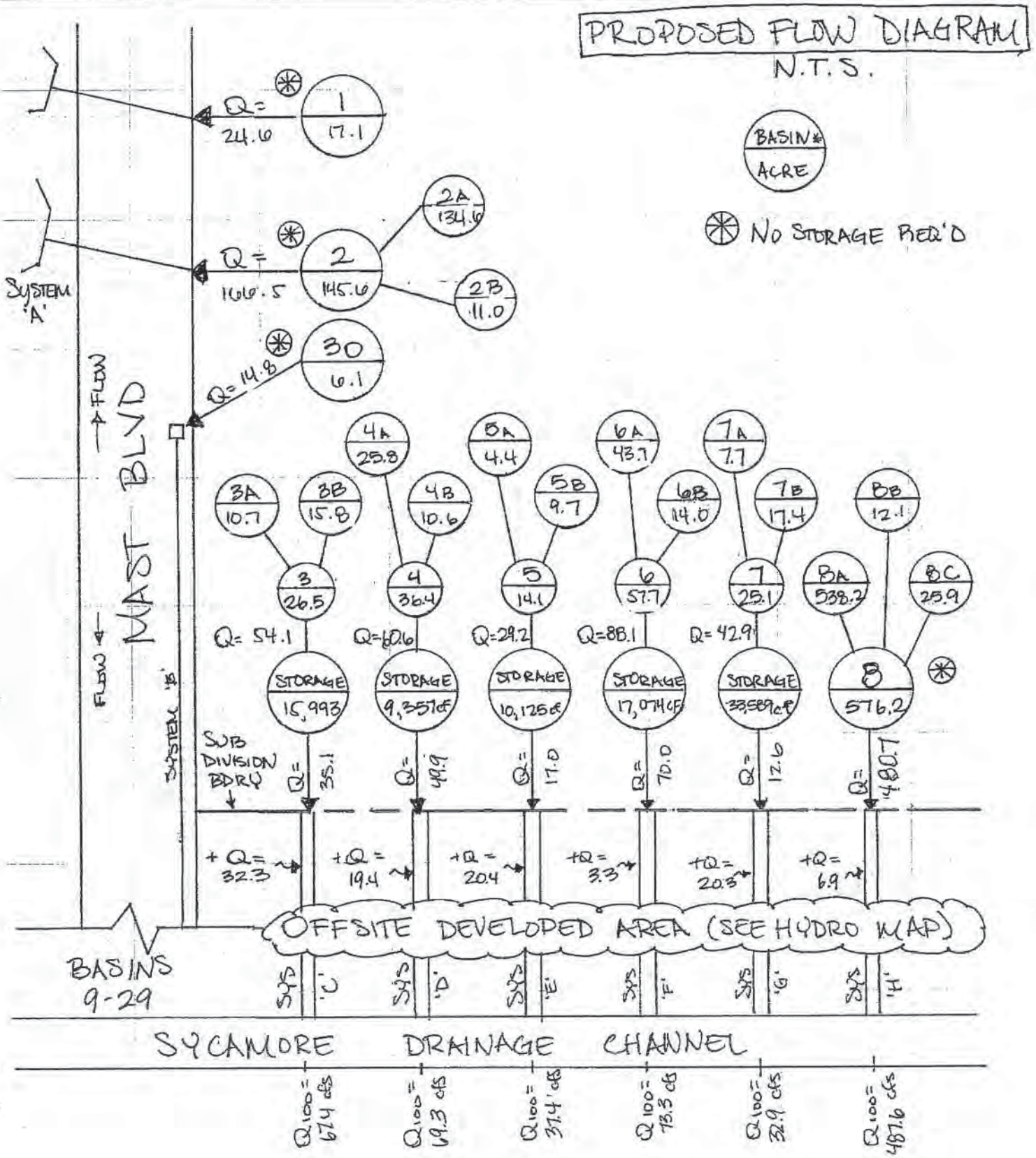
SEE END OF REPORT FOR 200' SCALE MAP



Latitude 33
Planning and Engineering
4933 Paramount Drive, Second Floor
San Diego, CA 92123
Tel 858-751-0633
Fax 858-751-0634

Date: 6/30/07 Sheet 1 of 1
Project Name: CASTLEROCK
Project No: 666.00 By AMB Checked

PROPOSED FLOW DIAGRAM
N.T.S.



Proposed Hydrology Calculations

Project Information

Project	City	Original Date	Revised Date	Revised Date	Project No.
CASTLE ROCK	San Diego	8/10/2006	9/29/2006	10/18/2010	666.00
		By	By	By	Checked
		JAG	MJY	AMB	CJE

Developed Conditions

BASIN NUMBER	*C*	*Weighted C*	*I_{100} (in/hr)*	*A*	*HT. (ft)*	*L (ft)*	*S (%)*	*Ti (min.)*	*Tt (min.)*	**Tc (min.)*	*Q_{100} (cfs)*
1.0	0.45		3.2	17.1	196	1400	14.0	14.5	0.0	14.5	24.6
2A	0.45		2.4	134.6	255	3800	6.7	22.0	0.3		
2B	0.80			11.0							
2.0		0.48	2.4	145.6						22.3	166.5
3A	0.45		3.2	10.7	208	1000	20.8	12.9	1.1		
3B	0.80			15.8							
3.0		0.66	3.1	26.5						14.0	54.1
4A	0.45		3.1	25.8	349	1700	20.5	14.0	0.6		
4B	0.75			10.6							
4.0		0.54	3.1	36.4						14.6	60.6
5A	0.45		3.2	4.4	195	1000	19.5	13.0	0.8		
5B	0.75			9.7							
5.0		0.66	3.15	14.1						13.8	29.2
6A	0.45		3.0	43.7	293	1750	16.7	15.2	1.2		
6B	0.75			14.0							
6.0		0.52	2.9	57.7						16.4	87.5
7A	0.45		3.3	7.7	146	490	29.8	11.5			
7B	0.75		4.0	17.4					7.0		
7.0		0.66	2.6	25.1						18.5	42.9
8A	0.45		1.9	538.2	420	8450	5.1	36.0			
8B	0.45		3.1	12.1	225	930	24.2	12.6			
8C	0.75		4.0	25.9					7.0		
8.0		0.46	1.8	576.2						38.0	480.7
Basins 9-29: Peak flows equivalent to existing (refer to Existing Conditions Hydrology Calculations)											
30.0	0.90		2.7	6.1	74	1260	5.9	6.9	12.4	19.3	14.8

*TC = Ti + Tt

Composite C Value Calculations

Project Information

Project	County	Date	Project No.
Castlerock	San Diego	10/18/2010	666.00
	Condition: Proposed	By: amb	Checked: amo

Proposed Condition

BASIN NUMBER	*AREA (acres)*	*Incremental area*	*Incremental C*	*Total C*
1	17.1	17.1	0.45	0.45
2	145.6	134.6	0.45	0.48
		11.0	0.80	
3	26.5	10.7	0.45	0.66
		15.8	0.80	
4	36.4	25.8	0.45	0.54
		10.6	0.75	
5	14.1	4.4	0.45	0.66
		9.7	0.75	
6	57.7	43.7	0.45	0.52
		14.0	0.75	
7	25.1	7.7	0.45	0.66
		17.4	0.75	
8	576.2	538.2	0.45	0.46
		12.1	0.45	
		25.9	0.75	
30	6.1	6.1	0.9	0.90

Latitude 33
Planning and Engineering
4933 Paramount Drive, Second Floor
San Diego, CA 92123
Tel 858-751-0633
Fax 858-751-0634

Date: 6/20/07 Sheet 1 of ____
Project Name: CASTLEROCK
Project No: 666.00 By AMB Checked ____

T_c NATURAL WATERSHEDS

$$T_c = \left[\frac{(11.9)L^3}{\Delta E}\right]^{0.385} + 10\,\text{min}$$

- BASIN 7A

$E_1 = 606'$ $E_2 = 460'$ $\Delta E = 146'$

$L = 489.3' = 0.0927$ mile

$$T_c = \left[\frac{(11.9)(0.0927)^3}{146'}\right]^{0.385} = 0.0244\ \text{hr} = 1.46\ \text{min}$$

$\Rightarrow$ **$T_c = 11.5$ min**

- BASIN 8A

$E_1 = 850'$ $E_2 = 420'$ $\Delta E = 430'$

$L = 8450' = 1.6$ mile

$$T_c = \left[\frac{(11.9)(1.6)^3}{430'}\right]^{0.385} = 0.4321\ \text{hr} = 26\ \text{min}$$

$\Rightarrow$ **$T_c = 36$ min**

- BASIN 8B

$E_1 = 690'$ $E_2 = 465'$ $\Delta E = 225'$

$L = 930' = 0.176$ mile

$$T_c = \left[\frac{(11.9)(0.176)^3}{225'}\right]^{0.385} = 0.0433\ \text{hr} = 2.6\ \text{min}$$

$\Rightarrow$ **$T_c = 12.6$ min**

FLOW TO MAST BOULEVARD

PIPE SYSTEM 'A.'

Subcat Reach Pond Link

Drainage Diagram for PROPOSED BASIN 1
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/25/2008
HydroCAD® 7.00 s/n 000000 © 1986-2003 Applied Microcomputer Systems

Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 1: FLOW TO MAST BOULEVARD Runoff Area=18.500 ac Runoff Depth=0.36"
Tc=14.5 min C=0.45 Runoff=26.60 cfs 0.548 af

Total Runoff Area = 18.500 ac Runoff Volume = 0.548 af Average Runoff Depth = 0.36"

Subcatchment BASIN 1: FLOW TO MAST BOULEVARD

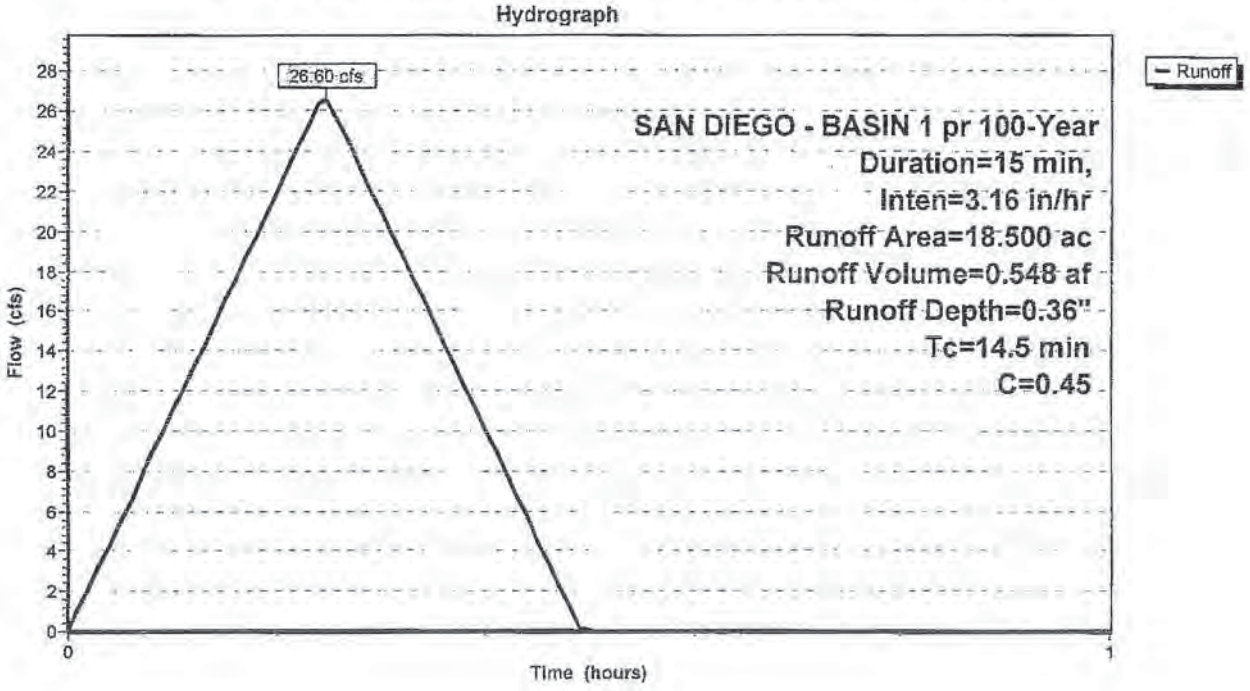
Runoff = 26.60 cfs @ 0.25 hrs, Volume= 0.548 af, Depth= 0.36"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 1 pr 100-Year Duration=15 min, Inten=3.16 in/hr

Area (ac)	C	Description
18.500	0.45	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry, TIME OF CONCENTRATION**

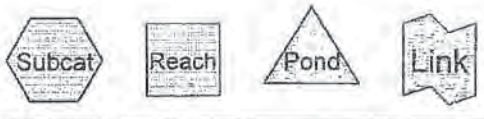
Subcatchment BASIN 1: FLOW TO MAST BOULEVARD



Hydrograph for Subcatchment BASIN 1: FLOW TO MAST BOULEVARD

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	0.00	0.52	0.00
0.01	1.10	0.53	0.00
0.02	2.19	0.54	0.00
0.03	3.29	0.55	0.00
0.04	4.39	0.56	0.00
0.05	5.49	0.57	0.00
0.06	6.58	0.58	0.00
0.07	7.68	0.59	0.00
0.08	8.78	0.60	0.00
0.09	9.88	0.61	0.00
0.10	10.97	0.62	0.00
0.11	12.07	0.63	0.00
0.12	13.17	0.64	0.00
0.13	14.27	0.65	0.00
0.14	15.36	0.66	0.00
0.15	16.46	0.67	0.00
0.16	17.56	0.68	0.00
0.17	18.66	0.69	0.00
0.18	19.75	0.70	0.00
0.19	20.85	0.71	0.00
0.20	21.95	0.72	0.00
0.21	23.05	0.73	0.00
0.22	24.14	0.74	0.00
0.23	25.24	0.75	0.00
0.24	26.34	0.76	0.00
0.25	**26.52**	0.77	0.00
0.26	25.42	0.78	0.00
0.27	24.33	0.79	0.00
0.28	23.23	0.80	0.00
0.29	22.13	0.81	0.00
0.30	21.03	0.82	0.00
0.31	19.94	0.83	0.00
0.32	18.84	0.84	0.00
0.33	17.74	0.85	0.00
0.34	16.64	0.86	0.00
0.35	15.55	0.87	0.00
0.36	14.45	0.88	0.00
0.37	13.35	0.89	0.00
0.38	12.25	0.90	0.00
0.39	11.16	0.91	0.00
0.40	10.06	0.92	0.00
0.41	8.96	0.93	0.00
0.42	7.87	0.94	0.00
0.43	6.77	0.95	0.00
0.44	5.67	0.96	0.00
0.45	4.57	0.97	0.00
0.46	3.48	0.98	0.00
0.47	2.38	0.99	0.00
0.48	1.28	1.00	0.00
0.49	0.18		
0.50	0.00		
0.51	0.00		

FLOW TO DRAINAGE SYSTEM 'A'$_2$



Drainage Diagram for PROPOSED BASIN 2
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/25/2006
HydroCAD® 7.00 s/n 000000 © 1986-2003 Applied Microcomputer Systems

Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 2: FLOW TO DRAINAGE SYSTEM 'A' Runoff Area=144.900 ac Runoff Depth=0.42"
Tc=22.3 min C=0.47 Runoff=164.30 cfs 5.018 af

Total Runoff Area = 144.900 ac Runoff Volume = 5.018 af Average Runoff Depth = 0.42"

Subcatchment BASIN 2: FLOW TO DRAINAGE SYSTEM 'A'

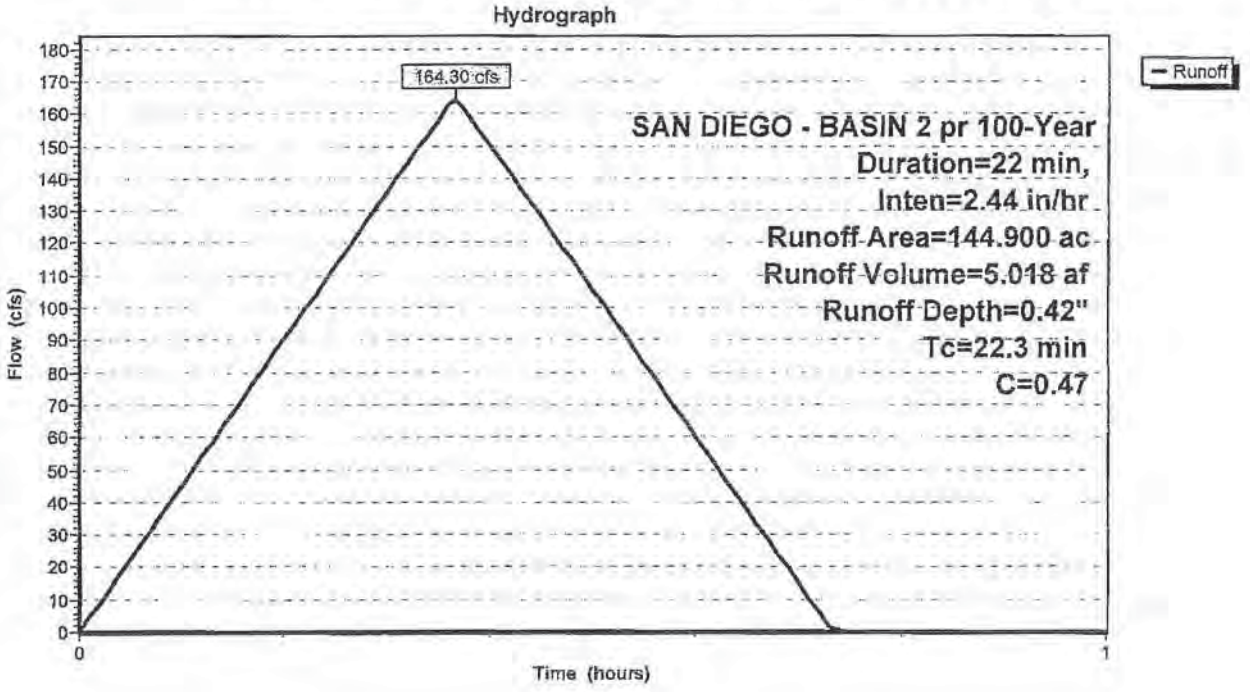
Runoff = 164.30 cfs @ 0.37 hrs, Volume= 5.018 af, Depth= 0.42"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 2 pr 100-Year Duration=22 min, Inten=2.44 in/hr

Area (ac)	C	Description
144.900	0.47	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.3					Direct Entry, TIME OF CONCENTRATION

Subcatchment BASIN 2: FLOW TO DRAINAGE SYSTEM 'A'



Hydrograph for Subcatchment BASIN 2: FLOW TO DRAINAGE SYSTEM 'A'

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	0.00	0.52	96.36
0.01	4.52	0.53	91.84
0.02	9.03	0.54	87.32
0.03	13.55	0.55	82.81
0.04	18.07	0.56	78.29
0.05	22.58	0.57	73.77
0.06	27.10	0.58	69.26
0.07	31.62	0.59	64.74
0.08	36.13	0.60	60.22
0.09	40.65	0.61	55.71
0.10	45.17	0.62	51.19
0.11	49.68	0.63	46.67
0.12	54.20	0.64	42.16
0.13	58.72	0.65	37.64
0.14	63.23	0.66	33.12
0.15	67.75	0.67	28.61
0.16	72.27	0.68	24.09
0.17	76.78	0.69	19.57
0.18	81.30	0.70	15.06
0.19	85.82	0.71	10.54
0.20	90.33	0.72	6.02
0.21	94.85	0.73	1.51
0.22	99.37	0.74	0.00
0.23	103.89	0.75	0.00
0.24	108.40	0.76	0.00
0.25	112.92	0.77	0.00
0.26	117.44	0.78	0.00
0.27	121.95	0.79	0.00
0.28	126.47	0.80	0.00
0.29	130.99	0.81	0.00
0.30	135.50	0.82	0.00
0.31	140.02	0.83	0.00
0.32	144.54	0.84	0.00
0.33	149.05	0.85	0.00
0.34	153.57	0.86	0.00
0.35	158.09	0.87	0.00
0.36	162.60	0.88	0.00
0.37	**164.11**	0.89	0.00
0.38	159.59	0.90	0.00
0.39	155.07	0.91	0.00
0.40	150.56	0.92	0.00
0.41	146.04	0.93	0.00
0.42	141.52	0.94	0.00
0.43	137.01	0.95	0.00
0.44	132.49	0.96	0.00
0.45	127.97	0.97	0.00
0.46	123.46	0.98	0.00
0.47	118.94	0.99	0.00
0.48	114.42	1.00	0.00
0.49	109.91		
0.50	105.39		
0.51	100.87		

FLOW TO DRAINAGE SYSTEM 'B'

Drainage Diagram for PROPOSED BASIN 30
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/28/2006

Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 30: FLOW TO DRAINAGE SYSTEM 'B' Runoff Area=6.200 ac Runoff Depth=0.77"
Tc=19.3 min C=0.90 Runoff=15.10 cfs 0.399 af

Total Runoff Area = 6.200 ac Runoff Volume = 0.399 af Average Runoff Depth = 0.77"

Subcatchment BASIN 30: FLOW TO DRAINAGE SYSTEM 'B'

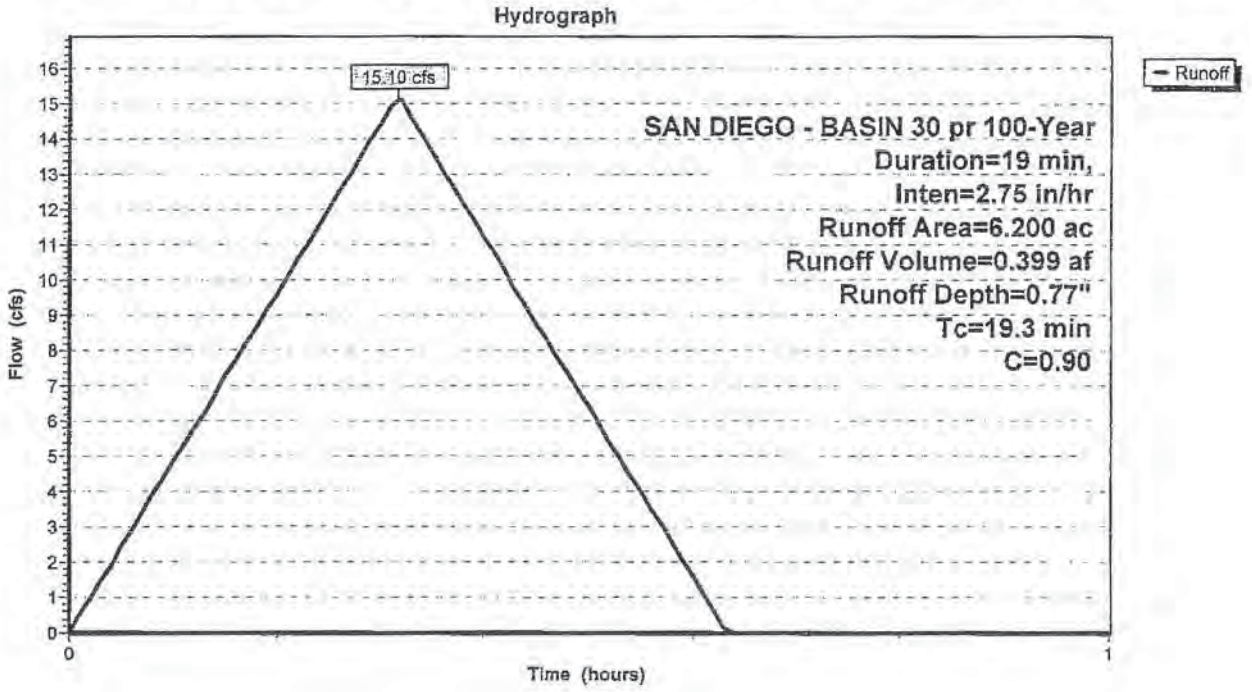
Runoff = 15.10 cfs @ 0.32 hrs, Volume= 0.399 af, Depth= 0.77"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 30 pr 100-Year Duration=19 min, Inten=2.75 in/hr

Area (ac)	C	Description
6.200	0.90	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.3					Direct Entry, TIME OF CONCENTRATION

Subcatchment BASIN 30: FLOW TO DRAINAGE SYSTEM 'B'



FLOW TO DRAINAGE SYSTEM 'C'

Drainage Diagram for PROPOSED BASIN 3
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/25/2006

Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 3: FLOW TO DRAINAGE SYSTEM 'C' Runoff Area=26.500 ac Runoff Depth=0.48"
Tc=14.0 min C=0.66 Runoff=54.00 cfs 1.054 af

Total Runoff Area = 26.500 ac Runoff Volume = 1.054 af Average Runoff Depth = 0.48"

Subcatchment BASIN 3: FLOW TO DRAINAGE SYSTEM 'C'

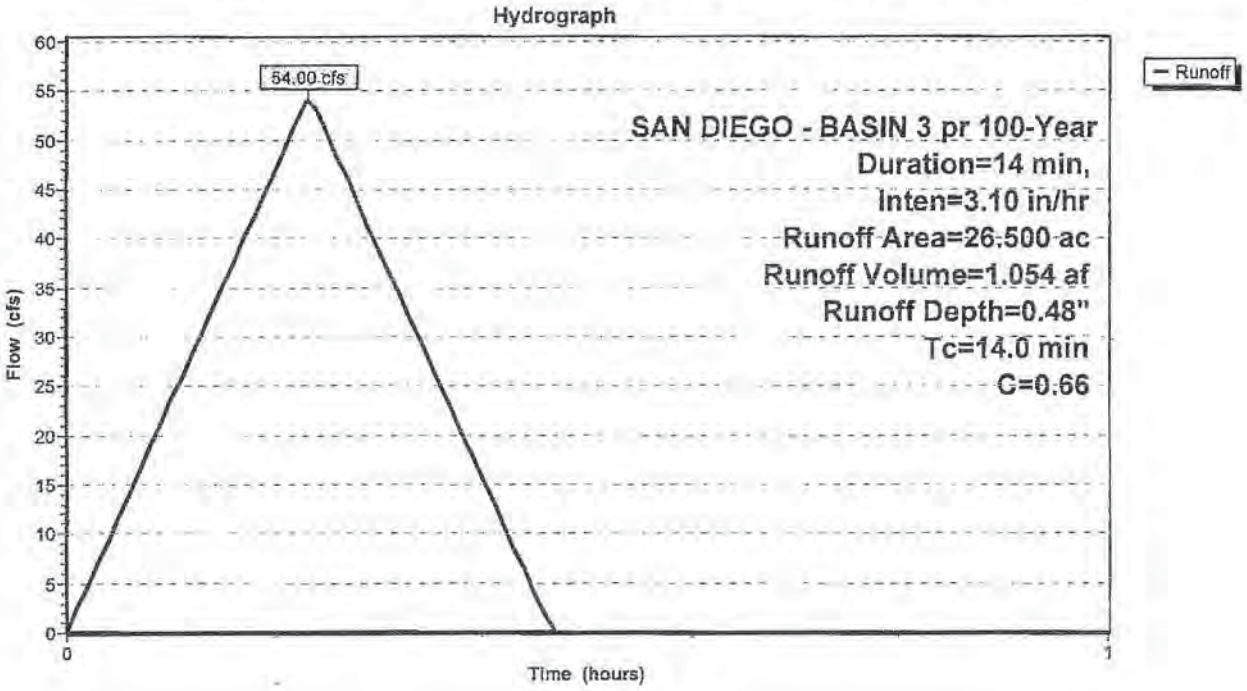
Runoff = 54.00 cfs @ 0.23 hrs, Volume= 1.054 af, Depth= 0.48"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 3 pr 100-Year Duration=14 min, Inten=3.10 in/hr

Area (ac)	C	Description
26.500	0.66	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0					Direct Entry, TIME OF CONCENTRATION

Subcatchment BASIN 3: FLOW TO DRAINAGE SYSTEM 'C'



Hydrograph for Subcatchment BASIN 3: FLOW TO DRAINAGE SYSTEM 'C'

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	0.00	0.52	0.00
0.01	2.34	0.53	0.00
0.02	4.69	0.54	0.00
0.03	7.03	0.55	0.00
0.04	9.37	0.56	0.00
0.05	11.72	0.57	0.00
0.06	14.06	0.58	0.00
0.07	16.41	0.59	0.00
0.08	18.75	0.60	0.00
0.09	21.09	0.61	0.00
0.10	23.44	0.62	0.00
0.11	25.78	0.63	0.00
0.12	28.12	0.64	0.00
0.13	30.47	0.65	0.00
0.14	32.81	0.66	0.00
0.15	35.15	0.67	0.00
0.16	37.50	0.68	0.00
0.17	39.84	0.69	0.00
0.18	42.19	0.70	0.00
0.19	44.53	0.71	0.00
0.20	46.87	0.72	0.00
0.21	49.22	0.73	0.00
0.22	51.56	0.74	0.00
0.23	**53.90**	0.75	0.00
0.24	53.12	0.76	0.00
0.25	50.78	0.77	0.00
0.26	48.44	0.78	0.00
0.27	46.09	0.79	0.00
0.28	43.75	0.80	0.00
0.29	41.40	0.81	0.00
0.30	39.06	0.82	0.00
0.31	36.72	0.83	0.00
0.32	34.37	0.84	0.00
0.33	32.03	0.85	0.00
0.34	29.69	0.86	0.00
0.35	27.34	0.87	0.00
0.36	25.00	0.88	0.00
0.37	22.66	0.89	0.00
0.38	20.31	0.90	0.00
0.39	17.97	0.91	0.00
0.40	15.62	0.92	0.00
0.41	13.28	0.93	0.00
0.42	10.94	0.94	0.00
0.43	8.59	0.95	0.00
0.44	6.25	0.96	0.00
0.45	3.91	0.97	0.00
0.46	1.56	0.98	0.00
0.47	0.00	0.99	0.00
0.48	0.00	1.00	0.00
0.49	0.00		
0.50	0.00		
0.51	0.00		

FLOW TO DRAINAGE SYSTEM 'D'

Drainage Diagram for EXISTING BASIN 4
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/25/2006

Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 4: FLOW TO DRAINAGE BASIN 'D' Runoff Area=36.400 ac Runoff Depth=0.41"
Tc=14.6 min C=0.54 Runoff=60.60 cfs 1.250 af

Total Runoff Area = 36.400 ac Runoff Volume = 1.250 af Average Runoff Depth = 0.41"

Subcatchment BASIN 4: FLOW TO DRAINAGE BASIN 'D'

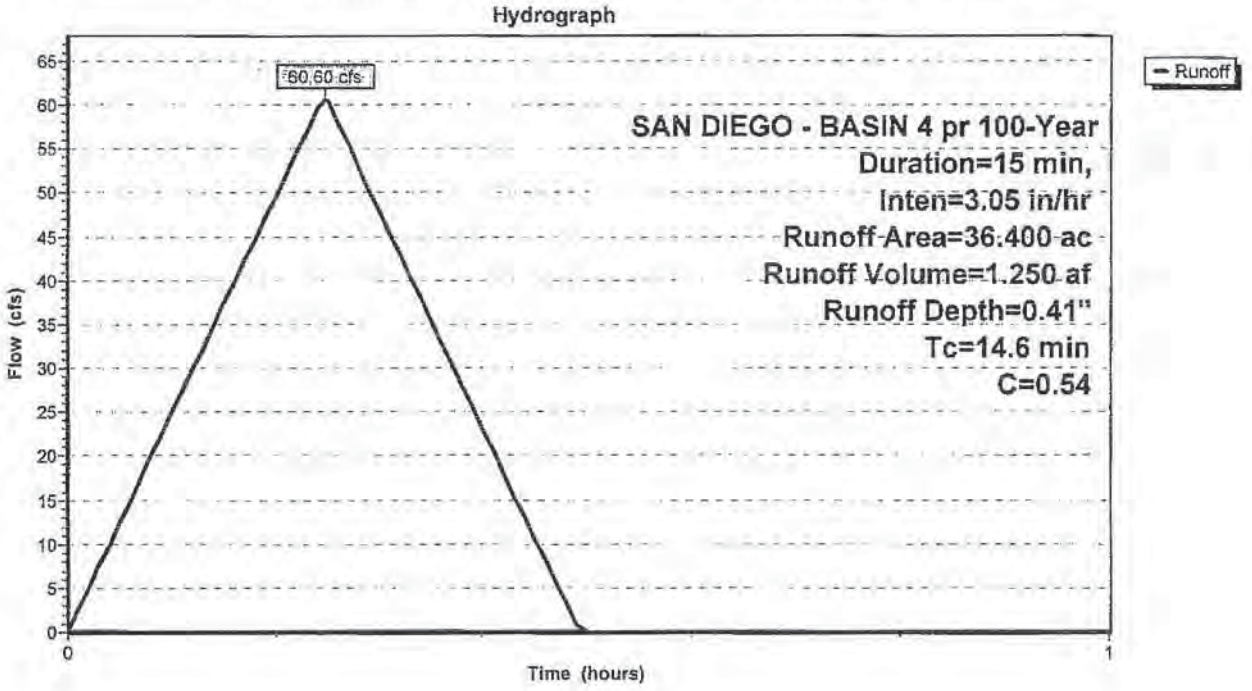
Runoff = 60.60 cfs @ 0.25 hrs, Volume= 1.250 af, Depth= 0.41"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 4 pr 100-Year Duration=15 min, Inten=3.05 in/hr

Area (ac)	C	Description
36.400	0.54	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6					Direct Entry, TIME OF CONCENTRATION

Subcatchment BASIN 4: FLOW TO DRAINAGE BASIN 'D'



Hydrograph for Subcatchment BASIN 4: FLOW TO DRAINAGE BASIN 'D'

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	0.00	0.52	0.00
0.01	2.49	0.53	0.00
0.02	4.97	0.54	0.00
0.03	7.46	0.55	0.00
0.04	9.94	0.56	0.00
0.05	12.43	0.57	0.00
0.06	14.92	0.58	0.00
0.07	17.40	0.59	0.00
0.08	19.89	0.60	0.00
0.09	22.38	0.61	0.00
0.10	24.86	0.62	0.00
0.11	27.35	0.63	0.00
0.12	29.83	0.64	0.00
0.13	32.32	0.65	0.00
0.14	34.81	0.66	0.00
0.15	37.29	0.67	0.00
0.16	39.78	0.68	0.00
0.17	42.27	0.69	0.00
0.18	44.75	0.70	0.00
0.19	47.24	0.71	0.00
0.20	49.72	0.72	0.00
0.21	52.21	0.73	0.00
0.22	54.70	0.74	0.00
0.23	57.18	0.75	0.00
0.24	59.67	0.76	0.00
0.25	**60.50**	0.77	0.00
0.26	58.01	0.78	0.00
0.27	55.53	0.79	0.00
0.28	53.04	0.80	0.00
0.29	50.55	0.81	0.00
0.30	48.07	0.82	0.00
0.31	45.58	0.83	0.00
0.32	43.09	0.84	0.00
0.33	40.61	0.85	0.00
0.34	38.12	0.86	0.00
0.35	35.64	0.87	0.00
0.36	33.15	0.88	0.00
0.37	30.66	0.89	0.00
0.38	28.18	0.90	0.00
0.39	25.69	0.91	0.00
0.40	23.20	0.92	0.00
0.41	20.72	0.93	0.00
0.42	18.23	0.94	0.00
0.43	15.75	0.95	0.00
0.44	13.26	0.96	0.00
0.45	10.77	0.97	0.00
0.46	8.29	0.98	0.00
0.47	5.80	0.99	0.00
0.48	3.31	1.00	0.00
0.49	0.83		
0.50	0.00		
0.51	0.00		

FLOW TO DRAINAGE SYSTEM 'E'

Drainage Diagram for EXISTING BASIN 5
Prepared by HydroCAD SAMPLER 1-800-927-7246 www.hydrocad.net 9/25/2006
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Time span=0.00-1.00 hrs, dt=0.01 hrs, 101 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment BASIN 5: FLOW TO DRAINAGE BASIN 'E' Runoff Area=14.100 ac Runoff Depth=0.48"
Tc=13.8 min C=0.66 Runoff=29.20 cfs 0.563 af

Total Runoff Area = 14.100 ac Runoff Volume = 0.563 af Average Runoff Depth = 0.48"

Subcatchment BASIN 5: FLOW TO DRAINAGE BASIN 'E'

Runoff = 29.20 cfs @ 0.23 hrs, Volume= 0.563 af, Depth= 0.48"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-1.00 hrs, dt= 0.01 hrs
SAN DIEGO - BASIN 5 pr 100-Year Duration=14 min, Inten=3.11 in/hr

Area (ac)	C	Description
14.100	0.66	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					Direct Entry, TIME OF CONCENTRATION

Subcatchment BASIN 5: FLOW TO DRAINAGE BASIN 'E'