TESORO SUBDIVISION AT FIESTA

DRAINAGE REPORT

PREPARED FOR
Sivage Community Development
4902 Alameda Blvd. NE
Albuquerque, NM 87113

PREPARED BY
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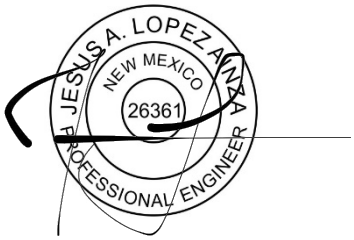
OCTOBER 2020
Project Number 03954

RESPEC.COM

I, Jesus Lopez, do hereby certify that this report was duly prepared by me or under my direction and that I am a duly registered Professional Engineer under the laws of the State of New Mexico.



Jesus Lopez P.E.
NMPE No. 26361

11/11/20

Date

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 PURPOSE

This drainage report provides the rationale and calculations to effectively manage storm water runoff for the 100-year 24-hour storm event for the proposed Fiesta Subdivision Development using a system of street and storm drainage improvements.

1.2 LOCATION AND DESCRIPTION

The proposed Tesoro Subdivision is approximately 26.5 acres within the Fiesta planned community in the Village of Los Lunas. The Fiesta development is located east of I-25 and north of State Road 6. The proposed development will be comprised of single-family housing with the appropriate infrastructure constituents.

FIGURE 1.2.1– PROJECT LOCATION

2.0 DESIGN CRITERIA / ASSUMPTIONS

- On site storm drain systems are designed using the 100-year 24-hour design storm.
- Storm runoff conveyed in residential streets shall not exceed a depth of 0.2 feet above the top of curb in the 100-year storm event.
- Flow depths in the event of the a 10-year design storm will not exceed 0.5 feet in any collector or arterial street. One lane free of flowing or standing water in each traffic direction will be preserved on arterial streets.
- The product of depth times velocity will not exceed 6.5 in any street conveyance location in the event of a 10-year design storm.

3.0 HYDROLOGY

Hydrologic modeling was performed using the Arid Lands Hydrologic Model, 1997 (AHYMO). The results for the proposed models along with sub-basin maps can be found in Appendix A. Hydrologic analysis conforms to Albuquerque Development Process Manual (DPM) Volume II Chapter 22 Section 3, October 2008 Revision.

3.1 EXISTING CONDITIONS

The site is predominantly undisturbed sandy soils with slopes ranging from 2% to 20%. The site is moderately vegetated with various native shrubs and grasses. A high point generally divides stormwater runoff towards the northeast and southwest area of the site with some ponding and eventual discharge into the Highline Irrigation Canal.

3.2 PROPOSED CONDITIONS

Upon development, the site is to be divided into three sub-basins as depicted in Exhibit A under Appendix A. The sub-basins are DEV1, DEV2, and DEV3. Sub-basin DEV1 will surface drain to a low point at the southeast corner of the sub-basin where the flows will be picked up via inlets and conveyed to Retention Pond 2 via a 48" CMP storm drain. Sub-basin DEV2 will be conveyed to a temporary retention pond that will be constructed at the end of Los Cerritos. Sub-basin DEV3 will be left with native vegetation and will continue to sheet flow to the east and discharge into the Highline Irrigation Canal as it has done historically. Additionally, subbasin "C" contains developed flows that are currently retained in a temporary retention pond as outlined in the Inspiracion Phase 1-3 Drainage Report. Upon development of this subdivision, the flows from subbasin "C" will be routed through subbasin DEV1 and to the proposed inlets. Per the Inspiracion Drainage Plan, the flows from Subbasin C will be routed through a plunge pool to dissipate energy and drop sediment prior to its conveyance through 7-24" wide sidewalk culverts and onto Tesoro Loop. In an emergency event larger than the 100-year 24-hour design storm, the flows from Subbasin C will overtop the sidewalk culverts and discharge onto Tesoro Loop.

The table below shows the proposed sub-basins analysis results. The full analysis and results can be found in Appendix A.

TABLE 3.2.1 – PROPOSED SUB-BASINS RESULTS

SUB-BASIN	AREA (AC)	Q100 (CFS)	V100 (AC-FT)	YIELD (CFS/AC)
DEV1	24.8	84.63	3.40	3.42
DEV2	3.1	6.87	0.23	2.21
DEV3	0.8	1.86	0.10	2.33
BASIN C	4.50	16.25	.68	3.61

4.0 HYDRAULICS

Hydraulic analysis to determine peak flow rates for street capacities and storm drain systems conforms to Albuquerque Development Process Manual (DPM) Volume II Chapter 22 Section 3, October 2008 Revision.

4.1 STREETS

Runoff quantities for the hydraulic design of Tesoro Subdivision are those calculated by the AHYMO hydrologic model. Street capacities were checked at certain locations throughout the roadways where flow runoff rates are critical.

The maximum street capacity was determined for a given street section using ManningSolver Version 1.019 to ensure the design criteria mentioned in Section 2 of this report were met. Calculations for street capacities are shown in Appendix B.

4.2 SIDEWALK CULVERTS, STORM INLETS, AND STORM DRAINS

The size and number of sidewalk culverts to route the subbasin "C" flows were determined using a weir equation and the software ManningSolver. Calculations and results can be found in Appendix C.

Flow quantities intercepted by curb inlets on grade were determined using the Albuquerque DPM grating capacities rating curves for the appropriate inlets. The capacity of the curb inlets in the sump were calculated using weir and orifice equations. The storm drains were sized using StormCAD Version 10.3.1.8 and double checked using ManningSolver. Inlet and storm drain capacity calculations and model results can be found in Appendix C.

5.0 CONCLUSION

The analysis performed for this drainage report demonstrates that the capacity of the proposed drainage system will match the requirements for a 100-year 24-hour storm event for the development of Fiesta Unit IV using the requirements set forth by the Albuquerque DPM.

6.0 REFERENCES

- **City of Albuquerque** "Albuquerque DPM" *Drainage, Flood Control and Erosion, chapter 22.*
- **National Oceanic and Atmosphere Administration** "Point Precipitation Frequency Estimates" *NOAA Atlas 14, Volume 1, Version 5 Location name: Los Lunas, New Mexico, USA* Latitude: 34.8131°, Longitude: -106.7313°*
- **NRCS – "**National Engineering Handbook" Website Address – https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/manage/hydrology/?cid=stelprdb1043063
- **USDA,** "Peak Rates of Discharge for Small Watersheds," *Revised 10/73 for New Mexico Engineering Field Manual for conservation Practices, Chapter 2.*
- **USDA** "Soil Survey of Valencia County New Mexico, Eastern Part", 1973.

APPENDIX A

HYDROLOGY

RESPEC

AHYMO

INPUT

```
*  100 YEAR RAINFALL TABLE
RAINFALL              TYPE=13  RAIN QUARTER=0.0
                     RAIN ONE=1.89 IN  RAIN SIX=2.26 IN
                     RAIN DAY=2.77 IN  DT=0.05 HR
************************************************************
*S EXISTING CONDITIONS

*S  COMPUTE HYD EX1
COMPUTE NM HYD       ID=1  HYDNO=101  DA=0.01220SQ MI
                     PER A=64.4   PER B=32.8    PER C=2.8    PER D=0
                     TP=-0.13   RAIN=-1
PRINT HYD            ID=1  CODE=10

*S  COMPUTE HYD EX2
COMPUTE NM HYD       ID=2  HYDNO=102  DA=0.00673SQ MI
                     PER A=20.4   PER B=79.6    PER C=0    PER D=0
                     TP=-0.13   RAIN=-1
PRINT HYD            ID=2 CODE=10

*S  COMPUTE HYD EX3
COMPUTE NM HYD       ID=3  HYDNO=103  DA=0.01973SQ MI
                     PER A=64.8   PER B=29.2    PER C=6    PER D=0
                     TP=-0.13   RAIN=-1
PRINT HYD            ID=3  CODE=10

*S  COMPUTE HYD EX4
COMPUTE NM HYD       ID=4  HYDNO=104  DA=0.00486SQ MI
                     PER A=87.3   PER B=0    PER C=12.7    PER D=0
                     TP=-0.13   RAIN=-1
PRINT HYD            ID=4  CODE=10

*S  PROPOSED CONDITIONS

*S  COMPUTE HYD DEV1
COMPUTE NM HYD       ID=5  HYDNO=105  DA=0.03867SQ MI
                     PER A=0   PER B=26.15   PER C=26.15    PER D=47.7
                     TP=-0.13   RAIN=-1
PRINT HYD            ID=5   CODE=10

*S  COMPUTE HYD DEV2-INTERIM
COMPUTE NM HYD       ID=6  HYDNO=106  DA=0.00486SQ MI
                     PER A=47.2   PER B=18.8   PER C=20.4   PER D=13.6
                     TP=-0.13   RAIN=-1
PRINT HYD            ID=6  CODE=10

*S  COMPUTE HYD DEV2-FULL
COMPUTE NM HYD       ID=7  HYDNO=107  DA=0.00486SQ MI
                     PER A=0   PER B=36.2    PER C=36.2    PER D=27.7
                     TP=-0.13   RAIN=-1
PRINT HYD            ID=7  CODE=10

*S  COMPUTE HYD DEV3
```

```
COMPUTE NM HYD      ID=8  HYDNO=108  DA=0.00125SQ MI
                    PER A=12.5   PER B=75    PER C=0    PER D=12.5
                    TP=-0.13   RAIN=-1
PRINT HYD           ID=8  CODE=10


FINISH
```

RESPEC

AHYMO

OUTPUT

```
        AHYMO PROGRAM (AHYMO-S4)                    - Version:
S4.02a - Rel: 02a
             RUN DATE (MON/DAY/YR) = 09/01/2020
             START TIME (HR:MIN:SEC) = 11:53:13     USER NO.=
AHYMO-S4TempUser05901704
             INPUT FILE = Library\ENG Tools\ahymo-s4-r2\ahymo-s4-
r2\DISK1\program files\AHYMO-S4\Input.HMI

    *  100 YEAR RAINFALL TABLE
    RAINFALL              TYPE=13  RAIN QUARTER=0.0
                         RAIN ONE=1.89 IN  RAIN SIX=2.26 IN
                         RAIN DAY=2.77 IN  DT=0.05 HR

                   COMPUTED 24-HOUR RAINFALL DISTRIBUTION BASED
ON NOAA ATLAS 2 - PEAK AT 1.40 HR.
                   DT =   0.050000 HOURS       END TIME =
24.000002 HOURS
                     0.0000  0.0030  0.0062  0.0094  0.0127
0.0162  0.0198
                     0.0235  0.0274  0.0314  0.0357  0.0401
0.0447  0.0495
                     0.0547  0.0601  0.0659  0.0720  0.0786
0.0857  0.0934
                     0.1013  0.1102  0.1357  0.1959  0.2996
0.4599  0.6907
                     1.0063  1.2552  1.3676  1.4616  1.5438
1.6173  1.6839
                     1.7447  1.8004  1.8518  1.8991  1.9429
1.9834  1.9928
                     2.0016  2.0097  2.0174  2.0246  2.0314
2.0379  2.0441
                     2.0501  2.0558  2.0612  2.0665  2.0716
2.0766  2.0813
                     2.0860  2.0905  2.0948  2.0991  2.1033
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                     2.1151  2.1189  2.1226  2.1262  2.1297
2.1332  2.1366
                     2.1399  2.1432  2.1464  2.1496  2.1527
2.1558  2.1588
                     2.1618  2.1647  2.1675  2.1704  2.1732
2.1759  2.1786
                     2.1813  2.1839  2.1865  2.1891  2.1917
2.1942  2.1966
                     2.1991  2.2015  2.2039  2.2062  2.2086
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                     2.2154  2.2177  2.2199  2.2221  2.2242
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                     2.2306  2.2327  2.2348  2.2368  2.2388
2.2408  2.2428
                     2.2448  2.2468  2.2487  2.2506  2.2525
2.2544  2.2563
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2.2582 2.2600 2.2622 2.2643 2.2665
2.2686 2.2707
2.2729 2.2750 2.2771 2.2792 2.2813
2.2834 2.2855
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2.4179 2.4195 2.4212 2.4229 2.4246
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2.6358 2.6370 2.6382 2.6394 2.6406
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2.6525 2.6537 2.6548 2.6560 2.6572
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2.6745 2.6756
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2.6824 2.6835
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2.7640 2.7650
2.7660 2.7670 2.7680 2.7690 2.7700

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    *S  COMPUTE HYD EX1
    COMPUTE NM HYD      ID=1  HYDNO=101  DA=0.01220SQ MI
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PER D=0
                        TP=-0.13   RAIN=-1

         K =  0.147172HR    TP =  0.130000HR    K/TP RATIO =
1.132094     SHAPE CONSTANT, N =  3.126315
         UNIT PEAK =   27.400    CFS   UNIT VOLUME =   0.9991
B =   291.97      P60 = 1.8900
         AREA =     0.012200 SQ MI    IA =   0.59240 INCHES
INF =   1.50872 INCHES PER HOUR
         RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION
NUMBER METHOD - DT =  0.050000

    PRINT HYD           ID=1  CODE=10

                                        PARTIAL HYDROGRAPH
101.00

         TIME      FLOW           TIME      FLOW           TIME
FLOW           TIME      FLOW           TIME      FLOW
          HRS       CFS             HRS       CFS            HRS
CFS            HRS       CFS            HRS       CFS
         0.000       0.0           1.000       0.0          2.000
1.1          3.000       0.1          4.000       0.0
         0.500       0.0           1.500      12.8          2.500
0.4          3.500       0.0

        RUNOFF VOLUME =     0.54209 INCHES     =       0.3527
ACRE-FEET
        PEAK DISCHARGE RATE =      12.82 CFS  AT   1.500 HOURS
BASIN AREA =  0.0122 SQ. MI.



    *S  COMPUTE HYD EX2
    COMPUTE NM HYD      ID=2  HYDNO=102  DA=0.00673SQ MI
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D=0
                        TP=-0.13   RAIN=-1

         K =  0.133880HR    TP =  0.130000HR    K/TP RATIO =
1.029843     SHAPE CONSTANT, N =  3.427519
         UNIT PEAK =   16.308    CFS   UNIT VOLUME =    1.000
B =   315.01      P60 = 1.8900
         AREA =     0.006730 SQ MI    IA =   0.53060 INCHES
INF =   1.33568 INCHES PER HOUR
```

```
         RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION
NUMBER METHOD - DT =  0.050000

    PRINT HYD           ID=2 CODE=10

                                          PARTIAL HYDROGRAPH
102.00

         TIME      FLOW           TIME      FLOW           TIME
FLOW           TIME      FLOW           TIME      FLOW
          HRS       CFS             HRS       CFS            HRS
CFS            HRS       CFS            HRS       CFS
         0.000       0.0          1.000       0.0          2.000
0.7          3.000       0.1
         0.500       0.0          1.500       8.5          2.500
0.2          3.500       0.0

        RUNOFF VOLUME =     0.63967 INCHES     =       0.2296
ACRE-FEET
        PEAK DISCHARGE RATE =       8.46 CFS  AT   1.500 HOURS
BASIN AREA =  0.0067 SQ. MI.



    *S  COMPUTE HYD EX3
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                        PER A=64.8   PER B=29.2    PER C=6    PER
D=0
                        TP=-0.13   RAIN=-1

         K =  0.146533HR    TP =  0.130000HR    K/TP RATIO =
1.127178     SHAPE CONSTANT, N =  3.139247
         UNIT PEAK =   44.467    CFS   UNIT VOLUME =   0.9993
B =   292.99      P60 = 1.8900
         AREA =     0.019730 SQ MI    IA =   0.58820 INCHES
INF =   1.49696 INCHES PER HOUR
         RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION
NUMBER METHOD - DT =  0.050000

    PRINT HYD           ID=3  CODE=10

                                          PARTIAL HYDROGRAPH
103.00

         TIME      FLOW           TIME      FLOW           TIME
FLOW           TIME      FLOW           TIME      FLOW
          HRS       CFS             HRS       CFS            HRS
CFS            HRS       CFS            HRS       CFS
         0.000       0.0          1.000       0.0          2.000
1.8          3.000       0.2          4.000       0.0
         0.500       0.0          1.500      21.0          2.500
```

```
0.6          3.500       0.1          4.500       0.0

        RUNOFF VOLUME =     0.54812 INCHES     =       0.5768
ACRE-FEET
        PEAK DISCHARGE RATE =      20.96 CFS  AT   1.500 HOURS
BASIN AREA =  0.0197 SQ. MI.



    *S  COMPUTE HYD EX4
    COMPUTE NM HYD      ID=4  HYDNO=104  DA=0.00486SQ MI
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D=0
                        TP=-0.13   RAIN=-1

         K =  0.152069HR    TP =  0.130000HR    K/TP RATIO =
1.169764     SHAPE CONSTANT, N =  3.031699
         UNIT PEAK =   10.632    CFS   UNIT VOLUME =   0.9979
B =   284.40      P60 = 1.8900
         AREA =     0.004860 SQ MI    IA =   0.61190 INCHES
INF =   1.56332 INCHES PER HOUR
         RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION
NUMBER METHOD - DT =  0.050000

    PRINT HYD           ID=4  CODE=10

                                        PARTIAL HYDROGRAPH
104.00

         TIME      FLOW           TIME      FLOW           TIME
FLOW           TIME      FLOW           TIME      FLOW
          HRS       CFS            HRS       CFS            HRS
CFS            HRS       CFS            HRS       CFS
         0.000       0.0          1.000       0.0          2.000
0.4          3.000       0.0          4.000       0.0
         0.500       0.0          1.500       4.8          2.500
0.1          3.500       0.0

        RUNOFF VOLUME =     0.51438 INCHES     =       0.1333
ACRE-FEET
        PEAK DISCHARGE RATE =       4.81 CFS  AT   1.500 HOURS
BASIN AREA =  0.0049 SQ. MI.



    *S  PROPOSED CONDITIONS

    *S  COMPUTE HYD DEV1
    COMPUTE NM HYD      ID=5  HYDNO=105  DA=0.03867SQ MI
                        PER A=0   PER B=26.15   PER C=26.15
```

PER D=47.7

TP=-0.13 RAIN=-1

K = 0.070850HR TP = 0.130000HR K/TP RATIO = 0.545000 SHAPE CONSTANT, N = 7.106428
UNIT PEAK = 74.673 CFS UNIT VOLUME = 0.9992 B = 526.28 P60 = 1.8900
AREA = 0.018446 SQ MI IA = 0.10000 INCHES INF = 0.04000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = 0.050000

K = 0.115436HR TP = 0.130000HR K/TP RATIO = 0.887968 SHAPE CONSTANT, N = 3.994622
UNIT PEAK = 55.200 CFS UNIT VOLUME = 1.002 B = 354.82 P60 = 1.8900
AREA = 0.020224 SQ MI IA = 0.42500 INCHES INF = 1.04000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = 0.050000

PRINT HYD ID=5 CODE=10

PARTIAL HYDROGRAPH 105.00

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.0	5.500	0.4	11.000	0.4	16.500	0.3
0.500	0.0	6.000	0.4	11.500	0.4	17.000	0.3
1.000	0.0	6.500	0.5	12.000	0.4	17.500	0.3
1.500	84.6	7.000	0.5	12.500	0.4	18.000	0.3
2.000	15.6	7.500	0.5	13.000	0.3	18.500	0.3
2.500	2.3	8.000	0.5	13.500	0.3	19.000	0.3
3.000	0.8	8.500	0.4	14.000	0.3	19.500	0.3
3.500	0.5	9.000	0.4	14.500	0.3	20.000	0.3
4.000	0.4	9.500	0.4	15.000	0.3	20.500	0.3
4.500	0.4	10.000	0.4	15.500	0.3	21.000	0.3
5.000	0.4	10.500	0.4	16.000	0.3	21.500	0.2
5.500	0.4	11.000	0.4	16.500	0.3	22.000	0.3
6.000	0.4	11.500	0.4	17.000	0.3	22.500	0.2
6.500	0.5	12.000	0.4	17.500	0.3	23.000	0.2
7.000	0.5	12.500	0.4	18.000	0.3	23.500	0.2
7.500	0.5	13.000	0.3	18.500	0.3	24.000	0.2
8.000	0.5	13.500	0.3	19.000	0.3	24.500	0.0
8.500	0.4	14.000	0.3	19.500	0.3	25.000	0.0
9.000	0.4	14.500	0.3	20.000	0.3		
9.500	0.4	15.000	0.3	20.500	0.3		
10.000	0.4	15.500	0.3	21.000	0.3		
10.500	0.4	16.000	0.3	21.500	0.2		

```
0.3         21.500       0.3

        RUNOFF VOLUME =     1.65032 INCHES     =       3.4036
ACRE-FEET
        PEAK DISCHARGE RATE =      84.63 CFS  AT   1.500 HOURS
BASIN AREA =  0.0387 SQ. MI.



    *S  COMPUTE HYD DEV2-INTERIM
    COMPUTE NM HYD      ID=6  HYDNO=106  DA=0.00486SQ MI
                        PER A=47.2   PER B=18.8   PER C=20.4
PER D=13.6
                        TP=-0.13   RAIN=-1

         K =  0.070850HR    TP =  0.130000HR    K/TP RATIO =
0.545000     SHAPE CONSTANT, N =  7.106428
         UNIT PEAK =   2.6757    CFS   UNIT VOLUME =   0.9958
B =   526.28      P60 = 1.8900
         AREA =     0.000661 SQ MI    IA =   0.10000 INCHES
INF =   0.04000 INCHES PER HOUR
         RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION
NUMBER METHOD - DT =  0.050000


         K =  0.139090HR    TP =  0.130000HR    K/TP RATIO =
1.069920     SHAPE CONSTANT, N =  3.300879
         UNIT PEAK =   9.8679    CFS   UNIT VOLUME =   0.9987
B =   305.51      P60 = 1.8900
         AREA =     0.004199 SQ MI    IA =   0.54653 INCHES
INF =   1.38028 INCHES PER HOUR
         RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION
NUMBER METHOD - DT =  0.050000

    PRINT HYD           ID=6  CODE=10

                                        PARTIAL HYDROGRAPH
106.00

         TIME      FLOW           TIME      FLOW           TIME
FLOW           TIME      FLOW           TIME      FLOW
          HRS       CFS             HRS       CFS             HRS
CFS            HRS       CFS            HRS       CFS
         0.000       0.0          5.000       0.0         10.000
0.0         15.000       0.0         20.000       0.0
         0.500       0.0          5.500       0.0         10.500
0.0         15.500       0.0         20.500       0.0
         1.000       0.0          6.000       0.0         11.000
0.0         16.000       0.0         21.000       0.0
         1.500       6.9          6.500       0.0         11.500
0.0         16.500       0.0         21.500       0.0
```

```
        2.000       0.9          7.000       0.0          12.000
0.0        17.000       0.0         22.000       0.0
        2.500       0.2          7.500       0.0          12.500
0.0        17.500       0.0         22.500       0.0
        3.000       0.1          8.000       0.0          13.000
0.0        18.000       0.0         23.000       0.0
        3.500       0.0          8.500       0.0          13.500
0.0        18.500       0.0         23.500       0.0
        4.000       0.0          9.000       0.0          14.000
0.0        19.000       0.0         24.000       0.0
        4.500       0.0          9.500       0.0          14.500
0.0        19.500       0.0

       RUNOFF VOLUME =     0.87480 INCHES     =       0.2267
ACRE-FEET
       PEAK DISCHARGE RATE =       6.87 CFS  AT   1.500 HOURS
BASIN AREA =  0.0049 SQ. MI.



    *S  COMPUTE HYD DEV2-FULL
    COMPUTE NM HYD      ID=7  HYDNO=107  DA=0.00486SQ MI
                        PER A=0   PER B=36.2    PER C=36.2    PER
D=27.7
                        TP=-0.13   RAIN=-1
        *****WARNING*****  SUM OF TREATMENT TYPES DOES NOT EQUAL
100 PERCENT OR TOTAL AREA


         K =  0.070850HR    TP =  0.130000HR    K/TP RATIO =
0.545000     SHAPE CONSTANT, N =  7.106428
         UNIT PEAK =   5.4444    CFS   UNIT VOLUME =   0.9976
B =   526.28      P60 = 1.8900
         AREA =     0.001345 SQ MI    IA =   0.10000 INCHES
INF =   0.04000 INCHES PER HOUR
         RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION
NUMBER METHOD - DT =  0.050000


         K =  0.115436HR    TP =  0.130000HR    K/TP RATIO =
0.887968     SHAPE CONSTANT, N =  3.994622
         UNIT PEAK =   9.5940    CFS   UNIT VOLUME =    1.000
B =   354.82      P60 = 1.8900
         AREA =     0.003515 SQ MI    IA =   0.42500 INCHES
INF =   1.04000 INCHES PER HOUR
         RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION
NUMBER METHOD - DT =  0.050000

    PRINT HYD           ID=7  CODE=10

                                        PARTIAL HYDROGRAPH
```

107.00

TIME	FLOW	TIME	FLOW	TIME	FLOW
HRS	CFS	HRS	CFS	HRS	CFS
0.000	0.0	5.000	0.0	10.000	0.0
15.000	0.0	20.000	0.0		
0.500	0.0	5.500	0.0	10.500	0.0
15.500	0.0	20.500	0.0		
1.000	0.0	6.000	0.0	11.000	0.0
16.000	0.0	21.000	0.0		
1.500	9.5	6.500	0.0	11.500	0.0
16.500	0.0	21.500	0.0		
2.000	1.4	7.000	0.0	12.000	0.0
17.000	0.0	22.000	0.0		
2.500	0.2	7.500	0.0	12.500	0.0
17.500	0.0	22.500	0.0		
3.000	0.1	8.000	0.0	13.000	0.0
18.000	0.0	23.000	0.0		
3.500	0.0	8.500	0.0	13.500	0.0
18.500	0.0	23.500	0.0		
4.000	0.0	9.000	0.0	14.000	0.0
19.000	0.0	24.000	0.0		
4.500	0.0	9.500	0.0	14.500	0.0
19.500	0.0				

RUNOFF VOLUME = 1.31180 INCHES = 0.3400 ACRE-FEET
PEAK DISCHARGE RATE = 9.50 CFS AT 1.500 HOURS BASIN AREA = 0.0049 SQ. MI.

*S COMPUTE HYD DEV3
COMPUTE NM HYD ID=8 HYDNO=108 DA=0.00125SQ MI
PER A=12.5 PER B=75 PER C=0 PER D=12.5
TP=-0.13 RAIN=-1

K = 0.070850HR TP = 0.130000HR K/TP RATIO = 0.545000 SHAPE CONSTANT, N = 7.106428
UNIT PEAK = 0.63254 CFS UNIT VOLUME = 0.9809
B = 526.28 P60 = 1.8900
AREA = 0.000156 SQ MI IA = 0.10000 INCHES
INF = 0.04000 INCHES PER HOUR
RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT = 0.050000

K = 0.131939HR TP = 0.130000HR K/TP RATIO =

```
1.014918     SHAPE CONSTANT, N =  3.477901
         UNIT PEAK =   2.6815    CFS   UNIT VOLUME =   0.9963
B =   318.72      P60 = 1.8900
         AREA =     0.001094 SQ MI    IA =   0.52143 INCHES
INF =   1.31000 INCHES PER HOUR
         RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION
NUMBER METHOD - DT =  0.050000

    PRINT HYD           ID=8  CODE=10

                                          PARTIAL HYDROGRAPH
108.00

          TIME      FLOW           TIME      FLOW           TIME
FLOW           TIME      FLOW           TIME      FLOW
           HRS       CFS            HRS       CFS            HRS
CFS            HRS       CFS            HRS       CFS
         0.000       0.0          5.000       0.0         10.000
0.0         15.000       0.0         20.000       0.0
         0.500       0.0          5.500       0.0         10.500
0.0         15.500       0.0         20.500       0.0
         1.000       0.0          6.000       0.0         11.000
0.0         16.000       0.0         21.000       0.0
         1.500       1.9          6.500       0.0         11.500
0.0         16.500       0.0         21.500       0.0
         2.000       0.2          7.000       0.0         12.000
0.0         17.000       0.0         22.000       0.0
         2.500       0.0          7.500       0.0         12.500
0.0         17.500       0.0         22.500       0.0
         3.000       0.0          8.000       0.0         13.000
0.0         18.000       0.0         23.000       0.0
         3.500       0.0          8.500       0.0         13.500
0.0         18.500       0.0         23.500       0.0
         4.000       0.0          9.000       0.0         14.000
0.0         19.000       0.0         24.000       0.0
         4.500       0.0          9.500       0.0         14.500
0.0         19.500       0.0

        RUNOFF VOLUME =     0.89073 INCHES     =       0.0594
ACRE-FEET
        PEAK DISCHARGE RATE =       1.86 CFS  AT   1.500 HOURS
BASIN AREA =  0.0013 SQ. MI.




    FINISH

        NORMAL PROGRAM FINISH          END TIME (HR:MIN:SEC) =
11:53:13
```

RESPEC

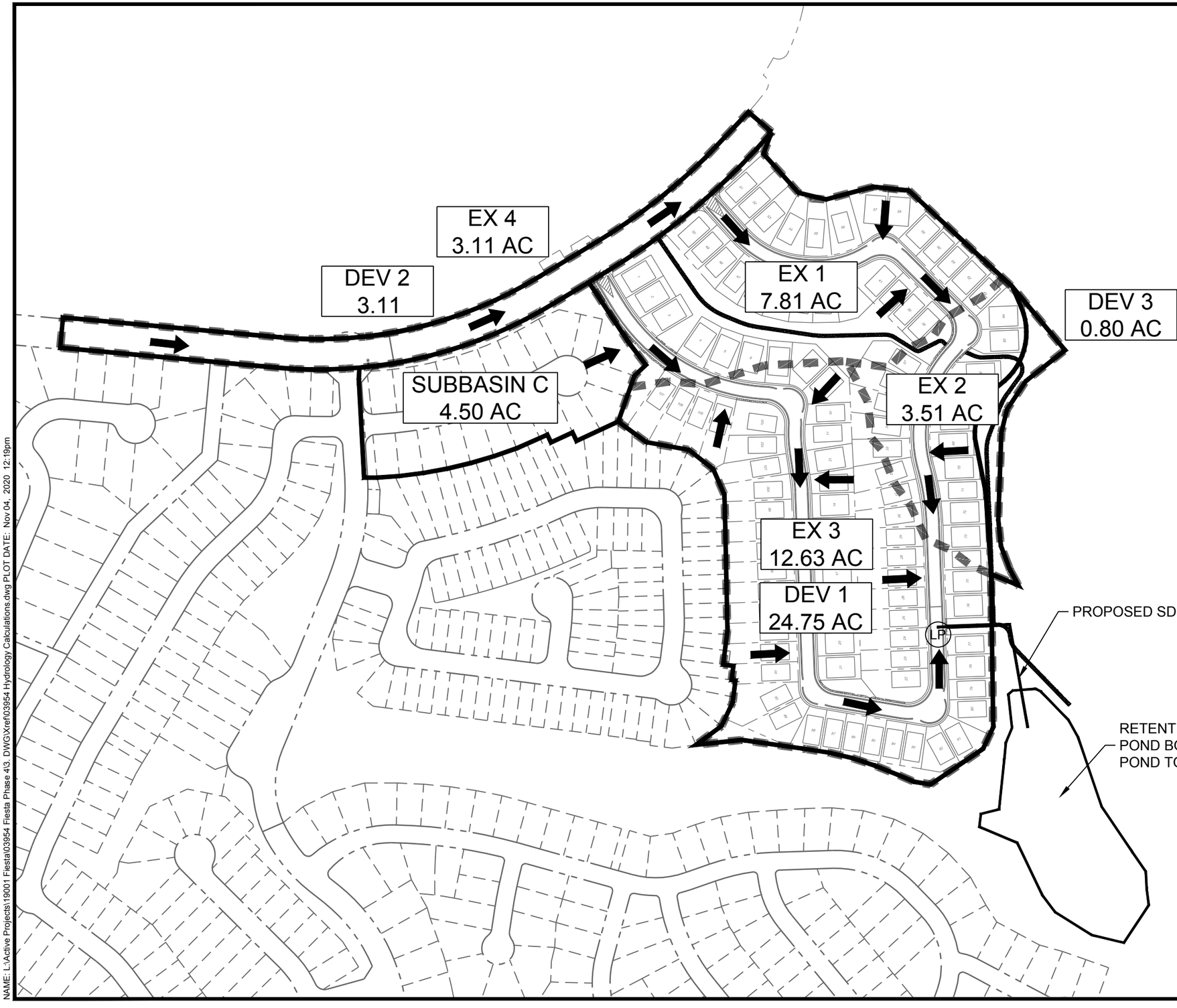
AHYMO

SUMMARY

AHYMO PROGRAM SUMMARY TABLE (AHYMO-S4) - Ver. S4.02a, Rel: 02a RUN DATE (MON/DAY/YR) =10/20/2020
INPUT FILE = ary\ENG Tools\ahymo-s4-r2\ahymo-s4-r2\DISK1\program files\AHYMO-S4\Input.HMI USER NO.= AHYMO-S4TempUser05901704

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
RAINFALL TYPE=13										RAIN24= 2.770
*S EXISTING CONDITIONS										
*S COMPUTE HYD EX1										
COMPUTE NM HYD	101.00	-	1	0.01220	12.82	0.353	0.54209	1.500	1.642	PER IMP= 0.00
*S COMPUTE HYD EX2										
COMPUTE NM HYD	102.00	-	2	0.00673	8.46	0.230	0.63967	1.500	1.964	PER IMP= 0.00
*S COMPUTE HYD EX3										
COMPUTE NM HYD	103.00	-	3	0.01973	20.96	0.577	0.54812	1.500	1.660	PER IMP= 0.00
*S COMPUTE HYD EX4										
COMPUTE NM HYD	104.00	-	4	0.00486	4.81	0.133	0.51438	1.500	1.546	PER IMP= 0.00
*S PROPOSED CONDITIONS										
*S COMPUTE HYD DEV1										
COMPUTE NM HYD	105.00	-	5	0.03867	84.63	3.404	1.65032	1.500	3.420	PER IMP= 47.70
*S COMPUTE HYD DEV2-INTERIM										
COMPUTE NM HYD	106.00	-	6	0.00486	6.87	0.227	0.87480	1.500	2.207	PER IMP= 13.60
*S COMPUTE HYD DEV2-FULL										
COMPUTE NM HYD	107.00	-	7	0.00486	9.50	0.340	1.31180	1.500	3.055	PER IMP= 27.67
*S COMPUTE HYD DEV3										
COMPUTE NM HYD	108.00	-	8	0.00125	1.86	0.059	0.89073	1.500	2.328	PER IMP= 12.50
*S COMPUTE HYD BASIN C										
COMPUTE NM HYD	109.00	-	9	0.00703	16.25	0.684	1.82441	1.500	3.612	PER IMP= 58.00
ADD HYD	201.00	5& 9	10	0.04570	100.88	4.088	1.67709	1.500	3.449	
FINISH										

EXHIBIT A
PROPOSED SUBBASINS
OCTOBER, 2020



SUBBASIN	AREA (Ac)	Q (CFS)	V (Ac-Ft)	Q/A (CFS/ACRE)
DEV 1	24.75	84.63	3.40	3.42
DEV 2 (INTERIM)	3.11	6.87	0.23	2.21
DEV 2 (FULL BUILD)	3.11	9.50	0.340	3.05
DEV 3	0.80	1.86	0.06	2.33
BASIN C	4.50	16.25	0.68	3.61
DEV 1+BASIN C	29.25	100.88	4.09	3.45

VOLUME TO RETENTION POND 2	V (AC-FT)
MAXIMUM STORAGE CAPACITY	13.53
CURRENT STORAGE CAPACITY (PER PREVIOUS DRAINAGE REPORT)	9.20
TESORO DEVELOPMENT STORAGE REQUIRED (INCLUDING SUBBASIN C)	4.09
TOTAL STORAGE REQUIRED	13.29

LEGEND

EXISTING BASIN BOUNDARY
PROPOSED BASIN BOUNDARY
PROPOSED FLOW DIRECTION
PROPOSED BASIN LOW POINT

N

0 250 500
SCALE IN FEET

RESPEC
COMMUNITY DESIGN SOLUTIONS
5971 JEFFERSON STREET SUITE 101
ALBUQUERQUE, NEW MEXICO 87109
WWW.RESPEC.COM PHONE: (505)253-9718

NAME: L:\Active Projects\19001 Fiesta\03954 Fiesta Phase 4\3. DWG\Xref\03954 Hydrology Calculations.dwg PLOT DATE: Nov 04, 2020 12:19pm

RETAINING POND TABLES

R2 (PER INSPIRACION PHASE 1 DRAINAGE REPORT)

Elev.	Area (Sq. Ft.)	Vol (Cu. Ft.)	Cum. (Cu. Ft.)	Cum. (Ac. Ft.)
4876	20010	0	0	0
4877	24503	22257	22257	0.51
4878	28758	26631	48887	1.12
4879	33220	30989	79876	1.83
4880	37812	35516	115392	2.65
4881	80350	59081	174473	4.01
4882	92513	86432	260905	5.99
4883	103655	98084	358989	8.24
4884	117030	110343	469331	10.77

R2 MODIFICATION TO ALLOW TESORO DEVELOPMENT

Elev.	Area (Sq. Ft.)	Vol (Cu. Ft.)	Cum. (Cu. Ft.)	Cum. (Ac. Ft.)
4876	19828	0	0	0
4877	23443	21636	21636	0.50
4878	46254	34849	56484	1.30
4879	50103	48179	104663	2.40
4880	54102	52103	156765	3.60
4881	104575	79339	236104	5.42
4882	113132	108854	344957	7.92
4883	121941	117537	462494	10.62
4884	131358	126650	589143	13.52

AREA = 24.5 AC X 0.15 ACFT/AC = 3.8 AC FT

CURRENT POND R2 VOL = 10.53 ACFT - HAS 1.3 ACFT CAPACITY REMAINING

APPENDIX B

STREET DESIGN

Manning Formula: Capacity of Max Flow Rate for Sub-basin DEV 1 (Right of High Point)

Irregular Section

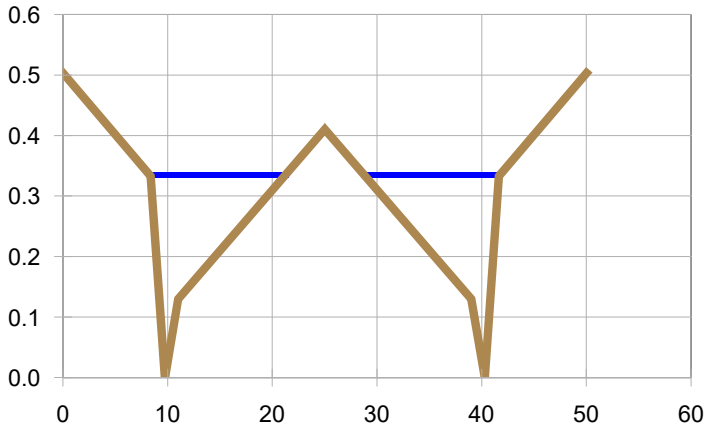
Input

Flow	12 cfs
Slope	0.02 ft/ft

Sta	Elev	n	Sta	Elev	n	Sta	Elev	n	Sta	Elev	n
0	0.503	0.013	8.38	0.333	0.013	9.74	0	0.013	11.01	0.13	0.017
25.01	0.41	0.017	39.01	0.13	.017	40.31	0	0.013	41.64	0.333	0.013
50.02	0.503	0.013	43.16	0.67	0.017	52.96	0.87	0.024			

Output

WSElev	0.335 ft
Flow Area	3.25 sf
Velocity	3.69 fps
Velocity Head	0.212 ft
Top Width	26.0 ft
Froude Number	1.84
Critical WSElev	0.408 ft
Critical Slope	ft/ft



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Manning Formula: Capacity of Max Flow Rate for Sub-basin DEV 1 (Right of High Point)

Irregular Section

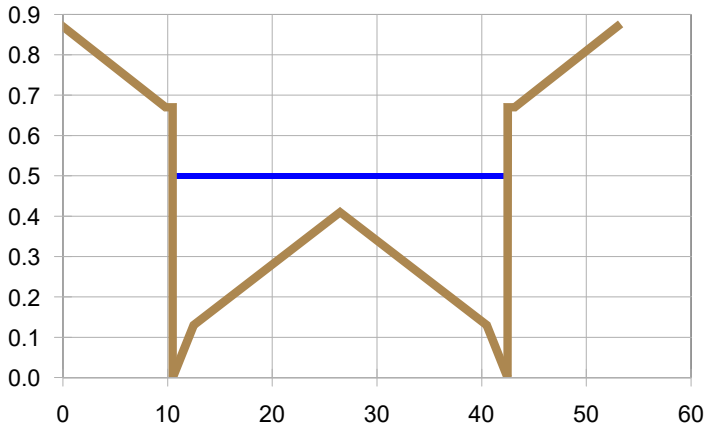
Input

Flow	42.32 cfs
Slope	0.02 ft/ft

Sta	Elev	n	Sta	Elev	n	Sta	Elev	n	Sta	Elev	n
0	0.87	0.024	9.8	0.67	0.017	10.47	0.67	0.017	10.48	0	0.017
12.48	0.13	0.017	26.48	0.41	0.017	40.48	0.13	0.017	42.48	0	0.017
42.49	0.67	0.017	43.16	0.67	0.017	52.96	0.87	0.024			

Output

WSElev	0.500 ft
Flow Area	8.20 sf
Velocity	5.16 fps
Velocity Head	0.414 ft
Top Width	32.0 ft
Froude Number	1.80
Critical WSElev	0.623 ft
Critical Slope	ft/ft



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Manning Formula: Capacity of Max Flow Rate for Sub-basin DEV 1 (Right of High Point)

Irregular Section

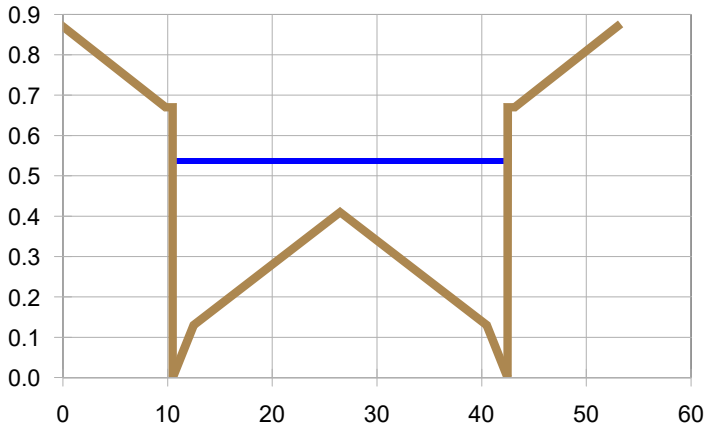
Input

Flow	58.57 cfs
Slope	0.025 ft/ft

Sta	Elev	n	Sta	Elev	n	Sta	Elev	n	Sta	Elev	n
0	0.87	0.024	9.8	0.67	0.017	10.47	0.67	0.017	10.48	0	0.017
12.48	0.13	0.017	26.48	0.41	0.017	40.48	0.13	0.017	42.48	0	0.017
42.49	0.67	0.017	43.16	0.67	0.017	52.96	0.87	0.024			

Output

WSElev	0.537 ft
Flow Area	9.36 sf
Velocity	6.26 fps
Velocity Head	0.608 ft
Top Width	32.0 ft
Froude Number	2.04
Critical WSElev	0.742 ft
Critical Slope	ft/ft



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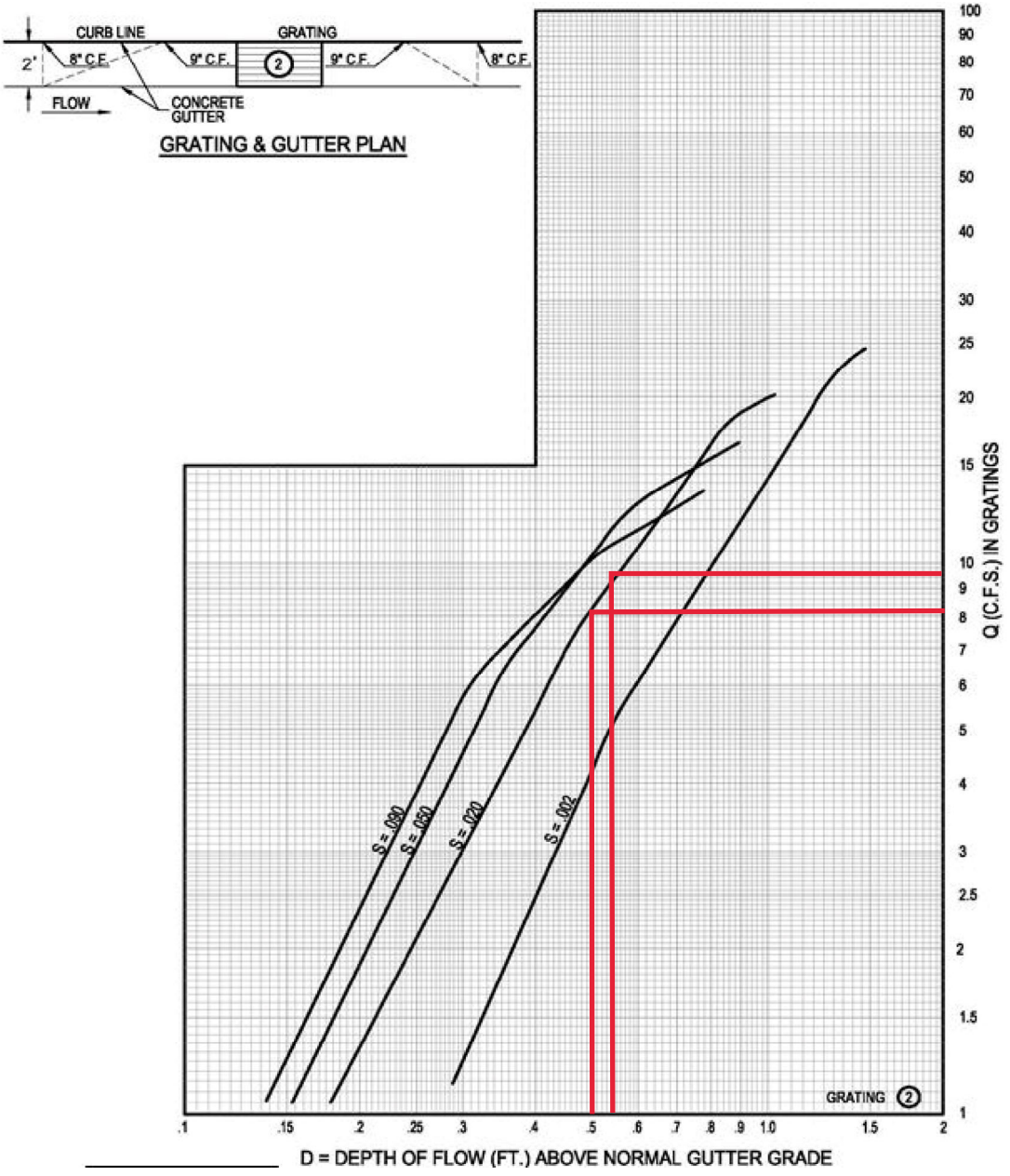
APPENDIX C

INLET & STORM DRAIN DESIGN

FIGURE 6.9.9 **Grate Capacities for Types " A," "C," and "D"**



Inlet Capacity - Weir/Orifice Calculations
Fiesta Unit 4

Curb Opening (Treated As Orifice)

Orifice Calcs
Qo = .6A√2gh

A = Open area of weir (sq. ft)	7.0
g = 32.2 (ft/s2)	32.20
H = Head (ft)	0.64
clogging factor =	15%
Qw = Capacity (cfs)	**22.9**

Notes:
-Boxed cells are user inputs.
-H is the height of water above the centroid of the curb opening.
-Clogging factor determined at Engineer's discretion.
Orifice Equation taken from COA DPM

Grate (Treated As Weir)

Weir Flow Calcs
Qw = 2.7L(H)1.5

P = Perimeter (ft)	9.0
H = Head (ft)	0.92
coefficient of discharge =	2.70
clogging factor =	50%
Qw = Capacity (cfs)	**10.7**

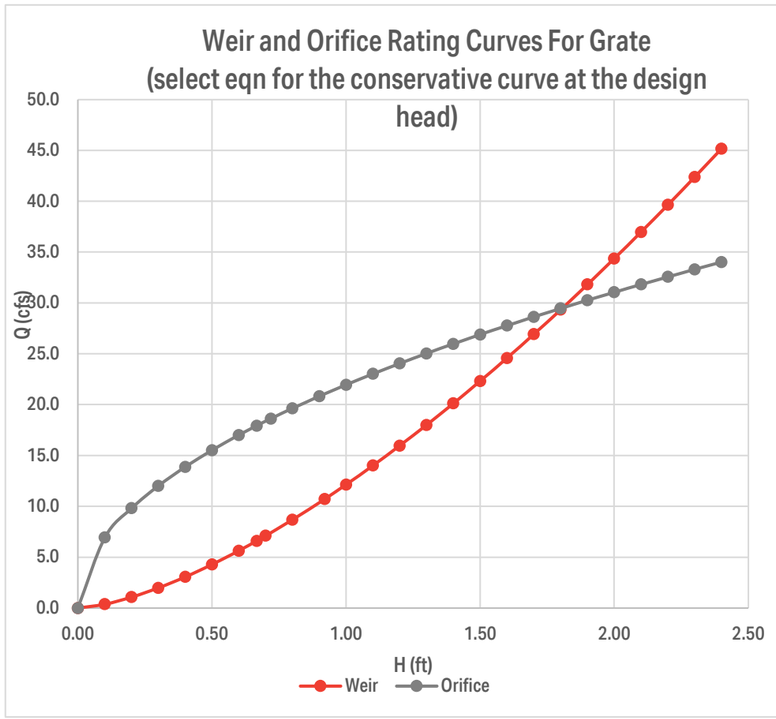
Notes:
-Boxed cells are user inputs.
-For a combination inlet P=2(width of grate - width of bars)+length of grate.
-For a double combination inlet P=2W+2L (i.e. the abutting grate widths do not contribute to the perimeter and the length of the grate along the curb also does not contribute to the perimeter.
-H is the hieght of water above the grate. 0.72' (8.63") is the average of the elevations at the front and back of the grate per COA type A inlet standard detail).
-Water is permitted to rise to the edge of ROW in the sump which results in a maximum head for the grate of .92'.
-2.7 for the coefficient of discharge is taken from the Albuquerque DPM.
-Clogging factor determined at Engineer's discretion.
-For COA standard grate, W=18.5" and L=35.5
Weir Equation taken from COA DPM

Grate (Treated As Orifice)

Orifice Calcs
Qo = .6A√2gh

A = Open area of grate (sq. ft)	9.1
g = 32.2 (ft/s2)	32.20
H = Head (ft)	0.72
clogging factor =	50%
Qo = Capacity (cfs)	**18.6**

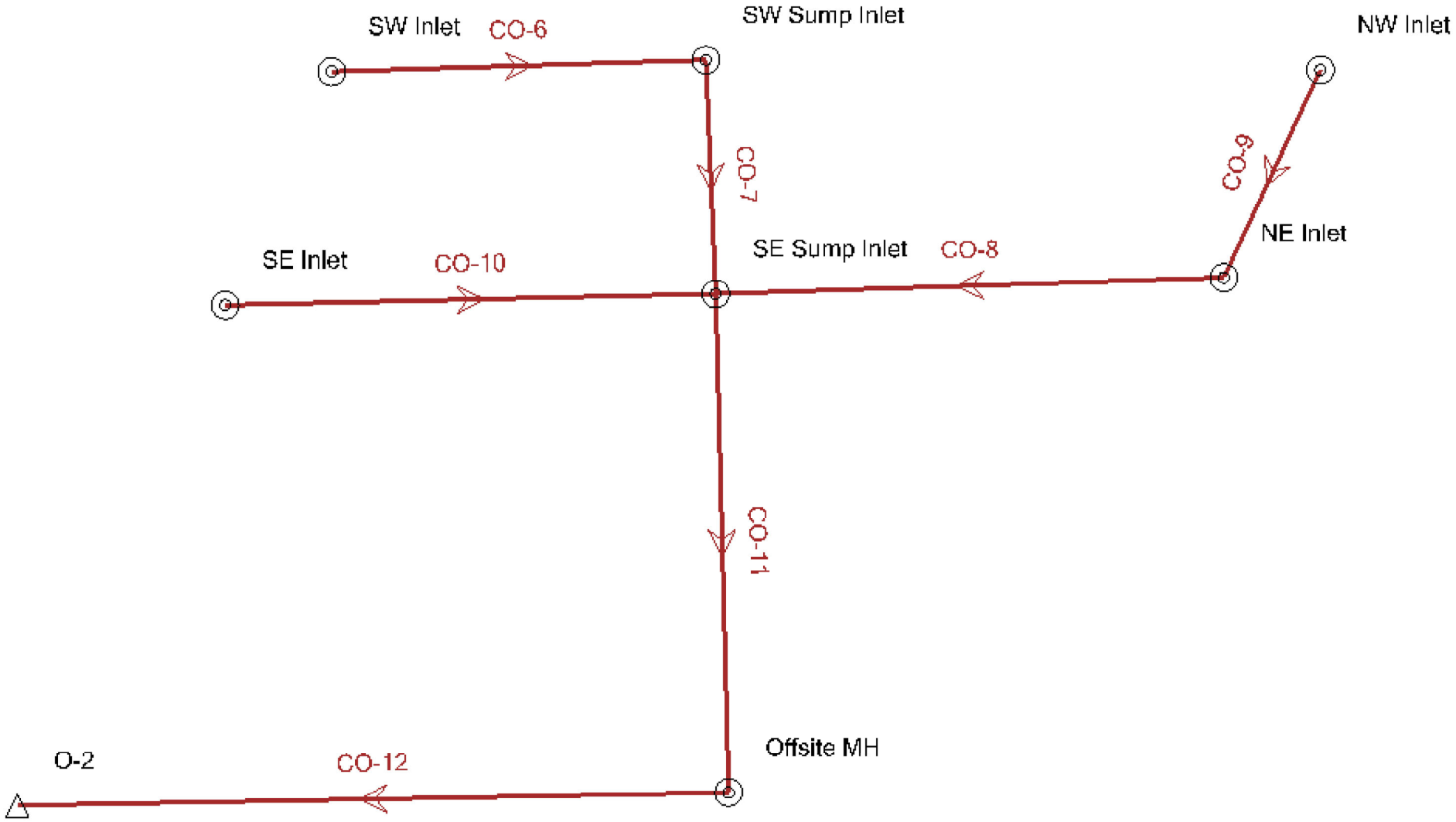
Notes:
-Boxed cells are user inputs.
-H is the height of water above the grate.
-When calculating A subtract out the area of the bars.
-Multiply A by 2 for a double inlet. (In this case, 9.1=18.5*35.5/(12^2)*2
-H is the hieght of water above the grate.
(8.63" is the average of the elevations at the front and back of the grate per COA type A inlet standard detail).
-Clogging factor determined at Engineer's discretion.
Orifice Equation taken from COA DPM



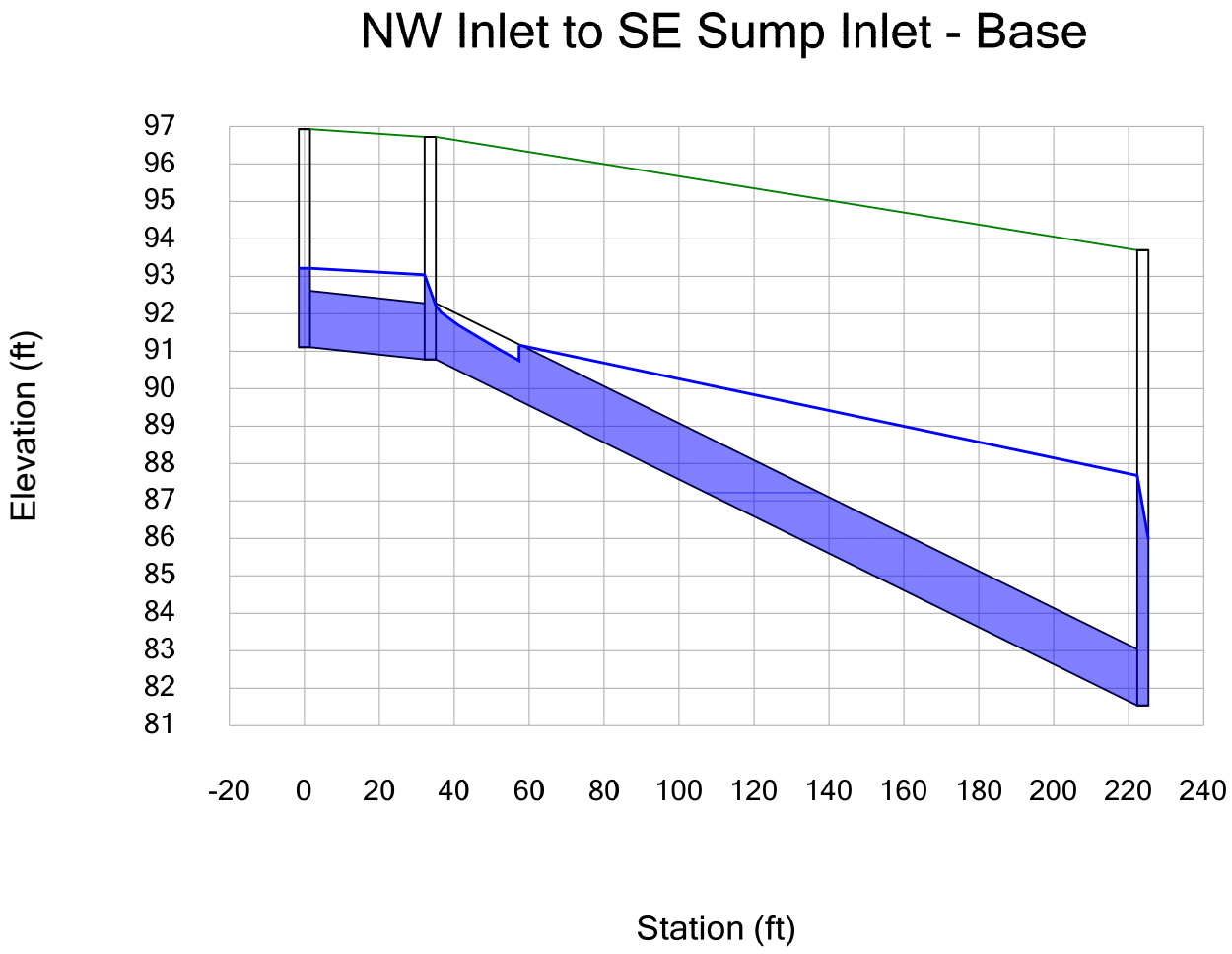
Weir Flow Calcs For A Single Sidewalk Culvert

$Q_w = 2.7L(H)^{1.5}$

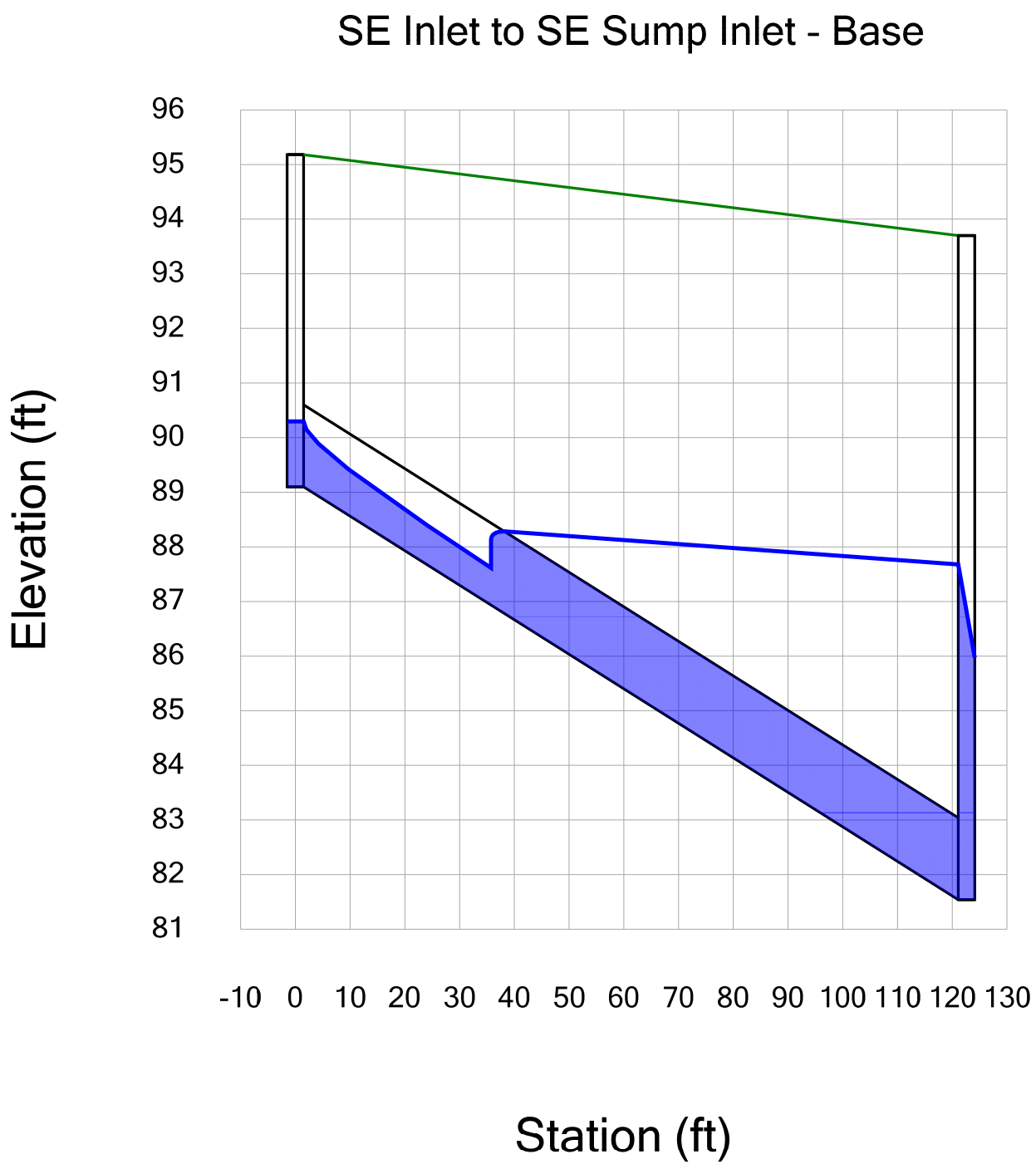
L = length (ft)	2
H = Head (ft)	0.58
coefficient of discharge =	2.7
Q_w = Capacity of a single sidewalk culvert (cfs)	**2.4**


SW Inlet
CO-6
SW Sump Inlet
NW Inlet
CO-7
CO-9
NE Inlet
SE Inlet
CO-10
SE Sump Inlet
CO-8
CO-11
Offsite MH
O-2
CO-12

Profile Report
Profile: NW Inlet to SE Sump Inlet

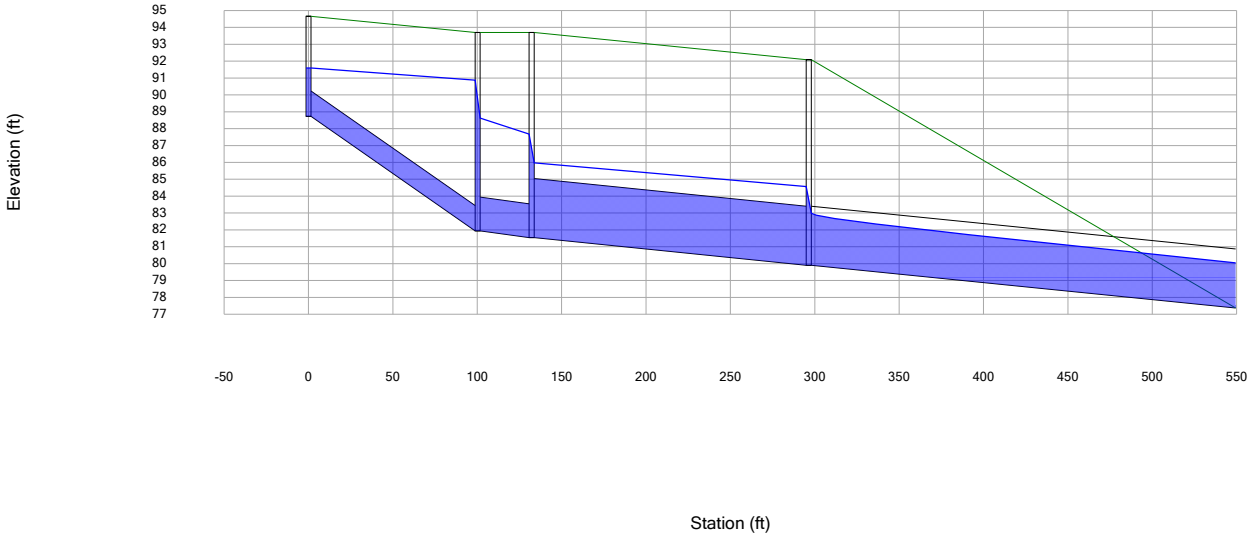


Profile Report
Profile: SE Inlet to SE Sump Inlet



Profile Report
Profile: SW Inlet to Outfall

SW Inlet to Outfall - Base



Manning Formula: CO-6 and CO-10

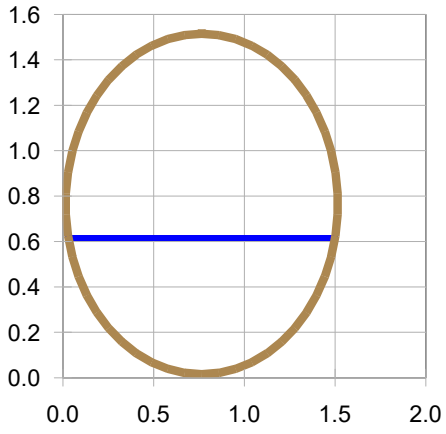
Circular Channel

Input

Flow	9.6 cfs
Slope	0.062 ft/ft
Manning's n	0.012
Diameter	18 in

Output

Depth	0.602 ft
Flow Area	0.663 sf
Velocity	14.5 fps
Velocity Head	3.26 ft
Top Width	1.47 ft
Froude Number	3.80
Critical Depth	1.197 ft
Critical Slope	0.00749 ft/ft



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Manning Formula: CO-8

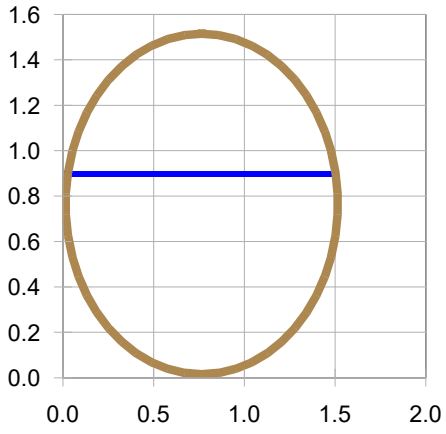
Circular Channel

Input

Flow	16.4 cfs
Slope	0.049 ft/ft
Manning's n	0.012
Diameter	18 in

Output

Depth	0.882 ft
Flow Area	1.08 sf
Velocity	15.2 fps
Velocity Head	3.58 ft
Top Width	1.48 ft
Froude Number	3.13
Critical Depth	1.431 ft
Critical Slope	0.0180 ft/ft



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Manning Formula: CO-9

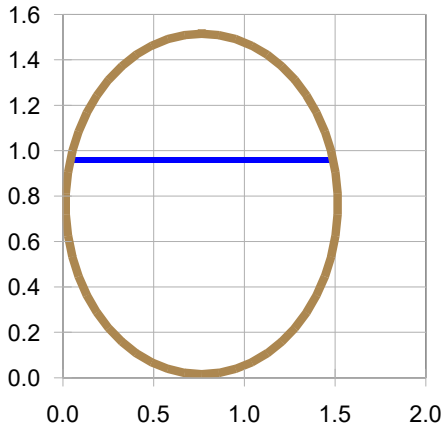
Circular Channel

Input

Flow	8.2 cfs
Slope	0.01 ft/ft
Manning's n	0.012
Diameter	18 in

Output

Depth	0.943 ft
Flow Area	1.17 sf
Velocity	7.01 fps
Velocity Head	0.764 ft
Top Width	1.45 ft
Froude Number	1.38
Critical Depth	1.109 ft
Critical Slope	0.00645 ft/ft



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Manning Formula: CO-11 and CO-12

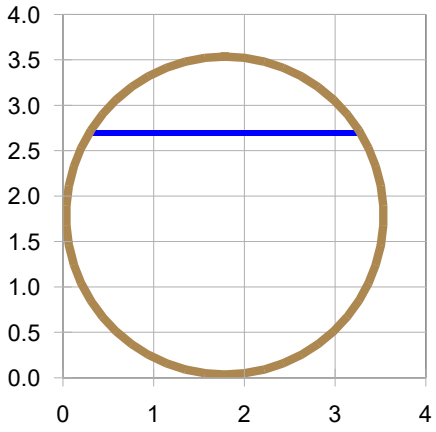
Circular Channel

Input

Flow	100.88 cfs
Slope	0.01 ft/ft
Manning's n	0.012
Diameter	42 in

Output

Depth	2.659 ft
Flow Area	7.84 sf
Velocity	12.9 fps
Velocity Head	2.57 ft
Top Width	2.99 ft
Froude Number	1.40
Critical Depth	3.079 ft
Critical Slope	0.00771 ft/ft



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