

DRAINAGE REPORT FOR MESA DEL SOL ARTISTE

JULY 2025

Prepared for:

TITAN DEVELOPMENT

6300 RIVERSIDE PLAZA LN NW # 200

ALBUQUERQUE, NM 87120

Prepared by:

Bohannon  Huston

Engineering

Spatial Data

Advanced Technologies



**MASTER DRAINAGE REPORT
FOR
MESA DEL SOL ARTISTE
ALBUQUERQUE, NM**

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**TITAN DEVELOPMENT
6300 RIVERSIDE PLAZA LN NW # 200
ALBUQUERQUE, NM 87120**

Prepared by:

**BOHANNAN HUSTON, INC.
COURTYARD II
7500 JEFFERSON STREET NE
ALBUQUERQUE, NM 87109**

PREPARED BY:



Yolanda Padilla Moyer
Yolanda Padilla Moyer, PE

07-03-2025

Date

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I. INTRODUCTION

This report incorporates drainage study of Mesa del Sol Artiste, Tract 1 through Tract 16. The site is approximately 227 acres and located west of University Blvd and south of Bobby Foster at Mesa del Sol. The proposed development will occur in different phases and will include single family and multifamily developments. In the existing conditions, a portion of the site drain northwest, and the other portion drain east. In the proposed conditions, storm runoff will be conveyed by the internal street network and collected by an internal storm drain network, which will ultimately outfall to the detention ponds located east of the property. The ponds ultimately drain south to the retention pond in the park area.

II. PURPOSE OF REPORT

The purpose of this report is to provide site-specific drainage analysis for existing and ultimate conditions for the development referred to as Mesa del Sol Artiste. This plan is prepared and submitted to support design and grading of the future developments, streets and roadways and construction plan approvals.

III. METHODOLOGY AND REFERENCES

All analysis was completed for the fully developed conditions. The runoff flow rates and volumes for the onsite basins were computed for the 100-year 6 hour and 100-year 24 hour storms in accordance with the City of Albuquerque Development Manual (DPM), Chapter 6. Rational Method is used in this report for the hydrology analysis to size storm and inlet capacity. Street hydraulic capacities were computed in accordance with the COA DPM and using 8" standard curb & gutter.

The overall drainage concept for this project will be onsite and offsite ponding of storm water. The runoff will either surface drain or be captured by storm drain network and outfall to the designated ponding areas, where it will retain and infiltrate as much as of the 100-year 10-day storm volume onsite and release the remaining portion to be retained at the Future Park location. The infiltration time for draining each of the ponds will be 96 hours or less.

IV. SITE LOCATION AND CHARACTERISTICS

The site is approximately 227 acres, located south of Bobby Foster Rd, west of University Blvd (see EXHIBIT A– Site Location Map and Preliminary Plat). There are existing drainage easements east of the proposed site boundary and east of that is the Montage Subdivision of which unit 5 and unit 6 are currently under construction.

V. EXISTING CONDITIONS

Based on the existing topography, the site is broken into two offsite and nine onsite basins. The existing basin and drainage patterns are shown graphically on the Existing Drainage Conditions Map in 'EXHIBIT B– Existing Conditions Basin Map'. The site consists of undeveloped land and a portion of the site currently drains from southwest to northeast and other portion drains west to east towards the drainage easement for future ponds.

The total flow of 9.3 cfs from offsite basin 1 and offsite basin 2 is entering the proposed site. Offsite flow from Offsite Basin 1 enters the proposed site from south and combines with onsite Existing Basin 1. The existing basin slopes northeast toward the depressed area located within the basin boundary and ponds there.

Similarly, flow from Offsite Basin 2 enters the proposed site from the south and combines with onsite Existing Basin 3. The runoff flows east and ultimately enters Existing Basin 6 which is a designated ponding location within the existing drainage easement.

Existing Basin 2 and Existing Basin 3 drains east and enters Existing Basin 5 and Existing Basin 6 respectively. Basin 5 is also a designated ponding location within the existing drainage easement.

Existing Basin 4 drains southeast and a portion of this basin enters Existing Basin 5 from north, where the remaining flow continues to drain southeast. Existing basins 5 and 6 are currently working as existing ponds for the interim conditions of the development east of the proposed site.

Existing unpaved Bobby foster Rd has been divided into three basins. Bobby Foster 1 drains east and Bobby Foster 2 drains west toward a low point which ultimately enters the site and ponds into Existing Basin 1. Bobby Foster 3 drains east and enters into Existing Basin 4.

VI. DEVELOPED CONDITIONS

A. OFFSITE FLOW MANAGEMENT

As mentioned in the Existing Conditions, the total offsite flow of 9.3 cfs enters the proposed site on its southern boundary. Ultimately, these flows will be accepted by the storm drain network proposed and will be discharged to the pond locations.

B. ONSITE

The proposed development will occur in multiple phases. There will be different types of development including single family developments, multifamily developments, roadways, parks and retention and detention ponds. Using Section 6-1(A)(2) of the City's DPM, a land treatment was assigned to onsite basins that are proposed to be single family residential development in future. Assuming the number of residential units per acre is less than 6, the percent D land treatment area was determined by "Single Family Residential" equation listed in City's DPM Table 6.2.10. The remaining area was split between land treatments B and C.

For the proposed multifamily development areas land treatment of 70% of D, 15% of B and 15% of C is used. For roadways it is 90% of D and 10% C and for pond and park locations it is 5% B and 95% C. For the remaining areas land treatment of 50% D, 25% B and 25% C is used.

Developed flows are calculated for the 100-year 24-hour storm event and are shown in 'APPENDIX A-Basin Analysis and Summary of Land Treatments'. The developed flows from the proposed site will be conveyed by the internal streets and proposed storm drain networks to the future ponds. These ponds will act to improve the quality of the storm water leaving each pond by removing sediments and debris from the flows entering the ponds. The Onsite Proposed Basin Map, EXHIBIT C, illustrates the basin locations and flow directions for the proposed development as well as the proposed street configurations.

In the developed condition, the entire site is divided into 28 onsite basins, Basin-1 to Basin-28. Where basins 19, 20, 21, 22, 23, 24, 25, 26, 27, 28 are future paved streets, and basins 11, 12, 13, 14 and 15 are future pond locations. Bobby Foster-1, Bobby Foster-2 and Bobby Foster-3 are paved roads in proposed conditions.

There are two proposed sump conditions at Street 1 (Basin 19 and Basin 20). The runoff from Basin 1, Basin 5, Basin 6, Basin 7, Basin 16, Basin 19, Basin 24, Basin 25, Basin 26, Bobby Foster-1 and Bobby Foster-2 will be collected by proposed storm drain system at the west half of Street 1. This storm drain will outfall at Basin 13, designated area for Pond 3. Pond 3 is a retention pond, designed to hold the volume for 100-year 10-day storm.

Another sump condition at Street 1 is proposed west of Basin 9. Basin 2, Basin 20 and Basin 21 will drain to this proposed low point where storm drain system will collect the runoff and outfall into Pond 1 located within Basin 11. This storm drain network will also capture flow from Basin 3, Basin 4, Basin 22 and Bobby Foster-3 which will outfall into Pond 1.

Pond 1 will also capture the flow from proposed basin 9 which drains west to east as well as offsite flow of 26 cfs from the subdivision located east of the property line. Pond 1 will act as a detention pond where it will retain a portion of the 100-year 10-day storm and remaining will flow south through proposed culvert pipe and outfall into Proposed pond 2A located within Basin 12.

Basin 12 consists of two ponds, Pond 2A and 2B which will be connected through culvert pipe and act as equilibrium pond. These ponds are designed to combinedly take runoff from Basin 8, Basin 10, Basin 23, Basin 28, Offsite Basin 2 and offsite flow of 64 cfs from the subdivision located east of the property line. This pond will act as a detention pond similar to Pond 1. Where it will retain a portion of the 100-year 10-day storm and remaining will flow south through proposed culvert pipe and outfall into Existing Pond 1.

Basin 17 will drain north toward pond 4 which is located within Basin 14. Basin 27 and Basin 18 will drain toward pond 5 located withing Basin 15. Pond 4 and Pond 5 will be connected through proposed culvert pipe. Both ponds are designed to be a detention pond where it will retain a portion of the 100-year 10-day storm and remaining will flow downstream through proposed culvert pipe.

Culvert 6 and Swale 1 will convey the outfall from Existing Pond 1 and Pond 5 respectively to the Future Park location. The remaining of the 100-year 10-day storm that was not retained by the proposed ponds onsite will be retained in this location. The stage storage volume is provided in 'APPENDIX E- Pond Volume'.

"EXHIBIT D- Inlet and Storm Drain Network Plan", shows the flow, street grade, water depth, flow captured, and type of each inlet and the size, slope, flow, and capacity of the storm drain system. All upstream flows were within the depth of flow in the street and does not exceed the curb height nor the energy grade line does not exceed at the right of way (ROW) of any street. At the downstream end, an inlet in sump condition that captures all the developed flows. See 'APPENDIX B- Inlet/Street Hydraulics'.

VII. GRADING PLAN

The grading plan will be prepared and sent for approval with the drainage report for each phase of the proposed site.

VIII. CONCLUSION

This drainage report summarizes the hydrologic and hydraulic analysis for the Master Plan of Artiste. With the proposed storm drain network there are no adverse effects anticipated to the existing infrastructure. The proposed storm drains infrastructure and drainage management schemes allow for the safe management of storm runoff. The implementation of these concepts would result in the safe passage of the 100-year – 24-hour storm event.

APPENDICES

**APPENDIX A: BASIN ANALYSIS AND SUMMARY
OF LAND TREATMENTS**

APPENDIX B: INLET/STREET HYDRAULICS

APPENDIX C: STORM DRAIN PIPE ANALYSIS

APPENDIX D: SWALE AND CULVERT ANALYSIS

APPENDIX E: POND VOLUME

APPENDIX A:
BASIN ANALYSIS AND SUMMARY OF LAND TREATMENTS

EXISTING CONDITIONS

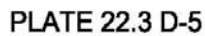
BASIN I.D.	AREA (AC)	% LAND TREATMENT				DISCHARGE (CFS)		VOLUME (AC-FT)	
		A	B	C	D	10 YR	100YR	10 YR	100YR
								6 HOUR STORM	
EXISTING BASIN 1	139.6	95.0%	5.0%	0.0%	0.0%	62.6	246.0	1.8	7.3
EXISTING BASIN 2	30.2	95.0%	5.0%	0.0%	0.0%	13.6	53.3	0.4	1.6
EXISTING BASIN 3	55.1	95.0%	5.0%	0.0%	0.0%	24.7	97.2	0.7	2.9
EXISTING BASIN 4	5.7	95.0%	5.0%	0.0%	0.0%	2.5	10.0	0.1	0.3
EXISTING BASIN 5	6.7	0.0%	5.0%	95.0%	0.0%	10.5	20.1	0.3	0.6
EXISTING BASIN 6	10.1	0.0%	5.0%	95.0%	0.0%	15.8	30.3	0.4	0.9
BOBBY FOSTER 1	0.9	95.0%	5.0%	0.0%	0.0%	0.4	1.5	0.0	0.0
BOBBY FOSTER 2	3.9	95.0%	5.0%	0.0%	0.0%	1.7	6.8	0.1	0.2
BOBBY FOSTER 3	1.7	95.0%	5.0%	0.0%	0.0%	0.8	3.0	0.0	0.1
OFFSITE BASIN 1	4.7	95.0%	5.0%	0.0%	0.0%	2.1	8.2	0.1	0.2
OFFSITE BASIN 2	0.6	95.0%	5.0%	0.0%	0.0%	0.3	1.1	0.0	0.0
TOTAL	259.1					134.9	477.5	3.7	13.8

PROPOSED CONDITIONS

BASIN I.D.	AREA (AC)	UNITS #	% LAND TREATMENT				DISCHARGE (CFS)		VOLUME (AC-FT)		VOLUME (AC-FT)	
			A	B	C	D	10 YR	100YR	10 YR	100YR	10 YR	100YR
									6 HOUR STORM		10 DAY STORM	
BASIN 1	42.2		0.0%	15.0%	15.0%	70.0%	96.2	162.0	4.1	6.7	6.79	9.98
BASIN 2	9.9		0.0%	15.0%	15.0%	70.0%	22.6	38.0	1.0	1.6	1.59	2.34
BASIN 3	2.3		0.0%	15.0%	15.0%	70.0%	5.3	9.0	0.2	0.4	0.38	0.55
BASIN 4	4.3		0.0%	15.0%	15.0%	70.0%	9.7	16.4	0.4	0.7	0.69	1.01
BASIN 5	18.6		0.0%	25.0%	25.0%	50.0%	37.0	65.2	1.5	2.5	2.31	3.54
BASIN 6	6.5		0.0%	25.0%	25.0%	50.0%	13.0	22.9	0.5	0.9	0.81	1.24
BASIN 7	2.8		0.0%	25.0%	25.0%	50.0%	5.5	9.7	0.2	0.4	0.34	0.53
BASIN 8	18.8		0.0%	25.0%	25.0%	50.0%	37.5	66.1	1.5	2.5	2.34	3.59
BASIN 9	19.9	88	0.0%	29.0%	29.0%	42.0%	37.4	67.2	1.4	2.5	2.18	3.42
BASIN 10	21.2	78	0.0%	29.0%	29.0%	42.0%	39.9	71.8	1.5	2.7	2.33	3.66
BASIN 11	3.5		0.0%	5.0%	95.0%	0.0%	5.4	10.3	0.1	0.3	0.14	0.29
BASIN 12	5.3		0.0%	5.0%	95.0%	0.0%	8.3	15.9	0.2	0.5	0.21	0.45
BASIN 13	6.2		0.0%	5.0%	95.0%	0.0%	9.6	18.4	0.2	0.5	0.24	0.52
BASIN 14	4.1		0.0%	5.0%	95.0%	0.0%	6.4	12.2	0.2	0.3	0.16	0.35
BASIN 15	4.1		0.0%	5.0%	95.0%	0.0%	6.4	12.2	0.2	0.3	0.16	0.35
BASIN 16	33.1		0.0%	25.0%	25.0%	50.0%	66.1	116.3	2.6	4.5	4.11	6.31
BASIN 17	25.0		0.0%	25.0%	25.0%	50.0%	49.8	87.6	2.0	3.4	3.10	4.76
BASIN 18	4.1		0.0%	5.0%	95.0%	0.0%	6.4	12.3	0.2	0.3	0.16	0.35
BASIN 19	3.3		0.0%	0.0%	10.0%	90.0%	8.6	14.0	0.4	0.6	0.66	0.94
BASIN 20	2.1		0.0%	0.0%	10.0%	90.0%	5.5	8.9	0.2	0.4	0.42	0.60
BASIN 21	0.4		0.0%	0.0%	10.0%	90.0%	1.1	1.8	0.0	0.1	0.08	0.12
BASIN 22	1.4		0.0%	0.0%	10.0%	90.0%	3.6	5.9	0.2	0.3	0.28	0.40
BASIN 23	0.3		0.0%	0.0%	10.0%	90.0%	0.7	1.2	0.0	0.1	0.05	0.08
BASIN 24	0.4		0.0%	0.0%	10.0%	90.0%	1.2	1.9	0.1	0.1	0.09	0.13
BASIN 25	0.8		0.0%	0.0%	10.0%	90.0%	2.2	3.5	0.1	0.2	0.17	0.24
BASIN 26	2.3		0.0%	0.0%	10.0%	90.0%	5.9	9.5	0.3	0.4	0.45	0.64
BASIN 27	1.1		0.0%	0.0%	10.0%	90.0%	2.8	4.5	0.1	0.2	0.21	0.30
BASIN 28	1.9		0.0%	0.0%	10.0%	90.0%	4.9	7.9	0.2	0.3	0.37	0.53
BOBBY FOSTER 1	0.9		0.0%	0.0%	10.0%	90.0%	2.3	3.7	0.1	0.2	0.17	0.25
BOBBY FOSTER 2	3.9		0.0%	0.0%	10.0%	90.0%	10.0	16.2	0.5	0.7	0.76	1.09
BOBBY FOSTER 3	1.7		0.0%	0.0%	10.0%	90.0%	4.4	7.1	0.2	0.3	0.34	0.48
OFFSITE BASIN 1	4.7		95.0%	5.0%	0.0%	0.0%	2.1	8.2	0.1	0.2	0.06	0.24
OFFSITE BASIN 2	0.6		95.0%	5.0%	0.0%	0.0%	0.3	1.1	0.0	0.0	0.01	0.03
TOTAL	257.5	166					518.2	909.0	20.5	35.0	32.15	49.32

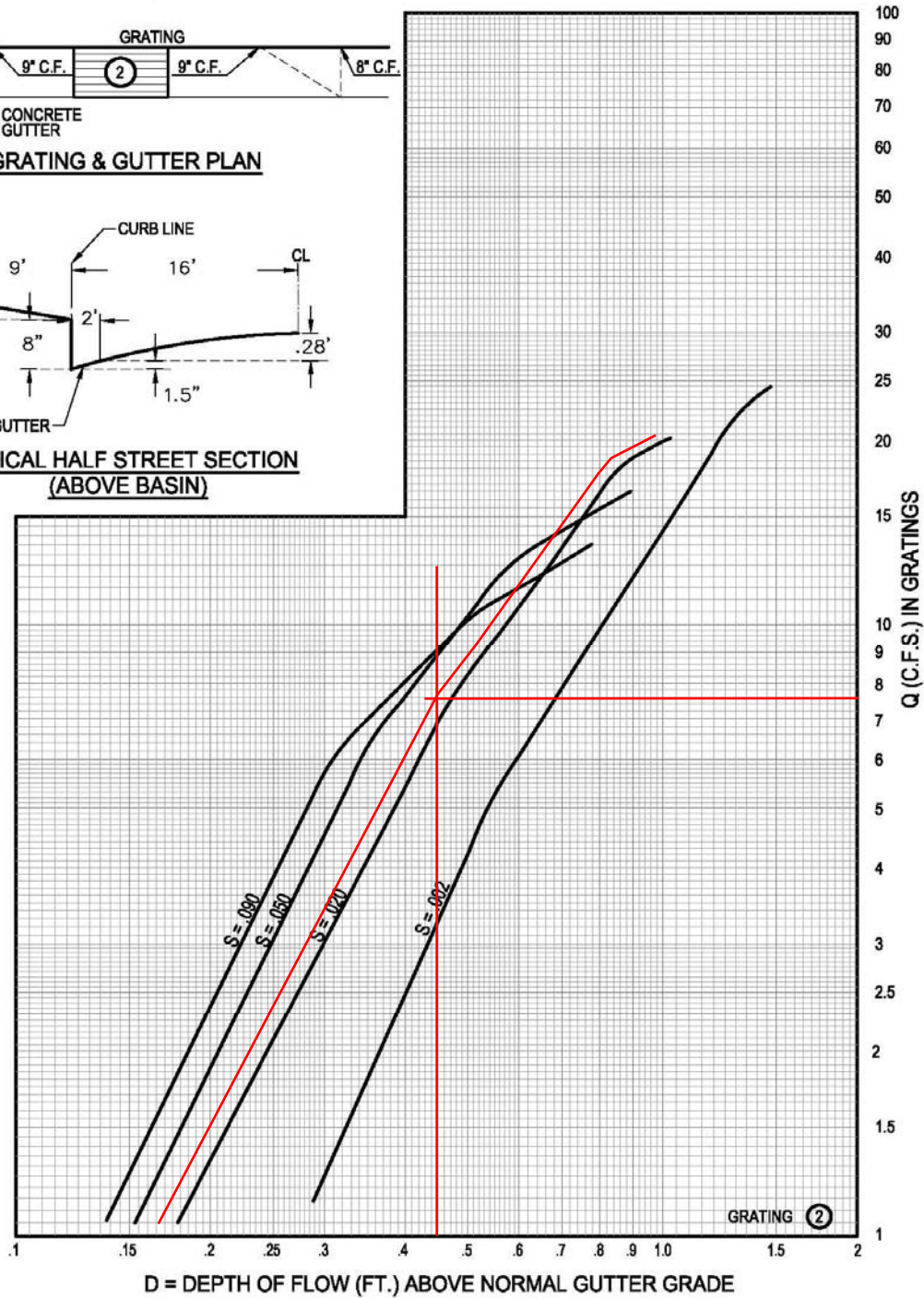
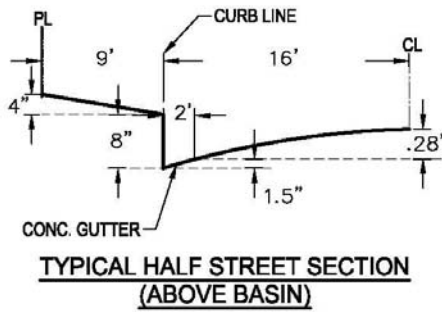
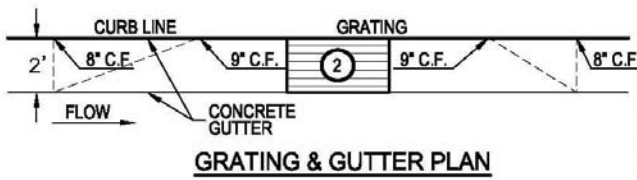
APPENDIX B: INLET/STREET HYDRAULICS

GRATING CAPACITIES FOR TYPE "A", "C" AND "D"



$d = 0.5'$

GRATING CAPACITIES FOR TYPE "A", "C" AND "D"



IN 3 and IN 4
Q_{in} = 7.5 cfs

PLATE 22.3 D-5

d = 0.45'

ANALYSIS OF AN INLET IN A SUMP CONDITION -

IN 5 & IN 6

INLET TYPE: Double Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: $Q = C * L * H^{1.5}$ Wing opening

C= 3.0

L= 4.0 ft

 $Q = 3.0(4.0')H^{1.5} = 12.0H^{1.5}$ Grate opening

C=3.0

L(double grate)=[2(2.67')+2(1.8')]=8.94 ft

 $Q = 3.0(8.94)H^{1.5} = 26.82 * H^{1.5}$ ORIFICE: $Q = C * A * (2 * G * H)^{0.5}$ Grate opening

C=0.6

A(double grate)=8.19 sf

 $Q = 0.6(7.14)((64.4 * H))^{0.5}$ Wing opening*

C=0.6

A=2.0 sf

 $Q = 1.2 * (64.4 * H)^{0.5}$

*not included in the orifice calc

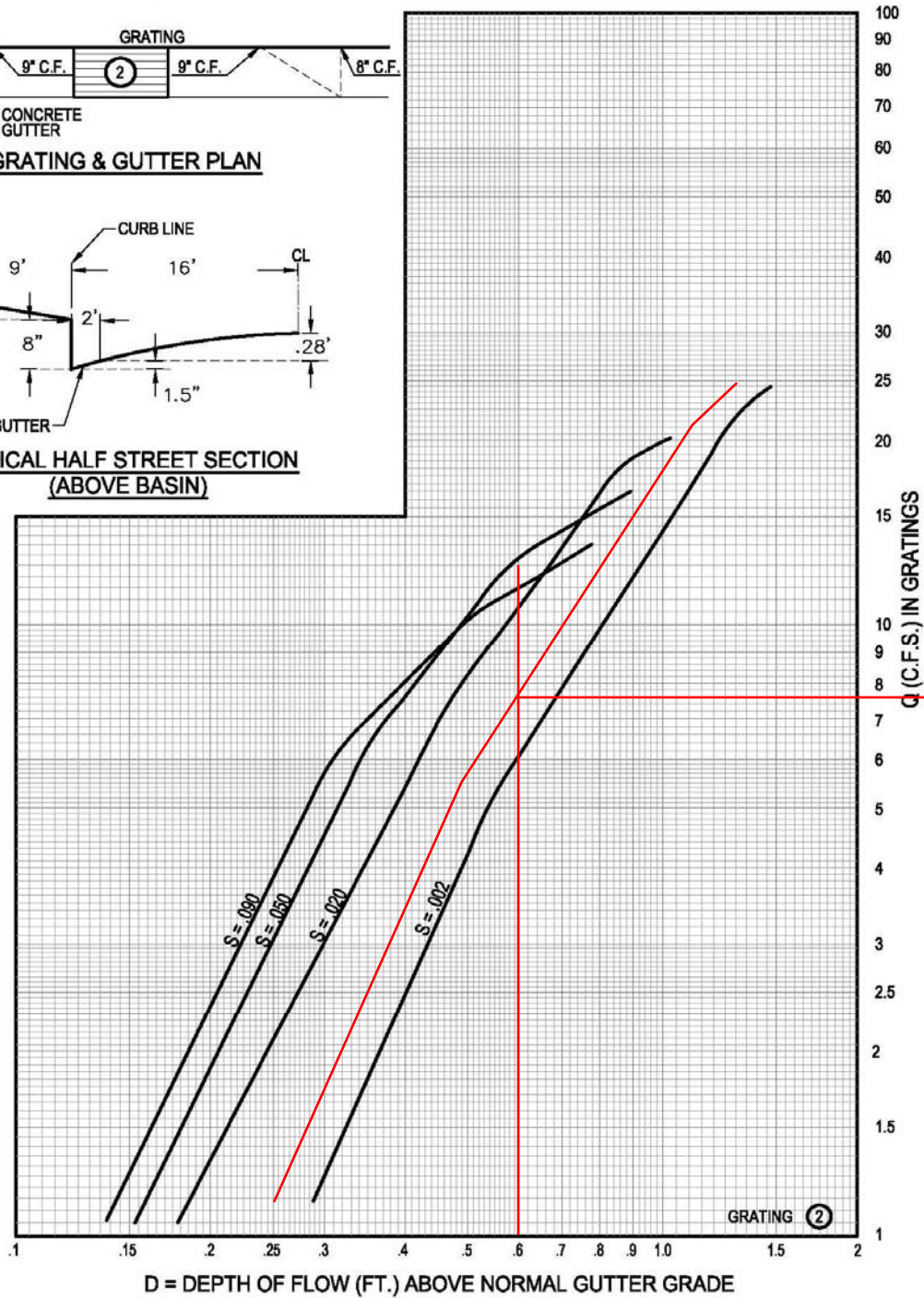
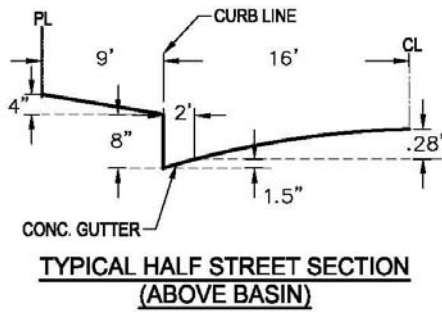
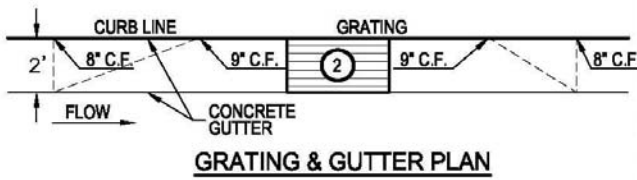
	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR	Q (CFS) WEIR	Q (CFS) ORIFICE	TOTAL Q (CFS)	Q=51.23 cfs/2 = 25.62 cfs per inlet
			"A" OPENING	DOUBLE GRATE	DOUBLE GRATE		COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at double "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.85	12.47	1.61	Weir controls on grate analysis
	0.20	0.20	1.07	2.40	17.64	4.55	
	0.30	0.30	1.97	4.41	21.60	8.35	
	0.40	0.40	3.04	6.78	24.94	12.86	
	0.50	0.50	4.24	9.48	27.88	17.97	
	0.60	0.60	5.58	12.46	30.55	23.62	@ Q(100 yr) = 22.95 cfs
TOP OF CURB	0.70	0.70	7.03	15.71	32.99	29.76	
	0.80	0.80	8.59	19.19	35.27	36.36	
ROW LIMIT	0.86	0.86	9.52	21.28	36.51	40.32	
	0.90	0.90	10.25	22.90	37.41	43.39	@ Q(2 x100 yr) = 45.9 cfs
	1.00	1.00	12.00	26.82	39.43	50.82	
	1.10	1.10	13.84	30.94	41.36	58.63	

NOTE:

The total runoff intercepted by the inlet at the low point in the road is:

$$Q_r(100) = 2 * [(\text{runoff of the wing opening}) + (\text{the lesser of the weir or orifice amount taken by the double grate})].$$

GRATING CAPACITIES FOR TYPE "A", "C" AND "D"



IN 7 and IN 8
Q_{in} = 7.8 cfs

ANALYSIS OF AN INLET IN A SUMP CONDITION

IN-9 and IN-10

INLET TYPE: Single Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: $Q = C * L * H^{1.5}$ Wing opening

C= 3.0

L= 4.0 ft

 $Q = 3.0(4.0)H^{1.5} = 12.0H^{1.5}$ Grate opening

C=3.0

L(single grate)=[(2.67')+2(1.8')]=6.27 ft

 $Q = 3.0(6.27)H^{1.5} = 18.81H^{1.5}$ ORIFICE: $Q = C * A * (2 * G * H)^{0.5}$ Grate opening

C=0.6

A(single grate)=3.72 sf

 $Q = 0.6 * 3.72 * (64.4 * H)^{0.5}$ Wing opening*

C=0.6

A=2.0 sf

 $Q = 1.2 * (64.4 * H)^{0.5}$

*not included in the orifice calcs

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR WING OPENING	Q (CFS) WEIR SINGLE GRATE	Q (CFS) ORIFICE SINGLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at single "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.59	5.66	1.35	Weir controls on grate analysis
	0.20	0.20	1.07	1.68	8.01	3.83	
	0.30	0.30	1.97	3.09	9.81	7.03	
	0.40	0.40	3.04	4.76	11.33	10.83	
	0.50	0.50	4.24	6.65	12.67	15.14	Q(100 yr) = 11.92 cfs
	0.60	0.60	5.58	8.74	13.87	19.90	
TOP OF CURB	0.70	0.70	7.03	11.02	14.99	25.07	Q(2x100 yr) = 23.85 cfs
	0.80	0.80	8.59	13.46	16.02	30.63	
ROW LIMIT	0.86	0.86	9.52	14.92	16.58	33.96	
	0.90	0.90	10.25	16.06	16.99	36.55	
	1.00	1.00	12.00	18.81	17.91	41.91	

NOTE:

The total runoff intercepted by the inlet at the low point in the road is:

$$Q(100) = 2 * [(\text{runoff of the wing opening}) + (\text{the lesser of the weir or orifice amount taken by the double grate})].$$

ANALYSIS OF AN INLET IN A SUMP CONDITION

IN-11 and IN-12

INLET TYPE: Single Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: $Q = C * L * H^{1.5}$ Wing opening

C= 3.0

L= 4.0 ft

 $Q = 3.0(4.0)H^{1.5} = 12.0H^{1.5}$ Grate opening

C=3.0

L(single grate)=[(2.67')+2(1.8')]=6.27 ft

 $Q = 3.0(6.27)H^{1.5} = 18.81H^{1.5}$ ORIFICE: $Q = C * A * (2 * G * H)^{0.5}$ Grate opening

C=0.6

A(single grate)=3.72 sf

 $Q = 0.6 * 3.72 * (64.4 * H)^{0.5}$ Wing opening*

C=0.6

A=2.0 sf

 $Q = 1.2 * (64.4 * H)^{0.5}$

*not included in the orifice calcs

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR WING OPENING	Q (CFS) WEIR SINGLE GRATE	Q (CFS) ORIFICE SINGLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at single "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.59	5.66	1.35	Weir controls on grate analysis
	0.20	0.20	1.07	1.68	8.01	3.83	
	0.30	0.30	1.97	3.09	9.81	7.03	
	0.40	0.40	3.04	4.76	11.33	10.83	
	0.50	0.50	4.24	6.65	12.67	15.14	
	0.60	0.60	5.58	8.74	13.87	19.90	Q(100 yr) = 19.55 cfs
TOP OF CURB	0.70	0.70	7.03	11.02	14.99	25.07	
	0.80	0.80	8.59	13.46	16.02	30.63	
ROW LIMIT	0.86	0.86	9.52	14.92	16.58	33.96	
	0.90	0.90	10.25	16.06	16.99	36.55	Q(2x100 yr) = 39.1 cfs
	1.00	1.00	12.00	18.81	17.91	41.91	

NOTE:

The total runoff intercepted by the inlet at the low point in the road is:

$$Q(100) = 2 * [(\text{runoff of the wing opening}) + (\text{the lesser of the weir or orifice amount taken by the double grate})].$$

52ftROW-32ftRoad_S=0.60%
MANNING'S N = 0.017 SLOPE = 0.006 (ft/ft)

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1.0	0.000	0.870	5.000	12.630	0.130	9.000	42.000	0.670
2.0	0.010	0.870	6.000	26.000	0.390	10.000	52.000	0.870
3.0	10.000	0.670	7.000	39.380	0.130			
4.0	10.630	0.000	8.000	41.380	0.000			

WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOPWID	TOPWID	TOTAL	FROUDE
FT.	INC	AREA	RATE	PER	VEL	PLUS	WATER	ENERGY	NO.
		SQ.FT.	(CFS)	(FT)	(FPS)	OBSTRUCTIONS		(FT)	
0.010	0.010	0.002	0.000	0.336	0.194	0.336	0.326	0.011	0.484
0.020	0.020	0.007	0.002	0.671	0.308	0.663	0.653	0.021	0.544
0.030	0.030	0.015	0.006	1.007	0.404	0.989	0.979	0.033	0.582
0.040	0.040	0.026	0.013	1.343	0.490	1.315	1.305	0.044	0.610
0.050	0.050	0.041	0.023	1.678	0.568	1.642	1.632	0.055	0.633
0.060	0.060	0.059	0.038	2.014	0.642	1.968	1.958	0.066	0.653
0.070	0.070	0.080	0.057	2.350	0.711	2.294	2.284	0.078	0.670
0.080	0.080	0.104	0.081	2.686	0.777	2.621	2.611	0.089	0.685
0.090	0.090	0.132	0.111	3.021	0.841	2.947	2.937	0.101	0.699
0.100	0.100	0.163	0.147	3.357	0.902	3.273	3.263	0.113	0.711
0.110	0.110	0.197	0.190	3.693	0.961	3.600	3.590	0.124	0.722
0.120	0.120	0.235	0.239	4.028	1.018	3.926	3.916	0.136	0.733
0.130	0.130	0.276	0.296	4.364	1.074	4.253	4.243	0.148	0.743
0.140	0.140	0.323	0.334	5.420	1.034	5.300	5.290	0.157	0.737
0.150	0.150	0.382	0.391	6.477	1.025	6.348	6.338	0.166	0.737
0.160	0.160	0.450	0.466	7.533	1.035	7.395	7.385	0.177	0.739
0.170	0.170	0.529	0.559	8.590	1.056	8.443	8.433	0.187	0.743
0.180	0.180	0.619	0.671	9.646	1.085	9.490	9.480	0.198	0.749
0.190	0.190	0.719	0.804	10.702	1.119	10.538	10.528	0.209	0.755
0.200	0.200	0.829	0.959	11.759	1.156	11.585	11.575	0.221	0.761
0.210	0.210	0.950	1.136	12.815	1.195	12.633	12.623	0.232	0.768
0.220	0.220	1.082	1.337	13.872	1.236	13.680	13.670	0.244	0.775
0.230	0.230	1.224	1.564	14.928	1.278	14.728	14.718	0.255	0.781
0.240	0.240	1.376	1.817	15.984	1.320	15.775	15.765	0.267	0.788
0.250	0.250	1.539	2.098	17.041	1.363	16.823	16.813	0.279	0.794
0.260	0.260	1.712	2.408	18.097	1.406	17.870	17.860	0.291	0.801
0.270	0.270	1.896	2.748	19.153	1.449	18.918	18.908	0.303	0.807
0.280	0.280	2.091	3.119	20.210	1.492	19.965	19.955	0.315	0.813
0.290	0.290	2.295	3.523	21.266	1.535	21.013	21.003	0.327	0.819
0.300	0.300	2.511	3.961	22.323	1.578	22.060	22.050	0.339	0.824
0.310	0.310	2.736	4.433	23.379	1.620	23.108	23.098	0.351	0.830
0.320	0.320	2.973	4.941	24.435	1.662	24.155	24.145	0.363	0.835
0.330	0.330	3.219	5.487	25.492	1.704	25.203	25.193	0.375	0.841
0.340	0.340	3.476	6.070	26.548	1.746	26.250	26.240	0.387	0.846
0.350	0.350	3.744	6.692	27.605	1.787	27.298	27.288	0.400	0.851

0.360	0.360	4.022	7.355	28.661	1.828	28.345	28.335	0.412	0.856
0.370	0.370	4.311	8.058	29.717	1.869	29.393	29.383	0.424	0.860
0.380	0.380	4.610	8.804	30.774	1.910	30.440	30.430	0.437	0.865
0.390	0.390	4.919	9.593	31.830	1.950	31.488	31.478	0.449	0.870
0.400	0.400	5.234	10.632	31.858	2.031	31.506	31.496	0.464	0.878
0.410	0.410	5.549	11.713	31.885	2.111	31.525	31.515	0.479	0.887
0.420	0.420	5.865	12.835	31.912	2.189	31.544	31.534	0.495	0.895
0.430	0.430	6.180	13.998	31.940	2.265	31.562	31.552	0.510	0.902
0.440	0.440	6.496	15.201	31.967	2.340	31.581	31.571	0.525	0.910
0.450	0.450	6.811	16.443	31.994	2.414	31.600	31.590	0.541	0.917
0.460	0.460	7.127	17.724	32.022	2.487	31.618	31.608	0.556	0.923
0.470	0.470	7.444	19.043	32.049	2.558	31.637	31.627	0.572	0.930
0.480	0.480	7.760	20.399	32.076	2.629	31.656	31.646	0.587	0.936
WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOPWID	TOPWID	TOTAL	FROUDE
FT.	INC	AREA	RATE	PER	VEL	PLUS	WATER	ENERGY	NO.
		SQ.FT.	(CFS)	(FT)	(FPS)	OBSTRUCTIONS		(FT)	
0.490	0.490	8.076	21.793	32.104	2.698	31.674	31.664	0.603	0.942
0.500	0.500	8.393	23.222	32.131	2.767	31.693	31.683	0.619	0.948
0.510	0.510	8.710	24.688	32.158	2.834	31.711	31.701	0.635	0.953
0.520	0.520	9.027	26.190	32.186	2.901	31.730	31.720	0.651	0.959
0.530	0.530	9.345	27.726	32.213	2.967	31.749	31.739	0.667	0.964
0.540	0.540	9.662	29.297	32.240	3.032	31.767	31.757	0.683	0.969
0.550	0.550	9.980	30.903	32.268	3.097	31.786	31.776	0.699	0.974
0.560	0.560	10.298	32.542	32.295	3.160	31.805	31.795	0.715	0.979
0.570	0.570	10.616	34.215	32.323	3.223	31.823	31.813	0.732	0.984
0.580	0.580	10.934	35.921	32.350	3.285	31.842	31.832	0.748	0.988
0.590	0.590	11.252	37.660	32.377	3.347	31.861	31.851	0.764	0.993
0.600	0.600	11.571	39.432	32.405	3.408	31.879	31.869	0.781	0.997
0.610	0.610	11.890	41.236	32.432	3.468	31.898	31.888	0.797	1.001
0.620	0.620	12.209	43.072	32.459	3.528	31.917	31.907	0.814	1.006
0.630	0.630	12.528	44.940	32.487	3.587	31.935	31.925	0.830	1.010
0.640	0.640	12.847	46.839	32.514	3.646	31.954	31.944	0.847	1.014
0.650	0.650	13.167	48.769	32.541	3.704	31.973	31.963	0.863	1.017
0.660	0.660	13.486	50.731	32.569	3.762	31.991	31.981	0.880	1.021
0.670	0.670	13.806	52.722	32.596	3.819	32.010	32.000	0.897	1.025
0.680	0.680	14.131	53.714	33.596	3.801	33.010	33.000	0.905	1.024
0.690	0.690	14.466	54.772	34.595	3.786	34.009	33.999	0.913	1.023
0.700	0.700	14.811	55.895	35.595	3.774	35.009	34.999	0.922	1.023
0.710	0.710	15.166	57.081	36.595	3.764	36.008	35.998	0.930	1.022
0.720	0.720	15.531	58.332	37.595	3.756	37.008	36.998	0.939	1.022
0.730	0.730	15.906	59.645	38.594	3.750	38.007	37.997	0.949	1.022
0.740	0.740	16.291	61.021	39.594	3.746	39.007	38.997	0.958	1.022
0.750	0.750	16.686	62.459	40.594	3.743	40.006	39.996	0.968	1.022
0.760	0.760	17.091	63.960	41.593	3.742	41.006	40.996	0.978	1.022
0.770	0.770	17.506	65.524	42.593	3.743	42.005	41.995	0.988	1.022
0.780	0.780	17.931	67.149	43.593	3.745	43.005	42.995	0.998	1.022
0.790	0.790	18.366	68.837	44.592	3.748	44.004	43.994	1.009	1.023
0.800	0.800	18.811	70.588	45.592	3.753	45.004	44.994	1.019	1.023
0.810	0.810	19.266	72.402	46.592	3.758	46.003	45.993	1.030	1.024

EGL = 0.9
Depth = 0.674
Q = 53.094 cfs



0.820	0.820	19.731	74.278	47.592	3.765	47.003	46.993	1.040	1.024
0.830	0.830	20.206	76.218	48.591	3.772	48.002	47.992	1.051	1.025
0.840	0.840	20.691	78.222	49.591	3.781	49.002	48.992	1.062	1.026
0.850	0.850	21.185	80.290	50.591	3.790	50.001	49.991	1.073	1.026
0.860	0.860	21.690	82.422	51.590	3.800	51.001	50.991	1.085	1.027

52ftROW-32ftRoad_S=1.20%
MANNING'S N = 0.017 SLOPE = 0.012 (ft/ft)

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1.0	0.000	0.870	5.000	12.630	0.130	9.000	42.000	0.670
2.0	0.010	0.870	6.000	26.000	0.390	10.000	52.000	0.870
3.0	10.000	0.670	7.000	39.380	0.130			
4.0	10.630	0.000	8.000	41.380	0.000			

WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOPWID	TOPWID	TOTAL	FROUDE
FT.	INC	AREA	RATE	PER	VEL	PLUS	WATER	ENERGY	NO.
		SQ.FT.	(CFS)	(FT)	(FPS)	OBSTRUCTIONS		(FT)	
0.010	0.010	0.002	0.000	0.336	0.275	0.336	0.326	0.011	0.685
0.020	0.020	0.007	0.003	0.671	0.436	0.663	0.653	0.023	0.769
0.030	0.030	0.015	0.008	1.007	0.572	0.989	0.979	0.035	0.823
0.040	0.040	0.026	0.018	1.343	0.692	1.315	1.305	0.047	0.863
0.050	0.050	0.041	0.033	1.678	0.803	1.642	1.632	0.060	0.896
0.060	0.060	0.059	0.053	2.014	0.907	1.968	1.958	0.073	0.923
0.070	0.070	0.080	0.080	2.350	1.005	2.294	2.284	0.086	0.948
0.080	0.080	0.104	0.115	2.686	1.099	2.621	2.611	0.099	0.969
0.090	0.090	0.132	0.157	3.021	1.189	2.947	2.937	0.112	0.988
0.100	0.100	0.163	0.208	3.357	1.275	3.273	3.263	0.125	1.006
0.110	0.110	0.197	0.268	3.693	1.359	3.600	3.590	0.139	1.022
0.120	0.120	0.235	0.338	4.028	1.440	3.926	3.916	0.152	1.037
0.130	0.130	0.276	0.419	4.364	1.519	4.253	4.243	0.166	1.050
0.140	0.140	0.323	0.473	5.420	1.462	5.300	5.290	0.173	1.043
0.150	0.150	0.382	0.553	6.477	1.450	6.348	6.338	0.183	1.042
0.160	0.160	0.450	0.659	7.533	1.464	7.395	7.385	0.193	1.045
0.170	0.170	0.529	0.791	8.590	1.494	8.443	8.433	0.205	1.051
0.180	0.180	0.619	0.950	9.646	1.535	9.490	9.480	0.217	1.059
0.190	0.190	0.719	1.137	10.702	1.582	10.538	10.528	0.229	1.067
0.200	0.200	0.829	1.356	11.759	1.635	11.585	11.575	0.242	1.077
0.210	0.210	0.950	1.606	12.815	1.690	12.633	12.623	0.254	1.086
0.220	0.220	1.082	1.891	13.872	1.748	13.680	13.670	0.268	1.095
0.230	0.230	1.224	2.211	14.928	1.807	14.728	14.718	0.281	1.105
0.240	0.240	1.376	2.569	15.984	1.867	15.775	15.765	0.294	1.114
0.250	0.250	1.539	2.967	17.041	1.928	16.823	16.813	0.308	1.123
0.260	0.260	1.712	3.405	18.097	1.988	17.870	17.860	0.321	1.132
0.270	0.270	1.896	3.886	19.153	2.049	18.918	18.908	0.335	1.141
0.280	0.280	2.091	4.411	20.210	2.110	19.965	19.955	0.349	1.149
0.290	0.290	2.295	4.983	21.266	2.171	21.013	21.003	0.363	1.158
0.300	0.300	2.511	5.601	22.323	2.231	22.060	22.050	0.377	1.166
0.310	0.310	2.736	6.270	23.379	2.291	23.108	23.098	0.392	1.174
0.320	0.320	2.973	6.988	24.435	2.351	24.155	24.145	0.406	1.181
0.330	0.330	3.219	7.759	25.492	2.410	25.203	25.193	0.420	1.189
0.340	0.340	3.476	8.584	26.548	2.469	26.250	26.240	0.435	1.196
0.350	0.350	3.744	9.464	27.605	2.528	27.298	27.288	0.449	1.203

0.360	0.360	4.022	10.401	28.661	2.586	28.345	28.335	0.464	1.210
0.370	0.370	4.311	11.396	29.717	2.644	29.393	29.383	0.479	1.217
0.380	0.380	4.610	12.450	30.774	2.701	30.440	30.430	0.493	1.223
0.390	0.390	4.919	13.566	31.830	2.758	31.488	31.478	0.508	1.230
0.400	0.400	5.234	15.035	31.858	2.872	31.506	31.496	0.528	1.242
0.410	0.410	5.549	16.564	31.885	2.985	31.525	31.515	0.549	1.254
0.420	0.420	5.865	18.152	31.912	3.095	31.544	31.534	0.569	1.265
0.430	0.430	6.180	19.796	31.940	3.203	31.562	31.552	0.590	1.276
0.440	0.440	6.496	21.498	31.967	3.310	31.581	31.571	0.610	1.286
0.450	0.450	6.811	23.254	31.994	3.414	31.600	31.590	0.631	1.296
0.460	0.460	7.127	25.066	32.022	3.517	31.618	31.608	0.652	1.306
0.470	0.470	7.444	26.931	32.049	3.618	31.637	31.627	0.674	1.315
0.480	0.480	7.760	28.849	32.076	3.718	31.656	31.646	0.695	1.324
WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOPWID	TOPWID	TOTAL	FROUDE
FT.	INC	AREA	RATE	PER	VEL	PLUS	WATER	ENERGY	NO.
		SQ.FT.	(CFS)	(FT)	(FPS)	OBSTRUCTIONS		(FT)	
0.490	0.490	8.076	30.820	32.104	3.816	31.674	31.664	0.716	1.332
0.500	0.500	8.393	32.842	32.131	3.913	31.693	31.683	0.738	1.340
0.510	0.510	8.710	34.914	32.158	4.008	31.711	31.701	0.760	1.348
0.520	0.520	9.027	37.038	32.186	4.103	31.730	31.720	0.782	1.356
0.530	0.530	9.345	39.210	32.213	4.196	31.749	31.739	0.804	1.363
0.540	0.540	9.662	41.432	32.240	4.288	31.767	31.757	0.826	1.371
0.550	0.550	9.980	43.703	32.268	4.379	31.786	31.776	0.848	1.378
0.560	0.560	10.298	46.021	32.295	4.469	31.805	31.795	0.871	1.384
0.570	0.570	10.616	48.387	32.323	4.558	31.823	31.813	0.893	1.391
0.580	0.580	10.934	50.800	32.350	4.646	31.842	31.832	0.916	1.398
0.590	0.590	11.252	53.260	32.377	4.733	31.861	31.851	0.938	1.404
0.600	0.600	11.571	55.765	32.405	4.819	31.879	31.869	0.961	1.410
0.610	0.610	11.890	58.316	32.432	4.905	31.898	31.888	0.984	1.416
0.620	0.620	12.209	60.913	32.459	4.989	31.917	31.907	1.007	1.422
0.630	0.630	12.528	63.554	32.487	5.073	31.935	31.925	1.030	1.428
0.640	0.640	12.847	66.240	32.514	5.156	31.954	31.944	1.054	1.433
0.650	0.650	13.167	68.970	32.541	5.238	31.973	31.963	1.077	1.439
0.660	0.660	13.486	71.744	32.569	5.320	31.991	31.981	1.100	1.444
0.670	0.670	13.806	74.561	32.596	5.401	32.010	32.000	1.124	1.450
0.680	0.680	14.131	75.964	33.596	5.376	33.010	33.000	1.129	1.448
0.690	0.690	14.466	77.459	34.595	5.354	34.009	33.999	1.136	1.447
0.700	0.700	14.811	79.047	35.595	5.337	35.009	34.999	1.143	1.446
0.710	0.710	15.166	80.725	36.595	5.323	36.008	35.998	1.151	1.446
0.720	0.720	15.531	82.493	37.595	5.311	37.008	36.998	1.159	1.445
0.730	0.730	15.906	84.351	38.594	5.303	38.007	37.997	1.167	1.445
0.740	0.740	16.291	86.297	39.594	5.297	39.007	38.997	1.176	1.445
0.750	0.750	16.686	88.331	40.594	5.294	40.006	39.996	1.186	1.445
0.760	0.760	17.091	90.454	41.593	5.292	41.006	40.996	1.196	1.445
0.770	0.770	17.506	92.664	42.593	5.293	42.005	41.995	1.206	1.445
0.780	0.780	17.931	94.963	43.593	5.296	43.005	42.995	1.216	1.446
0.790	0.790	18.366	97.351	44.592	5.301	44.004	43.994	1.227	1.446
0.800	0.800	18.811	99.827	45.592	5.307	45.004	44.994	1.238	1.447
0.810	0.810	19.266	102.392	46.592	5.315	46.003	45.993	1.249	1.448

EGL = 0.9
Depth = 0.573
Q = 49.12 cfs

0.820	0.820	19.731	105.046	47.592	5.324	47.003	46.993	1.261	1.449
0.830	0.830	20.206	107.789	48.591	5.335	48.002	47.992	1.273	1.449
0.840	0.840	20.691	110.623	49.591	5.347	49.002	48.992	1.285	1.450
0.850	0.850	21.185	113.547	50.591	5.360	50.001	49.991	1.297	1.451
0.860	0.860	21.690	116.563	51.590	5.374	51.001	50.991	1.309	1.453

66ftROW-46ftRoad_S=0.50%

MANNING'S N = 0.017 SLOPE = 0.005

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1.0	0.0	0.9	4.0	12.6	0.1	7.0	55.4	0.0
2.0	10.0	0.7	5.0	33.0	0.5	8.0	56.0	0.7
3.0	10.6	0.0	6.0	53.4	0.1	9.0	66.0	0.9

WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOPWID	TOPWID	TOTAL	FROUDE
FT.	INC	AREA	RATE	PER	VEL	PLUS	WATER	ENERGY	NO.
		SQ.FT.	(CFS)	(FT)	(FPS)	OBSTRUCTIONS		(FT)	
0.010	0.010	0.002	0.000	0.336	0.177	0.326	0.326	0.010	0.442
0.020	0.020	0.007	0.002	0.671	0.282	0.653	0.653	0.021	0.496
0.030	0.030	0.015	0.005	1.007	0.369	0.979	0.979	0.032	0.531
0.040	0.040	0.026	0.012	1.343	0.447	1.305	1.305	0.043	0.557
0.050	0.050	0.041	0.021	1.678	0.519	1.632	1.632	0.054	0.578
0.060	0.060	0.059	0.034	2.014	0.586	1.958	1.958	0.065	0.596
0.070	0.070	0.080	0.052	2.350	0.649	2.284	2.284	0.077	0.612
0.080	0.080	0.104	0.074	2.686	0.709	2.611	2.611	0.088	0.625
0.090	0.090	0.132	0.101	3.021	0.767	2.937	2.937	0.099	0.638
0.100	0.100	0.163	0.134	3.357	0.823	3.263	3.263	0.111	0.649
0.110	0.110	0.197	0.173	3.693	0.877	3.590	3.590	0.122	0.659
0.120	0.120	0.235	0.218	4.028	0.930	3.916	3.916	0.133	0.669
0.130	0.130	0.276	0.270	4.364	0.981	4.243	4.243	0.145	0.678
0.140	0.140	0.323	0.306	5.410	0.945	5.280	5.280	0.154	0.673
0.150	0.150	0.381	0.358	6.457	0.937	6.317	6.317	0.164	0.673
0.160	0.160	0.450	0.426	7.503	0.947	7.355	7.355	0.174	0.675
0.170	0.170	0.528	0.511	8.549	0.966	8.392	8.392	0.185	0.679
0.180	0.180	0.618	0.613	9.595	0.993	9.430	9.430	0.195	0.684
0.190	0.190	0.717	0.734	10.642	1.023	10.467	10.467	0.206	0.689
0.200	0.200	0.827	0.874	11.688	1.057	11.504	11.504	0.217	0.695
0.210	0.210	0.947	1.035	12.734	1.093	12.542	12.542	0.229	0.701
0.220	0.220	1.078	1.218	13.781	1.130	13.579	13.579	0.240	0.707
0.230	0.230	1.219	1.424	14.827	1.168	14.617	14.617	0.251	0.713
0.240	0.240	1.370	1.654	15.873	1.207	15.654	15.654	0.263	0.719
0.250	0.250	1.532	1.909	16.920	1.246	16.691	16.691	0.274	0.725
0.260	0.260	1.704	2.190	17.966	1.285	17.729	17.729	0.286	0.731
0.270	0.270	1.886	2.499	19.012	1.325	18.766	18.766	0.297	0.737
0.280	0.280	2.079	2.836	20.058	1.364	19.804	19.804	0.309	0.742
0.290	0.290	2.282	3.202	21.105	1.403	20.841	20.841	0.321	0.747
0.300	0.300	2.496	3.599	22.151	1.442	21.878	21.878	0.332	0.753
0.310	0.310	2.720	4.028	23.197	1.481	22.916	22.916	0.344	0.758
0.320	0.320	2.954	4.488	24.244	1.519	23.953	23.953	0.356	0.763
0.330	0.330	3.199	4.983	25.290	1.558	24.991	24.991	0.368	0.767
0.340	0.340	3.454	5.511	26.336	1.596	26.028	26.028	0.380	0.772
0.350	0.350	3.720	6.075	27.383	1.633	27.065	27.065	0.391	0.777
0.360	0.360	3.995	6.676	28.429	1.671	28.103	28.103	0.403	0.781

0.370	0.370	4.282	7.313	29.475	1.708	29.140	29.140	0.415	0.786
0.380	0.380	4.578	7.989	30.521	1.745	30.178	30.178	0.427	0.790
0.390	0.390	4.885	8.704	31.568	1.782	31.215	31.215	0.439	0.794
0.400	0.400	5.203	9.458	32.614	1.818	32.253	32.253	0.451	0.798
0.410	0.410	5.530	10.254	33.660	1.854	33.290	33.290	0.463	0.802
0.420	0.420	5.868	11.091	34.707	1.890	34.327	34.327	0.476	0.806
0.430	0.430	6.217	11.971	35.753	1.926	35.365	35.365	0.488	0.810
0.440	0.440	6.576	12.894	36.799	1.961	36.402	36.402	0.500	0.813
0.450	0.450	6.945	13.862	37.846	1.996	37.440	37.440	0.512	0.817
0.460	0.460	7.324	14.875	38.892	2.031	38.477	38.477	0.524	0.821
0.470	0.470	7.714	15.933	39.938	2.065	39.514	39.514	0.536	0.824
0.480	0.480	8.115	17.039	40.984	2.100	40.552	40.552	0.549	0.828
0.490	0.490	8.525	18.192	42.031	2.134	41.589	41.589	0.561	0.831
WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOPWID	TOPWID	TOTAL	FROUDE
	INC	AREA	RATE	PER	VEL	PLUS	WATER	ENERGY	NO.
FT.		SQ.FT.	(CFS)	(FT)	(FPS)	OBSTRUCTIONS		(FT)	
0.500	0.500	8.947	19.393	43.077	2.168	42.627	42.627	0.573	0.834
0.510	0.510	9.378	20.644	44.123	2.201	43.664	43.664	0.585	0.837
0.520	0.520	9.820	21.945	45.170	2.235	44.701	44.701	0.598	0.841
0.530	0.530	10.272	23.296	46.216	2.268	45.739	45.739	0.610	0.844
0.540	0.540	10.730	25.041	46.243	2.334	45.757	45.757	0.625	0.850
0.550	0.550	11.187	26.836	46.271	2.399	45.776	45.776	0.640	0.855
0.560	0.560	11.645	28.680	46.298	2.463	45.795	45.795	0.654	0.861
0.570	0.570	12.103	30.573	46.325	2.526	45.813	45.813	0.669	0.866
0.580	0.580	12.561	32.513	46.353	2.588	45.832	45.832	0.684	0.872
0.590	0.590	13.020	34.501	46.380	2.650	45.851	45.851	0.699	0.877
0.600	0.600	13.478	36.536	46.407	2.711	45.869	45.869	0.714	0.882
0.610	0.610	13.937	38.617	46.435	2.771	45.888	45.888	0.729	0.886
0.620	0.620	14.396	40.744	46.462	2.830	45.907	45.907	0.745	0.891
0.630	0.630	14.855	42.916	46.489	2.889	45.925	45.925	0.760	0.896
0.640	0.640	15.315	45.133	46.517	2.947	45.944	45.944	0.775	0.900
0.650	0.650	15.774	47.394	46.544	3.005	45.963	45.963	0.790	0.904
0.660	0.660	16.234	49.699	46.571	3.061	45.981	45.981	0.806	0.908
0.670	0.670	16.694	52.047	46.599	3.118	46.000	46.000	0.821	0.912
0.680	0.680	17.159	53.720	47.599	3.131	47.000	47.000	0.832	0.913
0.690	0.690	17.634	55.448	48.598	3.144	47.999	47.999	0.844	0.915
0.700	0.700	18.119	57.230	49.598	3.159	48.999	48.999	0.855	0.916
0.710	0.710	18.614	59.069	50.598	3.173	49.998	49.998	0.867	0.917
0.720	0.720	19.119	60.963	51.597	3.189	50.998	50.998	0.878	0.918
0.730	0.730	19.634	62.914	52.597	3.204	51.997	51.997	0.890	0.919
0.740	0.740	20.159	64.923	53.597	3.221	52.997	52.997	0.901	0.921
0.750	0.750	20.694	66.989	54.596	3.237	53.996	53.996	0.913	0.922
0.760	0.760	21.239	69.114	55.596	3.254	54.996	54.996	0.925	0.923
0.770	0.770	21.794	71.298	56.596	3.272	55.995	55.995	0.936	0.925
0.780	0.780	22.358	73.541	57.596	3.289	56.995	56.995	0.948	0.926
0.790	0.790	22.933	75.845	58.595	3.307	57.994	57.994	0.960	0.927
0.800	0.800	23.518	78.209	59.595	3.325	58.994	58.994	0.972	0.929
0.810	0.810	24.113	80.635	60.595	3.344	59.993	59.993	0.984	0.930
0.820	0.820	24.718	83.123	61.594	3.363	60.993	60.993	0.996	0.931

EGL = 0.821
Depth = 0.67
Q = 52.047 cfs

EGL = 0.9
Depth = 0.74
Q = 64.74 cfs

0.830	0.830	25.333	85.674	62.594	3.382	61.992	61.992	1.008	0.933
0.840	0.840	25.958	88.287	63.594	3.401	62.992	62.992	1.020	0.934
0.850	0.850	26.593	90.965	64.593	3.421	63.991	63.991	1.032	0.935
0.860	0.860	27.238	93.707	65.593	3.440	64.991	64.991	1.044	0.937

66ftROW-46ftRoad_S=1.30%

MANNING'S N = 0.017 SLOPE = 0.013 (ft/ft)

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1.0	0.000	0.870	5.000	12.630	0.130	9.000	56.000	0.670
2.0	0.010	0.870	6.000	33.000	0.530	10.000	66.000	0.870
3.0	10.000	0.670	7.000	53.380	0.130			
4.0	10.630	0.000	8.000	55.380	0.000			

WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOPWID	TOPWID	TOTAL	FROUDE
FT.	INC	AREA	RATE	PER	VEL	PLUS	WATER	ENERGY	NO.
		SQ.FT.	(CFS)	(FT)	(FPS)	OBSTRUCTIONS		(FT)	
0.010	0.010	0.002	0.000	0.336	0.286	0.336	0.326	0.011	0.713
0.020	0.020	0.007	0.003	0.671	0.454	0.663	0.653	0.023	0.800
0.030	0.030	0.015	0.009	1.007	0.595	0.989	0.979	0.036	0.856
0.040	0.040	0.026	0.019	1.343	0.721	1.315	1.305	0.048	0.898
0.050	0.050	0.041	0.034	1.678	0.836	1.642	1.632	0.061	0.932
0.060	0.060	0.059	0.055	2.014	0.944	1.968	1.958	0.074	0.961
0.070	0.070	0.080	0.084	2.350	1.047	2.294	2.284	0.087	0.986
0.080	0.080	0.104	0.119	2.686	1.144	2.621	2.611	0.100	1.008
0.090	0.090	0.132	0.164	3.021	1.237	2.947	2.937	0.114	1.028
0.100	0.100	0.163	0.217	3.357	1.327	3.273	3.263	0.127	1.047
0.110	0.110	0.197	0.279	3.693	1.415	3.600	3.590	0.141	1.063
0.120	0.120	0.235	0.352	4.028	1.499	3.926	3.916	0.155	1.079
0.130	0.130	0.276	0.436	4.364	1.581	4.253	4.243	0.169	1.093
0.140	0.140	0.323	0.493	5.410	1.524	5.290	5.280	0.176	1.085
0.150	0.150	0.381	0.576	6.457	1.512	6.327	6.317	0.186	1.085
0.160	0.160	0.450	0.686	7.503	1.526	7.365	7.355	0.196	1.088
0.170	0.170	0.528	0.823	8.549	1.558	8.402	8.392	0.208	1.095
0.180	0.180	0.618	0.988	9.595	1.601	9.440	9.430	0.220	1.103
0.190	0.190	0.717	1.183	10.642	1.650	10.477	10.467	0.232	1.112
0.200	0.200	0.827	1.410	11.688	1.705	11.514	11.504	0.245	1.121
0.210	0.210	0.947	1.669	12.734	1.763	12.552	12.542	0.258	1.131
0.220	0.220	1.078	1.964	13.781	1.823	13.589	13.579	0.272	1.141
0.230	0.230	1.219	2.296	14.827	1.884	14.627	14.617	0.285	1.150
0.240	0.240	1.370	2.667	15.873	1.947	15.664	15.654	0.299	1.160
0.250	0.250	1.532	3.078	16.920	2.009	16.701	16.691	0.313	1.169
0.260	0.260	1.704	3.532	17.966	2.073	17.739	17.729	0.327	1.179
0.270	0.270	1.886	4.029	19.012	2.136	18.776	18.766	0.341	1.188
0.280	0.280	2.079	4.573	20.058	2.199	19.814	19.804	0.355	1.197
0.290	0.290	2.282	5.164	21.105	2.262	20.851	20.841	0.370	1.205
0.300	0.300	2.496	5.804	22.151	2.325	21.888	21.878	0.384	1.214
0.310	0.310	2.720	6.494	23.197	2.388	22.926	22.916	0.399	1.222
0.320	0.320	2.954	7.237	24.244	2.450	23.963	23.953	0.413	1.230
0.330	0.330	3.199	8.034	25.290	2.511	25.001	24.991	0.428	1.238
0.340	0.340	3.454	8.887	26.336	2.573	26.038	26.028	0.443	1.245
0.350	0.350	3.720	9.796	27.383	2.634	27.075	27.065	0.458	1.252

0.360	0.360	3.995	10.764	28.429	2.694	28.113	28.103	0.473	1.260
0.370	0.370	4.282	11.792	29.475	2.754	29.150	29.140	0.488	1.267
0.380	0.380	4.578	12.882	30.521	2.814	30.188	30.178	0.503	1.274
0.390	0.390	4.885	14.034	31.568	2.873	31.225	31.215	0.518	1.280
0.400	0.400	5.203	15.251	32.614	2.931	32.263	32.253	0.534	1.287
0.410	0.410	5.530	16.534	33.660	2.990	33.300	33.290	0.549	1.293
0.420	0.420	5.868	17.884	34.707	3.048	34.337	34.327	0.564	1.299
0.430	0.430	6.217	19.303	35.753	3.105	35.375	35.365	0.580	1.306
0.440	0.440	6.576	20.791	36.799	3.162	36.412	36.402	0.595	1.312
0.450	0.450	6.945	22.352	37.846	3.218	37.450	37.440	0.611	1.317
0.460	0.460	7.324	23.985	38.892	3.275	38.487	38.477	0.627	1.323
0.470	0.470	7.714	25.692	39.938	3.330	39.524	39.514	0.643	1.329
0.480	0.480	8.115	27.474	40.984	3.386	40.562	40.552	0.658	1.334
WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOPWID	TOPWID	TOTAL	FROUDE
FT.	INC	AREA	RATE	PER	VEL	PLUS	WATER	ENERGY	NO.
		SQ.FT.	(CFS)	(FT)	(FPS)	OBSTRUCTIONS		(FT)	
0.490	0.490	8.525	29.333	42.031	3.441	41.599	41.589	0.674	1.340
0.500	0.500	8.947	31.271	43.077	3.495	42.637	42.627	0.690	1.345
0.510	0.510	9.378	33.287	44.123	3.550	43.674	43.664	0.706	1.350
0.520	0.520	9.820	35.385	45.170	3.603	44.711	44.701	0.722	1.355
0.530	0.530	10.272	37.564	46.216	3.657	45.749	45.739	0.738	1.360
0.540	0.540	10.730	40.378	46.243	3.763	45.767	45.757	0.760	1.370
0.550	0.550	11.187	43.272	46.271	3.868	45.786	45.776	0.783	1.379
0.560	0.560	11.645	46.245	46.298	3.971	45.805	45.795	0.805	1.388
0.570	0.570	12.103	49.297	46.325	4.073	45.823	45.813	0.828	1.397
0.580	0.580	12.561	52.426	46.353	4.174	45.842	45.832	0.851	1.405
0.590	0.590	13.020	55.632	46.380	4.273	45.861	45.851	0.874	1.414
0.600	0.600	13.478	58.913	46.407	4.371	45.879	45.869	0.897	1.422
0.610	0.610	13.937	62.268	46.435	4.468	45.898	45.888	0.920	1.429
0.620	0.620	14.396	65.698	46.462	4.564	45.917	45.907	0.944	1.437
0.630	0.630	14.855	69.200	46.489	4.658	45.935	45.925	0.968	1.444
0.640	0.640	15.315	72.774	46.517	4.752	45.954	45.944	0.991	1.451
0.650	0.650	15.774	76.420	46.544	4.845	45.973	45.963	1.015	1.458
0.660	0.660	16.234	80.137	46.571	4.936	45.991	45.981	1.039	1.465
0.670	0.670	16.694	83.923	46.599	5.027	46.010	46.000	1.063	1.471
0.680	0.680	17.159	86.621	47.599	5.048	47.010	47.000	1.076	1.473
0.690	0.690	17.634	89.406	48.598	5.070	48.009	47.999	1.090	1.475
0.700	0.700	18.119	92.281	49.598	5.093	49.009	48.999	1.103	1.477
0.710	0.710	18.614	95.245	50.598	5.117	50.008	49.998	1.117	1.478
0.720	0.720	19.119	98.300	51.597	5.142	51.008	50.998	1.131	1.480
0.730	0.730	19.634	101.446	52.597	5.167	52.007	51.997	1.145	1.482
0.740	0.740	20.159	104.685	53.597	5.193	53.007	52.997	1.159	1.484
0.750	0.750	20.694	108.017	54.596	5.220	54.006	53.996	1.174	1.487
0.760	0.760	21.239	111.443	55.596	5.247	55.006	54.996	1.188	1.489
0.770	0.770	21.794	114.964	56.596	5.275	56.005	55.995	1.203	1.491
0.780	0.780	22.358	118.582	57.596	5.304	57.005	56.995	1.218	1.493
0.790	0.790	22.933	122.296	58.595	5.333	58.004	57.994	1.232	1.495
0.800	0.800	23.518	126.109	59.595	5.362	59.004	58.994	1.247	1.497
0.810	0.810	24.113	130.021	60.595	5.392	60.003	59.993	1.262	1.499

EGL = 0.9
Depth = 0.601
Q =59.35 cfs

0.820	0.820	24.718	134.032	61.594	5.422	61.003	60.993	1.277	1.502
0.830	0.830	25.333	138.145	62.594	5.453	62.002	61.992	1.293	1.504
0.840	0.840	25.958	142.359	63.594	5.484	63.002	62.992	1.308	1.506
0.850	0.850	26.593	146.676	64.593	5.516	64.001	63.991	1.323	1.508
0.860	0.860	27.238	151.098	65.593	5.547	65.001	64.991	1.339	1.511

66ftROW-46ftRoad_S=2.50%

MANNING'S N = 0.017 SLOPE = 0.025

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1.0	0.0	0.9	4.0	12.6	0.1	7.0	55.4	0.0
2.0	10.0	0.7	5.0	33.0	0.5	8.0	56.0	0.7
3.0	10.6	0.0	6.0	53.4	0.1	9.0	66.0	0.9

WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOPWID	TOPWID	TOTAL	FROUDE
FT.	INC	AREA	RATE	PER	VEL	PLUS	WATER	ENERGY	NO.
		SQ. FT.	(CFS)	(FT)	(FPS)	OBSTRUCTIONS		(FT)	
0.010	0.010	0.002	0.001	0.336	0.397	0.326	0.326	0.012	0.989
0.020	0.020	0.007	0.004	0.671	0.630	0.653	0.653	0.026	1.110
0.030	0.030	0.015	0.012	1.007	0.825	0.979	0.979	0.041	1.187
0.040	0.040	0.026	0.026	1.343	0.999	1.305	1.305	0.056	1.246
0.050	0.050	0.041	0.047	1.678	1.160	1.632	1.632	0.071	1.293
0.060	0.060	0.059	0.077	2.014	1.310	1.958	1.958	0.087	1.333
0.070	0.070	0.080	0.116	2.350	1.451	2.284	2.284	0.103	1.368
0.080	0.080	0.104	0.166	2.686	1.586	2.611	2.611	0.119	1.398
0.090	0.090	0.132	0.227	3.021	1.716	2.937	2.937	0.136	1.426
0.100	0.100	0.163	0.300	3.357	1.841	3.263	3.263	0.153	1.451
0.110	0.110	0.197	0.387	3.693	1.962	3.590	3.590	0.170	1.475
0.120	0.120	0.235	0.488	4.028	2.079	3.916	3.916	0.187	1.496
0.130	0.130	0.276	0.605	4.364	2.193	4.243	4.243	0.205	1.516
0.140	0.140	0.323	0.683	5.410	2.113	5.280	5.280	0.209	1.505
0.150	0.150	0.381	0.799	6.457	2.096	6.317	6.317	0.218	1.504
0.160	0.160	0.450	0.952	7.503	2.117	7.355	7.355	0.230	1.509
0.170	0.170	0.528	1.142	8.549	2.161	8.392	8.392	0.243	1.518
0.180	0.180	0.618	1.371	9.595	2.220	9.430	9.430	0.257	1.529
0.190	0.190	0.717	1.641	10.642	2.289	10.467	10.467	0.271	1.542
0.200	0.200	0.827	1.955	11.688	2.364	11.504	11.504	0.287	1.555
0.210	0.210	0.947	2.315	12.734	2.444	12.542	12.542	0.303	1.568
0.220	0.220	1.078	2.724	13.781	2.528	13.579	13.579	0.319	1.582
0.230	0.230	1.219	3.184	14.827	2.613	14.617	14.617	0.336	1.595
0.240	0.240	1.370	3.698	15.873	2.699	15.654	15.654	0.353	1.609
0.250	0.250	1.532	4.269	16.920	2.787	16.691	16.691	0.371	1.622
0.260	0.260	1.704	4.898	17.966	2.874	17.729	17.729	0.389	1.635
0.270	0.270	1.886	5.588	19.012	2.962	18.766	18.766	0.406	1.647
0.280	0.280	2.079	6.341	20.058	3.050	19.804	19.804	0.425	1.659
0.290	0.290	2.282	7.161	21.105	3.137	20.841	20.841	0.443	1.671
0.300	0.300	2.496	8.048	22.151	3.224	21.878	21.878	0.462	1.683
0.310	0.310	2.720	9.006	23.197	3.311	22.916	22.916	0.481	1.694
0.320	0.320	2.954	10.036	24.244	3.397	23.953	23.953	0.500	1.705
0.330	0.330	3.199	11.142	25.290	3.483	24.991	24.991	0.519	1.716
0.340	0.340	3.454	12.324	26.336	3.568	26.028	26.028	0.538	1.727
0.350	0.350	3.720	13.585	27.383	3.652	27.065	27.065	0.557	1.737
0.360	0.360	3.995	14.927	28.429	3.736	28.103	28.103	0.577	1.747

0.370	0.370	4.282	16.353	29.475	3.819	29.140	29.140	0.597	1.757
0.380	0.380	4.578	17.864	30.521	3.902	30.178	30.178	0.617	1.766
0.390	0.390	4.885	19.462	31.568	3.984	31.215	31.215	0.637	1.775
0.400	0.400	5.203	21.150	32.614	4.065	32.253	32.253	0.657	1.784
0.410	0.410	5.530	22.929	33.660	4.146	33.290	33.290	0.677	1.793
0.420	0.420	5.868	24.801	34.707	4.226	34.327	34.327	0.698	1.802
0.430	0.430	6.217	26.768	35.753	4.306	35.365	35.365	0.718	1.810
0.440	0.440	6.576	28.833	36.799	4.385	36.402	36.402	0.739	1.819
0.450	0.450	6.945	30.996	37.846	4.463	37.440	37.440	0.760	1.827
0.460	0.460	7.324	33.261	38.892	4.541	38.477	38.477	0.781	1.835
0.470	0.470	7.714	35.628	39.938	4.618	39.514	39.514	0.802	1.843
0.480	0.480	8.115	38.100	40.984	4.695	40.552	40.552	0.823	1.850
0.490	0.490	8.525	40.678	42.031	4.771	41.589	41.589	0.844	1.858
WSEL	DEPTH	FLOW	FLOW	WETTED	FLOW	TOPWID	TOPWID	TOTAL	FROUDE
	INC	AREA	RATE	PER	VEL	PLUS	WATER	ENERGY	NO.
FT.		SQ.FT.	(CFS)	(FT)	(FPS)	OBSTRUCTIONS		(FT)	
0.500	0.500	8.947	43.365	43.077	4.847	42.627	42.627	0.865	1.865
0.510	0.510	9.378	46.161	44.123	4.922	43.664	43.664	0.887	1.873
0.520	0.520	9.820	49.070	45.170	4.997	44.701	44.701	0.908	1.880
0.530	0.530	10.272	52.092	46.216	5.071	45.739	45.739	0.930	1.887
0.540	0.540	10.730	55.994	46.243	5.219	45.757	45.757	0.964	1.900
0.550	0.550	11.187	60.007	46.271	5.364	45.776	45.776	0.998	1.913
0.560	0.560	11.645	64.131	46.298	5.507	45.795	45.795	1.032	1.925
0.570	0.570	12.103	68.363	46.325	5.648	45.813	45.813	1.066	1.937
0.580	0.580	12.561	72.702	46.353	5.788	45.832	45.832	1.101	1.949
0.590	0.590	13.020	77.148	46.380	5.925	45.851	45.851	1.136	1.960
0.600	0.600	13.478	81.697	46.407	6.061	45.869	45.869	1.171	1.971
0.610	0.610	13.937	86.351	46.435	6.196	45.888	45.888	1.207	1.982
0.620	0.620	14.396	91.106	46.462	6.329	45.907	45.907	1.243	1.992
0.630	0.630	14.855	95.963	46.489	6.460	45.925	45.925	1.279	2.002
0.640	0.640	15.315	100.920	46.517	6.590	45.944	45.944	1.315	2.012
0.650	0.650	15.774	105.975	46.544	6.718	45.963	45.963	1.352	2.022
0.660	0.660	16.234	111.129	46.571	6.846	45.981	45.981	1.389	2.031
0.670	0.670	16.694	116.380	46.599	6.971	46.000	46.000	1.426	2.040
0.680	0.680	17.159	120.121	47.599	7.001	47.000	47.000	1.442	2.043
0.690	0.690	17.634	123.984	48.598	7.031	47.999	47.999	1.459	2.045
0.700	0.700	18.119	127.971	49.598	7.063	48.999	48.999	1.476	2.048
0.710	0.710	18.614	132.081	50.598	7.096	49.998	49.998	1.493	2.050
0.720	0.720	19.119	136.318	51.597	7.130	50.998	50.998	1.511	2.053
0.730	0.730	19.634	140.681	52.597	7.165	51.997	51.997	1.529	2.056
0.740	0.740	20.159	145.172	53.597	7.201	52.997	52.997	1.547	2.059
0.750	0.750	20.694	149.793	54.596	7.239	53.996	53.996	1.565	2.061
0.760	0.760	21.239	154.544	55.596	7.277	54.996	54.996	1.584	2.064
0.770	0.770	21.794	159.427	56.596	7.315	55.995	55.995	1.602	2.067
0.780	0.780	22.358	164.444	57.596	7.355	56.995	56.995	1.621	2.070
0.790	0.790	22.933	169.595	58.595	7.395	57.994	57.994	1.641	2.073
0.800	0.800	23.518	174.882	59.595	7.436	58.994	58.994	1.660	2.076
0.810	0.810	24.113	180.306	60.595	7.477	59.993	59.993	1.680	2.079
0.820	0.820	24.718	185.869	61.594	7.520	60.993	60.993	1.699	2.082

EGL = 0.9
Depth = 0.516
Q = 47.96 cfs

0.830	0.830	25.333	191.572	62.594	7.562	61.992	61.992	1.719	2.086
0.840	0.840	25.958	197.416	63.594	7.605	62.992	62.992	1.740	2.089
0.850	0.850	26.593	203.403	64.593	7.649	63.991	63.991	1.760	2.092
0.860	0.860	27.238	209.535	65.593	7.693	64.991	64.991	1.780	2.095

APPENDIX C: STORM DRAIN PIPE ANALYSIS

STORM DRAIN PIPE TABLE				
PIPE #	Size in.	Slope	Capacity1 cfs	ACTUAL FLOW cfs
ONSITE				
SDP1	18	1.00%	10.5	9.0
SDP2	18	1.00%	10.5	9.0
SDP3	24	2.00%	32.0	18.0
SDP4	24	2.00%	31.99	18.00
SDP5	24	2.00%	31.99	18.00
SDP6	18	1.00%	10.50	7.50
SDP7	18	1.00%	10.50	7.50
SDP8	36	0.50%	47.16	33.00
SDP9	36	0.50%	47.16	33.00
SDP10	36	0.50%	47.16	33.00
SDP11	36	0.50%	47.16	33.00
SDP12	60	0.50%	184.16	162.00
SDP13	66	0.50%	237.45	184.95
SDP14	66	0.50%	237.45	217.95
SDP15	72	0.50%	299.47	240.90
SDP16	72	0.50%	299.47	306.10
SDP17	18	1.00%	10.50	7.80
SDP18	18	1.00%	10.50	7.80
SDP19	24	0.50%	16.00	15.60
SDP20	24	0.50%	16.00	15.60
SDP21	24	0.50%	16.00	15.60
SDP22	24	0.50%	16.00	15.60
SDP23	18	1.50%	12.87	11.90
SDP24	18	1.50%	12.87	11.90
SDP25	36	0.50%	47.16	39.40
SDP26	36	0.50%	47.16	39.40
SDP27	36	0.50%	47.16	39.40
SDP28	36	0.50%	47.16	39.40
SDP29	36	0.50%	47.16	39.40
SDP30	36	0.50%	47.16	39.40
SDP31	36	0.50%	47.16	39.40
SDP32	24	1.00%	22.62	19.55
SDP33	36	1.00%	66.70	58.95
SDP34	36	2.00%	94.33	78.50
SDP35	42	0.50%	71.14	67.20
SDP36	48	0.50%	101.57	67.20
SDP37	48	0.50%	101.57	67.20
SDP38	48	1.00%	143.64	67.20

1- Capacity Based on Manning's Eq w/ n=0.013

APPENDIX D: SWALE AND CULVERT ANALYSIS

Channel Report

Swale -1

Trapezoidal

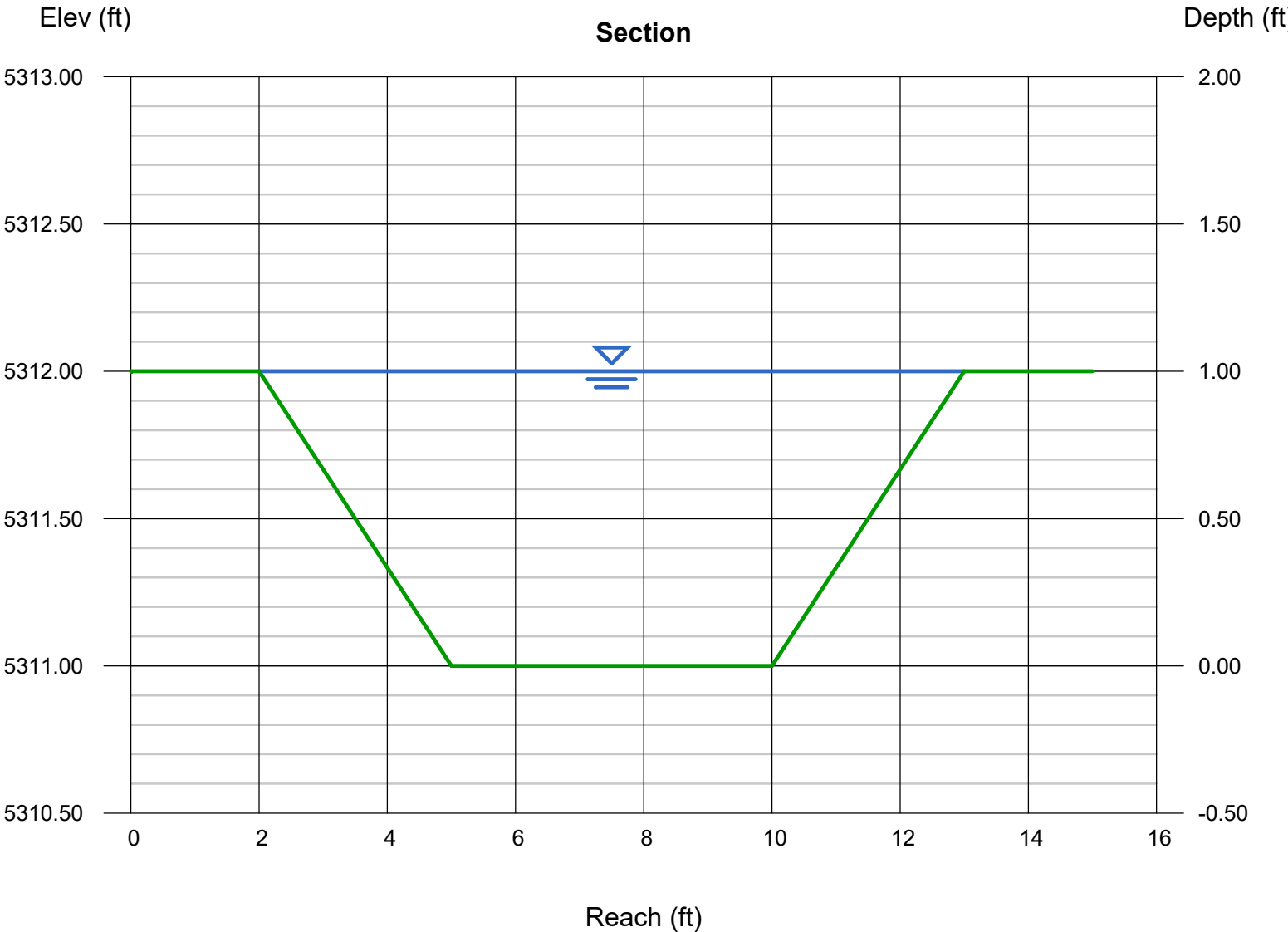
Bottom Width (ft) = 5.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 1.00
Invert Elev (ft) = 5311.00
Slope (%) = 0.70
N-Value = 0.035

Highlighted

Depth (ft) = 1.00
Q (cfs) = 22.54
Area (sqft) = 8.00
Velocity (ft/s) = 2.82
Wetted Perim (ft) = 11.32
Crit Depth, Yc (ft) = 0.74
Top Width (ft) = 11.00
EGL (ft) = 1.12

Calculations

Compute by: Q vs Depth
No. Increments = 10



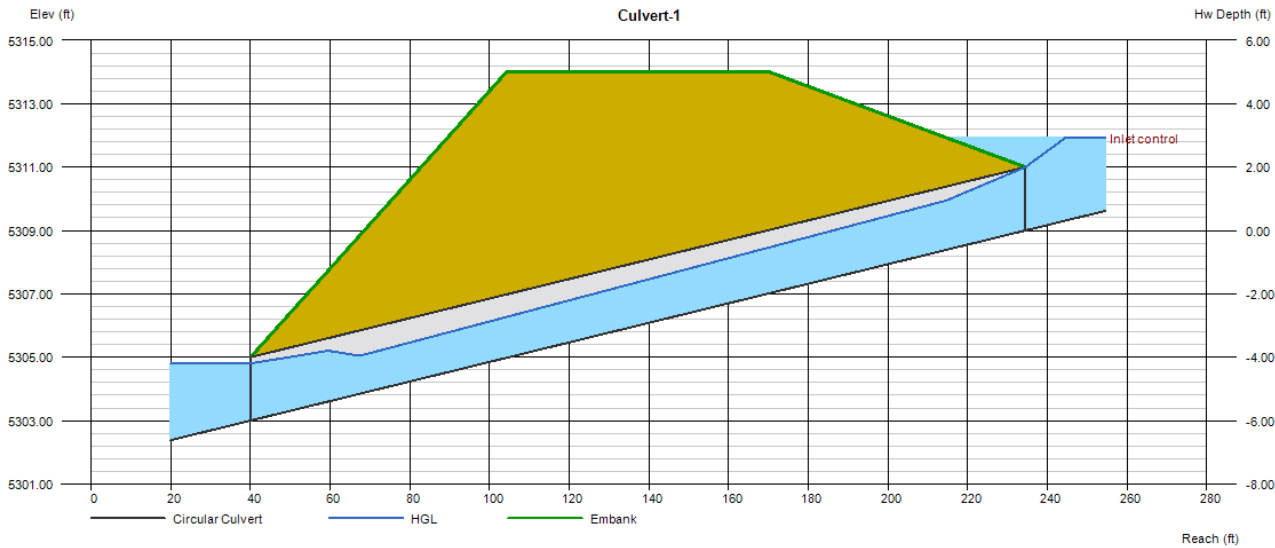
Culvert Report

Culvert-1

Invert Elev Dn (ft)	= 5303.00
Pipe Length (ft)	= 194.50
Slope (%)	= 3.08
Invert Elev Up (ft)	= 5309.00
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment	
Top Elevation (ft)	= 5314.00
Top Width (ft)	= 66.00
Crest Width (ft)	= 180.00

Calculations	
Qmin (cfs)	= 0.00
Qmax (cfs)	= 50.00
Tailwater Elev (ft)	= (dc+D)/2
Highlighted	
Qtotal (cfs)	= 20.00
Qpipe (cfs)	= 20.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 6.71
Veloc Up (ft/s)	= 7.40
HGL Dn (ft)	= 5304.80
HGL Up (ft)	= 5310.61
Hw Elev (ft)	= 5311.92
Hw/D (ft)	= 1.46
Flow Regime	= Inlet Control



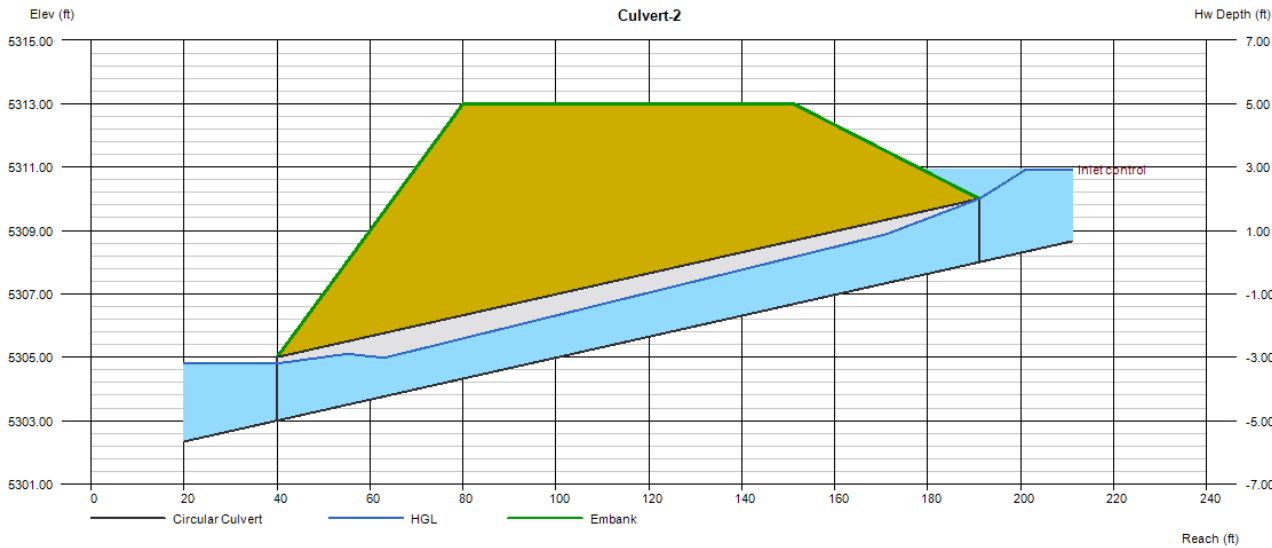
Culvert Report

Culvert-2

Invert Elev Dn (ft)	= 5303.00
Pipe Length (ft)	= 151.08
Slope (%)	= 3.31
Invert Elev Up (ft)	= 5308.00
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment	
Top Elevation (ft)	= 5313.00
Top Width (ft)	= 71.00
Crest Width (ft)	= 180.00

Calculations	
Qmin (cfs)	= 0.00
Qmax (cfs)	= 50.00
Tailwater Elev (ft)	= (dc+D)/2
Highlighted	
Qtotal (cfs)	= 20.00
Qpipe (cfs)	= 20.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 6.71
Veloc Up (ft/s)	= 7.40
HGL Dn (ft)	= 5304.80
HGL Up (ft)	= 5309.61
Hw Elev (ft)	= 5310.92
Hw/D (ft)	= 1.46
Flow Regime	= Inlet Control



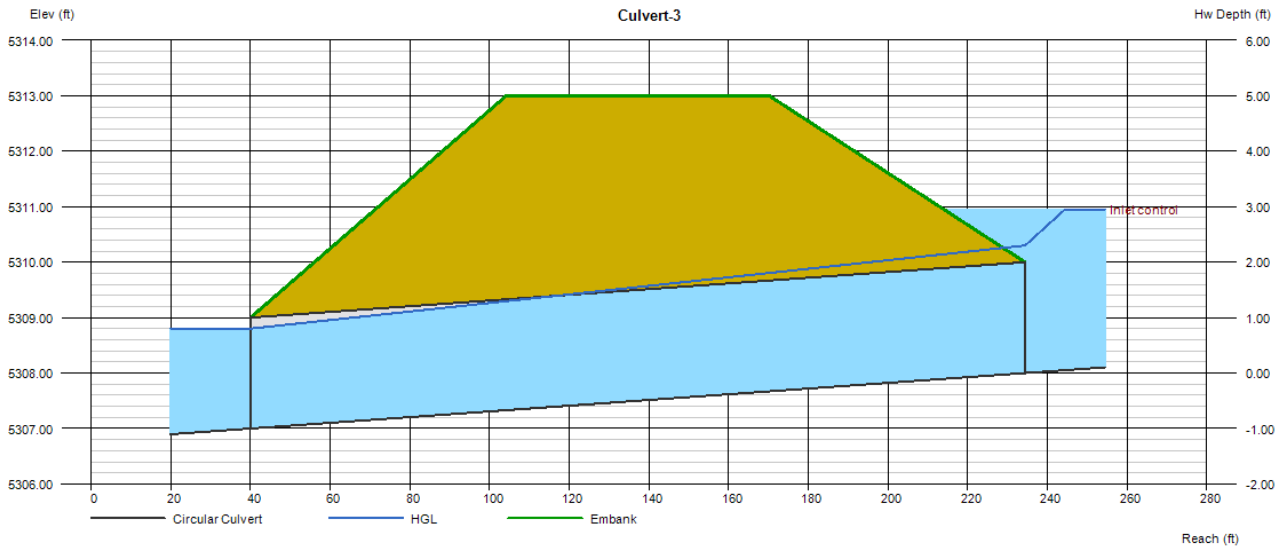
Culvert Report

Culvert-3

Invert Elev Dn (ft)	= 5307.00
Pipe Length (ft)	= 194.40
Slope (%)	= 0.51
Invert Elev Up (ft)	= 5308.00
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment	
Top Elevation (ft)	= 5313.00
Top Width (ft)	= 66.00
Crest Width (ft)	= 180.00

Calculations	
Qmin (cfs)	= 0.00
Qmax (cfs)	= 50.00
Tailwater Elev (ft)	= (dc+D)/2
Highlighted	
Qtotal (cfs)	= 20.00
Qpipe (cfs)	= 20.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 6.71
Veloc Up (ft/s)	= 6.37
HGL Dn (ft)	= 5308.80
HGL Up (ft)	= 5310.30
Hw Elev (ft)	= 5310.95
Hw/D (ft)	= 1.47
Flow Regime	= Inlet Control



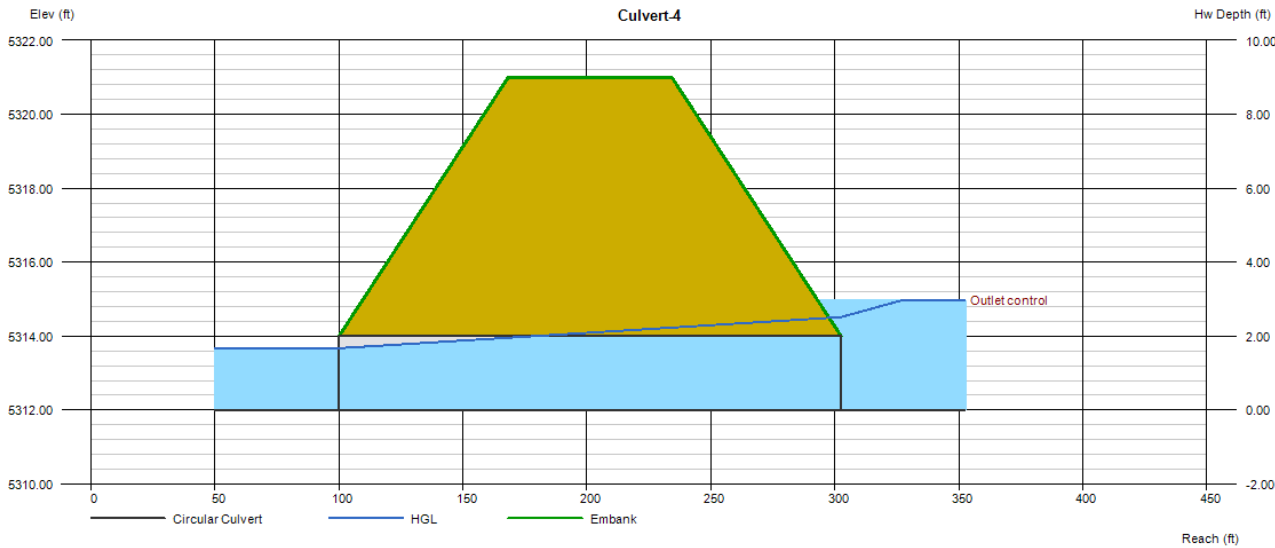
Culvert Report

Culvert-4

Invert Elev Dn (ft)	= 5312.00
Pipe Length (ft)	= 202.51
Slope (%)	= 0.00
Invert Elev Up (ft)	= 5312.00
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment	
Top Elevation (ft)	= 5321.00
Top Width (ft)	= 66.00
Crest Width (ft)	= 250.00

Calculations	
Qmin (cfs)	= 0.00
Qmax (cfs)	= 50.00
Tailwater Elev (ft)	= (dc+D)/2
Highlighted	
Qtotal (cfs)	= 14.00
Qpipe (cfs)	= 14.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 4.99
Veloc Up (ft/s)	= 4.46
HGL Dn (ft)	= 5313.67
HGL Up (ft)	= 5314.51
Hw Elev (ft)	= 5314.98
Hw/D (ft)	= 1.49
Flow Regime	= Outlet Control



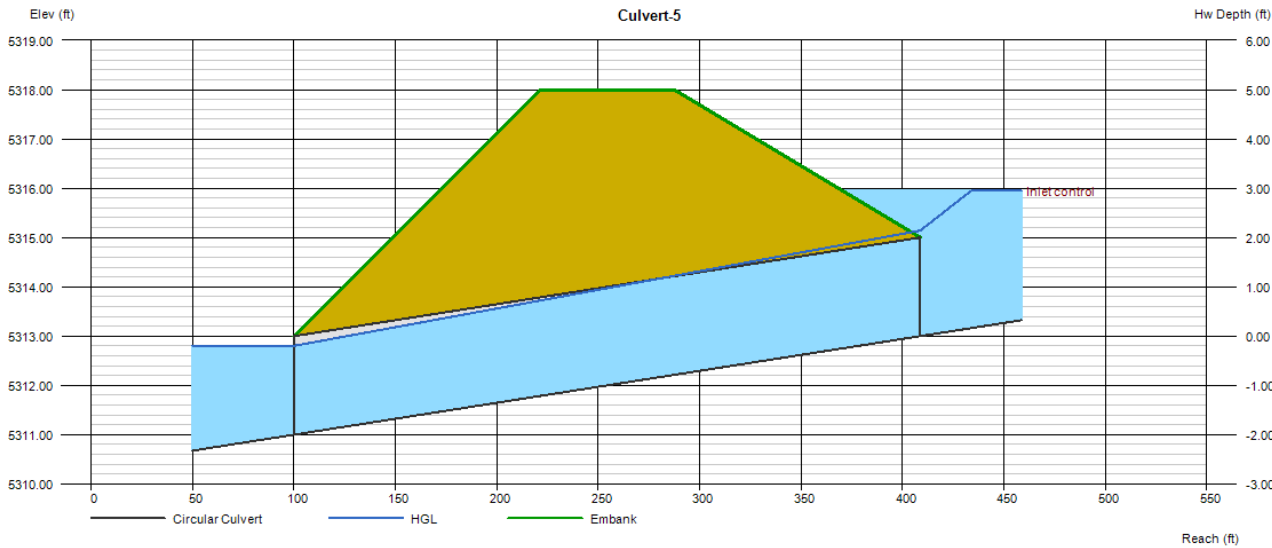
Culvert Report

Culvert-5

Invert Elev Dn (ft)	= 5311.00
Pipe Length (ft)	= 308.79
Slope (%)	= 0.65
Invert Elev Up (ft)	= 5313.00
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment	
Top Elevation (ft)	= 5318.00
Top Width (ft)	= 66.00
Crest Width (ft)	= 250.00

Calculations	
Qmin (cfs)	= 0.00
Qmax (cfs)	= 50.00
Tailwater Elev (ft)	= (dc+D)/2
Highlighted	
Qtotal (cfs)	= 20.00
Qpipe (cfs)	= 20.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 6.71
Veloc Up (ft/s)	= 6.37
HGL Dn (ft)	= 5312.80
HGL Up (ft)	= 5315.14
Hw Elev (ft)	= 5315.95
Hw/D (ft)	= 1.47
Flow Regime	= Inlet Control



APPENDIX E: POND VOLUME

Pond 1
Project:
Basin Description:

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)
5,301.000	34,448.46	N/A	N/A	0.00	N/A	0.00
5,302.000	41,735.95	1.000	38092.20	38092.20	38033.98	38033.98
5,303.000	49,179.15	1.000	45457.55	83549.76	45406.68	83440.67
5,304.000	56,778.07	1.000	52978.61	136528.37	52933.14	136373.80
5,305.000	64,538.00	1.000	60658.04	197186.40	60616.63	196990.44

Pond 2A
Project:
Basin Description:

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)
5,301.000	33,570.44	N/A	N/A	0.00	N/A	0.00
5,302.000	39,682.33	1.000	36626.38	36626.38	36583.81	36583.81
5,303.000	45,948.46	1.000	42815.39	79441.78	42777.13	79360.95
5,304.000	52,374.94	1.000	49161.70	128603.48	49126.66	128487.61
5,305.000	58,958.00	1.000	55666.47	184269.95	55634.01	184121.61

Pond 2B
Project:
Basin Description:

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)
5,301.000	22,397.22	N/A	N/A	0.00	N/A	0.00
5,302.000	26,680.48	1.000	24538.85	24538.85	24507.64	24507.64
5,303.000	31,117.98	1.000	28899.23	53438.08	28870.80	53378.44
5,304.000	35,715.83	1.000	33416.90	86854.98	33390.51	86768.95
5,305.000	40,470.25	1.000	38093.04	124948.02	38068.29	124837.23

Project: Artiste Master Drainage
Basin Description: Pond-3 Stage Storage (side slope 5:1, tie back 3:1)

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)
5,300.000	145,023.22	N/A	N/A	0.00	N/A	0.00
5,301.000	158,351.55	1.000	151687.39	151687.39	151638.57	151638.57
5,302.000	171,836.58	1.000	165094.07	316781.45	165048.15	316686.72
5,303.000	185,478.31	1.000	178657.45	495438.90	178614.03	495300.75
5,304.000	199,276.74	1.000	192377.52	687816.42	192336.27	687637.02
5,305.000	213,231.87	1.000	206254.30	894070.73	206214.95	893851.97
5,306.000	227,343.70	1.000	220287.79	1114358.51	220250.11	1114102.08
5,307.000	241,612.23	1.000	234477.97	1348836.48	234441.78	1348543.86
5,308.000	256,037.46	1.000	248824.85	1597661.33	248790.00	1597333.86

Project: Artiste Master Drainage
Basin Description: Pond-4 Stage Storage (side slope 5:1, tie back 3:1)

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)
5,314.000	122,516.94	N/A	N/A	0.00	N/A	0.00
5,315.000	132,057.66	1.000	127287.30	127287.30	127257.49	127257.49
5,316.000	141,753.92	1.000	136905.79	264193.09	136877.17	264134.66

Project: Artiste Master Drainage
Basin Description: Pond-5 Stage Storage (side slope 5:1, tie back 3:1)

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)
5,312.000	103,327.73	N/A	N/A	0.00	N/A	0.00
5,313.000	111,195.18	1.000	107261.45	107261.45	107237.40	107237.40

Existing Pond 1 Stage Storage
Project: Master Drainage
Basin Description:

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)
5,303.000	27,923.92	N/A	N/A	0.00	N/A	0.00
5,304.000	41,096.21	1.000	34510.07	34510.07	34298.63	34298.63
5,305.000	48,680.57	1.000	44888.39	79398.45	44834.90	79133.53
5,306.000	54,103.90	1.000	51392.24	130790.69	51368.37	130501.90
5,307.000	58,852.59	1.000	56478.25	187268.94	56461.60	186963.51
5,308.000	63,418.04	1.000	61135.31	248404.25	61121.10	248084.61
5,309.000	68,088.39	1.000	65753.21	314157.46	65739.39	313824.00
5,310.000	72,953.24	1.000	70520.81	384678.27	70506.82	384330.82

Project: Artiste Master Drainage
Basin Description: Future Park (side slope 10:1)

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)
5,303.000	713,759.35	N/A	N/A	0.00	N/A	0.00
5,304.000	745,584.48	1.000	729671.92	729671.92	729614.07	729614.07
5,305.000	778,038.79	1.000	761811.64	1491483.55	761754.02	1491368.10
5,306.000	811,122.27	1.000	794580.53	2286064.08	794523.13	2285891.22
5,307.000	844,834.91	1.000	827978.59	3114042.67	827921.39	3113812.61
5,308.000	879,176.73	1.000	862005.82	3976048.49	861948.81	3975761.42
5,309.000	914,147.71	1.000	896662.22	4872710.71	896605.39	4872366.81
5,310.000	949,747.87	1.000	931947.79	5804658.50	931891.12	5804257.93

EXHIBITS

EXHIBIT A: SITE LOCATION EXHIBIT

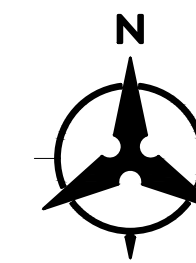
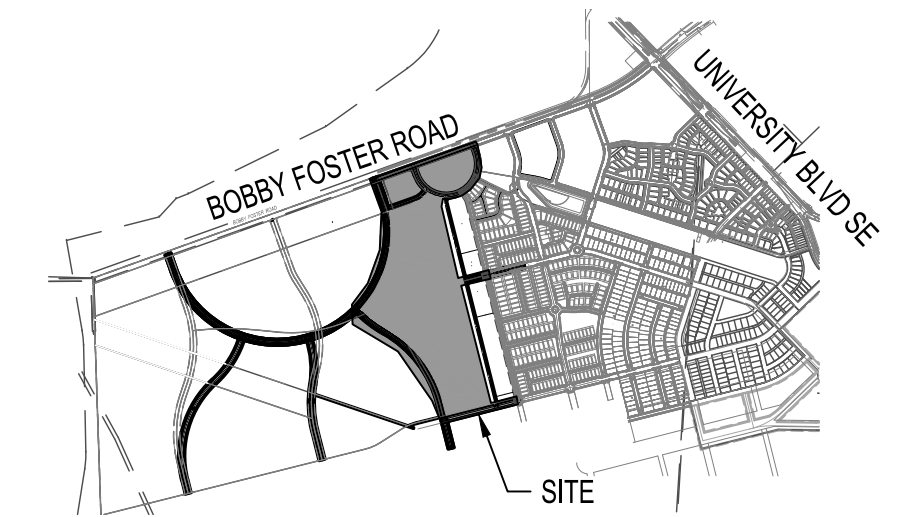
EXHIBIT B: EXISTING CONDITIONS BASIN MAP

**EXHIBIT C: PROPOSED CONDITIONS BASIN
MAP**

EXHIBIT D: STORM DRAIN AND POND EXHIBIT

EXHIBIT A:
SITE LOCATION EXHIBIT

SITE LOCATION EXHIBIT
ARTISTE SUBDIVISION
JULY 2024



LOCATION MAP
SCALE: 1" = 2000'

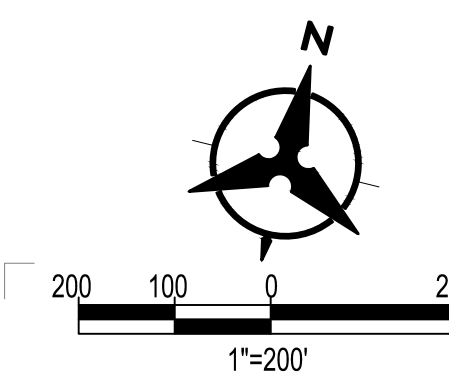
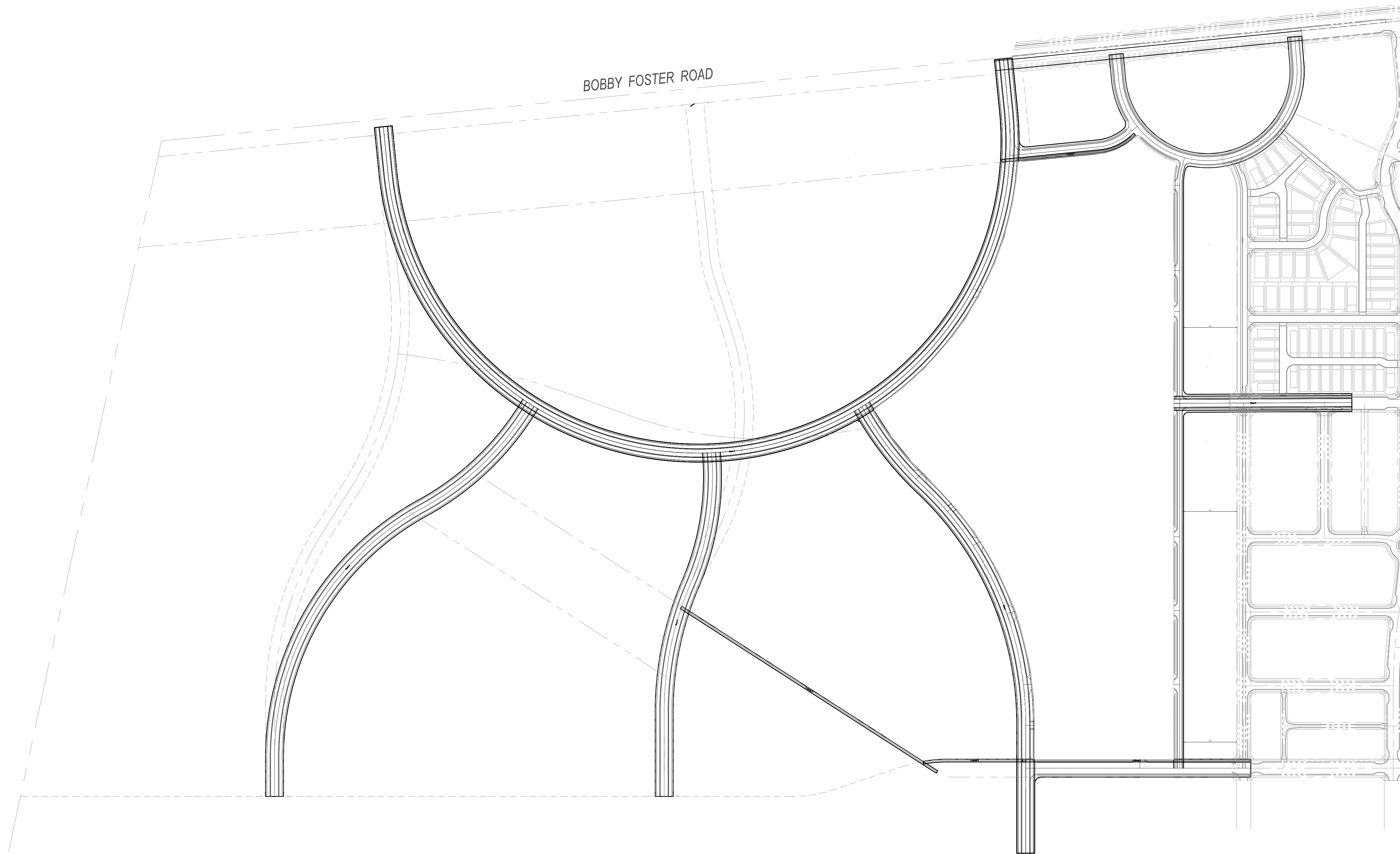
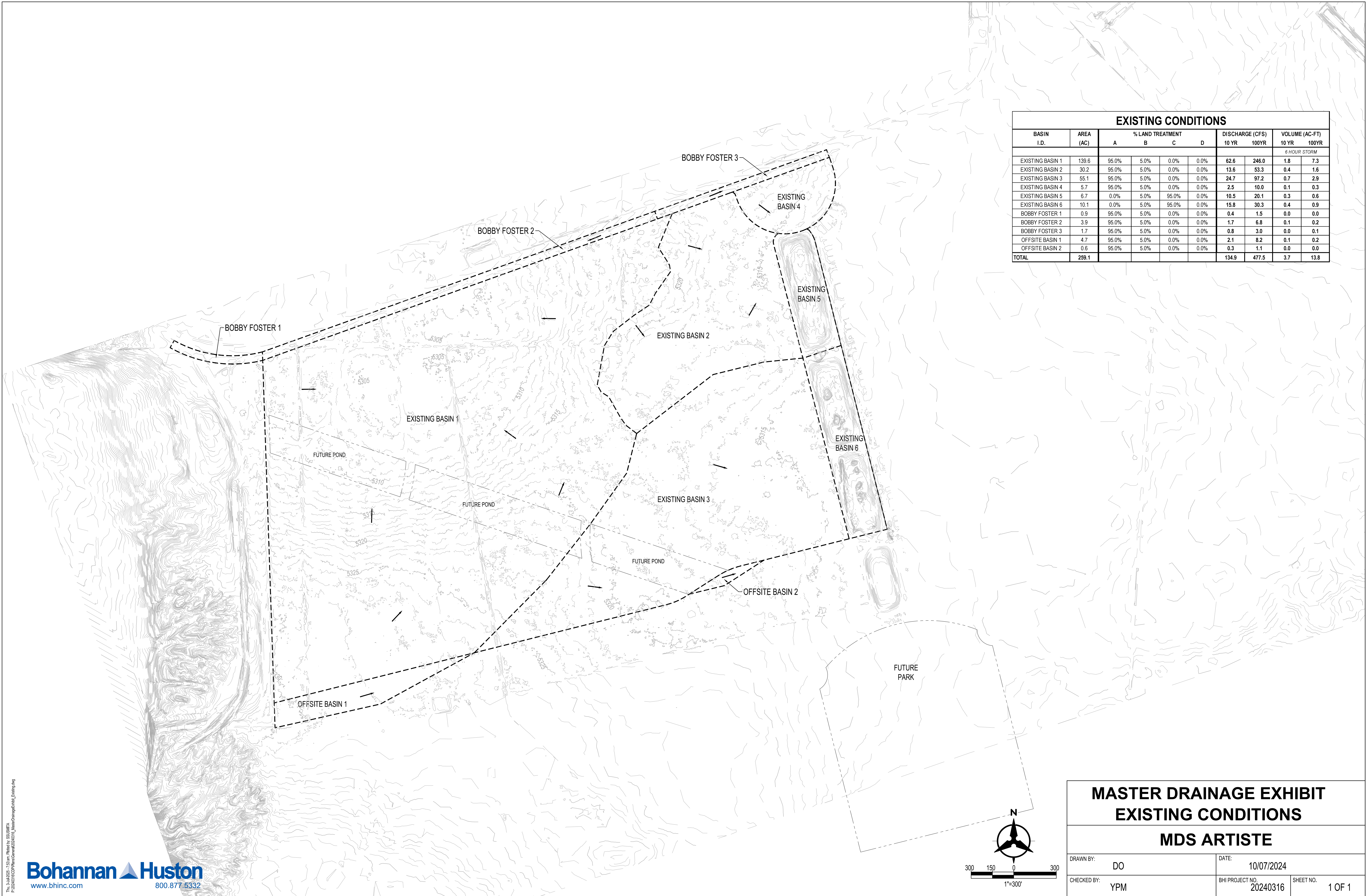


EXHIBIT B:
EXISTING CONDITIONS BASIN MAP

Thu, 3/4/2025 - 7:33am, Plotted by: SUB90MTA
P:\2024\20240316\Bhannan\20240316_MasterDrainageExhibit_Existing.dwg



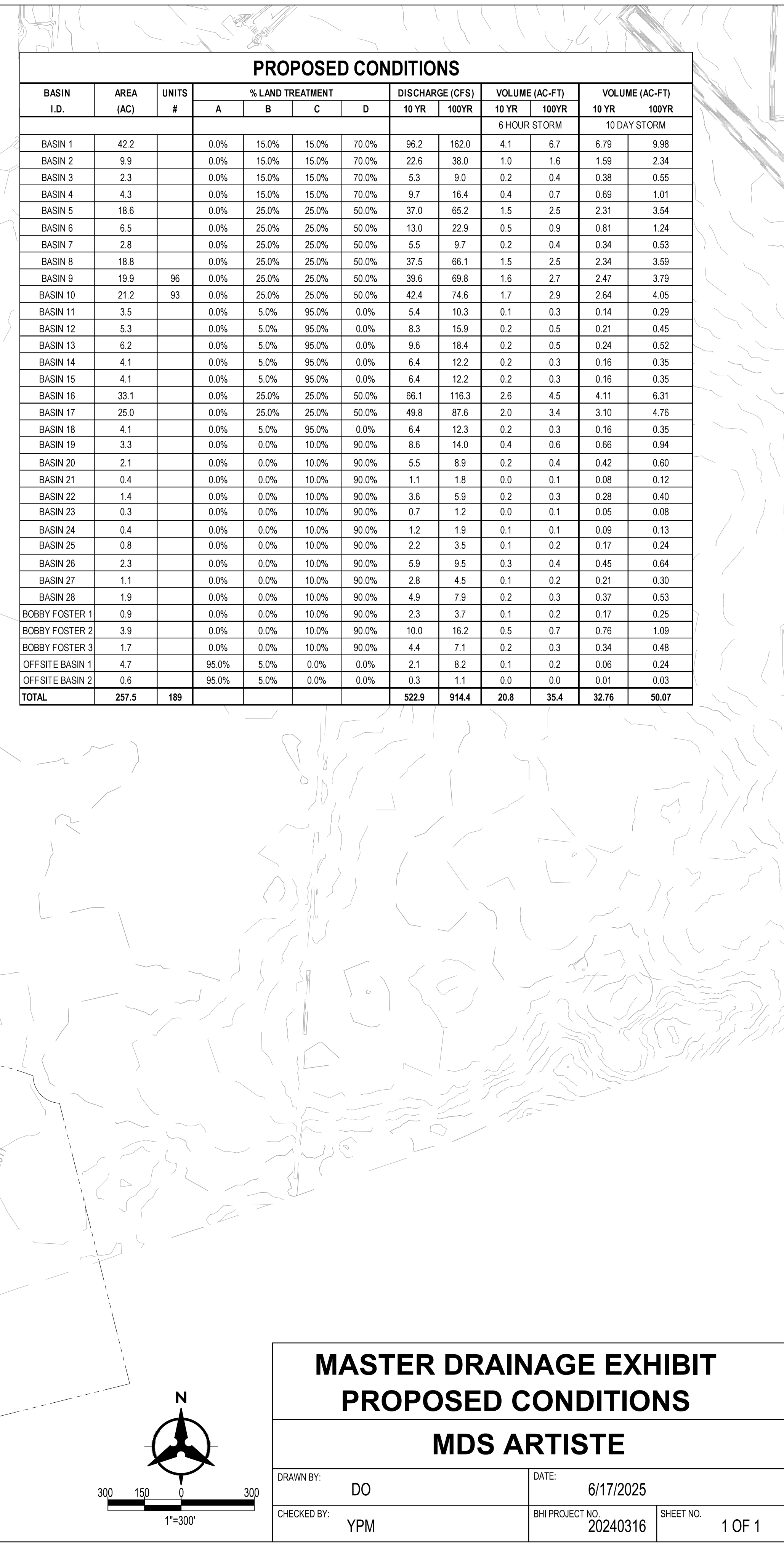
EXISTING CONDITIONS									
BASIN I.D.	AREA (AC)	% LAND TREATMENT				DISCHARGE (CFS)		VOLUME (AC-FT)	
		A	B	C	D	10 YR	100YR	10 YR	100YR
								6 HOUR STORM	
EXISTING BASIN 1	139.6	95.0%	5.0%	0.0%	0.0%	62.6	246.0	1.8	7.3
EXISTING BASIN 2	30.2	95.0%	5.0%	0.0%	0.0%	13.6	53.3	0.4	1.6
EXISTING BASIN 3	55.1	95.0%	5.0%	0.0%	0.0%	24.7	97.2	0.7	2.9
EXISTING BASIN 4	5.7	95.0%	5.0%	0.0%	0.0%	2.5	10.0	0.1	0.3
EXISTING BASIN 5	6.7	0.0%	5.0%	95.0%	0.0%	10.5	20.1	0.3	0.6
EXISTING BASIN 6	10.1	0.0%	5.0%	95.0%	0.0%	15.8	30.3	0.4	0.9
BOBBY FOSTER 1	0.9	95.0%	5.0%	0.0%	0.0%	0.4	1.5	0.0	0.0
BOBBY FOSTER 2	3.9	95.0%	5.0%	0.0%	0.0%	1.7	6.8	0.1	0.2
BOBBY FOSTER 3	1.7	95.0%	5.0%	0.0%	0.0%	0.8	3.0	0.0	0.1
OFFSITE BASIN 1	4.7	95.0%	5.0%	0.0%	0.0%	2.1	8.2	0.1	0.2
OFFSITE BASIN 2	0.6	95.0%	5.0%	0.0%	0.0%	0.3	1.1	0.0	0.0
TOTAL	259.1					134.9	477.5	3.7	13.8

MASTER DRAINAGE EXHIBIT
EXISTING CONDITIONS

MDS ARTISTE

DRAWN BY:	DO	DATE:	10/07/2024
CHECKED BY:	YPM	BHI PROJECT NO.	20240316
		SHEET NO.	1 OF 1

EXHIBIT C:
PROPOSED CONDITIONS BASIN MAP



MASTER DRAINAGE EXHIBIT PROPOSED CONDITIONS		
MDS ARTISTE		
DRAWN BY: DO	DATE: 6/17/2025	
CHECKED BY: YPM	BHI PROJECT NO. 20240316	SHEET NO. 1 OF 1

EXHIBIT D:
STORM DRAIN AND POND EXHIBIT

This Submittal is 24 hours. Please do not submit this Submittal to the City of Houston without the approval of the City Engineer.

Pond and Culvert Table											
POND	Top of Pond	Bottom of Pond	Total Volume Required (AC-FT)	Total Volume Provided (AC-FT)	Qin (CFS)	Pond Outlet	Pipe Size	Invert Up	Invert Down	Culvert Length (ft)	Qout (CFS)
Pond-1	5305	5301	11.02	4.53	168.6	Culvert-1	24"	5305.0	5301	194.5	20
Pond-2A	5305	5301	14.75	7.10	164.00	Culvert-2	24"	5305.00	5301	151.00	20
Pond-2B	5305	5301				Culvert-3	24"	5305.00	5301	194.50	20
Pond-3	5308	5300	25.54	36.67	306.1	N/A	N/A	N/A	N/A	N/A	N/A
Pond-4	5312	5310	5.39	6.06	108.3	Culvert-4	24"	5312.00	5312	202.50	14
Pond-5	5313	5312	1.04	2.46	29.30	Culvert-5	24"	5313.00	5311	308.80	20
Future Park	5310	5303	14.14	20.60	40.0	N/A	N/A	N/A	N/A	N/A	N/A

SWALE TABLE					
SWALE	SWALE TYPE	SWALE CAPACITY (cfs)	ACTUAL FLOW (cfs)	DEPTH OF FLOW (ft)	VELOCITY (ft/sec)
SWALE 1	Trapezoid SWALE 3:1 side slopes b=5.0' d=1.0' n=0.035 S=0.70%	22.5	20.0	0.94	2.72

INLET TABLE				
Inlet #	UPSTREAM FLOW (cfs)	Inlet Type	FLOW CAPTURED (cfs)	BYPASS FLOW (cfs)
IN1	21.7	1-SGL TYPE A	9.0	12.7
IN2	21.7	1-SGL TYPE A	9.0	12.7
IN3	18.3	1-SGL TYPE A	7.50	10.75
IN4	18.3	1-SGL TYPE A	7.50	10.75
IN5	22.95	1SGL TYPE A SUMP	22.95	0.00
IN6	22.95	1SGL TYPE A SUMP	22.95	0.00
IN7	15.4	Type A - SGL Grate SGL Wing R	15.40	0.00
IN8	15.4	Type A - SGL Grate SGL Wing L	15.40	0.00
IN9	7.25	Type A - SGL Grate DBL Wing	7.25	0.00
IN10	7.25	Type A - SGL Grate DBL Wing	7.25	0.00
IN11	18.3	Type A - DBL Grate DBL Wing	18.50	-0.20
IN12	18.3	Type A - DBL Grate DBL Wing	18.50	-0.20
IN13	3.8	Type A - SGL Grate DBL Wing	3.80	0.00
IN14	24.4	Type A - DBL Grate SGL Wing L	24.10	0.30
IN15	19.2	Type A - DBL Grate SGL Wing R	19.20	0.00
IN16	5.9	Type A - SGL Grate DBL Wing	5.90	0.00

STORM DRAIN PIPE TABLE				
PIPE #	Size in.	Slope	Capacity1 cfs	ACTUAL FLOW cfs
ONSITE				
SDP1	18	1.00%	10.5	9.0
SDP2	18	1.00%	10.5	9.0
SDP3	24	2.00%	32.0	18.0
SDP4	24	2.00%	31.99	18.00
SDP5	24	2.00%	31.99	18.00
SDP6	18	1.00%	10.50	7.50
SDP7	18	1.00%	10.50	7.50
SDP8	36	0.50%	47.16	33.00
SDP9	36	0.50%	47.16	33.00
SDP10	36	0.50%	47.16	33.00
SDP11	36	0.50%	47.16	33.00
SDP12	60	0.50%	184.16	162.00
SDP13	66	0.50%	237.45	184.95
SDP14	66	0.50%	237.45	217.95
SDP15	72	0.50%	299.47	240.90
SDP16	72	0.50%	299.47	306.10
SDP17	24	16.87%	92.92	15.40
SDP18	48	0.91%	137.03	51.40
SDP19	48	0.91%	137.03	51.40
SDP20	48	0.91%	137.03	51.40
SDP21	48	0.91%	137.03	51.40
SDP22	48	0.91%	137.03	51.40
SDP23	24	5.28%	51.98	18.85
SDP24	24	5.28%	51.98	18.85
SDP25	24	5.28%	51.98	18.85
SDP26	24	1.50%	27.71	18.50
SDP27	24	1.50%	27.71	18.50
SDP28	36	2.56%	106.72	37.00
SDP29	24	1.00%	22.62	20.00
SDP30	42	1.00%	100.61	57.00
SDP31	42	2.87%	170.44	60.80
SDP32	60	4.34%	542.57	63.60
SDP33	24	16.03%	90.57	19.20
SDP34	60	0.25%	130.22	106.90
SDP35	60	0.25%	130.22	106.90
SDP36	60	0.25%	130.22	106.90
SDP37	60	0.25%	130.22	106.90
SDP38	24	0.50%	16.00	20.00
SDP39	24	0.35%	13.38	25.90

1- Capacity Based on Manning's Eq w/ n=0.013

MASTER DRAINAGE STORM DRAIN & POND EXHIBIT

MDS ARTISTE

DRAWN BY: SS	DATE: 10/07/2024	
CHECKED BY: YPM	BHI PROJECT NO. 20240316	SHEET NO. 1 OF 1

