Galloway
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Greenwood Village, CO 80111
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04/27/2023

Town of Parker
20120 E. Mainstreet
Parker, CO 80138

RE: Land of Sushi – Crown Point Filing #1, Lot 4E, Drainage Conformance Letter

To Whom It May Concern,

The purpose of this letter is to show that the proposed development of the Land of Sushi on Lot 4E of Crown Point Filing #1 conforms to the requirements of the "*Phase III Drainage Study for Boondocks Entertainment Facility*" prepared by MM&D Engineering dated December 21, 2014.

Based on the "*Phase III Drainage Study for Boondocks Entertainment Facility"* Lot 4E is fully or partially apart of the following drainage Basins: A11, A12, A13, A14, A15, A16 & B1 which contains 1.08 acres of Lot 4E. This area is the part of lot that will be developed with this project. Basin A, along with the other Basins comprising the Crown Point Filing #1 development, eventually drain to a 42" storm line that crosses 18800 Rd. per the Crown Point Filing 1 14th Amendment drainage report. All flows and water quality/detention have been accommodated with the design of Crown point Filing 1.

The proposed OS1 and OS2 Basin correlates to Basin B1 from the "*Phase III Drainage Study for Boondocks Entertainment Facility".* These basins have a decrease in imperviousness (12.2% vs 29.7%) than the anticipated Basin B1 and which generate smaller flows, thus downstream infrastructure will experience no adverse impacts. All flows will continue to Cottonwood Dr and 18800DFR where it is captured by a 10' Type R inlet at the intersection of Cottonwood Dr. and 18800 Rd.

Basin OS3 will be conveyed to Cottonwood Drive where it will combine with OS2 and travel west along Cottonwood Drive where it is captured by the same 10' Type R inlet described above. Total flow from Basin B1 Check (Exhibit provided) = 2.0 CFS compared to the proposed combined flow of OS1, OS2, and OS3 =1.4 CFS. Thus, the inlet downstream has capacity for these offsite flows in the proposed condition.

The assumed flows from the developed lot for a 5-year and 100-year storm are 2.9 cfs and 7.1 cfs respectively.

The calculations for post-development Basin A (Lot 4E) for both the 5-year and 100-year storm are attached as part of Appendix A at the end of this letter. *Phase III Drainage Study for Boondocks Entertainment Facility"* drainage map and calculation for Basin A are included in Appendix D. Inlet capacities are included in Appendix B.

The Land of Sushi site was broken into six on-site sub-basins as follows and as shown on the Drainage Map included in Appendix C:

- Basin A1 (0.15 ac, 90% impervious) – Building roof area collected by roof drain system and connected to proposed storm line
- Basin A2 (0.40 ac, 87.9% impervious) – Contains eastern portion of the site which includes drive aisle and parking. Flows are captured by proposed Combo Type 13 inlet.
- Basin A4 (0.16 ac, 90% impervious) – Contains drive aisle, parking, and sidewalk south of the proposed building. Flows are captured by proposed Type 13 inlet.
- Basin A5 (0.04 ac, 90% impervious) – Contains parking south of the proposed drive aisle. Flows will pass through a curb cut and will be captured by an existing 5' CDOT Type 'R' Inlet.

- Basin A6 (0.04 ac, 90% impervious) – Contains parking south of the proposed drive aisle. Flows will pass through a curb cut and will be captured by an existing 10’ CDOT Type ‘R’ Inlet.

The actual design for Lot 4E is 1.08 acres which slightly differs from the Phase III Drainage Study as the proposed site is more refined. The approximate site imperviousness of 68% is less than the anticipated 70.6% imperviousness from the Phase III Drainage Study. Therefore, the Land of Sushi project follows the Final Drainage Report and there should be no adverse effects on the downstream system.

Sincerely,
GALLOWAY

Matthew Pepin
Civil Project Engineer

Appendices:

Appendix A – Hydrologic & Hydraulic Computations

Appendix B – Inlet Calcs

Appendix C – Drainage Map

Appendix D – Excerpts from "*Phase III Drainage Study for Boondocks Entertainment Facility*"

Appendix A: Hydrologic & Hydraulic Computations

BASIN SUMMARY TABLE						
Tributary Sub-basin	Area (acres)	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	0.15	0.77	0.85	5.00	0.5	1.1
A2	0.40	0.75	0.84	6.04	1.3	2.8
A4	0.16	0.77	0.85	5.00	0.6	1.2
A5	0.04	0.77	0.85	5.00	0.1	0.3
A6	0.04	0.77	0.85	5.00	0.1	0.3
OS1	0.06	0.41	0.67	5.00	0.1	0.4
OS2	0.20	0.05	0.49	5.00	0.0	0.9
OS3	0.03	0.05	0.49	5.00	0.0	0.1
Total On-Site	0.79	0.61	0.68		2.2	5.7
Total Site	1.08	0.64	0.82		2.9	7.1

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Land of Sushi
Location: CO, Parker

Project Name: Land of Sushi
Project No.: LOS01
Calculated By: MJP
Checked By: SMB
Date: 1/13/22

		Sidewalks and Drives			Lawns			Roofs			Basins Total
Basin ID	Total Area (ac)	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	Weighted % Imp.
A1	0.15	90	0.00	0.0	2	0.00	0.0	90	0.15	90.00	90.0
A2	0.40	90	0.39	87.8	2	0.01	0.1	90	0.00	0.00	87.9
A4	0.16	90	0.16	90.0	2	0.00	0.0	90	0.00	0.00	90.0
A5	0.04	90	0.04	90.0	2	0.00	0.0	90	0.00	0.00	90.0
A6	0.04	90	0.04	90.0	2	0.00	0.0	90	0.00	0.00	90.0
OS1	0.06	90	0.03	45.0	2	0.03	1.0	90	0.00	0.00	46.0
OS2	0.20	90	0.00	0.0	2	0.20	2.0	90	0.00	0.00	2.0
OS3	0.03	90	0.00	0.0	2	0.03	2.0	90	0.00	0.00	2.0
OS1 + OS2	0.26	90	0.03	10.4	2	0.23	1.8	90	0.00	0.00	12.2
Total	1.08	90	0.66	55.0	2	0.27	0.5	90	0.15	12.50	68.0

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Land of Sushi
Location: CO, Parker

Project Name: Land of Sushi
Project No.: LOS01
Calculated By: MJP
Checked By: SMB
Date: 1/13/22

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					Tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (AC)	Hydrologic Soils Group	Impervious (%)	C_{100}	C_5	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	Cv	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH (FT)	Urbanized T_c (MIN)	T_c (MIN)
A1	0.15	C	90.0	0.85	0.77	30	2.0	2.6	0	0.8	20.0	1.7	0.0	2.6	30.0	10.2	5.0
A2	0.40	C	87.9	0.84	0.75	120	2.0	5.6	50	0.8	20.0	1.8	0.5	6.0	170.0	10.9	6.0
A4	0.16	C	90.0	0.85	0.77	50	1.2	4.0	60	0.8	20.0	1.8	0.6	4.6	110.0	10.6	5.0
A5	0.04	C	90.0	0.85	0.77	25	3.0	2.1	80	1.0	20.0	2.0	0.7	2.8	105.0	10.6	5.0
A6	0.04	C	90.0	0.85	0.77	25	3.0	2.1	80	1.0	20.0	2.0	0.7	2.8	105.0	10.6	5.0
OS1	0.06	C	46.0	0.67	0.41	30	6.0	3.8	45	2.0	20.0	2.8	0.3	4.1	75.0	10.4	5.0
OS2	0.20	C	2.0	0.49	0.05	40	20.0	4.5	0	1.0	20.0	2.0	0.0	4.5	40.0	10.2	5.0
OS3	0.03	C	2.0	0.49	0.05	10	25.0	2.1	0	1.0	20.0	2.0	0.0	2.1	10.0	10.1	5.0
B1-Check*	0.38	C	29.7	0.61	0.28	50	25.0	3.6	150	1.0	20.0	2.0	1.3	4.9	200.0	11.1	5.0

NOTES:
$T_i = (0.395*(1.1 - C_5)*(L)^0.5)/((S)^0.33)$, S in ft/ft
T_t=L/60V (Velocity From Fig. 501)
Velocity V=Cv*S^0.5, S in ft/ft
Tc Check = 10+L/180
For Urbanized basins a minimum T_c of 5.0 minutes is required.
For non-urbanized basins a minimum T_c of 10.0 minutes is required

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STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Land of Sushi
Location: CO, Parker
Design Storm: 5-Year

Project Name: Land of Sushi
Project No.: LOS01
Calculated By: MJP
Checked By: SMB
Date: 1/13/22

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
	1	A1	0.15	0.77	5.0	0.12	4.71	0.6													Total Flow to Roof Leaders
	2	A2	0.40	0.75	6.0	0.30	4.47	1.3													Total flow captured by Proposed Type 13 Inlet
	4	A4	0.16	0.77	5.0	0.12	4.71	0.6													Total flow captured by Proposed Type 13 Inlet
	5	A5	0.04	0.77	5.0	0.03	4.71	0.1													Total flow to existing 5' Type R inlet
	6	A6	0.04	0.77	5.0	0.03	4.71	0.1													Total flow to existing 10' Type R inlet
	7	OS1	0.06	0.41	5.0	0.02	4.71	0.1													Sheet flow to existing access drive
	8	OS2	0.20	0.05	5.0	0.01	4.71	0.0													Sheet flow to Cottonwood Dr.
	9	OS3	0.03	0.05	5.0	0.00	4.71	0.0													Sheet flow to Cottonwood Dr.
		B1-Check*	0.38	0.28	5.0	0.11	4.71	0.5													Derived From Existing Boondocks Drainage Report

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Land of Sushi
Location: CO, Parker
Design Storm: 100-Year

Project Name: Land of Sushi
Project No.: LOS01
Calculated By: MJP
Checked By: SMB
Date: 1/13/22

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
	1	A1	0.15	0.85	5.0	0.13	8.82	1.1													Total Flow to Roof Leaders
	2	A2	0.40	0.84	6.0	0.34	8.37	2.8													Total flow captured by Proposed Type 13 Inlet
	4	A4	0.16	0.85	5.0	0.14	8.82	1.2													Total flow captured by Proposed Type 13 Inlet
	5	A5	0.04	0.85	5.0	0.03	8.82	0.3													Total flow to existing 5' Type R inlet
	6	A6	0.04	0.85	5.0	0.03	8.82	0.3													Total flow to existing 10' Type R inlet
	7	OS1	0.06	0.67	5.0	0.04	8.82	0.4													Sheet flow to existing access drive
	8	OS2	0.20	0.49	5.0	0.10	8.82	0.9													Sheet flow to Cottonwood Dr.
	9	OS3	0.03	0.49	5.0	0.01	8.82	0.1													Sheet flow to Cottonwood Dr.
		B1-Check*	0.38	0.61	5.0	0.23	8.82	2.0													Derived From Existing Boondocks Drainage Report

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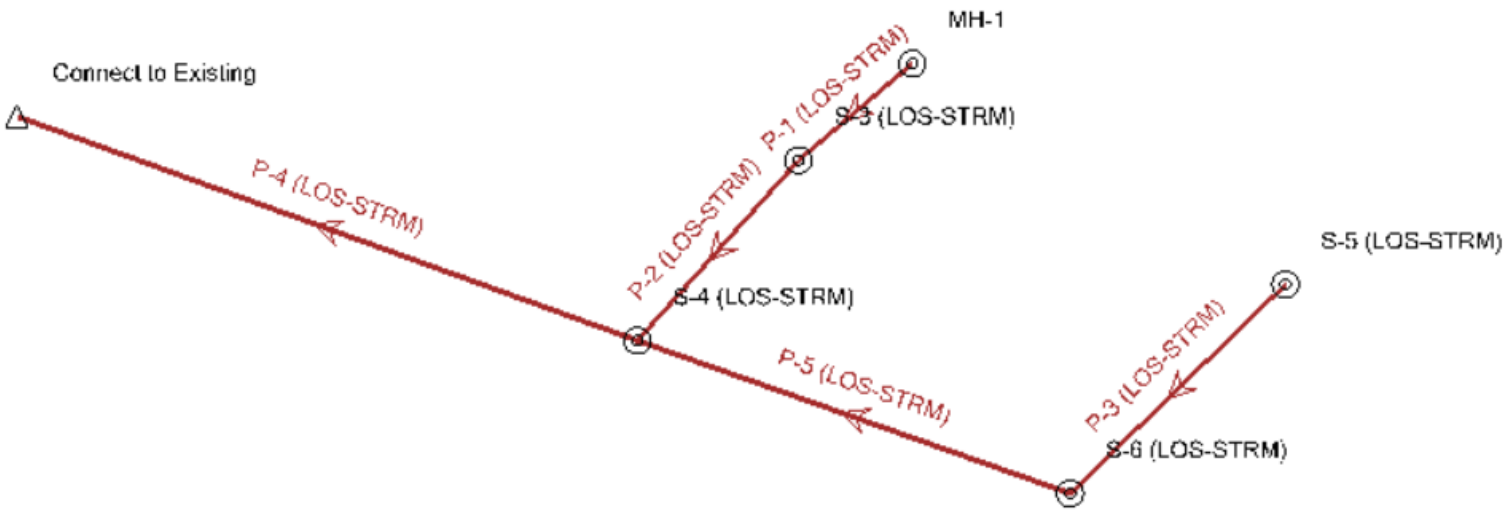
MH-1
Connect to Existing
P-1 (LOS-STRM)
S-3 (LOS-STRM)
P-2 (LOS-STRM)
P-4 (LOS-STRM)
S-4 (LOS-STRM)
S-5 (LOS-STRM)
P-5 (LOS-STRM)
P-3 (LOS-STRM)
S-6 (LOS-STRM)

Scenario: 5-YR
Current Time Step: 0.000 h
FlexTable: GAL_Conduit

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Headloss (ft)
P-4 (LOS-STRM)	S-4 (LOS-STRM)	Connect to Existing	5,797.26	5,790.37	148.2	0.046	18.0	0.013	6.50	11.06	22.64	5,798.25	5,790.92	5,798.68	5,792.83	7.32
P-3 (LOS-STRM)	S-5 (LOS-STRM)	S-6 (LOS-STRM)	5,799.36	5,798.69	67.3	0.010	18.0	0.013	1.30	4.04	10.50	5,799.79	5,799.80	5,799.94	5,799.81	-0.01
P-5 (LOS-STRM)	S-6 (LOS-STRM)	S-4 (LOS-STRM)	5,798.49	5,797.26	103.0	0.012	18.0	0.013	5.40	6.40	11.48	5,799.39	5,798.72	5,799.76	5,798.87	0.66
P-2 (LOS-STRM)	S-3 (LOS-STRM)	S-4 (LOS-STRM)	5,797.92	5,797.46	54.3	0.008	18.0	0.013	1.10	3.64	9.68	5,798.72	5,798.72	5,798.74	5,798.73	0.00
P-1 (LOS-STRM)	MH-1	S-3 (LOS-STRM)	5,799.36	5,798.92	33.5	0.013	8.0	0.013	0.50	3.63	1.38	5,799.69	5,799.26	5,799.82	5,799.38	0.43

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Scenario: 5-YR
Current Time Step: 0.000 h
FlexTable: GAL_Manhole

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Headloss (ft)
S-6 (LOS-STRM)	5,803.48	5,798.49	5,799.80	5,799.39	5,799.81	5,799.76	0.41
S-5 (LOS-STRM)	5,803.32	5,799.36	5,799.79	5,799.79	5,799.94	5,799.94	0.00
S-4 (LOS-STRM)	5,802.39	5,797.26	5,798.72	5,798.25	5,798.87	5,798.68	0.48
S-3 (LOS-STRM)	5,800.51	5,797.36	5,799.26	5,798.72	5,799.38	5,798.74	0.54
MH-1	5,803.51	5,799.36	5,799.69	5,799.69	5,799.82	5,799.82	0.00

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Scenario: 5-YR
Current Time Step: 0.000 h
FlexTable: GAL_Outfall

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)
Connect to Existing	5,790.37	5,795.37	6.50	Free Outfall	-

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Scenario: 100-YR
Current Time Step: 0.000 h
FlexTable: GAL_Conduit

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Headloss (ft)
P-4 (LOS-STRM)	S-4 (LOS-STRM)	Connect to Existing	5,797.26	5,790.37	148.2	0.046	18.0	0.013	13.70	13.42	22.64	5,798.63	5,791.75	5,799.65	5,792.76	6.88
P-3 (LOS-STRM)	S-5 (LOS-STRM)	S-6 (LOS-STRM)	5,799.36	5,798.69	67.3	0.010	18.0	0.013	2.80	1.58	10.50	5,801.72	5,801.68	5,801.76	5,801.71	0.05
P-5 (LOS-STRM)	S-6 (LOS-STRM)	S-4 (LOS-STRM)	5,798.49	5,797.26	103.0	0.012	18.0	0.013	11.40	6.45	11.48	5,800.96	5,799.75	5,801.61	5,800.40	1.21
P-2 (LOS-STRM)	S-3 (LOS-STRM)	S-4 (LOS-STRM)	5,797.92	5,797.46	54.3	0.008	18.0	0.013	2.30	1.30	9.68	5,799.78	5,799.75	5,799.80	5,799.78	0.03
P-1 (LOS-STRM)	MH-1	S-3 (LOS-STRM)	5,799.36	5,798.92	33.5	0.013	8.0	0.013	1.10	3.15	1.38	5,800.59	5,800.32	5,800.75	5,800.47	0.28

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Scenario: 100-YR
Current Time Step: 0.000 h
FlexTable: GAL_Manhole

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Headloss (ft)
S-6 (LOS-STRM)	5,803.48	5,798.49	5,801.68	5,800.96	5,801.71	5,801.61	0.71
S-5 (LOS-STRM)	5,803.32	5,799.36	5,801.72	5,801.72	5,801.76	5,801.76	0.00
S-4 (LOS-STRM)	5,802.39	5,797.26	5,799.75	5,798.63	5,800.40	5,799.65	1.12
S-3 (LOS-STRM)	5,800.51	5,797.36	5,800.32	5,799.78	5,800.47	5,799.80	0.54
MH-1	5,803.51	5,799.36	5,800.59	5,800.59	5,800.75	5,800.75	0.00

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Scenario: 100-YR
Current Time Step: 0.000 h
FlexTable: GAL_Outfall

Label	Elevation (Invert) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)
Connect to Existing	5,790.37	5,795.37	13.70	User Defined Tailwater	5,791.75

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Appendix B: Inlet Calcs

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin A2 | DP2	Basin A4 | DP4	Basin A5
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT/Denver 13 Combination	CDOT/Denver 13 Valley Grate	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.3	0.6	2.1
Major Q_{Known} (cfs)	2.7	1.2	4.4

Bypass (Carry-Over) Flow from Upstream

Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)		0.0	0.0
Major Bypass Flow Received, Q_b (cfs)		0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	1.3	0.6	2.1
Major Total Design Peak Flow, Q (cfs)	2.7	1.2	4.4
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin A6
Site Type (Urban or Rural)	URBAN
Inlet Application (Street or Area)	STREET
Hydraulic Condition	In Sump
Inlet Type	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.0
Major Q_{Known} (cfs)	4.2

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0

Watershed Characteristics

Subcatchment Area (acres)	
Percent Impervious	
NRCS Soil Type	

Watershed Profile

Overland Slope (ft/ft)	
Overland Length (ft)	
Channel Slope (ft/ft)	
Channel Length (ft)	

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	

CALCULATED OUTPUT

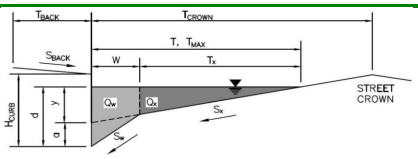
Minor Total Design Peak Flow, Q (cfs)	2.0
Major Total Design Peak Flow, Q (cfs)	4.2
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: LOS01_Land of Sushi

Inlet ID: Basin A2 | DP2



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft	
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches	
Distance from Curb Face to Street Crown	T_{CROWN} =	14.0	ft	
Gutter Width	W =	2.00	ft	
Street Transverse Slope	S_X =	0.020	ft/ft	
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft	
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft	
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		

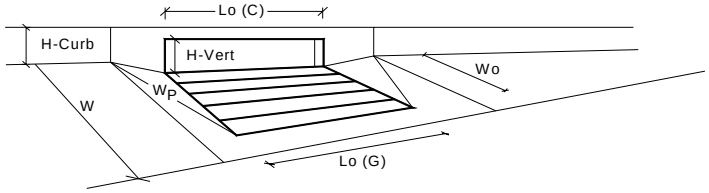
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.0	14.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.2	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	SUMP	SUMP	cfs

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



CDOT/Denver 13 Combination

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.9	7.2	☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.43	0.62	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.24	0.43	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.76	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.76	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	2.8	6.8	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.3	2.7	cfs

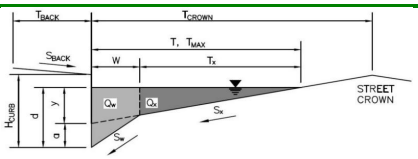
MHFD-Inlet, Version 5.02 (August 2022)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: LOS01_Land of Sushi

Inlet ID: Basin A4 | DP4



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	32.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	32.0	32.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

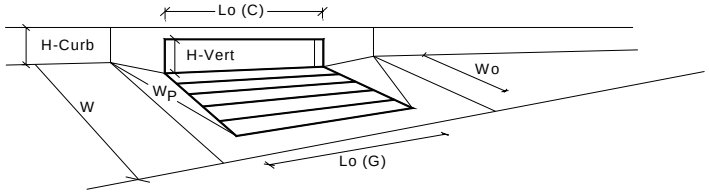
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

		Minor Storm	Major Storm	
	Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



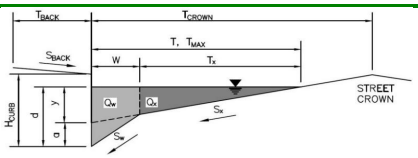
CDOT/Denver 13 Valley Grate

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.0	6.0	☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.36	0.52	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.63	0.94	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	1.0	2.6	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.6	1.2	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: LOS01_Land of Sushi
Inlet ID: Basin A5



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	40.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

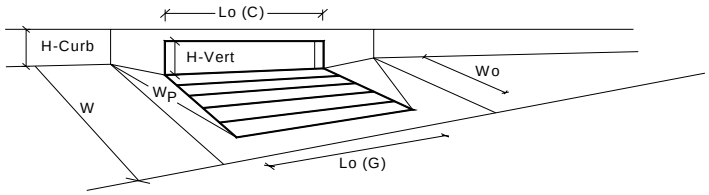
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	40.0	40.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.2	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.2	☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.43	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	5.4	8.0	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.1	4.4	cfs

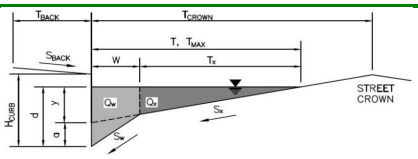
MHFD-Inlet, Version 5.02 (August 2022)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: LOS01_Land of Sushi

Inlet ID: Basin A6



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	28.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

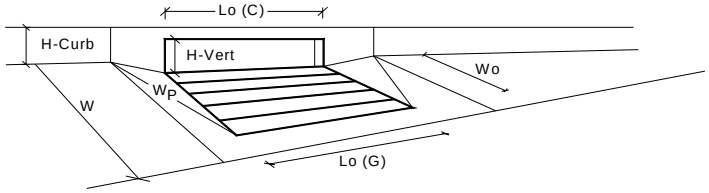
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	28.0	28.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.2	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	SUMP	SUMP	cfs

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.2	☐ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.43	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	8.3	13.1	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.0	4.2	cfs

Appendix C: Drainage Map

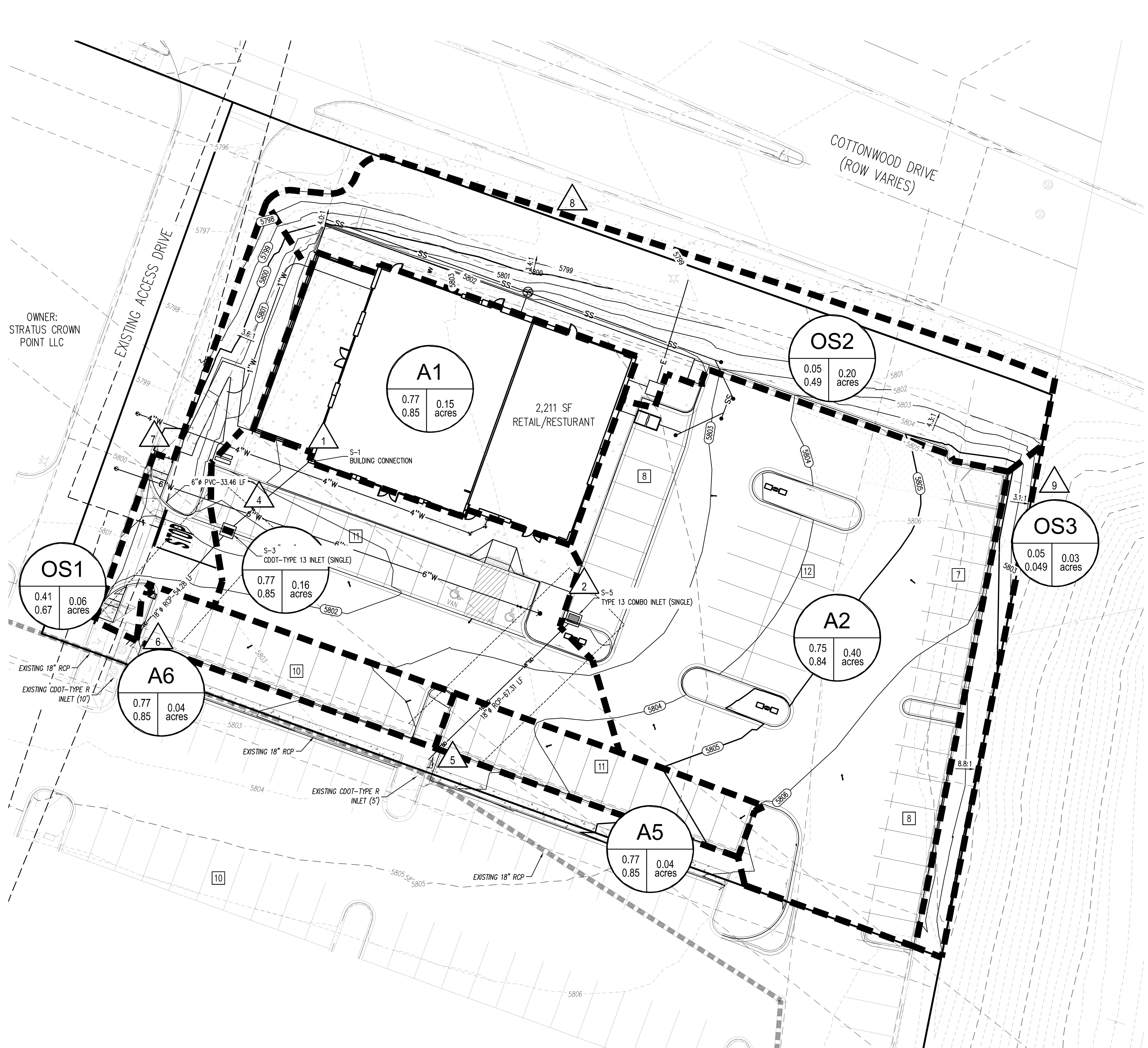
LAND OF SUSHI

CROWN POINT FILING NO.1 LOT 4E

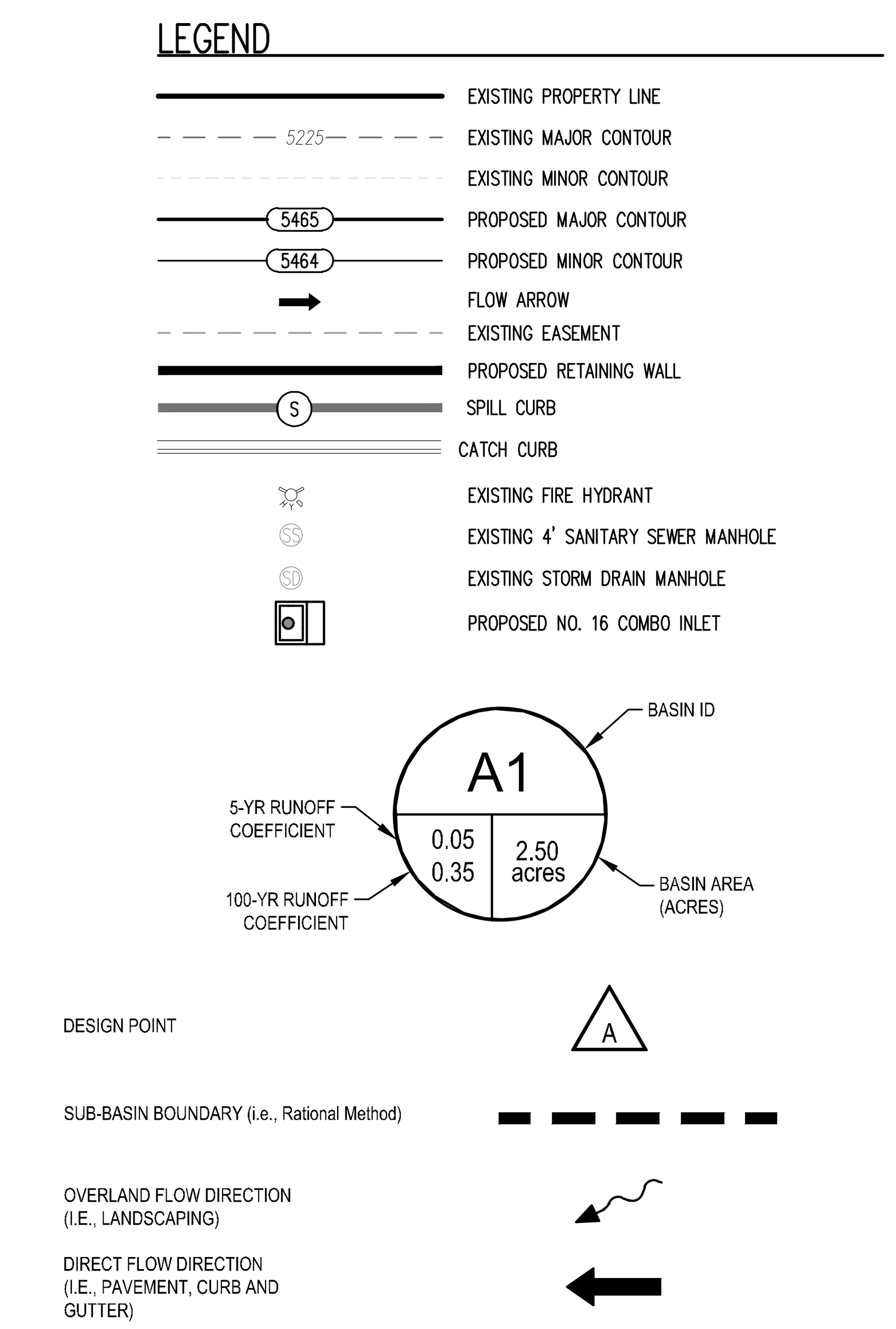
LOCATED IN THE SOUTHWEST QUARTER OF SECTION 3, TOWNSHIP 6 SOUTH,
RANGE 66 WEST OF THE 6TH PRINCIPAL MERIDIAN,
CITY OF PARKER, COUNTY OF DOUGLAS, STATE OF COLORADO

CONSTRUCTION DOCUMENTS

MAY 2023



BASIN SUMMARY TABLE						
Tributary Sub-basin	Area (acres)	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	0.15	0.77	0.85	5.00	0.5	1.1
A2	0.40	0.75	0.84	6.04	1.3	2.8
A4	0.16	0.77	0.85	5.00	0.6	1.2
A5	0.04	0.77	0.85	5.00	0.1	0.3
A6	0.04	0.77	0.85	5.00	0.1	0.3
OS1	0.06	0.41	0.67	5.00	0.1	0.4
OS2	0.20	0.05	0.49	5.00	0.0	0.9
OS3	0.03	0.05	0.49	5.00	0.0	0.1
Total On-Site	0.79	0.61	0.68		2.2	5.7
Total Site	1.08	0.64	0.82		2.9	7.1



THE TOWN OF PARKER REVIEW CONSTITUTES GENERAL COMPLIANCE WITH THE TOWN'S STANDARDS AND APPROVED VARIANCES, SUBJECT TO THESE PLANS BEING STAMPED, SIGNED, AND DATED BY THE PROFESSIONAL ENGINEER OF RECORD. REVIEW BY THE TOWN DOES NOT CONSTITUTE APPROVAL OF THE PLAN DESIGN OR ACCURACY AND CORRECTNESS OF ENGINEERING CALCULATIONS. ERRORS IN THE DESIGN OR CALCULATIONS REMAIN THE RESPONSIBILITY OF THE REGISTERED PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE ARE AFFIXED TO THIS DOCUMENT.

THIS REVIEW DOES NOT CONSTITUTE APPROVAL OF ANY PRIVATE ON-SITE IMPROVEMENTS WHICH MAY BE SHOWN. CONSTRUCTION CANNOT COMMENCE UNTIL ALL REQUIRED DRAINAGE/TRAFFIC REPORT(S), FINAL DEVELOPMENT PLAN(S), SPECIAL REVIEW(S), GRADING PERMIT, AND/OR OTHER PERMITS ARE COMPLETE, APPROVED AND ON FILE WITH THE TOWN OF PARKER.

TOWN OF PARKER, DIRECTOR OF ENGINEERING DATE

NOTES

1. SEE STORM SEWER PLANS FOR STORM SEWER INFORMATION.
2. CONTRACTOR SHALL FIELD VERIFY GRADES IN THE LOCATIONS INDICATED AT THE TIME OF CONSTRUCTION. CARE SHALL BE TAKEN TO MATCH EXISTING GRADES AT PROPERTY LINE TO ENSURE A SMOOTH TRANSITION BETWEEN PROPOSED ASPHALT PAVEMENT AND ADJACENT PROPERTY.
3. RIM ELEVATIONS FOR INLETS ARE FLOWLINE GRADES AND DO NOT TAKE INTO ACCOUNT LOCALIZED LOWERINGS PER INLET DETAILS.

BENCHMARK

SOURCE BENCHMARK: DOUGLAS COUNTY SURVEY MONUMENT DESIGNATION 1109036, ELEVATION = 5897.572' NAVD88
FOUND 2" ALUMINUM CAP STAMPED "DOUGLAS COUNTY GIS 1109036".

SITE BENCHMARK #1 : ELEVATION = 5824.30' NAVD88, NO. 5 REBAR WITH PINK PLASTIC CAP STAMPED "GALLOWAY CONTROL
SITE BENCHMARK #2 : ELEVATION = 5802.90' NAVD88, CHISELED "+" IN CONCRETE

BASIS OF BEARINGS

THE LINE BETWEEN THE WEST QUARTER CORNER OF SECTION 3, TOWNSHIP 6 SOUTH, RANGE 66 WEST OF THE 6TH PRINCIPAL MERIDIAN, AND THE CENTER QUARTER CORNER OF SAID SECTION 03, WHICH BEARS N86°26'45"E

CAUTION – NOTICE TO CONTRACTOR

1. ALL UTILITY LOCATIONS SHOWN ARE BASED ON MAPS PROVIDED BY THE APPROPRIATE UTILITY COMPANY AND FIELD SURFACE EVIDENCE AT THE TIME OF SURVEY AND IS TO BE CONSIDERED AN APPROXIMATE LOCATION ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION OF ALL UTILITIES, PUBLIC OR PRIVATE, WHETHER SHOWN ON THE PLANS OR NOT, PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIESTO THE ENGINEER PRIOR TO CONSTRUCTION.
2. WHERE A PROPOSED UTILITY CROSSES AN EXISTING UTILITY, IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF SUCH EXISTING UTILITY, EITHER THROUGH POTHOLING OR ALTERNATIVE METHOD. REPORT INFORMATION TO THE ENGINEER PRIOR TO CONSTRUCTION.

811 Know what's below. Call before you dig.

Galloway
5500 Greenwood Plaza Blvd., Suite 200
Greenwood Village, CO 80111
303.770.8884
GallowayUS.com

PRELIMINARY
NOT FOR BIDDING
NOT FOR CONSTRUCTION

LAND OF SUSHI
CROWN POINT FILING NO. 1
AMD 20, LOT 4E
PARKER, COLORADO

#	Date	Issue / Description	Init.

Project No:	LOS000001
Drawn By:	JRC
Checked By:	SMB
Date:	05/02/2023

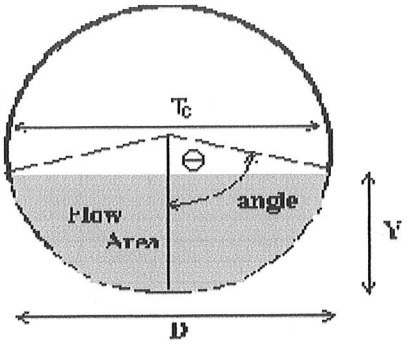
DRAINAGE PLAN

C8.1

Appendix D: Excerpts from "*Phase III Drainage Study for Boondocks Entertainment Facility*"

Circular Pipe Flow

Project: Boondocks
Pipe ID: DP 13 to DP 16



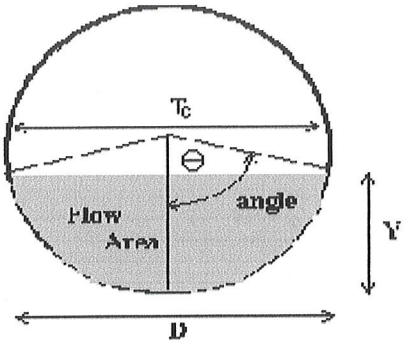
Design Information (Input)			
Pipe Invert Slope	So =	0.0200	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	18.00	inches
Design discharge	**Q =**	**13.8**	**cfs**
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	rad
Full-flow capacity	**Qf =**	**14.9**	cfs
Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	2.12	rad
Flow area	An =	1.44	sq ft
Top width	Tn =	1.28	ft
Wetted perimeter	Pn =	3.18	ft
Flow depth	Yn =	1.14	ft
Flow velocity	Vn =	9.57	fps
Discharge	**Qn =**	**13.8**	**cfs**
Normal Depth Froude Number	**Fr_n =**	**1.59**	
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.56	rad
Critical flow area	Ac =	1.70	sq ft
Critical top width	Tc =	0.83	ft
Critical flow depth	Yc =	1.38	ft
Critical flow velocity	Vc =	8.13	fps
Critical Depth Froude Number	**Fr_c =**	**1.00**	

Use for Tailwater condition at downstream

D.11

Circular Pipe Flow

Project: Boondocks
Pipe ID: DP 11 to DP 12



Design Information (Input)			
Pipe Invert Slope	So =	0.0068	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	18.00	inches
Design discharge	**Q =**	**8.6**	**cfs**

Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	rad
Full-flow capacity	**Qf =**	**8.7**	cfs

Ex. 100-Year Flow to S-6 MH

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	2.24	rad
Flow area	An =	1.54	sq ft
Top width	Tn =	1.17	ft
Wetted perimeter	Pn =	3.36	ft
Flow depth	Yn =	1.22	ft
Flow velocity	Vn =	5.60	fps
Discharge	**Qn =**	**8.6**	**cfs**
Normal Depth Froude Number	**Fr_n =**	**0.86**	

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.11	rad
Critical flow area	Ac =	1.44	sq ft
Critical top width	Tc =	1.29	ft
Critical flow depth	Yc =	1.14	ft
Critical flow velocity	Vc =	5.99	fps
Critical Depth Froude Number	**Fr_c =**	**1.00**	

D.8

BASIN NO.	DESIGN POINT	CONTRIBUTING AREA (acres)	PERCENT IMPERVIOUS	RUNOFF C(5yr)	COEFFICIENT C(100yr)	ROUTED 5yr(cfs)	FLOWS 100yr(cfs)	COMMENTS
A.1	1	0.50	11%	0.14	0.40	0.3	1.3	Single Type C Inlet with Close Mesh Grate
A.2	2	1.27	33%	0.26	0.48	1.25	4.0	Single Type C Inlet with Close Mesh Grate
A.3	3	2.29	45%	0.32	0.51	3.0	8.9	Single Type C Inlet with Close Mesh Grate
A.4	4	0.49	77%	0.58	0.68	1.3	2.9	5' Type R Inlet
A.5	5	0.29	90%	0.73	0.81	1.0	2.1	5' Type R Inlet
A.6	6	0.76	90%	0.73	0.81	2.6	5.4	5' Type R Inlet
A.7	7	0.25	90%	0.73	0.81	0.9	1.8	5' Type R Inlet
A.8	8	0.57	67%	0.47	0.6	1.3	3.0	5' Type R Inlet
A.9	9	0.94	84%	0.64	0.74	2.2	4.8	5' Type R Inlet
A.10	10	0.14	53%	0.37	0.53	0.2	0.7	5' Type R Inlet
A.11	11	0.37	45%	0.32	0.51	0.6	1.7	5' Type R Inlet
A.12	12	0.61	90%	0.73	0.81	2.1	4.4	5' Type R Inlet
A.13	13	0.59	90%	0.73	0.81	2.0	4.2	5' Type R Inlet
A.14	14	0.26	64%	0.45	0.63	0.6	1.4	Chase Section to A.15
A.15	–	0.46	79%	0.44	0.59	1.0	2.5	–
Sum A.14+A.15	15	0.72	–	–	–	1.5	3.7	5' Type R Inlet
A.16	–	0.18	90%	0.73	0.81	0.6	1.3	Flow into Basin A.17
A.17	–	0.25	90%	0.73	0.81	0.9	1.8	–
Sum A.16+A.17	16	0.43	–	–	–	1.4	2.9	5' Type R Inlet
A.18	17	0.55	90%	0.73	0.81	1.9	3.9	Future 5' Type R Inlet w/Commercial Construction
A.19	18	0.40	90%	0.73	0.81	1.4	2.9	Future 5' Type R Inlet w/Commercial Construction
A.20	19	0.44	90%	0.73	0.81	1.5	3.1	Future 5' Type R Inlet w/Commercial Construction
A.21	20	1.18	90%	0.73	0.81	4.1	8.4	Future 5' Type R Inlet w/Commercial Construction
B.1	21	0.56	36%	0.28	0.48	0.7	2.3	Flow into Basin B.2 in Curb
B.2	–	1.30	64%	0.45	0.63	2.3	6.0	Includes flow from B.1
Sum B.1+B.2	22	1.86	–	–	–	2.8	7.5	To be added with B.3+B.4
B.3	23	0.73	82%	0.45	0.63	1.4	3.7	Flow into Basin B.4 in Curb
B.4	–	0.71	52%	0.36	0.63	1.2	3.9	Includes Flow from B.3
Sum B.3+B.4	24	1.44	–	–	–	2.3	6.5	To be added with B.1+B.2
Sum B.1–B.4	25	0.14	–	–	–	2.2	13.8	Sum Flow into Existing 10' Type R Inlet

FLOW ARROW

1 DESIGN POINT

BASIN LIMITS

A.1 — BASIN DESIGNATION
0.54 — ACREAGE
0.29 — 5yr. C Value
0.57 — 100YR. C Value

HORIZONTAL SCALE: 1"=50'

Know what's below. Call before you dig.

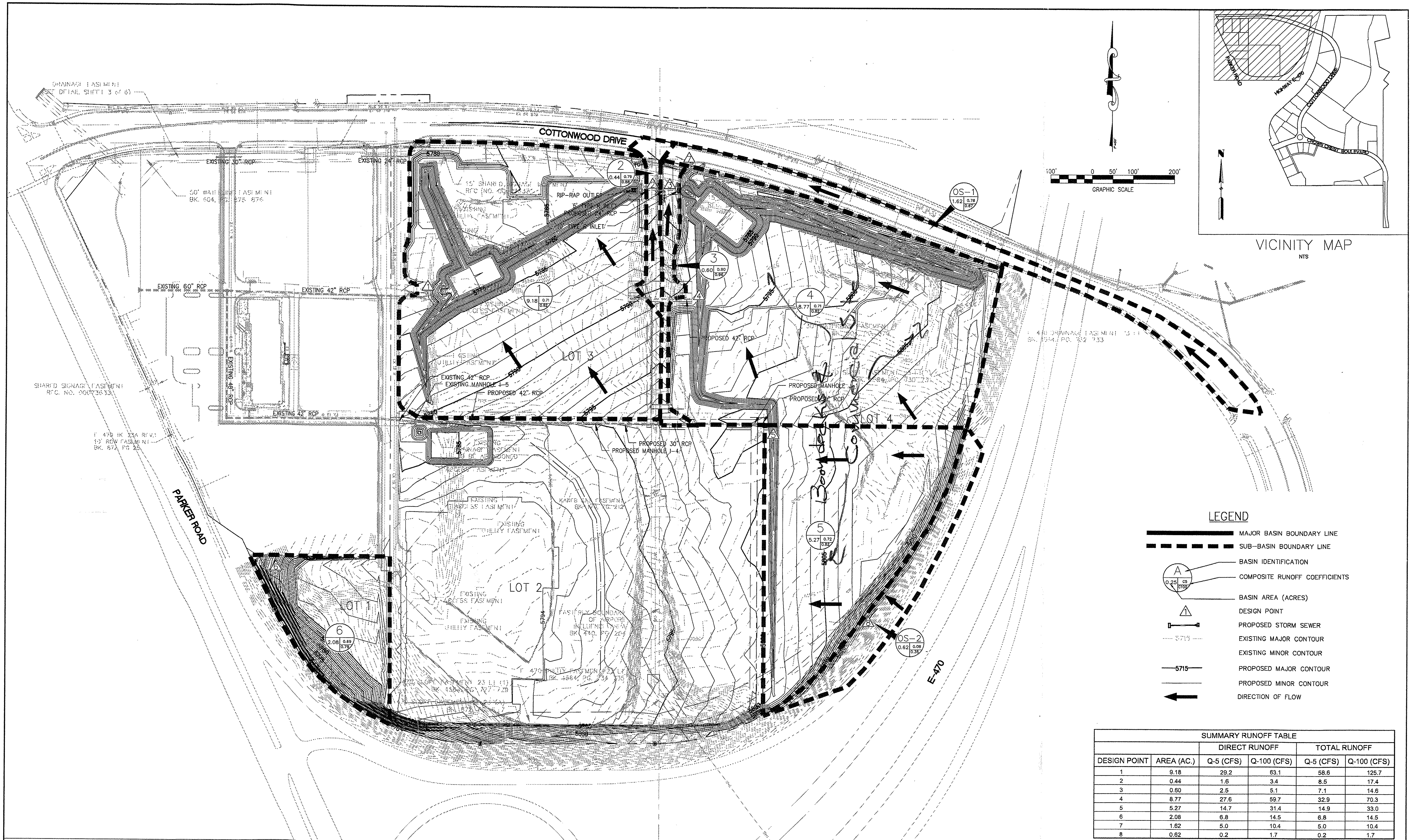
REVISION	DATE
PARKING LOT	09/24/2014

MM&D ENGINEERING SERVICES, INC.
William E. Miller, PE 13389
ENGINEERING
CONSTRUCTION MANAGEMENT
9125 N. Clydesdale Road PH (303) 908-0062
Castle Rock, Colorado 80108 FAX (303) 708-8399

Boondocks
Parker, Colorado
Developed Drainage Map

Prepared for:

DATE 10/10/2014
DES/DFT/CHK WEM/km
PROJ. NO. 13-343
SHEET 2 OF 2



SUMMARY RUNOFF TABLE

DESIGN POINT	AREA (AC.)	DIRECT RUNOFF Q-5 (CFS)	DIRECT RUNOFF Q-100 (CFS)	TOTAL RUNOFF Q-5 (CFS)	TOTAL RUNOFF Q-100 (CFS)
1	9.18	29.2	63.1	58.6	125.7
2	0.44	1.6	3.4	8.5	17.4
3	0.60	2.5	5.1	7.1	14.6
4	8.77	27.6	59.7	32.9	70.3
5	5.27	14.7	31.4	14.9	33.0
6	2.08	6.8	14.5	6.8	14.5
7	1.62	5.0	10.4	5.0	10.4
8	0.62	0.2	1.7	0.2	1.7

REV	REVISION DESCRIPTION	DATE	CHANGED BY	CHECKED BY	APPROVED BY
1	PER TOWN OF PARKER COMMENTS	7-20-07	SPH	BJP	

DEEPWATER POINT COMPANY
TIM LEONARD
MAIL: P.O. BOX 1175 KITTREDGE, CO 80457
DELIVERIES: 27905 MEADOW DR., STE. 11
EVERGREEN, CO 80439
PHONE: (303) 674-7856
FAX: (303) 674-2254

MERRICK
Engineers & Architects
2450 S. Peoria St., Aurora CO 80014, Phone 303/751 0741

MERRICK	SIGNATURE	DATE
DRAWN	CAW	07/20/07
DESIGNED	CAW	07/20/07
QC REVIEW	GAC	07/20/07
APPROVED	BJP	07/20/07
CLIENT	SIGNATURE	DATE
REVIEW		
APPROVED		

CAD FILE NAME: 3841-DRN

TODAY CROWN POINT
CROWN POINT F#1, 14TH AMENDMENT
PARKER, COLORADO

CLIENT PROJECT NO.
MERRICK PROJECT NO. 03013841
SCALE: 1"=100'

TITLE:
14TH AMENDMENT CONSTRUCTION PLANS
DRAINAGE MAP FUTURE

REVISION: DRAWING NO. LATEST DATE: 07/20/07 SHEET NO.