

12/06/2022

Town of Parker  
20120 E. Mainstreet  
Parker, CO 80138

**RE: Andy's Frozen Custard – Lincoln Professional Park, Lot 3, Drainage Conformance Letter**

To Whom It May Concern,

The purpose of this letter is to show that the proposed development of the Andy's Frozen Custard on Lot 3 of Lincoln Professional Park conforms to the requirements of the "*Final Drainage Report for Lincoln & Dransfeldt*" prepared by Harris Kocher Smith. dated July 21, 2022.

Based on the "*Final Drainage Report for Lincoln & Dransfeldt*" Lot 3 is part of drainage Basin A which contains 0.74 acres of Lot 3. This area is the part of lot that will be developed with the Andy's Frozen Custard project. Basin A in the overall report has an assumed imperviousness of 95%. Basin A, along with the other Basins comprising the Lincoln Professional Park development, drain to the newly constructed extended detention basin southeast of the intersection of Lincoln Ave and Dransfeldt Road. The assumed flows from the lot for a 5-year and 100-year storm are 2.76 cfs and 5.62 cfs respectively.

The calculations for post-development Basin A (Lot 3) for both the 5-year and 100-year storm are attached as part of Appendix A at the end of this letter. Excerpts from the "*Final Drainage Report for Lincoln & Dransfeldt*" drainage map and calculation for Basin A are included in Appendix D. Inlet capacities are included in Appendix B.

The Andy's Custard site was broken into four sub-basins as follows and as shown on the Drainage Map included in Appendix C:

- Basin A1 (0.20 ac, 50.4% impervious) – Contains drive aisle, parking and landscape area north of site. Flows are captured by existing Type 'R' inlet.
- Basin A2 (0.16 ac, 84.5% impervious) – Contains drive aisle, parking, and landscape area south and east of the site. Flows are captured by proposed Type 'R' inlet.
- Basin A3 (0.27 ac, 28.1% impervious) – Contains drive aisle, parking, and landscape area south and east of the site. Flows are captured by existing Type 'R' inlet.
- Basin A4 (0.05 ac, 90% impervious) – Building roof area collected by roof drain system and connected to existing storm line

The actual design for Lot 3 is 0.68 acres which slightly differs from the Final Drainage Report imperviousness of 52.5% which is less than what was assumed in the Final Drainage Report. Therefore, the Andy's Custard 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 “*Final Drainage Report for Lincoln & Dransfeldt*”

## **Appendix A: Hydrologic & Hydraulic Computations**

BASIN SUMMARY TABLE						
Tributary Sub-basin	Area (acres)	C <sub>5</sub>	C <sub>100</sub>	t <sub>c</sub> (min)	Q <sub>5</sub> (cfs)	Q <sub>100</sub> (cfs)
A1	0.20	0.41	0.66	6.88	0.4	1.1
A2	0.16	0.71	0.82	5.00	0.5	1.2
A3	0.27	0.22	0.56	5.00	0.3	1.3
A4	0.05	0.76	0.84	5.00	0.2	0.4
Total	0.68	0.31	0.67			

## COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Andy's Custard  
 Location: CO, Parker

Project Name: Project Name  
 Project No.: PSP01  
 Calculated By: MJP  
 Checked By: SMB  
 Date: 8/12/22

Basin ID	Total Area (ac)	Sidewalks and Drives			Lawns			Roofs			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
A1	0.20	90	0.10	45.0	2	0.09	0.9	90	0.01	4.50	50.4
A2	0.16	90	0.15	84.4	2	0.01	0.1	90	0.00	0.00	84.5
A3	0.27	90	0.08	26.7	2	0.19	1.4	90	0.00	0.00	28.1
A4	0.05	90	0.00	0.0	2	0.00	0.0	90	0.05	90.00	90.0
Total	0.68	90	0.33	43.7	2	0.29	0.9	90	0.06	7.90	52.5

STANDARD FORM SF-2  
TIME OF CONCENTRATION

Subdivision: Andy's Custard  
Location: CO, Parker

Project Name: Project Name  
Project No.: PSP01  
Calculated By: MJP  
Checked By: SMB  
Date: 8/12/22

SUB-BASIN						INITIAL/OVERLAND			TRAVEL TIME					T <sub>c</sub> CHECK			FINAL
DATA						(T <sub>i</sub> )			(T <sub>t</sub> )					(URBANIZED BASINS)			
BASIN ID	D.A. (AC)	Hydrologic Soils Group	Impervious (%)	C <sub>100</sub>	C <sub>5</sub>	L (FT)	S (%)	T <sub>i</sub> (MIN)	L (FT)	S (%)	C <sub>v</sub>	VEL. (FPS)	T <sub>t</sub> (MIN)	COMP. T <sub>c</sub> (MIN)	TOTAL LENGTH (FT)	Urbanized T <sub>c</sub> (MIN)	T <sub>c</sub> (MIN)
A1	0.20	B	50.4	0.66	0.41	36	2.8	5.4	180	1.0	20.0	2.0	1.5	6.9	216.0	11.2	6.9
A2	0.16	B	84.5	0.82	0.71	55	2.1	4.1	75	0.9	20.0	1.8	0.7	4.8	130.0	10.7	5.0
A3	0.27	B	28.1	0.56	0.22	38	2.8	7.0	192	1.0	20.0	2.0	1.6	8.6	230.0	11.3	8.6
A4	0.05	B	90.0	0.84	0.76	10	2.0	1.6	30	2.0	20.0	2.8	0.2	1.7	40.0	10.2	5.0

NOTES:

$$T_i = (0.395 * (1.1 - C_s) * L^{0.5}) / ((S)^{0.33}), \text{ S in ft/ft}$$

$$T_i = L / 60V \text{ (Velocity From Fig. 501)}$$

$$\text{Velocity } V = C_v * S^{0.5}, \text{ S in ft/ft}$$

$$T_c \text{ Check} = 10 + L / 180$$

For Urbanized basins a minimum T<sub>c</sub> of 5.0 minutes is required.

For non-urbanized basins a minimum T<sub>c</sub> of 10.0 minutes is required

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

Subdivision: Andy's Custard  
 Location: CO, Parker  
 Design Storm: 5-Year

Project Name: \_\_\_\_\_  
 Project No.: PSP01  
 Calculated By: MJP  
 Checked By: SMB  
 Date: 8/12/22

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	0.20	0.41	6.9	0.08	4.30	0.3													
	2	A2	0.16	0.71	5.0	0.11	4.71	0.5													Proposed Type R Inlet
	3	A3	0.27	0.22	8.6	0.06	3.97	0.2													
	4	A4	0.05	0.76	5.0	0.04	4.71	0.2													





## Worksheet for 6" Storm Roof Leader

### Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

### Input Data

Roughness Coefficient	0.011	
Channel Slope	0.02200	ft/ft
Diameter	0.50	ft
Discharge	0.40	ft <sup>3</sup> /s

### Results

Normal Depth	0.22	ft
Flow Area	0.08	ft <sup>2</sup>
Wetted Perimeter	0.73	ft
Hydraulic Radius	0.12	ft
Top Width	0.50	ft
Critical Depth	0.32	ft
Percent Full	44.3	%
Critical Slope	0.00654	ft/ft
Velocity	4.75	ft/s
Velocity Head	0.35	ft
Specific Energy	0.57	ft
Froude Number	2.04	
Maximum Discharge	1.06	ft <sup>3</sup> /s
Discharge Full	0.98	ft <sup>3</sup> /s
Slope Full	0.00363	ft/ft
Flow Type	SuperCritical	

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	44.34	%
Downstream Velocity	Infinity	ft/s

---

## Worksheet for 6" Storm Roof Leader

---

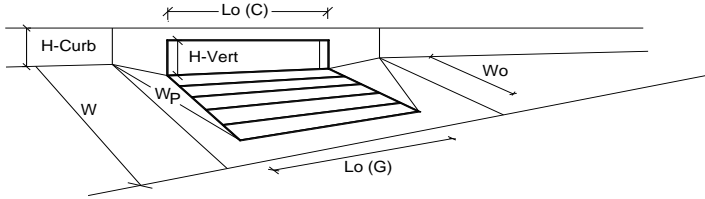
### GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.22	ft
Critical Depth	0.32	ft
Channel Slope	0.02200	ft/ft
Critical Slope	0.00654	ft/ft

## **Appendix B: Inlet Calcs**

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.1	5.1	inches
<b>Grate Information</b>			
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>			
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	<b>3.7</b>	<b>3.7</b>	<b>cfs</b>
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;0 PEAK)</b>	0.0	0.0	cfs

Minor = 0.5 cfs  
 Major = 1.2 cfs

## **Appendix C: Drainage Map**



**Appendix D: Excerpts from “*Final Drainage Report for Lincoln & Dransfeldt*”**

Project Name: Lincoln & Dransfeldt  
**Composite C-Value Computations**  
**Post-Development**

Project No: 200829  
Date: 07/30/21  
Revised: 07/21/22  
Design by: ORM  
Checked by: RCP  
NRCS Soil Group: C/D

BASIN	TOTAL AREA (ACRES)	ROOFS (90%)	CONCRETE DRIVES & WALKS (90%)	STREETS (100%)	LANDSCAPE AREA (2%)	PERCENT IMPERVIOUS	C <sub>5</sub> =	C <sub>100</sub> =
A	0.73					95%	0.81	0.87
B	1.31					95%	0.81	0.87
C	1.26					95%	0.81	0.87
D	0.78					95%	0.81	0.87
E	0.98					95%	0.81	0.87
F	0.47					95%	0.81	0.87
G	0.68	0.00	0.04	0.00	0.64	7%	0.09	0.51
RAB1	0.06	0.00	0.01	0.05	0.00	98%	0.84	0.89
RAB2	0.14	0.00	0.04	0.10	0.00	97%	0.83	0.88
RB1	0.07	0.00	0.02	0.05	0.00	97%	0.83	0.88
RB2	0.07	0.00	0.02	0.05	0.00	97%	0.83	0.88
RB3	0.06	0.00	0.02	0.04	0.00	97%	0.83	0.88
RA1	0.08	0.00	0.02	0.06	0.00	98%	0.83	0.88
RA2	0.01	0.00	0.00	0.01	0.00	100%	0.86	0.89
RA3	0.09	0.00	0.03	0.06	0.00	97%	0.83	0.88
RA4	0.09	0.00	0.03	0.06	0.00	97%	0.83	0.88
RA5	0.14	0.00	0.05	0.09	0.00	96%	0.83	0.88
RA6	0.14	0.00	0.05	0.09	0.00	96%	0.83	0.88
<b>OFF-SITE TO EX POND</b>								
EX-1	0.43	0.00	0.00	0.17	0.26	41%	0.37	0.65
EX-2	2.38					100%	0.86	0.89
<b>OFF-SITE RUNOFF</b>								
OS-1	0.05	0.00	0.02	0.03	0.00	96%	0.82	0.88
OS-2	0.06	0.00	0.02	0.04	0.00	97%	0.83	0.88
Total Runoff Off-Site	0.11							
<b>Total Treated</b>	<b>7.16</b>					<b>82%</b>	<b>0.71</b>	<b>0.82</b>

\*Percent Impervious for Basins A-F determined from USDCM Vol 1 Table 6-3

**Runoff Coefficient Equations (from USDCM Vol. 1)**

NCRS Soil Group C/D  
5-year 0.82(i)+0.035  
100-year 0.41(i)+0.484

Project Name: Lincoln & Dransfeldt  
 Project No: 200829  
 Date: 07/30/21  
 Revised: 07/21/22

**STANDARD FORM SF-2**  
**TIME OF CONCENTRATION**  
**Post-Development**

Designed By: ORM  
 Checked By: RCP

SUB-BASIN DATA			INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Ti)					Tc CHECK (URBANIZED BASINS)			FINAL	REMARKS
BASIN	AREA (AC)	C <sub>s</sub>	LENGTH (FT)	SLOPE %	Ti (MIN)	LENGTH (FT)	SLOPE %	C <sub>v</sub>	VELOCITY (FPS)	Tt (MIN)	COMPOS. Tc (MIN)	TOTAL LENGTH	Tc = (L/180) + 10 (MIN)	Tc (MIN)	
A	0.73	0.81	62.5	2.00	3.29	219.9	2.00	20	2.83	1.30	5.00	282	11.57	5.00	
B	1.31	0.81	150	2.00	5.10	142.81	2.00	20	2.83	0.84	5.94	293	11.63	5.94	
C	1.26	0.81	102.6	2.00	4.22	241	2.00	20	2.83	1.42	5.64	344	11.91	5.64	
D	0.78	0.81	150	2.00	5.10	238.9	2.00	20	2.83	1.41	6.50	389	12.16	6.50	
E	0.98	0.81	150	2.00	5.10	318.9	2.00	20	2.83	1.88	6.98	469	12.61	6.98	
F	0.47	0.81	25	2.00	2.08	76	2.00	20	2.83	0.45	5.00	101	10.56	5.00	
G	0.68	0.09	87	2.00	13.66	244	2.00	7	0.99	4.11	17.76	331	11.84	11.84	
RAB1	0.06	0.84	20.5	2.00	1.70	75	1.00	20	2.00	0.63	5.00	96	10.53	5.00	
RAB2	0.14	0.83	20.5	2.00	1.77	210	2.50	20	3.16	1.11	5.00	231	11.28	5.00	
RB1	0.07	0.83	15	2.00	1.51	89	1.00	20	2.00	0.74	5.00	104	10.58	5.00	
RB2	0.07	0.83	15	2.00	1.51	89	1.00	20	2.00	0.74	5.00	104	10.58	5.00	
RB3	0.06	0.83	15	2.00	1.53	244	2.50	20	3.16	1.29	5.00	259	11.44	5.00	
RA1	0.08	0.83	15	2.00	1.50	105	1.00	20	2.00	0.88	5.00	120	10.67	5.00	
RA2	0.01	0.86	15	2.00	1.38	40	2.30	20	3.03	0.22	5.00	55	10.31	5.00	
RA3	0.09	0.83	15	2.00	1.53	180	2.30	20	3.03	0.99	5.00	195	11.08	5.00	
RA4	0.09	0.83	15	2.00	1.53	180	2.30	20	3.03	0.99	5.00	195	11.08	5.00	
RA5	0.14	0.83	15	2.00	1.55	200	2.30	20	3.03	1.10	5.00	215	11.19	5.00	
RA6	0.14	0.83	15	2.00	1.55	200	2.30	20	3.03	1.10	5.00	215	11.19	5.00	
<b>OFF-SITE TO EX POND</b>															
EX-1	0.43	0.37	40	2.00	6.73	240	2.30	20	3.03	1.32	8.05	280	11.56	8.05	
EX-2	0.14	0.86	60	2.00	2.76	450	2.30	20	3.03	2.47	5.23	510	12.83	5.23	
<b>OFF-SITE RUNOFF</b>															
OS-1	0.05	0.82	15	2.00	1.57	50	1.00	20	2.00	0.42	5.00	65	10.36	5.00	
OS-2	0.05	0.00	0	2.00	0.00	40	2.00	7	0.99	0.67	0.00	40	0.00	5.00	
OS-3	0.06	#REF!	15	2.00	#REF!	50	1.00	20	2.00	0.42	#REF!	65	#REF!	#REF!	

Project Name: Lincoln & Dransfeldt  
 Project No: 200829  
 Date: 07/30/21  
 Revised: 07/21/22

**STANDARD FORM SF-2**  
**Post-Development**  
**Rational Method Procedure**

Designed By: ORM  
 Checked By: RCP  
 Design Storm: 5 YR

BASIN (s)	DESIGN POINT	DIRECT RUNOFF					TOTAL RUNOFF				STREET/INLET				STORM SEWER PIPE			TRAVEL TIME			CARRYOVER FLOWS					REMARKS			
		AREA (AC)	RUNOFF COEFF	Tc (min)	C x A (AC)	I (IN/HR)	DIRECT RUNOFF, Q (CFS)	Tc (min)	Σ(C x A) (AC)	I (IN/HR)	TOTAL RUNOFF, Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	INLET DESIGN FLOW (CFS)	STREET OR INLET INTERCEPTION (CFS)	CARRYOVER (CFS)	DESIGN FLOW (CFS)	PIPE SLOPE (%)	PIPE SIZE (IN)	Q <sub>FULL</sub> (CFS)	LENGTH (FT)	VELOCITY (FPS)	Tt (min)	Σ(C x A) BYPASS (AC)	LENGTH (FT)		SLOPE (%)	VELOCITY (FPS)	Tt (min)
A	1	0.73	0.81	5.00	0.59	4.65	2.76									2.8	1.0	18	13.7	34.3	1.5	0.38							Runoff for Lot 3
B	7	1.31	0.81	5.94	1.07	4.43	4.72									4.7	1.0	18	13.7	16.7	1.5	0.19							Runoff for Lot 2
C		1.26	0.81	5.64	1.03	4.50	4.61																						Runoff for Lot 1
D	12	0.78	0.81	6.50	0.63	4.31	2.74									2.7	0.5	18	9.7	18.6	1.1	0.29							Runoff for Lot 4
E	8	0.98	0.81	6.98	0.80	4.22	3.36									3.4	1.0	18	13.7	37.8	1.5	0.42							Runoff for Lot 5
F		0.47	0.81	5.00	0.38	4.65	1.78									1.8	0.8	18	12.2	32.6	1.3	0.40							Runoff of Lot 6
G		0.68	0.09	11.84	0.06	3.46	0.22																						Detention Pond
RAB1		0.06	0.84	5.00	0.050	4.65	0.23																						Portions of Roads A & B captured by Inlet A6
RAB2		0.14	0.83	5.00	0.12	4.65	0.54																						Portions of Roads A & B captured by Inlet D4
RB1		0.07	0.83	5.00	0.058	4.65	0.27																						Portion of Road B captured by Inlet F2
RB2		0.07	0.83	5.00	0.058	4.65	0.27																						Portion of Road B captured by Inlet F1
RB3		0.06	0.83	5.00	0.050	4.65	0.23																						Portion of Road B captured by Inlet D3
RA1		0.08	0.83	5.00	0.067	4.65	0.31																						Portion of Road A captured by Inlet A7
RA2		0.01	0.86	5.00	0.0086	4.65	0.0397																						Portion of Road A captured by Inlet D1
RA3		0.09	0.83	5.00	0.07	4.65	0.35																						Portion of Road A captured by Inlet C1
RA4		0.09	0.83	5.00	0.07	4.65	0.35																						Portion of Road A captured by Inlet A3
RA5		0.14	0.83	5.00	0.12	4.65	0.54																						Portion of Road A captured by Inlet B1
RA6		0.14	0.83	5.00	0.12	4.65	0.54																						Portion of Road A captured by Inlet A1
ΣDP1 + BASIN RB2	2							5.38	0.65	4.56	2.97					3.0	1.0	18	13.7	119.8	1.5	1.33							
ΣBASIN F + BASIN RAB2	3							5.40	0.50	4.55	2.27					2.3	0.8	18	12.2	32.2	1.3	0.40							
ΣDP3 + BASIN RB3	4							5.80	0.55	4.46	2.45					2.4	0.8	18	12.2	98.3	1.3	1.22							
ΣDP4 + BASIN RA2	5							7.03	0.56	4.21	2.34					2.3	1.0	18	13.7	30.7	1.5	0.34							
ΣDP2 + DP5 + BASIN RAB1	6							7.37	1.26	4.14	5.22					5.2	1.5	18	16.7	192.5	1.8	1.75							
ΣDP8 + BASIN RA3	9							7.40	0.87	4.14	3.61					3.6	1.0	18	13.7	34.6	1.5	0.38							
ΣDP7 + DP9 + BASIN RA4	10							7.78	2.01	4.07	8.18					8.2	1.0	18	13.7	118.2	1.5	1.31							
ΣDP10 + BASIN C	11							9.09	3.04	3.84	11.68					11.7	0.5	18	9.7	115.8	1.1	1.82							
ΣDP12 + BASIN RA5	13							6.80	0.75	4.25	3.19					3.2	0.5	24	20.8	41.6	1.1	0.65							
ΣDP11 + DP13 + BASIN RA6	14							10.91	3.90	3.58	13.97					14.0	0.5	24	20.8	23.7	1.1	0.37							
TOTAL OUTFLOW TO POND	15							11.29	3.90	3.53	13.78					13.8	0.5	24	20.8	35.6	1.1	0.56							
<b>OFFSITE AREA GOING TO EX POND</b>																0.0	3.0	24	50.9	521.4	2.6	3.34							
EX-1		0.43	0.37	8.05	0.16	4.02	0.64																						
EX-2		2.38	0.86	5.23	2.03	4.59	9.34																						
ΣBASIN EX-1 + BASIN EX-2	16							8.05	2.19	4.02	8.81																		
OUTFLOW FROM POND							0.70									0.7	0.5	24	20.8	35.6	1.1	0.56							Outflow from UD_Detention Spreadsheet
ΣOUTFLOW FROM POND + DP16	17							8.05	3.90	4.02	15.69																		
OS-1		0.05	0.09	5.00	0.00	4.65	0.02																						
OS-2		0.05	0.09	5.00	0.00	4.65	0.02																						
0		0.05	0.09	#REF!	0.00	#REF!	#REF!																						

Project Name: Lincoln & Dransfeldt  
 Project No: 200829  
 Date: 07/30/21  
 Revised: 07/21/22

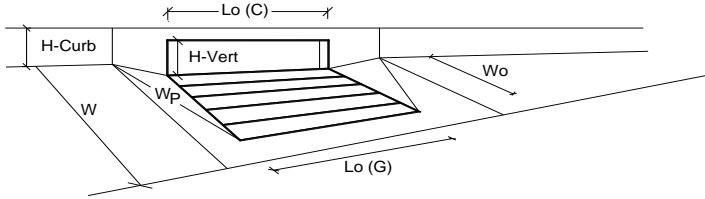
**STANDARD FORM SF-2**  
**Post-Development**  
**Rational Method Procedure**

Designed By: ORM  
 Checked By: RCP  
 Design Storm: 100 YR

BASIN (s)	DESIGN POINT	DIRECT RUNOFF					TOTAL RUNOFF				STREET/INLET				STORM SEWER PIPE				TRAVEL TIME			CARRYOVER FLOWS					REMARKS		
		AREA (AC)	RUNOFF COEFF	Tc (min)	C x A (AC)	I (IN/HR)	DIRECT RUNOFF, Q (CFS)	Tc (min)	Σ(C x A) (AC)	I (IN/HR)	TOTAL RUNOFF, Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	INLET DESIGN FLOW (CFS)	STREET OR INLET INTERCEPTION (CFS)	CARRYOVER (CFS)	DESIGN FLOW (CFS)	PIPE SLOPE (%)	PIPE SIZE (IN)	Q <sub>FULL</sub> (CFS)	LENGTH (FT)	VELOCITY (FPS)	Tt (min)	Σ(C x A) BYPASS (AC)	LENGTH (FT)	SLOPE (%)		VELOCITY (FPS)	Tt (min)
A	1	0.73	0.87	5.00	0.64	8.82	5.62									5.6	1.0	18	13.7	34.3	1.5	0.38							Runoff for Lot 3
B	7	1.31	0.87	5.94	1.14	8.41	9.62									9.6	1.0	18	13.7	16.7	1.5	0.19							Runoff for Lot 2
C		1.26	0.87	5.64	1.10	8.54	9.39																						Runoff for Lot 1
D	12	0.78	0.87	6.50	0.68	8.18	5.57									5.6	0.5	18	9.7	18.6	1.1	0.29							Runoff for Lot 4
E	8	0.98	0.87	6.98	0.86	8.00	6.85									6.8	1.0	18	13.7	37.8	1.5	0.42							Runoff for Lot 5
F		0.47	0.87	5.00	0.41	8.82	3.62									3.6	0.8	18	12.2	32.6	1.3	0.40							Runoff for Lot 6
G		0.68	0.51	11.84	0.35	6.56	2.29																						Detention Pond
RAB1		0.06	0.89	5.00	0.053	8.82	0.47																						Portions of Roads A & B captured by Inlet A6
RAB2		0.14	0.88	5.00	0.12	8.82	1.09																						Portions of Roads A & B captured by Inlet D4
RB1		0.07	0.88	5.00	0.062	8.82	0.54																						Portion of Road B captured by Inlet F2
RB2		0.07	0.88	5.00	0.062	8.82	0.54																						Portion of Road B captured by Inlet F1
RB3		0.06	0.88	5.00	0.053	8.82	0.47																						Portion of Road B captured by Inlet D3
RA1		0.08	0.88	5.00	0.071	8.82	0.62																						Portion of Road A captured by Inlet A7
RA2		0.01	0.89	5.00	0.0089	8.82	0.0788																						Portion of Road A captured by Inlet D1
RA3		0.09	0.88	5.00	0.08	8.82	0.70																						Portion of Road A captured by Inlet C1
RA4		0.09	0.88	5.00	0.08	8.82	0.70																						Portion of Road A captured by Inlet A3
RA5		0.14	0.88	5.00	0.12	8.82	1.09																						Portion of Road A captured by Inlet B1
RA6		0.14	0.88	5.00	0.12	8.82	1.09																						Portion of Road A captured by Inlet A1
ΣDP1 + BASIN RB2	2							5.38	0.70	8.65	6.05					6.0	1.0	18	13.7	119.8	1.5	1.33							
ΣBASIN F + BASIN RAB2	3							5.40	0.53	8.64	4.61					4.6	0.8	18	12.2	32.2	1.3	0.40							
ΣDP3 + BASIN RB3	4							5.80	0.59	8.46	4.97					5.0	0.8	18	12.2	98.3	1.3	1.22							
ΣDP4 + BASIN RA2	5							7.03	0.60	7.98	4.76					4.8	1.0	18	13.7	30.7	1.5	0.34							
ΣDP2 + DP5 + BASIN RAB1	6							7.37	1.35	7.86	10.60					10.6	1.5	18	16.7	192.5	1.8	1.75							
ΣDP8 + BASIN RA3	9							7.40	0.94	7.85	7.34					7.3	1.0	18	13.7	34.6	1.5	0.38							
ΣDP7 + DP9 + BASIN RA4	10							7.78	2.16	7.72	16.66					16.7	1.0	18	13.7	118.2	1.5	1.31							
ΣDP10 + BASIN C	11							9.09	3.26	7.30	23.78					23.8	0.5	18	9.7	115.8	1.1	1.82							
ΣDP12 + BASIN RA5	13							6.80	0.80	8.07	6.49					6.5	0.5	24	20.8	41.6	1.1	0.65							
ΣDP11 + DP13 + BASIN RA6	14							10.91	4.19	6.79	28.44					28.4	0.5	24	20.8	23.7	1.1	0.37							
TOTAL OUTFLOW TO POND	15							11.29	4.19	6.70	28.04					28.0	0.5	24	20.8	35.6	1.1	0.56							
OFFSITE AREA GOING TO EX POND																0.0	3.0	24	50.9	521.4	2.6	3.34							
EX-1		0.43	0.65	8.05	0.28	7.63	2.13																						
EX-2		2.38	0.89	5.23	2.13	8.71	18.54																						

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.1	5.1	inches
<b>Grate Information</b>			
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>			
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	<b>3.7</b>	<b>3.7</b>	<b>cfs</b>
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;0 PEAK)</b>	0.0	0.0	cfs