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July 9, 2020

Michael Grabczyk  
20120 E. Mainstreet  
Parker, CO 80138

RE: Murphy Express – Drainage Conformance Letter – #SP20-019

Dear Michael,

This Drainage Conformance Letter has been prepared for the proposed Murphy Express located at 12405 South Parker Road. The purpose of this letter is to show that the proposed development conforms to the Storm Drainage and Environmental Criteria Manual for the Town of Parker and the Parker & Pine Retail Final Drainage Report Version 1 prepared by Kimley Horn dated November 2019.

The project site is a portion of Lot 1 Block 3 within the Parker Auto Plaza Filing No. 1 located in the Southwest Quarter of Section 10, Township 6 South, Range 66 West of the 6<sup>th</sup> Principal Meridian, Town of Parker, County of Douglas, State of Colorado. The site is bounded by South Parker Road (State Highway No. 83) to the east, Pine Lane to north, Twenty Mile Road to the west, and an existing detention pond and Baldwin Gulch to the south. The site is currently vacant.

The existing site generally slopes to the northwest. In the existing conditions sheet flow to an existing inlet northwest of the proposed site. The existing underground storm drain system conveys stormwater to an existing detention pond which ultimately discharges into Baldwin Gulch. The proposed Murphy Express occupies approximately 1.09 acres of vacant land covered mostly by native grasses and weeds. An on-site storm sewer system is being proposed, which will convey stormwater to the northwest corner of the site. The proposed storm sewer system connects and ultimately discharges into the existing storm sewer system south of the site which has been sized to receive flows from the developed property. Inlet capacity calculations are included with this memo (Attachment A).

The project site was studied in the Parker & Pine Retail Final Drainage Report Version 1 prepared by Kimley Horn dated November 2019. Per said report, this site lies within Basin 5.0. The impervious percentage assigned to this basin was 85%. The impervious percentage for the proposed Murphy Express at 12405 South Parker Street was calculated to be 68%. Since the proposed development is below the 85% imperviousness estimated by the Parker & Pine Final Drainage Report Version 1, the existing drainage facilities should be sufficient to safely convey the runoff from the proposed Murphy site and not negatively impact adjacent properties.

Sincerely,  
**GALLOWAY**

Zachary Stone, PE  
Civil Engineering Project Engineer  
[ZacharyStone@GallowayUS.com](mailto:ZacharyStone@GallowayUS.com)



# Appendix A – Inlet Capacity Calculations

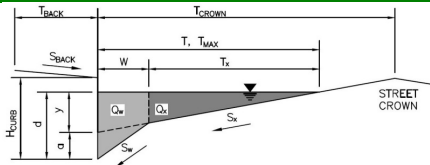


**ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)**

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

Project: \_\_\_\_\_  
 Inlet ID: \_\_\_\_\_

**Curb Inlet**

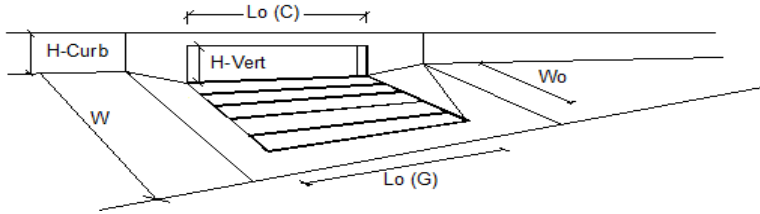


Gutter Geometry (Enter data in the blue cells)	
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 1.0$ ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.050$ ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.020$
Height of Curb at Gutter Flow Line	$H_{CURB} = 6.00$ inches
Distance from Curb Face to Street Crown	$T_{CROWN} = 35.0$ ft
Gutter Width	$W = 2.00$ ft
Street Transverse Slope	$S_x = 0.083$ 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	$S_o = 0.050$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = 0.012$
Max. Allowable Spread for Minor & Major Storm	$T_{MAX} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 17.5 & 17.5 \end{matrix}$ ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 6.0 & 6.0 \end{matrix}$ inches
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> <input type="checkbox"/> check = yes
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>	
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>	
	$Q_{allow} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 9.8 & 9.8 \end{matrix}$ cfs

**Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**  
**Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

## INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018

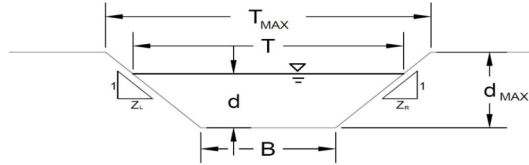


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity*</b>			
Total Inlet Interception Capacity	0.7	1.5	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	0.2	cfs
Capture Percentage = $Q_i/Q_c$ =	100	86	%

## AREA INLET IN A SWALE

Enter Your Project Name Here

Inlet 1



This worksheet uses the NRCS vegetative retardance method to determine Manning's n.  
For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method														
NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E													
Manning's n (Leave cell D16 blank to manually enter an n value)	n = 0.030													
Channel Invert Slope	S <sub>0</sub> = 0.0800 ft/ft													
Bottom Width	B = 0.00 ft													
Left Side Slope	Z <sub>1</sub> = 10.00 ft/ft													
Right Side Slope	Z <sub>2</sub> = 10.00 ft/ft													
Check one of the following soil types:	Choose One:													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding: 2px;">Soil Type:</th> <th style="text-align: left; padding: 2px;">Max. Velocity (V<sub>MAX</sub>)</th> <th style="text-align: left; padding: 2px;">Max Froude No. (F<sub>MAX</sub>)</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">Non-Cohesive</td> <td style="padding: 2px;">5.0 fps</td> <td style="padding: 2px;">0.60</td> </tr> <tr> <td style="padding: 2px;">Cohesive</td> <td style="padding: 2px;">7.0 fps</td> <td style="padding: 2px;">0.80</td> </tr> <tr> <td style="padding: 2px;">Paved</td> <td style="padding: 2px;">N/A</td> <td style="padding: 2px;">N/A</td> </tr> </tbody> </table>	Soil Type:	Max. Velocity (V <sub>MAX</sub> )	Max Froude No. (F <sub>MAX</sub> )	Non-Cohesive	5.0 fps	0.60	Cohesive	7.0 fps	0.80	Paved	N/A	N/A	<input type="checkbox"/> Non-Cohesive <input checked="" type="checkbox"/> Cohesive <input type="checkbox"/> Paved	
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Cohesive	7.0 fps	0.80												
Paved	N/A	N/A												
Max. Allowable Top Width of Channel for Minor & Major Storm	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 35%; text-align: center;">Minor Storm</th> <th style="width: 35%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>T<sub>MAX</sub> =</td> <td style="text-align: center;">16.00</td> <td style="text-align: center;">16.00</td> <td style="text-align: right;">feet</td> </tr> </tbody> </table>			Minor Storm	Major Storm		T <sub>MAX</sub> =	16.00	16.00	feet				
	Minor Storm	Major Storm												
T <sub>MAX</sub> =	16.00	16.00	feet											
Max. Allowable Water Depth in Channel for Minor & Major Storm	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 35%; text-align: center;">Minor Storm</th> <th style="width: 35%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>d<sub>MAX</sub> =</td> <td style="text-align: center;">1.00</td> <td style="text-align: center;">1.00</td> <td style="text-align: right;">feet</td> </tr> </tbody> </table>			Minor Storm	Major Storm		d <sub>MAX</sub> =	1.00	1.00	feet				
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<b>Allowable Channel Capacity Based On Channel Geometry</b>														
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d <sub>allow</sub> =	0.80	0.80	ft											
<b>Water Depth in Channel Based On Design Peak Flow</b>														
Design Peak Flow	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 35%; text-align: center;">Minor Storm</th> <th style="width: 35%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>Q<sub>c</sub> =</td> <td style="text-align: center;">0.5</td> <td style="text-align: center;">1.3</td> <td style="text-align: right;">cfs</td> </tr> </tbody> </table>			Minor Storm	Major Storm		Q <sub>c</sub> =	0.5	1.3	cfs				
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Q <sub>c</sub> =	0.5	1.3	cfs											
Water Depth	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 35%; text-align: center;">Minor Storm</th> <th style="width: 35%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td>d =</td> <td style="text-align: center;">0.14</td> <td style="text-align: center;">0.20</td> <td style="text-align: right;">feet</td> </tr> </tbody> </table>			Minor Storm	Major Storm		d =	0.14	0.20	feet				
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## AREA INLET IN A SWALE

Enter Your Project Name Here

Inlet 1

**Inlet Design Information (Input)**

Type of Inlet: CDOT Type C      Inlet Type = CDOT Type C

Angle of Inclined Grate (must be <= 30 degrees)       $\theta =$  0.00 degrees

Width of Grate       $W =$  3.00 feet

Length of Grate       $L =$  3.00 feet

Open Area Ratio       $A_{RATIO} =$  0.70

Height of Inclined Grate       $H_B =$  0.00 feet

Clogging Factor       $C_f =$  0.50

Grate Discharge Coefficient       $C_d =$  0.96

Orifice Coefficient       $C_o =$  0.64

Weir Coefficient       $C_w =$  2.05

Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)

	MINOR	MAJOR	
$d =$	0.14	0.20	
<b><math>Q_a =</math></b>	<b>0.9</b>	<b>1.7</b>	<b>cfs</b>
<b>Bypassed Flow, <math>Q_b =</math></b>	<b>0.0</b>	<b>0.0</b>	<b>cfs</b>
<b>Capture Percentage = <math>Q_a/Q_o = C\%</math></b>	<b>100</b>	<b>100</b>	<b>%</b>

**Total Inlet Interception Capacity (assumes clogged condition)**

Warning 04: Froude No. exceeds USDCM Volume I recommendation.