

December 18, 2024

Town of Grand Lake
1026 Park Avenue
Grand Lake, CO 80447
970-627-3435

Drainage Conformance Letter

Subject: Drainage Conformance and Culvert Sizing

Project Location: The Gateway Inn, 120 Lake Avenue, Grand Lake, CO 80447

Town of Grand Lake,

Bowman Consulting is the Engineer of Record representing The Gateway Inn regarding the improvements located at 120 Lake Avenue, Grand Lake, CO 80447. Our project involves improving the parking lot and stabilizing the drainage flows to avoid rutting and washout issues onto W. Portal Road. To accomplish this, the following work is being proposed:

1. Stabilize paving in the drainage area west of the building
2. Adjust the rip-rap at the edge of paving at the point of discharge from the pavement area
3. Add a culvert at the trail crossing with associated rip-rap at the culvert entrance and exit.

The total contributing drainage area including pavement and roof is 29,680 sf. The direct runoff based on a 100-yr, 1-hour storm event is 3.1 cfs. Based on velocities ranging from 3 fps to 10 fps, the culvert size would range from 0.71' to 1.29' or 12" to 18". Therefore, an 18" CMP culvert is being proposed. Hydrology and calculation worksheets are attached for reference.

The proposed work provides adequate infrastructure to direct runoff to the existing wetland to avoid future rutting and washout towards W. Portal Road while improving the overall hydration of the existing wetland.

Thank you for your attention to this matter. Please feel free to contact us at (303) 801-2905 or hehrsam@bowman.com for any inquiries or discussions related to drainage conformance.

Sincerely,
Bowman Consulting Group, Ltd


Howard Ehram, P.E.
Sr Project Manager



Enclosure: Hydrology and Calculation Worksheets

Table 400
ADJUSTMENT FACTORS TO OBTAIN N-MINUTE ESTIMATES FROM
ONE-HOUR VALUES

Duration (minutes)	5	10	15	30
Ratio to 1-Hr Depth	0.29	0.45	0.57	0.79

From NOAA Atlas 2 Vol. III Table 12

Table 401
ONE-HOUR DESIGN POINT RAINFALL VALUES
FOR VARIOUS PARTS OF GRAND COUNTY

	<u>5-YR</u>	<u>10-YR</u>	<u>100-YR</u>
FRASER	0.88	1.01	1.64
GRAND LAKE	0.88	0.99	1.47
GRANBY	0.80	0.95	1.43
KREMMLING	0.78	0.90	1.43

From NOAA Atlas 2 Vol. III Table 11

Engineering discretion should be used when performing analysis outside these areas. All pertinent information concerning the NOAA Atlas should be referenced and applied as site location dictates.

Designer:	Howard Ehram, P.E.
Company:	BOWMAN
Date:	12/18/2024
Project:	Gateway Inn
Location:	Grand Lake

Global Parameters ¹	
Land Use	% Imp.
Open Space/Landscaping	2
Hardscape	100
Roof	100

Summary	
Total Area (ac)	0.68
Composite Impervious	100.0%

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Cells of this color are for optional user-input

¹ From Table 6-3 in UDFCD Volume 1

² From Table 6-4 in UDFCD Volme 1

[illegible]

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Location: Grand Lake

Computed $t_c = t_i + t_r$

$$t_{\text{minimum}} = 5 \text{ (urban)}$$
$$t_{\text{minimum}} = 10 \text{ (non-urban)}$$

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

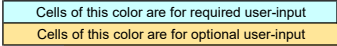
$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_r}}$$

$$\text{Selected } t_c = \max\{t_{\text{minimum}}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

Cells of this color are for required user-input

[illegible]

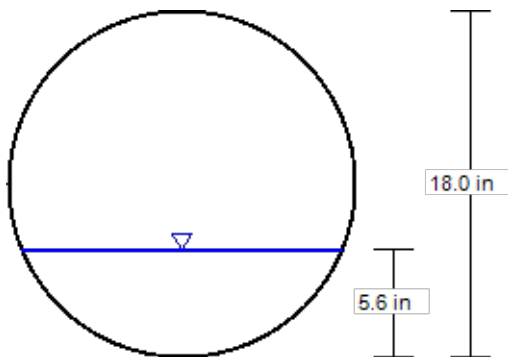
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[illegible]

Culvert Sizing Calculation		
Q=	3.03	cfs
V=	2	fs
A=	1.517	sf
D-ft=	1.57	ft
D-in=	18.83	in
Q=	3.03	cfs
V=	7	fs
A=	0.433	sf
D-ft=	0.84	ft
D-in=	10.06	in

Cross Section for 18" CMP

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.024
Channel Slope	6.500 %
Normal Depth	5.6 in
Diameter	18.0 in
Discharge	3.03 cfs



V: 1
H: 1