APPENDIX

DEVELOPED DRAINAGE BASIN
PEAK RUNOFF FLOW DETERMINATION

DRAINAGE BASIN	TOTAL AREA ACRES	100-YEAR RUNOFF COEFFICIENT	100-YEAR INTENSITY in/hr	"Q" VALUE cfs
1	0.922	0.92	5.94	5.04
2	0.132	0.92	5.94	0.72
3	0.037	0.35	5.94	0.08
4	0.045	0.35	5.94	0.09

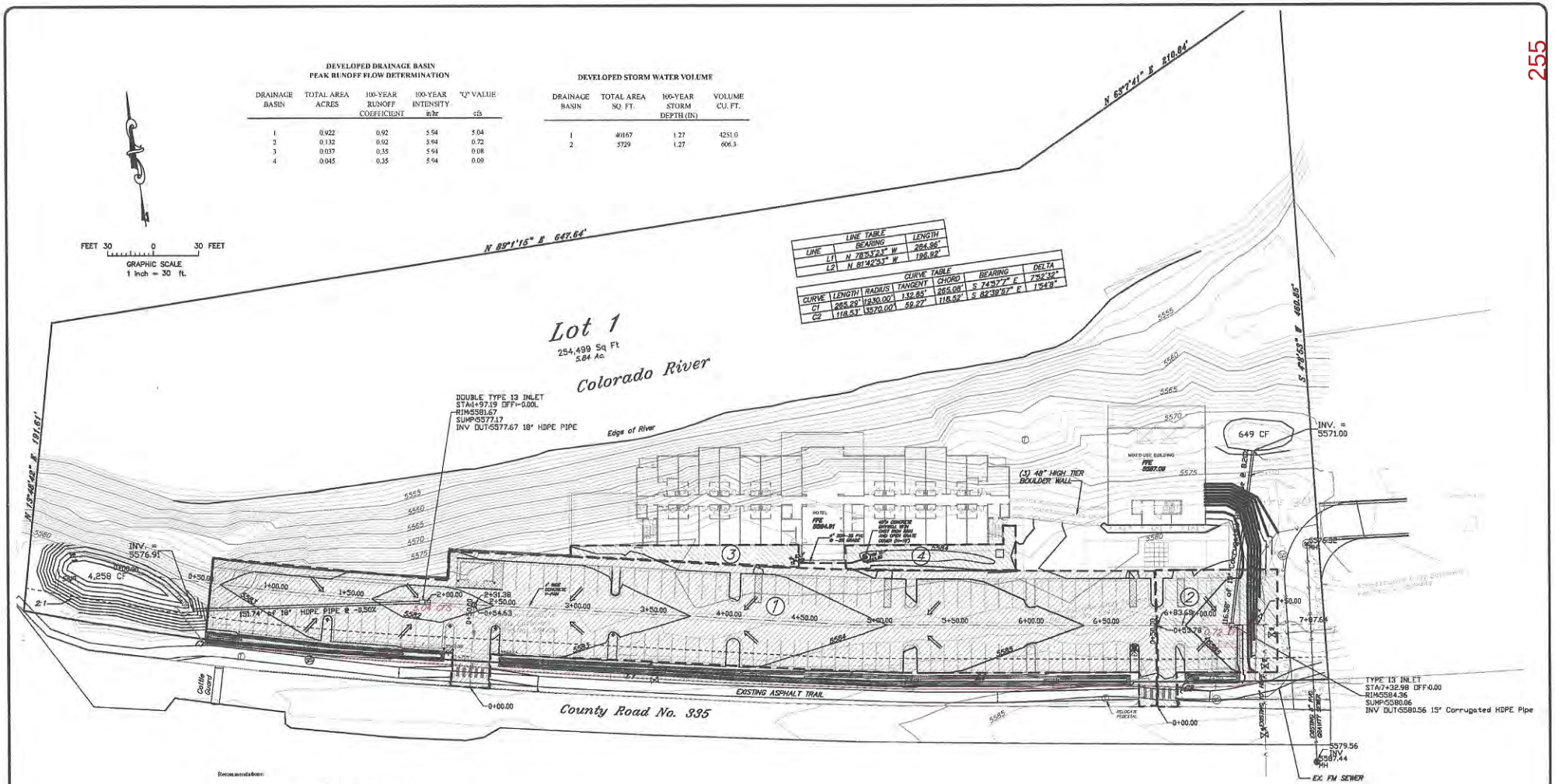
DEVELOPED STORM WATER VOLUME

DRAINAGE BASIN	TOTAL AREA SQ. FT.	100-YEAR STORM DEPTH (IN)	VOLUME CU. FT.
1	40167	1.27	4251.0
2	5729	1.27	606.3

FEET 30 0 30 FEET
GRAPHIC SCALE
1 Inch = 30 ft.

LINE TABLE		
LINE	BEARING	LENGTH
L1	N 78°53'23" W	284.96'
L2	N 81°42'53" W	196.92'

CURVE TABLE					
CURVE	LENGTH	RADIUS	TANGENT	CHORD	BEARING	DELTA
C1	265.29'	1930.00'	132.85'	265.08'	S 74°57'7" E	7°52'32"
C2	116.53'	3570.00'	58.27'	116.52'	S 82°39'07" E	1°54'9"



Recommendations:

1. Positive drainage should be constructed away from the building foundations in accordance with the grading and drainage plan (if proposed grades are shown) and to the extent possible, with the final soils report.
2. Storm water should be conveyed to the dry detention basins via underground storm drain as shown on the Grading Plan.
3. Erosion control measures recommended above should be strictly followed.
4. Maintenance for drainage facilities should be in accordance with the aforementioned maintenance section.

DRAWN & DESIGNED BY: H.E.B.	REVIEWED BY:	PINNACLE DESIGN CONSULTING GROUP, INC.	REVISION / DATE / DESCRIPTION / BY / CHD	COAL SEAM LLC	SCALE: 1" = 30' / JOB NO: 2504.11 / DATE: 10-29-25
CHECKED BY: H.E.B.	DATE: FOR:	CONSULTING ENGINEERS • 0905 BUCK POINT ROAD CARBONDALE, CO 81623 • (970) 963-2170 pinnacledesign@sopris.net		LOT 1 HIGHWAY P.U.D. – 7051 COUNTY ROAD 335 DRAINAGE BASINS	SHEET NO: C5

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 2**

Designer: Hans Brucker
Company: Pinnacle Design
Date: October 25, 2025
Project: 7051 County Road 335
Location: New Castle, Colorado

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter): I_a = 100.0 %

B) Tributary Area's Imperviousness Ratio (i = I_a/100): i = 1.000

C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time
WQCV= 0.8 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i): WQCV = 0.40 watershed inches

D) Contributing Watershed Area (including sand filter area): Area = 40,167 sq ft

E) Water Quality Capture Volume (WQCV) Design Volume
V_{WQCV} = WQCV / 12 * Area: V_{WQCV} = cu ft

F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm: d_6 = 0.30 in

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume: $V_{WQCV\ OTHER}$ = 934 cu ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired): $V_{WQCV\ USER}$ = cu ft

2. Basin Geometry

A) WQCV Depth: D_{WQCV} = 3.0 ft

B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.: Z = 0.00 ft / ft

C) Minimum Filter Area (Flat Surface Area): A_{Min} = 502 sq ft

D) Actual Filter Area: A_{Actual} = sq ft

E) Volume Provided: V_T = cu ft

3. Filter Material

Choose One
- (●) 18" CDOT Class B or C Filter Material
- ( ) Other (Explain):

4. Underdrain System

A) Are underdrains provided?

Choose One
- ( ) YES
- (●) NO

B) Underdrain system orifice diameter for 12 hour drain time

i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice: y = N/A ft

ii) Volume to Drain in 12 Hours: Vol_{12} = N/A cu ft

iii) Orifice Diameter, 3/8" Minimum: D_O = N/A in

Design Procedure Form: Sand Filter (SF)

Designer: Hans Brucker
Company: Pinnacle Design
Date: October 25, 2025
Project: 7051 County Road 335
Location: New Castle, Colorado

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One: ○ YES ◉ NO
6. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	100% detention will be provided so there won't be any excess flows.

Notes:

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 2**

Designer:	**Hans Brucker**
Company:	**Pinnacle Design**
Date:	**October 25, 2025**
Project:	**7051 County Road 335**
Location:	**New Castle, Colorado**

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter): I_a = 100.0 %

B) Tributary Area's Imperviousness Ratio (i = I_a/100): i = 1.000

C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time
WQCV= 0.8 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i): WQCV = 0.40 watershed inches

D) Contributing Watershed Area (including sand filter area): Area = 5,729 sq ft

E) Water Quality Capture Volume (WQCV) Design Volume
V_{WQCV} = WQCV / 12 * Area: V_{WQCV} = cu ft

F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm: d_6 = 0.30 in

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume: $V_{WQCV\ OTHER}$ = 133 cu ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired): $V_{WQCV\ USER}$ = cu ft

2. Basin Geometry

A) WQCV Depth: D_{WQCV} = 3.0 ft

B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.: Z = 0.00 ft / ft

C) Minimum Filter Area (Flat Surface Area): A_{Min} = 72 sq ft

D) Actual Filter Area: A_{Actual} = sq ft

E) Volume Provided: V_T = cu ft

3. Filter Material

Choose One
- (●) 18" CDOT Class B or C Filter Material
- ( ) Other (Explain):

4. Underdrain System

A) Are underdrains provided?

Choose One
- ( ) YES
- (●) NO

B) Underdrain system orifice diameter for 12 hour drain time

i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice: y = N/A ft

ii) Volume to Drain in 12 Hours: Vol_{12} = N/A cu ft

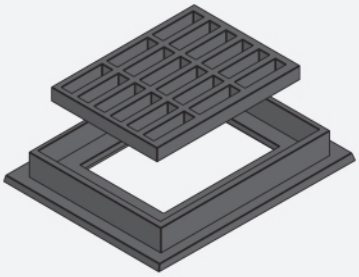
iii) Orifice Diameter, 3/8" Minimum: D_O = N/A in

Design Procedure Form: Sand Filter (SF)

Designer: Hans Brucker
Company: Pinnacle Design
Date: October 25, 2025
Project: 7051 County Road 335
Location: New Castle, Colorado

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One: ○ YES ◉ NO
6. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	100% detention will be provided so there won't be any excess flows.

Notes:

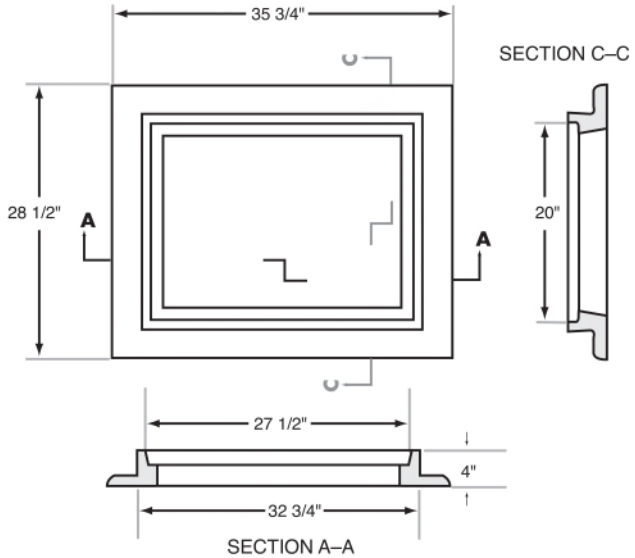


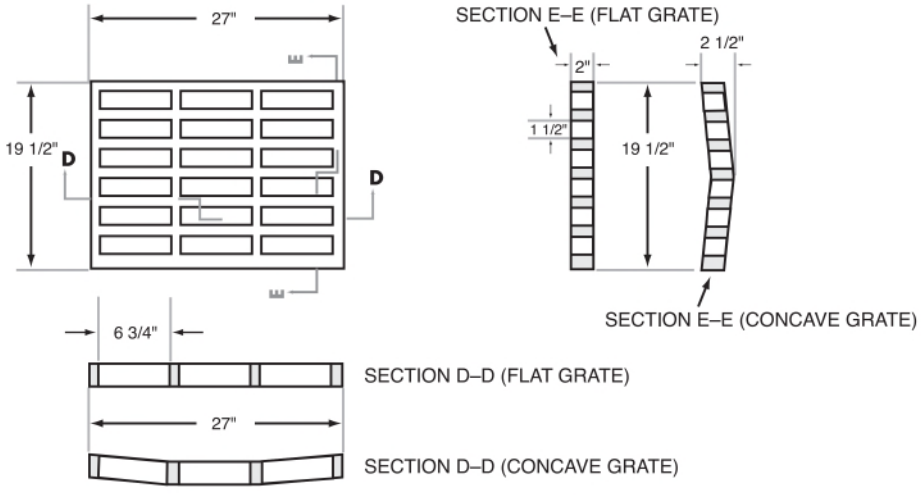
IFG1927CI

APPROXIMATE WEIGHT

FRAME	190 lb
GRATE FLAT	169 lb
GRATE CONCAVE	182 lb

NOTE:
FINISH—BLACK BITUMINOUS PAINT





182.25 sq. in. was the calculated opening of the grate.

CASTINGS INC. 860 4TH AVE. • P.O. BOX 669 • GRAND JCT, CO 81502 • 970.243.2032 • FAX 970.242.4962

Double Type 13 Inlet Capacity

Dept and Area in inch Units

Area sq. in.	Depth in	Q cfs	Q gpm
364.5	6	8.62	3862.66

two inlets

50% Clogging is 5.04 cfs x 1.5 = 7.56 cfs

So the inlet has adequate capacity.

Channel Report

4 INCH PVC PIPE FLOWING 0.08 CFS AT 2% GRADE

Circular

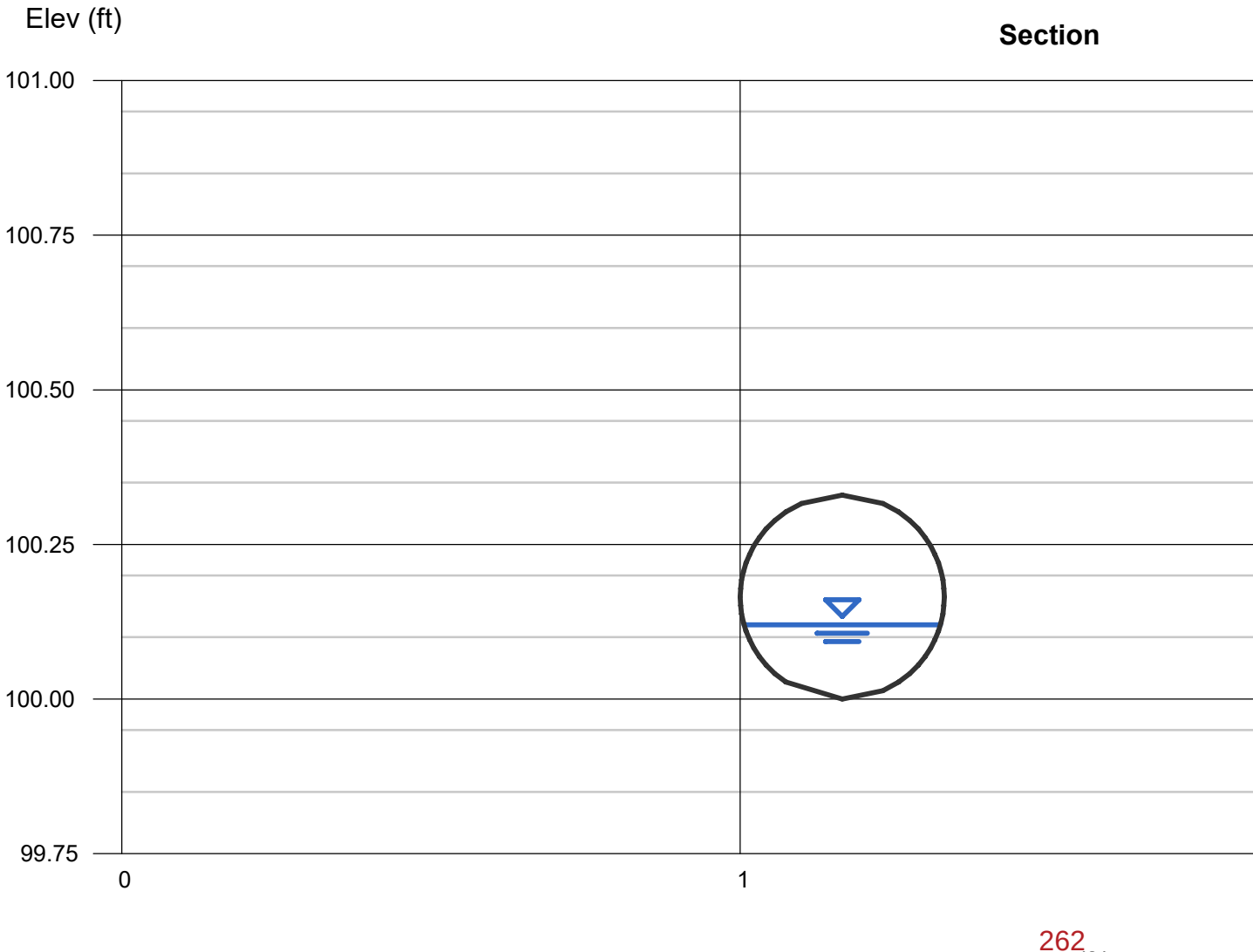
Diameter (ft)	= 0.33
Invert Elev (ft)	= 100.00
Slope (%)	= 2.00
N-Value	= 0.012

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.08

Highlighted

Depth (ft)	= 0.12
Q (cfs)	= 0.080
Area (sqft)	= 0.03
Velocity (ft/s)	= 2.84
Wetted Perim (ft)	= 0.43
Crit Depth, Yc (ft)	= 0.16
Top Width (ft)	= 0.32
EGL (ft)	= 0.25



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Saturday, Oct 25 2025

15 INCH CORRUGATED HDPE FLOWING 0.72 CFS AT 8.2% GRADE

Circular

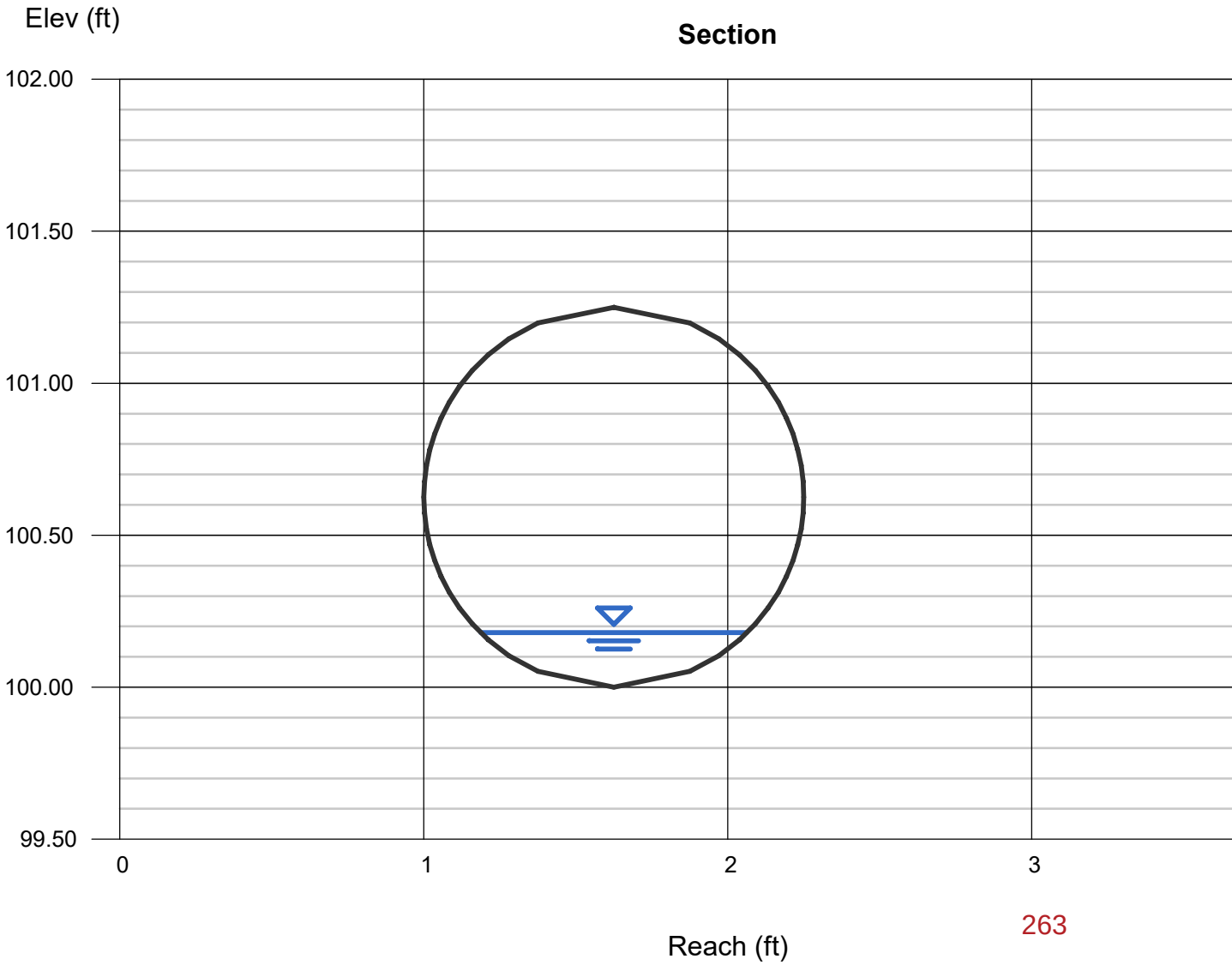
Diameter (ft)	= 1.25
Invert Elev (ft)	= 100.00
Slope (%)	= 8.20
N-Value	= 0.015

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.72

Highlighted

Depth (ft)	= 0.18
Q (cfs)	= 0.720
Area (sqft)	= 0.11
Velocity (ft/s)	= 6.58
Wetted Perim (ft)	= 0.97
Crit Depth, Yc (ft)	= 0.34
Top Width (ft)	= 0.88
EGL (ft)	= 0.85



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Saturday, Oct 25 2025

18 INCH HDPE FLOWING 5.04 CFS AT 0.5% GRADE

Circular

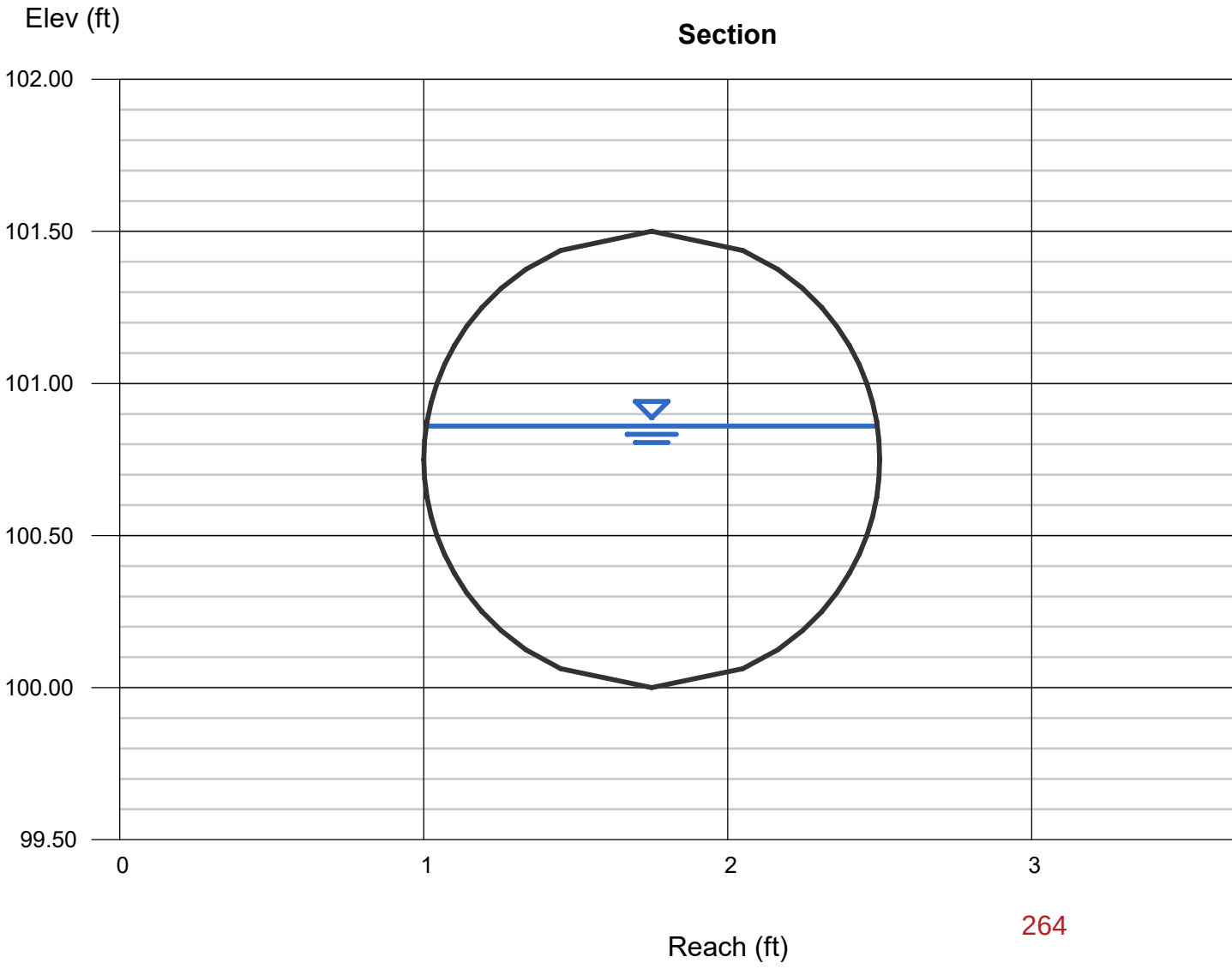
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.012

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.04

Highlighted

Depth (ft)	= 0.86
Q (cfs)	= 5.040
Area (sqft)	= 1.05
Velocity (ft/s)	= 4.80
Wetted Perim (ft)	= 2.58
Crit Depth, Yc (ft)	= 0.87
Top Width (ft)	= 1.48
EGL (ft)	= 1.22



Culvert Report

Circular Culvert

Invert Elev Dn (ft)	=	100.00
Pipe Length (ft)	=	151.74
Slope (%)	=	0.50
Invert Elev Up (ft)	=	100.76
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Culvert
Culvert Entrance	=	Smooth tapered inlet throat
Coeff. K,M,c,Y,k	=	0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

Top Elevation (ft)	=	103.00
Top Width (ft)	=	120.00
Crest Width (ft)	=	3.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	5.04
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	0.50
Qpipe (cfs)	=	0.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	0.46
Veloc Up (ft/s)	=	2.42
HGL Dn (ft)	=	100.88
HGL Up (ft)	=	101.02
Hw Elev (ft)	=	101.12
Hw/D (ft)	=	0.24
Flow Regime	=	Inlet Control