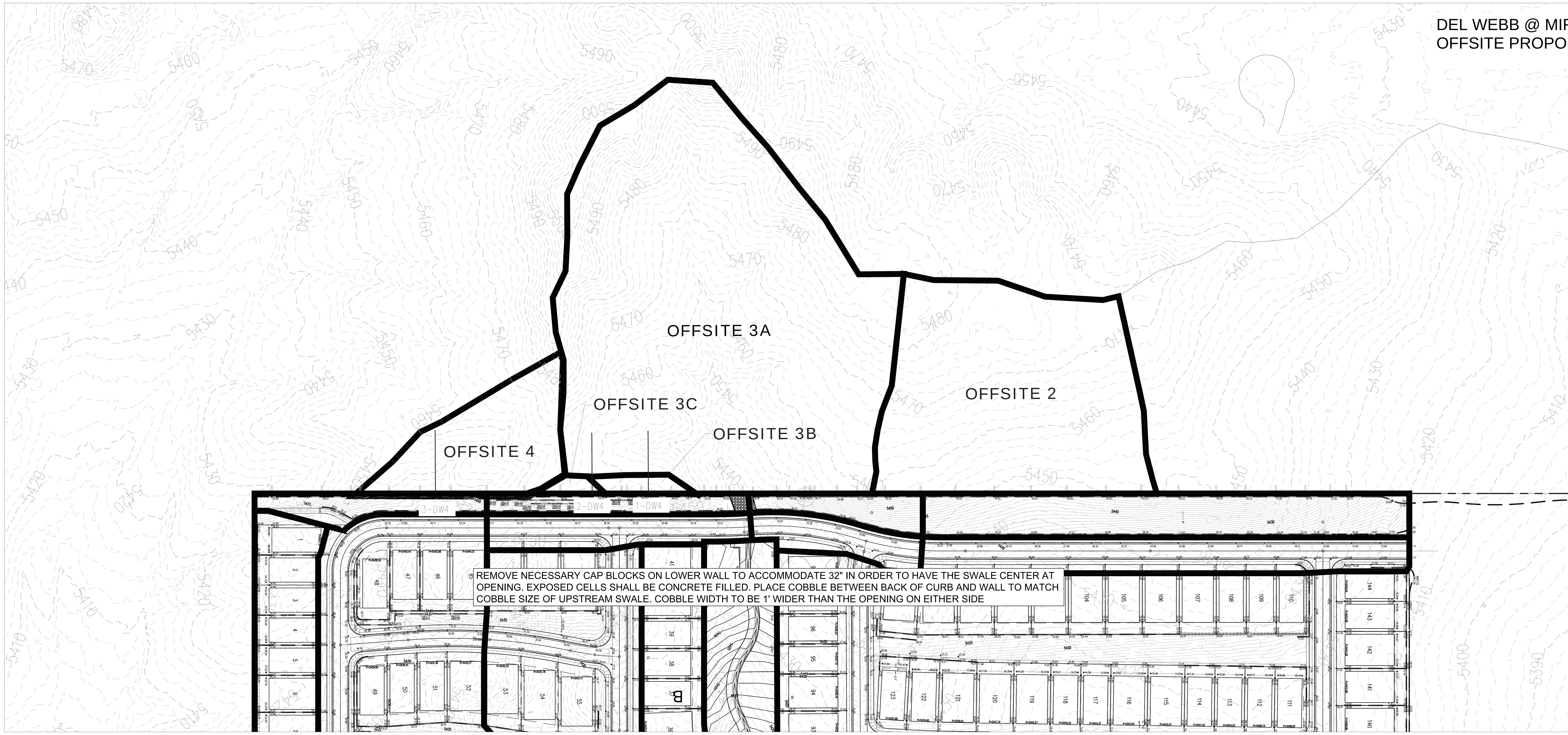
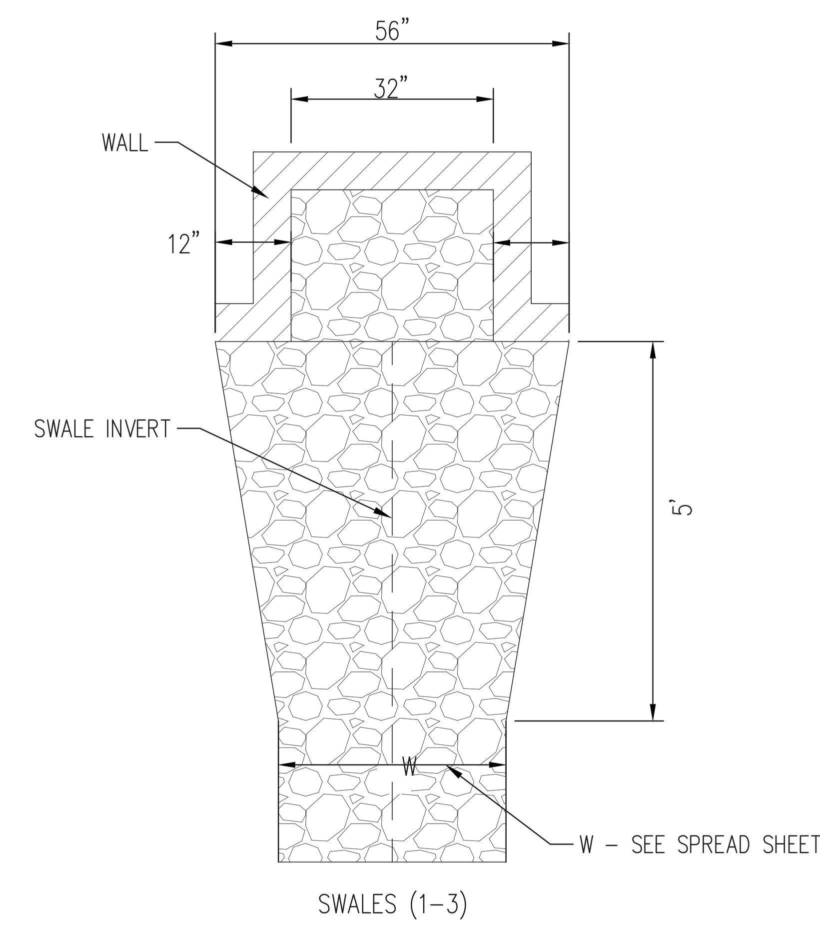
DEL WEBB @ MIREHAVEN PHASE 4
OFFSITE PROPOSED BASIN MAP



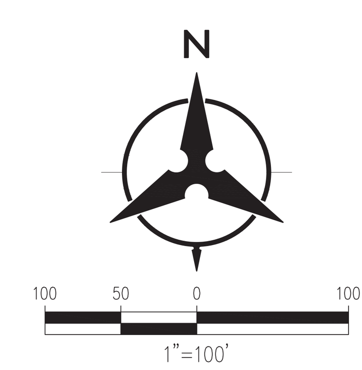
YOLANDA PADILLA MOYER
NEW MEXICO
16035
4-21-2021
LICENSED PROFESSIONAL ENGINEER

DEVELOPED BASIN SUMMARY									
BASIN	AREA		% LAND TREATMENT				DISCHARGE (CFS)	VOLUME (AC-FT)	VOLUME (AC-FT)
I.D.	(AC)		A	B	C	D	100YR	2yr	100 yr
OFFSITE 3A	7.43		19.00%	50.00%	31.00%	0.00%	15.9	0.03	0.45
OFFSITE 3B	0.13		19.00%	50.00%	31.00%	0.00%	0.3	0.00	0.01
OFFSITE 3C	0.07		19.00%	50.00%	31.00%	0.00%	0.2	0.00	0.00
OFFSITE 4	1.14		19.00%	50.00%	31.00%	0.00%	2.4	0.00	0.07
TOTAL	**7.63**						**18.8**	**0.03**	**0.53**

Del Webb Offsite Flow												
Swale number	Basin ID	Q(100yr-6hr)	17% bulking	longitudinal	cobble size	n-value	permissible velocity	actual velocity	V-swale top width	V-swale top width	Design width	Depth of swale
				slope	Actual				based on depth	based on EGL		
		cfs	cfs		in		ft/s	ft/s	ft	ft	ft	ft
	3A	INSTALLED WITH PHASE 3 GRADING PLAN										
1-DW4	3B	0.3	0.35	3:1	6	0.069	5.5	2.65	1.26	1.92	3.00	0.50
2-DW4	3C	0.2	0.23	4:1	6	0.069	5.5	2.12	1.14	1.56	3.00	0.50
3-DW4	4	2.4	2.81	4:1	6	0.069	5.5	3.9	2.94	4.38	4.50	0.75



RUN DOWN DETAIL
NOT TO SCALE



LEGEND

BASIN BOUNDARY	
FLOW ARROW	
PROPOSED STORM DRAIN	
EXISTING STORM DRAIN	
PROPOSED STREET SLOPE OR FLOW PATH	2.19%
PROPOSED STORM DRAIN MANHOLE	
PROPOSED STORM DRAIN INLET	

Yolanda Padilla Moyer

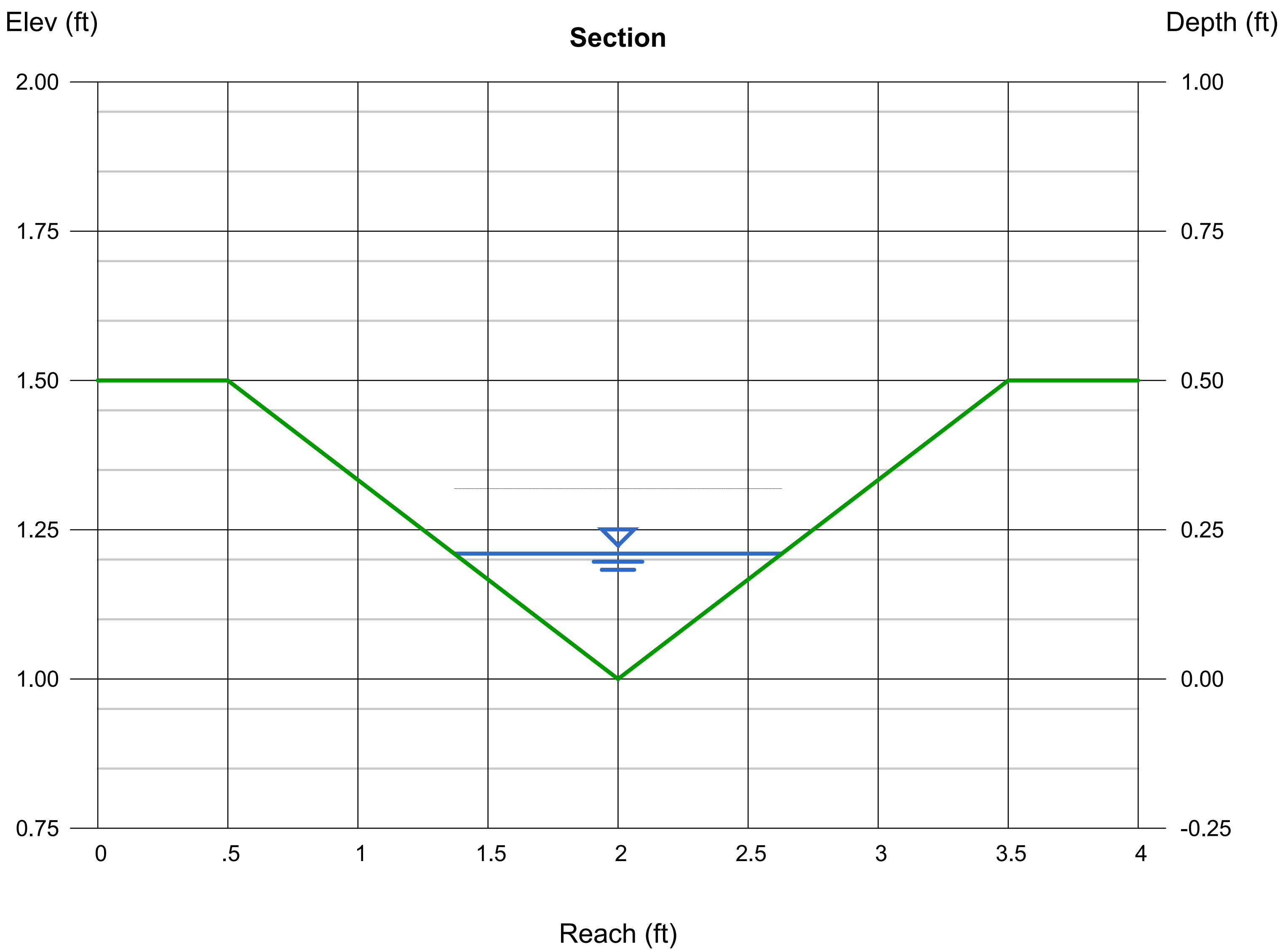
Mon, 15–Mar–2021 – 11:11:am, Plotted by: AROMERO
P:\20180338\CDP\Hydro\Phase 4\20180338_grading.dwg

Bohannan Huston
www.bhinc.com 800.877.5332

Channel Report

1-DW4

Triangular		**Highlighted**	
Side Slopes (z:1)	= 3.00, 3.00	Depth (ft)	= 0.21
Total Depth (ft)	= 0.50	Q (cfs)	= 0.350
		Area (sqft)	= 0.13
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.65
Slope (%)	= 33.00	Wetted Perim (ft)	= 1.33
N-Value	= 0.069	Crit Depth, Yc (ft)	= 0.25
		Top Width (ft)	= 1.26
Calculations		EGL (ft)	= 0.32
Compute by:	Known Q		
Known Q (cfs)	= 0.35		

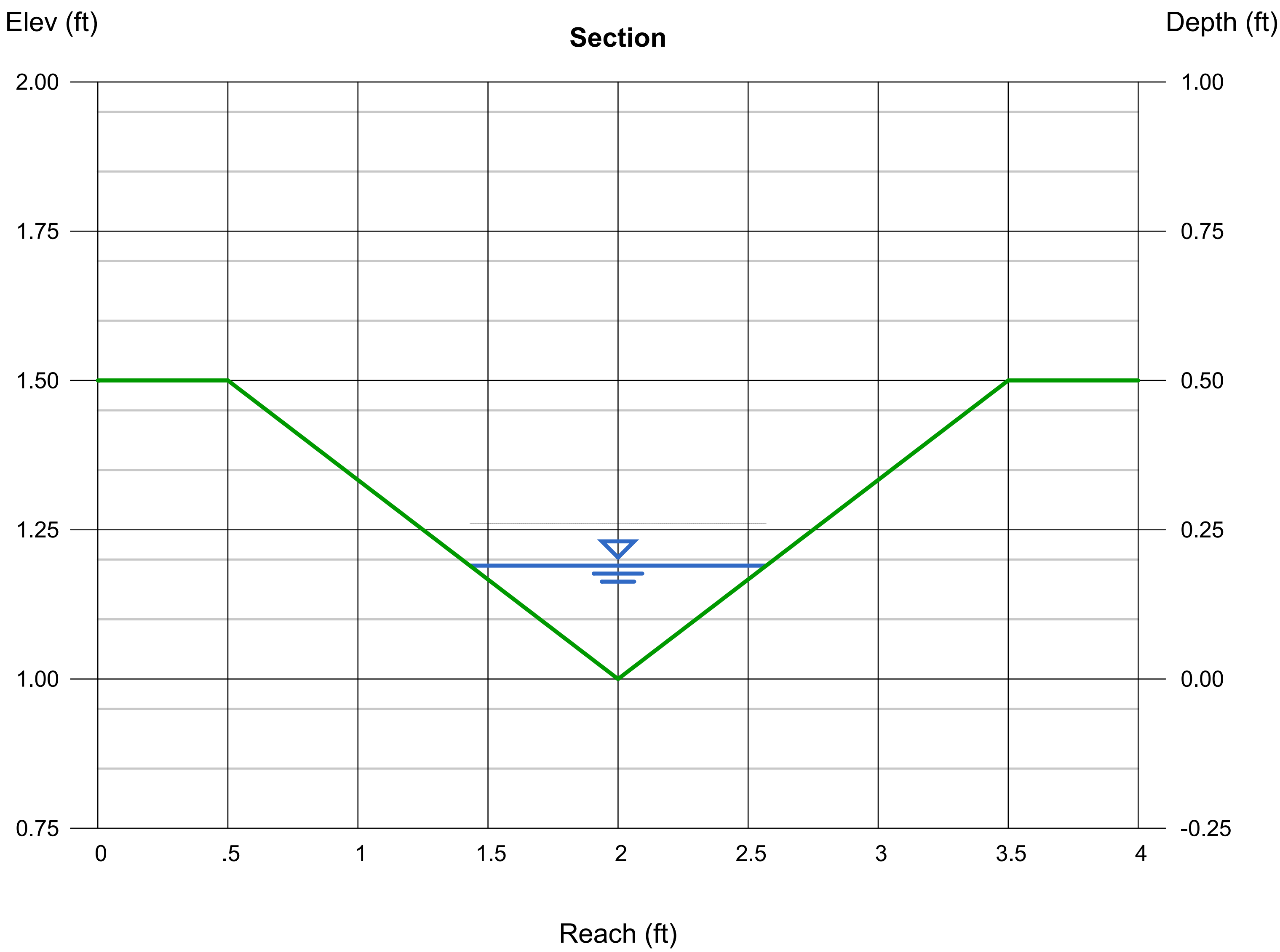


Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jan 26 2021

2-DW4

Triangular		**Highlighted**	
Side Slopes (z:1)	= 3.00, 3.00	Depth (ft)	= 0.19
Total Depth (ft)	= 0.50	Q (cfs)	= 0.230
		Area (sqft)	= 0.11
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.12
Slope (%)	= 25.00	Wetted Perim (ft)	= 1.20
N-Value	= 0.069	Crit Depth, Yc (ft)	= 0.21
		Top Width (ft)	= 1.14
Calculations		EGL (ft)	= 0.26
Compute by:	Known Q		
Known Q (cfs)	= 0.23		



Channel Report

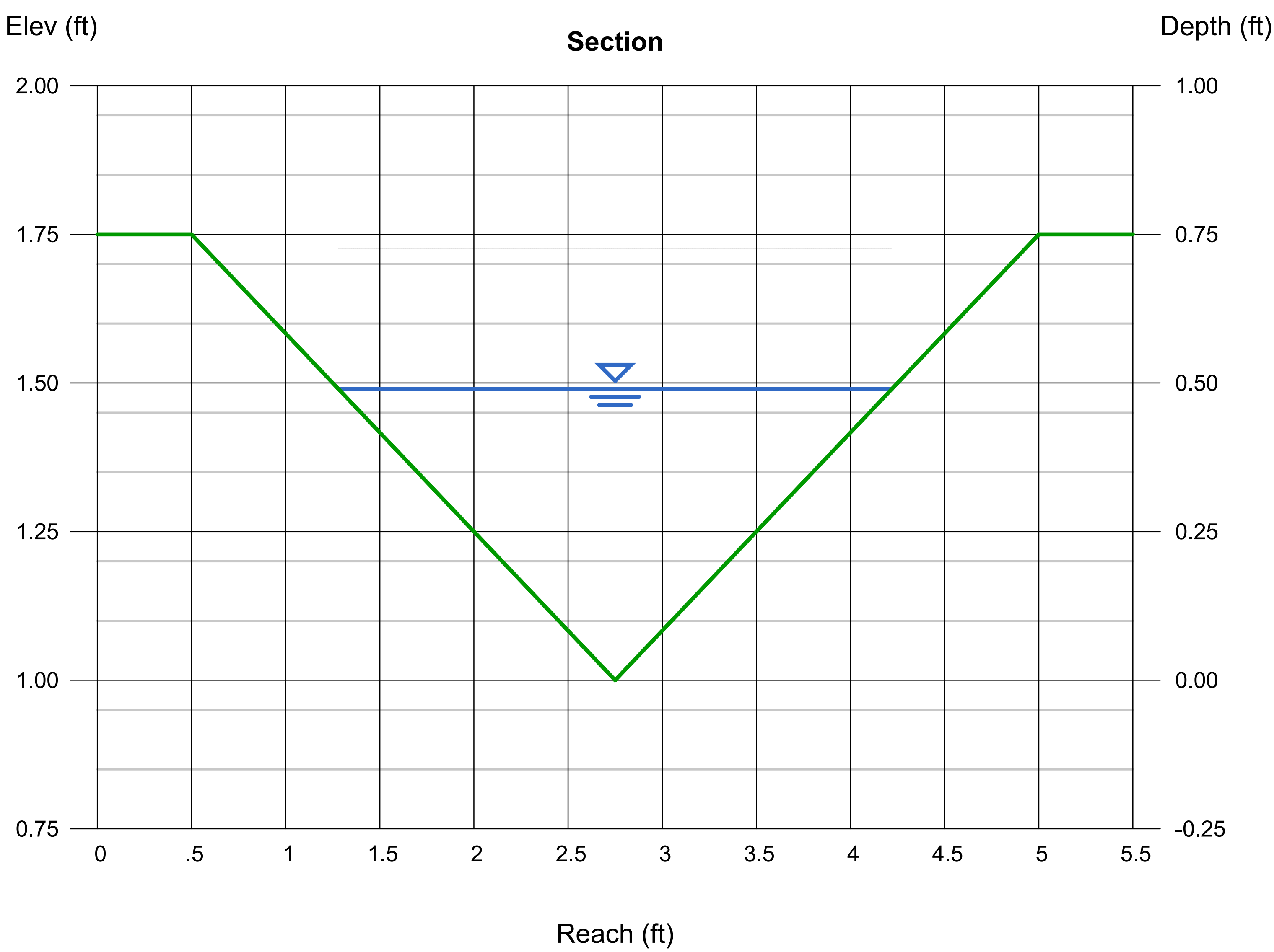
3-DW4

Triangular
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 0.75

Invert Elev (ft) = 1.00
Slope (%) = 25.00
N-Value = 0.069

Calculations
Compute by: Known Q
Known Q (cfs) = 2.81

Highlighted
Depth (ft) = 0.49
Q (cfs) = 2.810
Area (sqft) = 0.72
Velocity (ft/s) = 3.90
Wetted Perim (ft) = 3.10
Crit Depth, Yc (ft) = 0.56
Top Width (ft) = 2.94
EGL (ft) = 0.73



Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Apr 7 2020

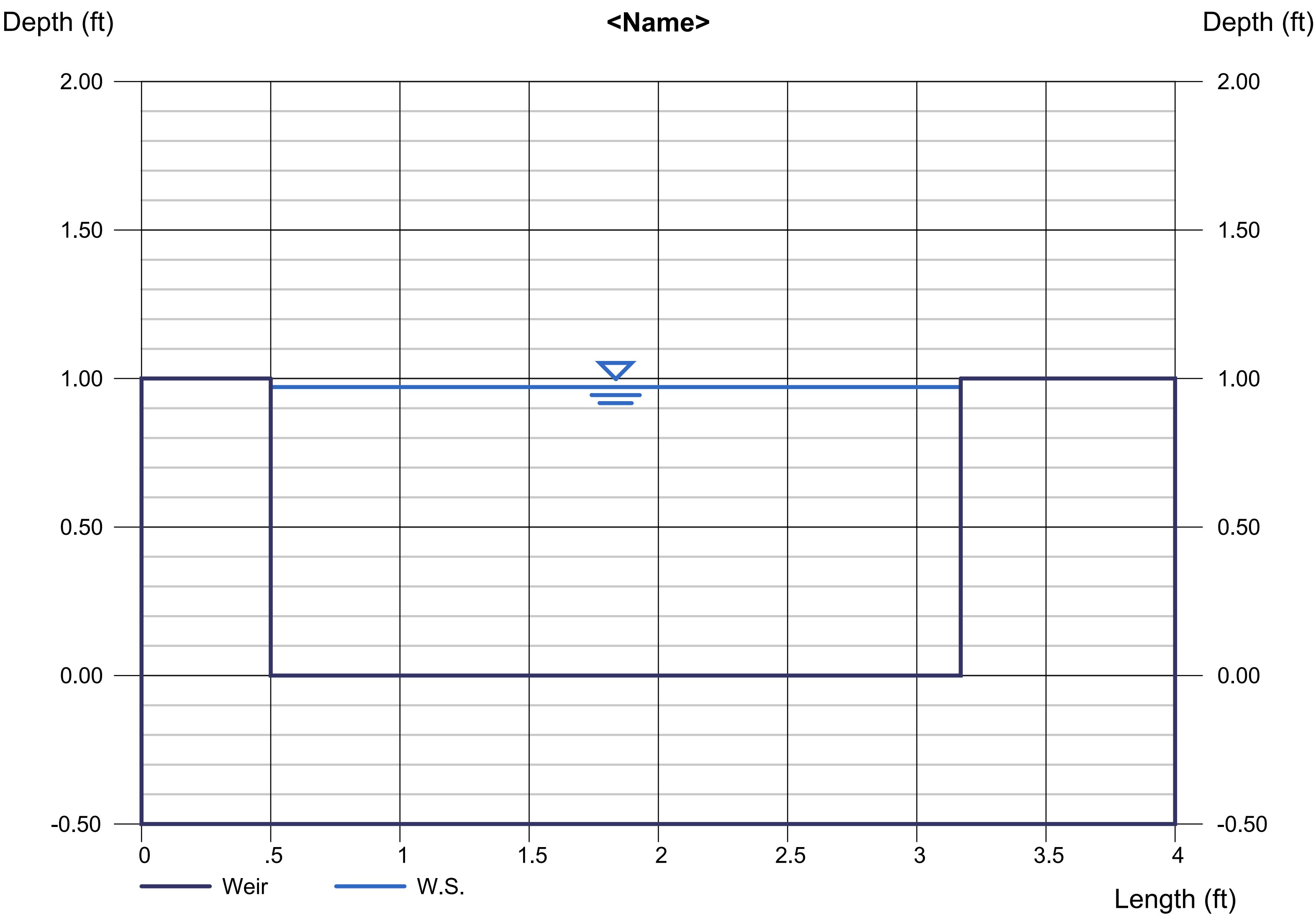
<Name>

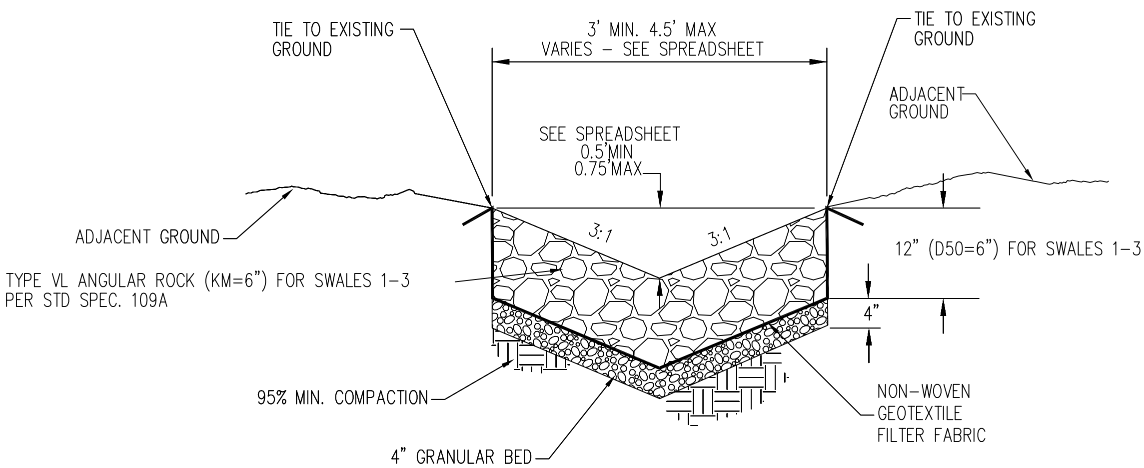
Rectangular Weir
Crest = Sharp
Bottom Length (ft) = 2.67
Total Depth (ft) = 1.00

Calculations
Weir Coeff. Cw = 3.02
Compute by: Known Q
Known Q (cfs) = 7.72

Highlighted
Depth (ft) = 0.97
Q (cfs) = 7.720
Area (sqft) = 2.59
Velocity (ft/s) = 2.98
Top Width (ft) = 2.67

Qs for swales 1-3 </= 7.72 so weir works for all locations





SWALE TYPICAL SECTION

NOT TO SCALE

Swale 1 - DW4

$Q = 0.3$ cfs

$S_{ch} = 0.33$

$$D_{50} = \left[\frac{0.3(0.33)^{0.58}}{0.0393}\right]^{\frac{1}{1.89}}$$

$D_{50} = 2.1''$ use $6''$

Swale 2 - DW4

$Q = 0.2$ cfs

$S_{ch} = 0.25$

$$D_{50} = \left[\frac{0.2(0.25)^{0.58}}{0.0393}\right]^{\frac{1}{1.89}}$$

$D_{50} = 1.5''$ use $6''$

Swale 3 - DW4

$Q = 2.4$ cfs

$S_{ch} = 0.25$

$$D_{50} = \left[\frac{2.4(0.25)^{0.58}}{0.0393}\right]^{\frac{1}{1.89}}$$

$D_{50} = 5.8''$ use $6''$

Reference:

Denver Urban Drainage & Flood Control District Urban Storm Drainage Criteria Manual Ch. 8.1.2 for Slope 2%-40% use Below.

Reference

An excel program to Design Rock chutes for grade Stabilization by USDA

Eq 9:

$$D_{50} = \left[\frac{q(S_{ch})^{0.58}}{3.93\times10^{-2}}\right]^{\frac{1}{1.89}}$$

Table 6-2 Permissible Velocities for Grass and Earth-Lined Channels

Grass Lining		
Channel Slope	Grass Lining	Permissible Velocity*
5-10%	Small grains (temp)	
	Bermuda grass	1.5 m/s
	Reed canary grass	1.2 m/s
	Tall fescue	1.2 m/s
	Grass-legume mixture	0.9 m/s
>10%	Bermuda grass	1.2 m/s
	Reed canary grass	0.9 m/s
	Tall fescue	0.9 m/s

* For highly erodible soils, decrease permissible velocities by 25%

Earth Linings	
Earth Lining Soil Types	Permissible Velocity
Fine Sand (noncolloidal)	2.5 ft/s
Sandy Loam (noncolloidal)	2.5 ft/s
Silt Loam (noncolloidal)	3.0 ft/s
Ordinary Firm Loam	3.5 ft/s
Fine Gravel	5.0 ft/s
Stiff Clay (very colloidal)	5.0 ft/s
Graded, Loam to Cobbles (noncolloidal)	5.0 ft/s
Graded, Silt to Cobbles (colloidal)	5.5 ft/s
Alluvial Silts (noncolloidal)	3.5 ft/s
Alluvial Silts (colloidal)	5.0 ft/s
Coarse Gravel (noncolloidal)	6.0 ft/s
Cobbles and Shingles	5.5 ft/s
Shales and Hard Pans	6.0 ft/s

Source: HEC-15 (1988)

The value of n can also vary with flow depth. Typical values of n for various channel lining materials, as a function of flow depth, are given in **Table 3-2**.

Table 3-2 Manning's Roughness Coefficients

		n value		
		Depth Ranges		
Lining Category	Lining Type	0-0.5 ft (0-15 cm)	0.5-2.0 ft (15-60 cm)	>2.0 ft (>60 cm)
Rigid	Concrete	0.015	0.013	0.013
	Grouted Riprap	0.040	0.030	0.028
	Stone Masonry	0.042	0.032	0.030
	Soil Cement	0.025	0.022	0.020
	Asphalt	0.018	0.016	0.016
Unlined	Bare Soil	0.23	0.020	0.020
	Rock Cut	0.045	0.035	0.025
Temporary	Woven Paper Net	0.016	0.015	0.015
	Jute Net	0.028	0.022	0.019
	Fiberglass Roving	0.028	0.021	0.019
	Straw with Net	0.065	0.033	0.025
	Curled Wood Net	0.066	0.035	0.028
	Synthetic Mat	0.036	0.025	0.021
Gravel Riprap	1-inch (2.5 cm) d_{50}	0.044	0.033	0.030
	2-inch (5 cm) d_{50}	0.066	0.041	0.034
Rock Riprap	6-inch (15 cm) d_{50}	0.104	0.069	0.035
	12-inch (30 cm) d_{50}	--	0.078	0.040

NOTE: Values listed are representative values for the respective depth ranges.
Source: HEC-15 (Chang & Cotton, 1988)

Manning's n for Fixed-bed Sand Bottom Channels

Manning's n for natural sand bottom channels can also be determined by Strickler's formula which defines n as a function of particle size:

$$n = \frac{d_{50}^{\;1/6}}{21.1} \tag{3-2}$$

where d_{50} is in mm.

This formula was modified by Meyer-Peter and Müller for non-uniformly graded sand mixtures:

$$n = \frac{(d_{90})^{1/6}}{26} \tag{3-3}$$

where d_{90} is in mm.