Appendix C – Hydraulic Calculations

- Normal Depth Calculations – Onsite Streets
- Drop Inlet Calculations
- WSPG Model

Worksheet for ON3S

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.840	%
Discharge	8.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.48
0+05.00	0.38
0+06.50	0.00
0+07.50	0.08
0+07.50	0.13
0+42.50	0.83
0+42.50	0.78
0+43.50	0.70
0+45.00	1.08

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+45.00, 1.08)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.44	ft
Roughness Coefficient	0.016	
Elevation	0.44	ft
Elevation Range	0.00 to 1.08	ft
Flow Area	3.3	ft²
Wetted Perimeter	21.07	ft
Hydraulic Radius	0.15	ft
Top Width	20.97	ft
Normal Depth	0.44	ft
Critical Depth	0.45	ft
Critical Slope	0.693	%
Velocity	2.45	ft/s

Worksheet for ON3S

Results	
Velocity Head	0.09 ft
Specific Energy	0.53 ft
Froude Number	1.097
Flow Type	Supercritical

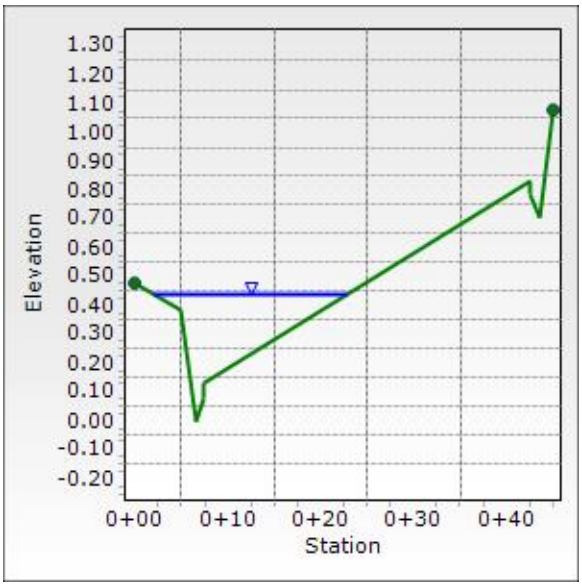
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.44 ft
Critical Depth	0.45 ft
Channel Slope	0.840 %
Critical Slope	0.693 %

Cross Section for ON3S

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.840 %
Normal Depth	0.44 ft
Discharge	8.00 cfs



Worksheet for ON8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.890	%
Discharge	4.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+01.50	0.00
0+02.50	0.08
0+02.50	0.13
0+20.00	0.48
0+37.50	0.13
0+37.50	0.08
0+38.50	0.00
0+40.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+40.00, 0.38)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.26	ft
Roughness Coefficient	0.016	
Elevation	0.26	ft
Elevation Range	0.00 to 0.48	ft
Flow Area	1.6	ft²
Wetted Perimeter	17.25	ft
Hydraulic Radius	0.09	ft
Top Width	17.08	ft
Normal Depth	0.26	ft
Critical Depth	0.29	ft
Critical Slope	0.799	%
Velocity	2.57	ft/s

Worksheet for ON8

Results	
Velocity Head	0.10 ft
Specific Energy	0.36 ft
Froude Number	1.502
Flow Type	Supercritical

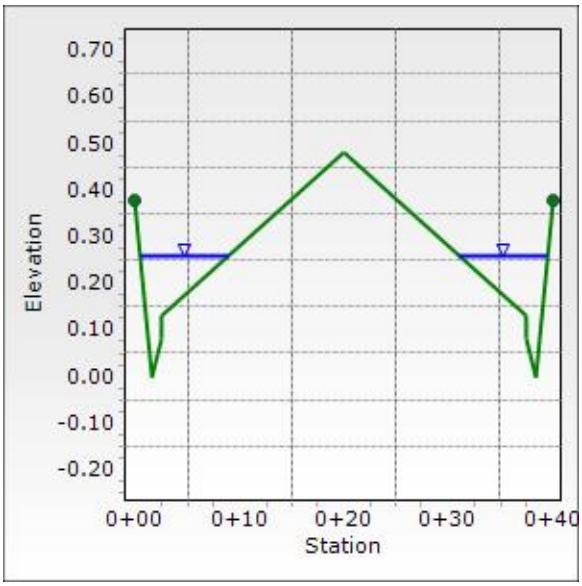
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.26 ft
Critical Depth	0.29 ft
Channel Slope	1.890 %
Critical Slope	0.799 %

XS for ON8

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.890 %
Normal Depth	0.26 ft
Discharge	4.00 cfs



Worksheet for ON13

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.890 %
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+01.50	0.00
0+02.50	0.08
0+02.50	0.13
0+15.00	0.38
0+27.50	0.13
0+27.50	0.08
0+28.50	0.00
0+30.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+30.00, 0.38)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.24 ft
Roughness Coefficient	0.016
Elevation	0.24 ft
Elevation Range	0.00 to 0.38 ft
Flow Area	1.2 ft²
Wetted Perimeter	15.17 ft
Hydraulic Radius	0.08 ft
Top Width	15.00 ft
Normal Depth	0.24 ft
Critical Depth	0.27 ft
Critical Slope	0.828 %
Velocity	2.41 ft/s

Worksheet for ON13

Results	
Velocity Head	0.09 ft
Specific Energy	0.33 ft
Froude Number	1.471
Flow Type	Supercritical

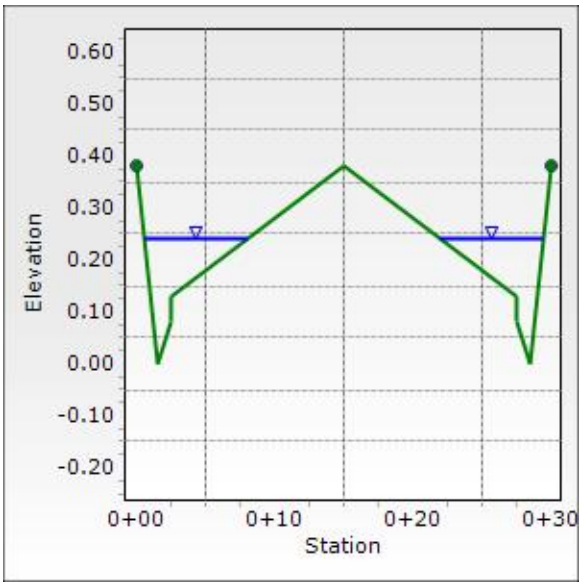
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.24 ft
Critical Depth	0.27 ft
Channel Slope	1.890 %
Critical Slope	0.828 %

XS for ON13

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.890 %
Normal Depth	0.24 ft
Discharge	3.00 cfs



Worksheet for ON14

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.500	%
Discharge	4.90	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.48
0+05.00	0.38
0+06.50	0.00
0+07.50	0.08
0+07.50	0.13
0+42.50	0.83
0+42.50	0.78
0+43.50	0.70
0+45.00	1.08

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+45.00, 1.08)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.41	ft
Roughness Coefficient	0.016	
Elevation	0.41	ft
Elevation Range	0.00 to 1.08	ft
Flow Area	2.7	ft²
Wetted Perimeter	18.03	ft
Hydraulic Radius	0.15	ft
Top Width	17.92	ft
Normal Depth	0.41	ft
Critical Depth	0.38	ft
Critical Slope	0.715	%
Velocity	1.84	ft/s

Worksheet for ON14

Results	
Velocity Head	0.05 ft
Specific Energy	0.46 ft
Froude Number	0.839
Flow Type	Subcritical

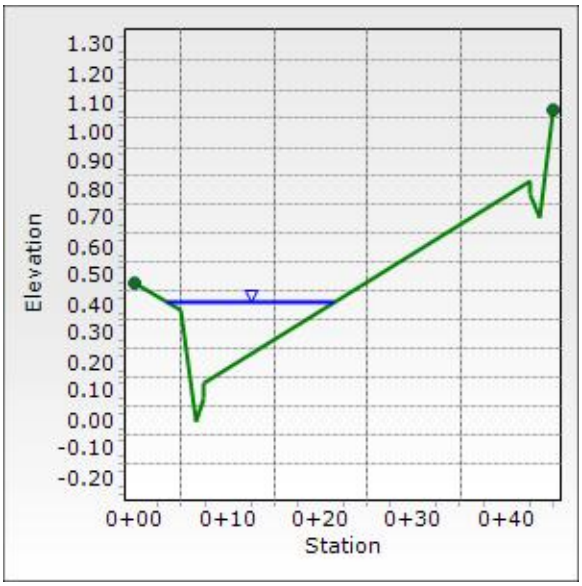
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.41 ft
Critical Depth	0.38 ft
Channel Slope	0.500 %
Critical Slope	0.715 %

XS for ON14

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.41 ft
Discharge	4.90 cfs



Type CM Drop Inlet Sizing in Sump

DI#3

Known:

D_p=	Ponding Depth at Inlet	0.33	ft
W=	Gutter Width	1.5	ft
L_g=	Length of Grate	12.5	ft
L_c=	Length of Curb Opening	14.5	ft
H_c=	Curb Opening Height	0.5	ft
C_{wc}=	Weir coefficient for curb opening	2.3	
C_{wg}=	Weir coefficient for grate	3.0	
C_o=	Orifice coefficient	0.67	
R_o=	Grate opening factor	0.60	
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

P_g=	Active grate weir length (agwl) = 2*W+Lg	15.50	ft
P_{agl}	Adjusted agwl = 2*(1-Cfg/100)*W+Lg	14.00	ft
A_g=	Grate area = W*L_g	18.75	ft^2
A_{aga}=	Adjusted open grate area = Ag*Ro*(1-Cfg/100)	5.63	ft^2
	check - If Dp<1.792*Aaga/Pagl; weir; else orifice	weir	
Q_{ig}=	Flow intercepted by grate If "weir" controls Qig=Cwg*Pagl*$Dp^{1.5}$ If "orifice" controls Qig=Co*Aaga*$(64.4*Dp)^{0.5}$	8.0	cfs

Curb Opening Capacity Calculations

Pc =	Active curb opening weir length (acowl) = Lc+1.8*W	17.20	ft
Pacl =	Adjusted acowl = Lc+1.8*(1-Cfc/100)*W	15.85	ft
Ac=	curb opening area (coa) = Lc*Hc	7.25	ft^2
A_{aca}=	Adjusted coa = Ac*(1-Cfc/100)	3.63	ft^2
	check - If Dp<Hc; weir; else orifice	weir	
Qic=	Flow intercepted by curb opening If "weir" controls Qic=Cwc*Pacl*Dp1.5 If "orifice" controls Qic=Co*Aaca*(64.4*Dp-Hc/2)0.5	7.0	cfs

Total Inlet Calculations

Qti =	Total flow intercepted = Qig+Qic	15.0	cfs
q =	Interception per unit ratio = Q_{ti}/L_g	1.03	cfs/ft

Type CM Drop Inlet Sizing on a C. G.

DI#4

Known:

Q_s=	Half Street Flow	4.9	cfs
S_o=	Longitudinal Slope	0.005	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	1.84	fps
D=	Flow Depth	0.41	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	7.5	ft
L_c=	Length of Curb Opening	9.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	8.71	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.28	
	Q_w= Frontal flow=A_w*V_s	1.36	cfs
	Q_x= Side flow = Q_s-Q_w	3.54	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.48	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	3.1	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.079	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	13.06	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	2.7	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	4.9	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.0	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.52	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	100	%

Type CM Drop Inlet Sizing on a C. G.

DI#5

Known:

Q_s=	Half Street Flow	5.5	cfs
S_o=	Longitudinal Slope	0.0064	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	2.07	fps
D=	Flow Depth	0.41	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	5.0	ft
L_c=	Length of Curb Opening	7.0	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	7.22	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.28	
	Q_w= Frontal flow=A_w*V_s	1.52	cfs
	Q_x= Side flow = Q_s-Q_w	3.98	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.23	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	2.4	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.079	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	14.75	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	2.1	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	4.6	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.9	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.65	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	83	%

Type CM Drop Inlet Sizing in Sump

DI#6

Known:

D_p=	Ponding Depth at Inlet	0.42	ft
W=	Gutter Width	1.5	ft
L_g=	Length of Grate	7.5	ft
L_c=	Length of Curb Opening	9.5	ft
H_c=	Curb Opening Height	0.5	ft
C_{wc}=	Weir coefficient for curb opening	2.3	
C_{wg}=	Weir coefficient for grate	3.0	
C_o=	Orifice coefficient	0.67	
R_o=	Grate opening factor	0.60	
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

P_g=	Active grate weir length (agwl) = 2*W+Lg	10.50	ft
P_{agl}	Adjusted agwl = 2*(1-Cfg/100)*W+Lg	9.00	ft
A_g=	Grate area = W*L_g	11.25	ft^2
A_{aga}=	Adjusted open grate area = Ag*Ro*(1-Cfg/100)	3.38	ft^2
	check - If Dp<1.792*Aaga/Pagl; weir; else orifice	weir	
Q_{ig}=	Flow intercepted by grate If "weir" controls Qig=Cwg*Pagl*$Dp^{1.5}$ If "orifice" controls Qig=Co*Aaga*$(64.4*Dp)^{0.5}$	7.3	cfs

Curb Opening Capacity Calculations

Pc =	Active curb opening weir length (acowl) = Lc+1.8*W	12.20	ft
Pacl =	Adjusted acowl = Lc+1.8*(1-Cfc/100)*W	10.85	ft
Ac=	curb opening area (coa) = Lc*Hc	4.75	ft^2
A_{aca}=	Adjusted coa = Ac*(1-Cfc/100)	2.38	ft^2
	check - If Dp<Hc; weir; else orifice	weir	
Qic=	Flow intercepted by curb opening If "weir" controls Qic=Cwc*Pacl*Dp1.5 If "orifice" controls Qic=Co*Aaca*(64.4*Dp-Hc/2)0.5	6.7	cfs

Total Inlet Calculations

Qti =	Total flow intercepted = Qig+Qic	14.0	cfs
q =	Interception per unit ratio = Q_{ti}/L_g	1.47	cfs/ft

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T1 DURANGO AND GRAND MONTECITO                                          0
T2 MAIN1
T3 KHA JOB# 092935040 BY:SS/MS
SO   1000.0002473.000 30                        2476.4
R    1035.7202473.357 30      .013                                  .000    .000 0
R    1039.7202473.406 30      .013                                  .000 -90.000 1
R    1140.4352474.846 30      .013                                  .000    .000 0
JX   1144.4352474.895 30 30   .013    9.500         2474.874        -79.3     81.600
R    1200.8392475.459 30      .013                                  .000    .000 0
JX   1204.8392475.510 30 30   .013   15.000         2475.478          8.3      -81.200
R    1417.9042478.856 24      .013                                  .000    .000 0
R    1421.9042478.935 24      .013                                  .000    .000 1
R    1635.0042483.996 24      .013                                  .000    .000 0
R    1640.0042484.145 24      .013                                  .000 -90.000 1
R    1697.0652486.200 24      .013                                  .000    .000 0
SH   1697.0652486.200 24
CD   6  4   0    .000   0.500     .000  .000  .000   .00
CD   8  4   0    .000   0.670     .000  .000  .000   .00
CD  12  4   0    .000   1.000     .000  .000  .000   .00
CD  18  4   0    .000   1.500     .000  .000  .000   .00
CD  24  4   0    .000   2.000     .000  .000  .000   .00
CD  30  4   0    .000   2.500     .000  .000  .000   .00
CD  36  4   0    .000   3.000     .000  .000  .000   .00
CD  42  4   0    .000   3.500     .000  .000  .000   .00
CD  48  4   0    .000   4.000     .000  .000  .000   .00
CD  54  4   0    .000   4.500     .000  .000  .000   .00
CD  60  4   0    .000   5.000     .000  .000  .000   .00
CD  66  4   0    .000   5.500     .000  .000  .000   .00
CD  72  4   0    .000   6.000     .000  .000  .000   .00
Q            14.000   .0
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Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2473.000	3.400	2476.400	38.50	7.84	.96	2477.36	.00	2.10	.00	2.500	.000	.00	0 .0
35.720	.0100					.0088	.31	3.40	.00	1.92	.013	.00	.00	PIPE
1035.720	2473.357	3.358	2476.715	38.50	7.84	.96	2477.67	.00	2.10	.00	2.500	.000	.00	0 .0
4.000	.0123					.0088	.04	3.36	.00	1.77	.013	.00	.00	PIPE
1039.720	2473.406	3.675	2477.081	38.50	7.84	.96	2478.04	.00	2.10	.00	2.500	.000	.00	0 .0
100.715	.0143					.0088	.89	3.68	.00	1.67	.013	.00	.00	PIPE
1140.435	2474.846	3.123	2477.969	38.50	7.84	.96	2478.92	.00	2.10	.00	2.500	.000	.00	0 .0
JUNCT STR	.0123					.0069	.03	.00	.00		.013	.00	.00	PIPE
1144.435	2474.895	3.906	2478.801	29.00	5.91	.54	2479.34	.00	1.84	.00	2.500	.000	.00	0 .0
56.404	.0100					.0050	.28	3.91	.00	1.55	.013	.00	.00	PIPE
1200.839	2475.459	3.624	2479.083	29.00	5.91	.54	2479.63	.00	1.84	.00	2.500	.000	.00	0 .0
JUNCT STR	.0128					.0031	.01	.00	.00		.013	.00	.00	PIPE
1204.839	2475.510	4.130	2479.640	14.00	4.46	.31	2479.95	.00	1.35	.00	2.000	.000	.00	0 .0
179.353	.0157					.0038	.68	4.13	.00	.99	.013	.00	.00	PIPE
1384.192	2478.327	2.000	2480.327	14.00	4.46	.31	2480.64	.00	1.35	.00	2.000	.000	.00	0 .0
6.632	.0157					.0035	.02	2.00	.00	.99	.013	.00	.00	PIPE
1390.825	2478.431	1.909	2480.340	14.00	4.53	.32	2480.66	.00	1.35	.83	2.000	.000	.00	0 .0

HYDRAULIC JUMP

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1390.825	2478.431	.918	2479.349	14.00	9.95	1.54	2480.89	.00	1.35	1.99	2.000	.000	.00	0 .0
7.828	.0157					.0206	.16	.92	2.09	.99	.013	.00	.00	PIPE
1398.652	2478.554	.918	2479.472	14.00	9.95	1.54	2481.01	.00	1.35	1.99	2.000	.000	.00	0 .0
19.252	.0157					.0220	.42	.92	2.09	.99	.013	.00	.00	PIPE
1417.904	2478.856	.885	2479.741	14.00	10.43	1.69	2481.43	.00	1.35	1.99	2.000	.000	.00	0 .0
4.000	.0198					.0236	.09	.89	2.24	.93	.013	.00	.00	PIPE
1421.904	2478.935	.882	2479.817	14.00	10.49	1.71	2481.53	.00	1.35	1.99	2.000	.000	.00	0 .0
85.339	.0237					.0237	2.03	.88	2.26	.88	.013	.00	.00	PIPE
1507.243	2480.962	.882	2481.844	14.00	10.49	1.71	2483.55	.00	1.35	1.99	2.000	.000	.00	0 .0
85.119	.0237					.0246	2.10	.88	2.26	.88	.013	.00	.00	PIPE
1592.362	2482.983	.864	2483.848	14.00	10.77	1.80	2485.65	.00	1.35	1.98	2.000	.000	.00	0 .0
42.642	.0237					.0273	1.16	.86	2.34	.88	.013	.00	.00	PIPE
1635.004	2483.996	.834	2484.830	14.00	11.29	1.98	2486.81	.00	1.35	1.97	2.000	.000	.00	0 .0
5.000	.0298					.0290	.14	.83	2.51	.83	.013	.00	.00	PIPE
1640.004	2484.145	.834	2484.979	14.00	11.28	1.98	2486.95	.00	1.35	1.97	2.000	.000	.00	0 .0

9.341	.0360					.0281	.26	.83	2.51	.79	.013	.00	.00	PIPE					
1649.345	2484.481	.849	2485.330	14.00	11.02	1.89	2487.22	.00	1.35	1.98	2.000	.000	.00	0	.0				
13.383	.0360					.0255	.34	.85	2.42	.79	.013	.00	.00	PIPE					

Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date: 6-20-2024 Time: 2: 2:29

DURANGO AND GRAND MONTECITO 0

MAIN1

KHA JOB# 092935040 BY:SS/MS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1662.728	2484.963	.880	2485.843	14.00	10.51	1.72	2487.56	.00	1.35	1.99	2.000	.000	.00	0 .0
9.080	.0360					.0224	.20	.88	2.26	.79	.013	.00	.00	PIPE
1671.807	2485.290	.913	2486.203	14.00	10.02	1.56	2487.76	.00	1.35	1.99	2.000	.000	.00	0 .0
6.606	.0360					.0197	.13	.91	2.11	.79	.013	.00	.00	PIPE
1678.414	2485.528	.947	2486.475	14.00	9.56	1.42	2487.89	.00	1.35	2.00	2.000	.000	.00	0 .0
4.995	.0360					.0174	.09	.95	1.97	.79	.013	.00	.00	PIPE
1683.409	2485.708	.983	2486.691	14.00	9.11	1.29	2487.98	.00	1.35	2.00	2.000	.000	.00	0 .0
3.843	.0360					.0153	.06	.98	1.83	.79	.013	.00	.00	PIPE
1687.252	2485.846	1.020	2486.866	14.00	8.69	1.17	2488.04	.00	1.35	2.00	2.000	.000	.00	0 .0
2.977	.0360					.0135	.04	1.02	1.71	.79	.013	.00	.00	PIPE
1690.229	2485.953	1.060	2487.013	14.00	8.28	1.07	2488.08	.00	1.35	2.00	2.000	.000	.00	0 .0
2.297	.0360					.0119	.03	1.06	1.59	.79	.013	.00	.00	PIPE
1692.525	2486.036	1.101	2487.137	14.00	7.90	.97	2488.11	.00	1.35	1.99	2.000	.000	.00	0 .0
1.740	.0360					.0105	.02	1.10	1.47	.79	.013	.00	.00	PIPE
1694.265	2486.099	1.145	2487.244	14.00	7.53	.88	2488.12	.00	1.35	1.98	2.000	.000	.00	0 .0
1.272	.0360					.0093	.01	1.14	1.37	.79	.013	.00	.00	PIPE
1695.538	2486.145	1.191	2487.335	14.00	7.18	.80	2488.14	.00	1.35	1.96	2.000	.000	.00	0 .0
.865	.0360					.0082	.01	1.19	1.27	.79	.013	.00	.00	PIPE

Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date: 6-20-2024 Time: 2: 2:29

DURANGO AND GRAND MONTECITO 0

MAIN1

KHA JOB# 092935040 BY:SS/MS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1696.402	2486.176	1.239	2487.416	14.00	6.85	.73	2488.14	.00	1.35	1.94	2.000	.000	.00	0 .0
.499	.0360					.0073	.00	1.24	1.18	.79	.013	.00	.00	PIPE
1696.901	2486.194	1.291	2487.485	14.00	6.53	.66	2488.15	.00	1.35	1.91	2.000	.000	.00	0 .0
.163	.0360					.0064	.00	1.29	1.09	.79	.013	.00	.00	PIPE
1697.065	2486.200	1.348	2487.547	14.00	6.22	.60	2488.15	.00	1.35	1.88	2.000	.000	.00	0 .0

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T1 DURANGO AND GRAND MONTECITO                                          0
T2 MAIN_LAT1
T3 KHA JOB# 092935040 BY:SS/MS
SO   1000.0002475.478 30                        2479.9
R    1032.7722475.806 30      .013                                .000    .000 0
R    1036.7722475.901 30      .013                                .000 -64.300 1
R    1055.3232476.596 30      .013                                .000    .000 0
SH   1055.3232476.596 30
CD   6  4   0    .000   0.500     .000  .000  .000   .00
CD   8  4   0    .000   0.670     .000  .000  .000   .00
CD  12  4   0    .000   1.000     .000  .000  .000   .00
CD  18  4   0    .000   1.500     .000  .000  .000   .00
CD  24  4   0    .000   2.000     .000  .000  .000   .00
CD  30  4   0    .000   2.500     .000  .000  .000   .00
CD  36  4   0    .000   3.000     .000  .000  .000   .00
CD  42  4   0    .000   3.500     .000  .000  .000   .00
CD  48  4   0    .000   4.000     .000  .000  .000   .00
CD  54  4   0    .000   4.500     .000  .000  .000   .00
CD  60  4   0    .000   5.000     .000  .000  .000   .00
CD  66  4   0    .000   5.500     .000  .000  .000   .00
CD  72  4   0    .000   6.000     .000  .000  .000   .00
Q             15.000   .0
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Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date: 6-20-2024 Time: 1:57:44

DURANGO AND GRAND MONTECITO 0

MAIN_LAT1

KHA JOB# 092935040 BY:SS/MS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2475.478	4.422	2479.900	15.00	3.06	.14	2480.04	.00	1.31	.00	2.500	.000	.00	0 .0
32.772	.0100					.0013	.04	4.42	.00	1.05	.013	.00	.00	PIPE
1032.772	2475.806	4.138	2479.944	15.00	3.06	.14	2480.09	.00	1.31	.00	2.500	.000	.00	0 .0
4.000	.0237					.0013	.01	4.14	.00	.83	.013	.00	.00	PIPE
1036.772	2475.901	4.086	2479.987	15.00	3.06	.14	2480.13	.00	1.31	.00	2.500	.000	.00	0 .0
18.551	.0375					.0013	.02	4.09	.00	.74	.013	.00	.00	PIPE
1055.323	2476.596	3.416	2480.012	15.00	3.06	.14	2480.16	.00	1.31	.00	2.500	.000	.00	0 .0

```
T1 DURANGO AND GRAND MONTECITO                                          0
T2 MAIN2
T3 KHA JOB# 092935040 BY:SS/MS
SO   1000.0002474.874 24                        2479.0
R    1049.8202476.304 24      .013                                 .000    .000 0
JX   1053.8202476.381 18 18   .013    4.9           2474.874        45.0      0.000
R    1210.8722477.952 18      .013                                 .000    .000 0
R    1214.8722477.994 18      .013                                 .000  61.400 1
R    1233.9472478.186 18      .013                                 .000    .000 0
SH   1233.9472478.186 18
CD   6  4   0    .000   0.500     .000  .000  .000   .00
CD   8  4   0    .000   0.670     .000  .000  .000   .00
CD  12  4   0    .000   1.000     .000  .000  .000   .00
CD  18  4   0    .000   1.500     .000  .000  .000   .00
CD  24  4   0    .000   2.000     .000  .000  .000   .00
CD  30  4   0    .000   2.500     .000  .000  .000   .00
CD  36  4   0    .000   3.000     .000  .000  .000   .00
CD  42  4   0    .000   3.500     .000  .000  .000   .00
CD  48  4   0    .000   4.000     .000  .000  .000   .00
CD  54  4   0    .000   4.500     .000  .000  .000   .00
CD  60  4   0    .000   5.000     .000  .000  .000   .00
CD  66  4   0    .000   5.500     .000  .000  .000   .00
CD  72  4   0    .000   6.000     .000  .000  .000   .00
Q             4.600   .0
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Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date: 6-20-2024 Time: 2: 0: 0

DURANGO AND GRAND MONTECITO 0

MAIN2

KHA JOB# 092935040 BY:SS/MS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2474.874	4.126	2479.000	9.50	3.02	.14	2479.14	.00	1.10	.00	2.000	.000	.00	0 .0
49.820	.0287					.0018	.09	4.13	.00	.68	.013	.00	.00	PIPE
1049.820	2476.304	2.784	2479.088	9.50	3.02	.14	2479.23	.00	1.10	.00	2.000	.000	.00	0 .0
JUNCT STR	.0193					.0018	.01	2.78	.00		.013	.00	.00	PIPE
1053.820	2476.381	2.805	2479.186	4.60	2.60	.11	2479.29	.00	.82	.00	1.500	.000	.00	0 .0
157.052	.0100					.0019	.30	2.80	.00	.69	.013	.00	.00	PIPE
1210.872	2477.952	1.535	2479.487	4.60	2.60	.11	2479.59	.00	.82	.00	1.500	.000	.00	0 .0
4.000	.0105					.0019	.01	1.53	.00	.68	.013	.00	.00	PIPE
1214.872	2477.994	1.527	2479.521	4.60	2.60	.11	2479.63	.00	.82	.00	1.500	.000	.00	0 .0
3.332	.0101					.0019	.01	1.53	.00	.69	.013	.00	.00	PIPE
1218.204	2478.027	1.500	2479.527	4.60	2.60	.11	2479.63	.00	.82	.00	1.500	.000	.00	0 .0
15.377	.0101					.0018	.03	1.50	.00	.69	.013	.00	.00	PIPE
1233.581	2478.182	1.361	2479.543	4.60	2.73	.12	2479.66	.00	.82	.87	1.500	.000	.00	0 .0
.366	.0101					.0017	.00	1.36	.35	.69	.013	.00	.00	PIPE
1233.947	2478.186	1.358	2479.543	4.60	2.73	.12	2479.66	.00	.82	.88	1.500	.000	.00	0 .0

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T1 DURANGO AND GRAND MONTECITO                                          0
T2 MAIN2_LAT1
T3 KHA JOB# 092935040 BY:SS/MS
SO   1000.0002476.362 18                        2479.2
R    1026.1752477.158 18      .013                                 .000    .000 0
SH   1026.1752477.158 18
CD   6  4   0    .000   0.500     .000  .000  .000   .00
CD   8  4   0    .000   0.670     .000  .000  .000   .00
CD  12  4   0    .000   1.000     .000  .000  .000   .00
CD  18  4   0    .000   1.500     .000  .000  .000   .00
CD  24  4   0    .000   2.000     .000  .000  .000   .00
CD  30  4   0    .000   2.500     .000  .000  .000   .00
CD  36  4   0    .000   3.000     .000  .000  .000   .00
CD  42  4   0    .000   3.500     .000  .000  .000   .00
CD  48  4   0    .000   4.000     .000  .000  .000   .00
CD  54  4   0    .000   4.500     .000  .000  .000   .00
CD  60  4   0    .000   5.000     .000  .000  .000   .00
CD  66  4   0    .000   5.500     .000  .000  .000   .00
CD  72  4   0    .000   6.000     .000  .000  .000   .00
Q              4.900   .0
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Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date: 6-20-2024 Time: 1:43:49

DURANGO AND GRAND MONTECITO 0

MAIN2_LAT1

KHA JOB# 092935040 BY:SS/MS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2476.362	2.838	2479.200	4.90	2.77	.12	2479.32	.00	.85	.00	1.500	.000	.00	0 .0
26.175	.0304					.0022	.06	2.84	.00	.53	.013	.00	.00	PIPE
1026.175	2477.158	2.099	2479.257	4.90	2.77	.12	2479.38	.00	.85	.00	1.500	.000	.00	0 .0

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