UNIVERSAL CULVERT DESIGN

PID : 110922 **Date :** 08/31/2021 **Project :** DEL-605-0.31 **Location :** SR 605 and Fancher Rd.

Description : Location 1 inlet **Designer :** DES

HEADWATER CONTROL CODES:

INLET - Inlet Control.
OUTLET - Outlet Control.
OUTLET* - Outlet Control with backwater curve used to compute headwater. See Figure III - 7E in HDS 5 for type flow.
OUTLET** - Outlet Control - See Figure III - 7D in HDS 5 for type flow.
N/A - Flow is supercritical with low headwater and low tailwater. Control Section is at the inlet.

Inlet Invert Elevation (ft.) : 1038.95 **Outlet Invert Elevation (ft.) :** 1037.68 **Tailwater Elevation (ft.) :** 1038.98 **Overflow Elevation (ft.) :** 1041.00

Allowable Headwater Elevation (ft.) : 1040.50 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 84.00 **Culvert Slope (ft./ft.) :** 0.0151 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 8.10 **@** 25 yrs. **Flood Discharge (cfs) :** 9.65 **@** 100 yrs.

	FLOW (cfs.)	PIPE #	CULVERT SIZE	HWI (ft.)	HWO (ft.)	FLOW TYPE	VELOCITY (fps.)	DN (ft.)	DC (ft.)	MANNING N	HEADWATER CONTROL	OVER FLOW (cfs.)	DESIGN CODE	BURIAL DEPTH (ft.)
CULVERT TYPE : CIRCULAR SMOOTH				**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.20			
	8.10	1	21 in.	1040.4	N/A	1 - C	8.19	0.75	1.06	0.0120	INLET	0.00	D	0.00
	8.10	1	18 in.	1040.6	N/A	1 - C	8.20	0.82	1.10	0.0120	INLET	0.00	D - 1	0.00
	7.50	1	15 in.	1041.1	1040.9	2 - H	7.90	0.90	1.09	0.0120	INLET	0.60	D - 2	0.00
	8.10	1	24 in.	1040.4	N/A	1 - C	8.14	0.71	1.01	0.0120	INLET	0.00	D + 1	0.00
	9.65	1	21 in.	1040.6	N/A	1 - C	8.59	0.83	1.16	0.0120	INLET	0.00	F	0.00
	9.65	1	18 in.	1040.9	1040.1	2 - E	8.53	0.92	1.20	0.0120	INLET	0.00	F - 1	0.00
	7.55	1	15 in.	1041.7	1041.7	2 - H	7.91	0.91	1.09	0.0120	INLET	2.10	F - 2	0.00
	9.65	1	24 in.	1040.5	N/A	1 - C	8.53	0.78	1.11	0.0120	INLET	0.00	F + 1	0.00
CULVERT TYPE : CIRCULAR CORRUGATED				**Entrance Type :** Half Headwall							**Entrance Loss (Ke) :** 0.90			
Corrugated Metal Pipe (2 2/3 x 1/2 in. corrugations)														
Diameter exceeds 1.25 HWA	8.10	1	30 in.	1040.3	N/A	1 - C	4.79	0.94	0.95	0.0244	INLET	0.00	D	0.00

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	8.10	1	27 in.	1040.3	1040.6	1 - B	3.40	0.99	0.98	0.0245	OUTLET*	0.00	D - 1	0.00
	8.10	1	24 in.	1040.4	1040.6	1 - B	3.75	1.06	1.01	0.0247	OUTLET*	0.00	D - 2	0.00
	9.65	1	30 in.	1040.4	N/A	1 - C	5.02	1.04	1.04	0.0244	INLET	0.00	F	0.00
	9.65	1	27 in.	1040.5	1040.7	1 - B	4.05	1.09	1.07	0.0245	OUTLET*	0.00	F - 1	0.00
	9.65	1	24 in.	1040.6	1040.8	1 - B	4.46	1.18	1.11	0.0247	OUTLET*	0.00	F - 2	0.00
	4.05	2	18 in.	1040.0	1039.5	1 - C	3.99	0.84	0.77	0.0249	INLET	0.00	D	0.00
	4.05	2	15 in.	1040.2	1040.5	2 - G	3.30	1.00	0.81	0.0250	OUTLET	0.00	D - 1	0.00
	2.55	2	12 in.	1040.9	1043.7	2 - G	3.25	1.00	0.68	0.0251	OUTLET	1.50	D - 2	0.00
	4.05	2	21 in.	1040.0	1039.2	1 - C	4.00	0.77	0.73	0.0248	INLET	0.00	D + 1	0.00
	4.83	2	18 in.	1040.2	1039.8	1 - C	4.15	0.94	0.84	0.0249	INLET	0.00	F	0.00
	4.63	2	15 in.	1040.4	1041.1	2 - G	3.77	1.25	0.87	0.0250	OUTLET	0.20	F - 1	0.00
	2.63	2	12 in.	1041.4	1045.8	2 - G	3.34	1.00	0.69	0.0251	OUTLET	2.20	F - 2	0.00
	4.83	2	21 in.	1040.1	1039.3	1 - C	4.18	0.85	0.81	0.0248	INLET	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)														
Diameter exceeds 1.25 HWA	8.10	1	36 in.	1040.2	1040.4	1 - B	2.76	0.94	0.90	0.0281	OUTLET*	0.00	D	0.00
	8.10	1	42 in.	1040.1	1040.3	1 - B	2.49	0.88	0.86	0.0278	OUTLET*	0.00	D + 1	0.00
	9.65	1	36 in.	1040.3	1040.5	1 - B	3.29	1.03	0.98	0.0281	OUTLET*	0.00	F	0.00
	9.65	1	42 in.	1040.2	1040.5	1 - B	2.97	0.97	0.94	0.0278	OUTLET*	0.00	F + 1	0.00
Diameter exceeds 1.25 HWA	4.05	2	36 in.	1039.8	1039.9	1 - B	1.38	0.66	0.63	0.0281	OUTLET*	0.00	D	0.00
	4.05	2	42 in.	1039.7	1039.9	1 - B	1.24	0.63	0.60	0.0278	OUTLET*	0.00	D + 1	0.00
	4.83	2	36 in.	1039.8	1040.0	1 - B	1.64	0.72	0.69	0.0281	OUTLET*	0.00	F	0.00
	4.83	2	42 in.	1039.8	1040.0	1 - B	1.48	0.68	0.66	0.0278	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)														

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Diameter exceeds 1.25 HWA	8.10	1	60 in.	1040.0	1040.2	1 - B	2.00	0.86	0.78	0.0332	OUTLET*	0.00	D	0.00
	8.10	1	66 in.	1039.9	1040.1	1 - B	1.89	0.83	0.76	0.0330	OUTLET*	0.00	D + 1	0.00
	9.65	1	60 in.	1040.0	1040.3	1 - B	2.38	0.94	0.85	0.0332	OUTLET*	0.00	F	0.00
	9.65	1	66 in.	1040.0	1040.2	1 - B	2.25	0.91	0.83	0.0330	OUTLET*	0.00	F + 1	0.00
Diameter exceeds 1.25 HWA	4.05	2	60 in.	1039.7	1039.8	1 - B	1.00	0.62	0.55	0.0332	OUTLET*	0.00	D	0.00
	4.05	2	66 in.	1039.7	1039.8	1 - B	0.94	0.60	0.53	0.0330	OUTLET*	0.00	D + 1	0.00
	4.83	2	60 in.	1039.8	1039.9	1 - B	1.19	0.67	0.60	0.0332	OUTLET*	0.00	F	0.00
	4.83	2	66 in.	1039.8	1039.9	1 - B	1.12	0.65	0.58	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)														
	0.10	1	252 in.	1041.2	N/A	1 - C	0.91	0.07	0.06	0.0260	INLET	8.00	MAXS	0.00
Diameter exceeds 1.25 HWA	4.05	2	60 in.	1039.7	1039.8	1 - B	1.00	0.55	0.55	0.0260	OUTLET*	0.00	D	0.00
	4.05	2	66 in.	1039.7	1039.8	1 - B	0.94	0.53	0.53	0.0260	OUTLET*	0.00	D + 1	0.00
	4.83	2	60 in.	1039.8	N/A	1 - C	1.19	0.60	0.60	0.0260	INLET	0.00	F	0.00
	4.83	2	66 in.	1039.8	N/A	1 - C	1.12	0.58	0.58	0.0260	INLET	0.00	F + 1	0.00