UNIVERSAL CULVERT DESIGN

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

Description : Location 4 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.) : 1036.02 **Outlet Invert Elevation (ft.) :** 1035.29 **Tailwater Elevation (ft.) :** 1036.53 **Overflow Elevation (ft.) :** 1041.28

Allowable Headwater Elevation (ft.) : 1039.00 **or** Diameter + 2 ft. *(whichever is less)*

Pipe Length (ft.) : 72.00 **Culvert Slope (ft./ft.) :** 0.0101 **Design Manning 'n' :** 0.0120

Design Discharge (cfs) : 6.50 **@** 25 yrs. **Flood Discharge (cfs) :** 7.60 **@** 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			
6.50	1	15 in.	1037.7	1037.6	2 - E	6.52	0.95	1.03	0.0120	INLET	0.00	D	0.00
6.50	1	12 in.	1038.8	1039.8	2 - G	8.28	1.00	0.97	0.0120	OUTLET	0.00	D - 1	0.00
6.50	1	18 in.	1037.4	N/A	1 - C	6.68	0.81	0.99	0.0120	INLET	0.00	D + 1	0.00
7.60	1	15 in.	1038.0	1038.0	2 - F	6.20	1.25	1.09	0.0120	OUTLET	0.00	F	0.00
7.60	1	12 in.	1039.5	1041.0	2 - G	9.68	1.00	0.98	0.0120	OUTLET	0.00	F - 1	0.00
7.60	1	18 in.	1037.6	N/A	1 - C	6.93	0.89	1.07	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)													
6.50	1	18 in.	1037.6	1037.9	2 - F	4.16	1.50	0.99	0.0249	OUTLET**	0.00	D	0.00
6.50	1	15 in.	1038.2	1040.0	2 - F	5.30	1.25	1.03	0.0250	OUTLET	0.00	D - 1	0.00
4.20	1	12 in.	1039.9	1047.4	2 - G	5.35	1.00	0.86	0.0251	OUTLET	2.30	D - 2	0.00

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	6.50	1	21 in.	1037.4	1037.6	1 - B	3.57	1.16	0.94	0.0248	OUTLET*	0.00	D + 1	0.00
	7.60	1	18 in.	1037.8	1038.4	2 - F	4.86	1.50	1.07	0.0249	OUTLET**	0.00	F	0.00
	7.50	1	15 in.	1038.7	1041.3	2 - F	6.12	1.25	1.09	0.0250	OUTLET	0.10	F - 1	0.00
	4.20	1	12 in.	1041.0	1051.4	2 - G	5.35	1.00	0.86	0.0251	OUTLET	3.40	F - 2	0.00
	7.60	1	21 in.	1037.5	1037.7	1 - A	4.17	1.31	1.02	0.0248	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (3 x 1 in. corrugations)														
	6.50	1	36 in.	1037.1	1037.3	1 - B	2.36	0.93	0.80	0.0281	OUTLET*	0.00	D	0.00
	6.50	1	42 in.	1037.0	1037.2	1 - B	2.13	0.88	0.77	0.0278	OUTLET*	0.00	D + 1	0.00
	7.60	1	36 in.	1037.2	1037.4	1 - B	2.76	1.01	0.87	0.0281	OUTLET*	0.00	F	0.00
	7.60	1	42 in.	1037.1	1037.3	1 - B	2.49	0.95	0.83	0.0278	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations)														
Diameter exceeds 1.25 HWA	6.50	1	60 in.	1036.9	1037.1	1 - B	1.71	0.85	0.70	0.0332	OUTLET*	0.00	D	0.00
	6.50	1	66 in.	1036.9	1037.1	1 - B	1.62	0.83	0.68	0.0330	OUTLET*	0.00	D + 1	0.00
	7.60	1	60 in.	1037.0	1037.2	1 - B	2.00	0.92	0.75	0.0332	OUTLET*	0.00	F	0.00
	7.60	1	66 in.	1037.0	1037.2	1 - B	1.89	0.89	0.73	0.0330	OUTLET*	0.00	F + 1	0.00
Diameter exceeds 1.25 HWA	3.25	2	60 in.	1036.7	1036.8	1 - B	0.86	0.61	0.49	0.0332	OUTLET*	0.00	D	0.00
	3.25	2	66 in.	1036.8	1036.8	1 - B	0.81	0.59	0.48	0.0330	OUTLET*	0.00	D + 1	0.00
	3.80	2	60 in.	1036.8	1036.8	1 - B	1.00	0.66	0.53	0.0332	OUTLET*	0.00	F	0.00
	3.80	2	66 in.	1036.8	1036.8	1 - B	0.95	0.64	0.52	0.0330	OUTLET*	0.00	F + 1	0.00
Corrugated Metal Pipe (6 x 2 in. corrugations, Field Paved Invert)														
Diameter exceeds 1.25 HWA	6.50	1	60 in.	1036.9	1037.1	1 - B	1.71	0.76	0.70	0.0260	OUTLET*	0.00	D	0.00
	6.50	1	66 in.	1036.9	1037.1	1 - B	1.62	0.74	0.68	0.0260	OUTLET*	0.00	D + 1	0.00
	7.60	1	60 in.	1037.0	1037.2	1 - B	2.00	0.82	0.75	0.0260	OUTLET*	0.00	F	0.00
	7.60	1	66 in.	1037.0	1037.2	1 - B	1.89	0.79	0.73	0.0260	OUTLET*	0.00	F + 1	0.00

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Diameter exceeds 1.25 HWA	3.25	2	60 in.	1036.7	1036.8	1 - B	0.86	0.54	0.49	0.0260	OUTLET*	0.00	D	0.00
	3.25	2	66 in.	1036.8	1036.8	1 - B	0.81	0.53	0.48	0.0260	OUTLET*	0.00	D + 1	0.00
	3.80	2	60 in.	1036.8	1036.8	1 - B	1.00	0.58	0.53	0.0260	OUTLET*	0.00	F	0.00
	3.80	2	66 in.	1036.8	1036.8	1 - B	0.95	0.57	0.52	0.0260	OUTLET*	0.00	F + 1	0.00