HY-8 Culvert Analysis Report

Project Notes

Project Title: Fayetteville, NC at Forest Hills Drive

Designer: Betty Farr

Project Date: Thursday, November 5, 2010

Notes: Assume slightly less opening area of 70 sf using (2) 12s x 3r concrete box culvert system. Analyze the 12x3 as 12 x 2.90 for area approximate of 70 sf. Flow of 25-yr event with one box slightly lower (0.2') to provide some aquatic function was used.

Project Units: U.S. Customary Units

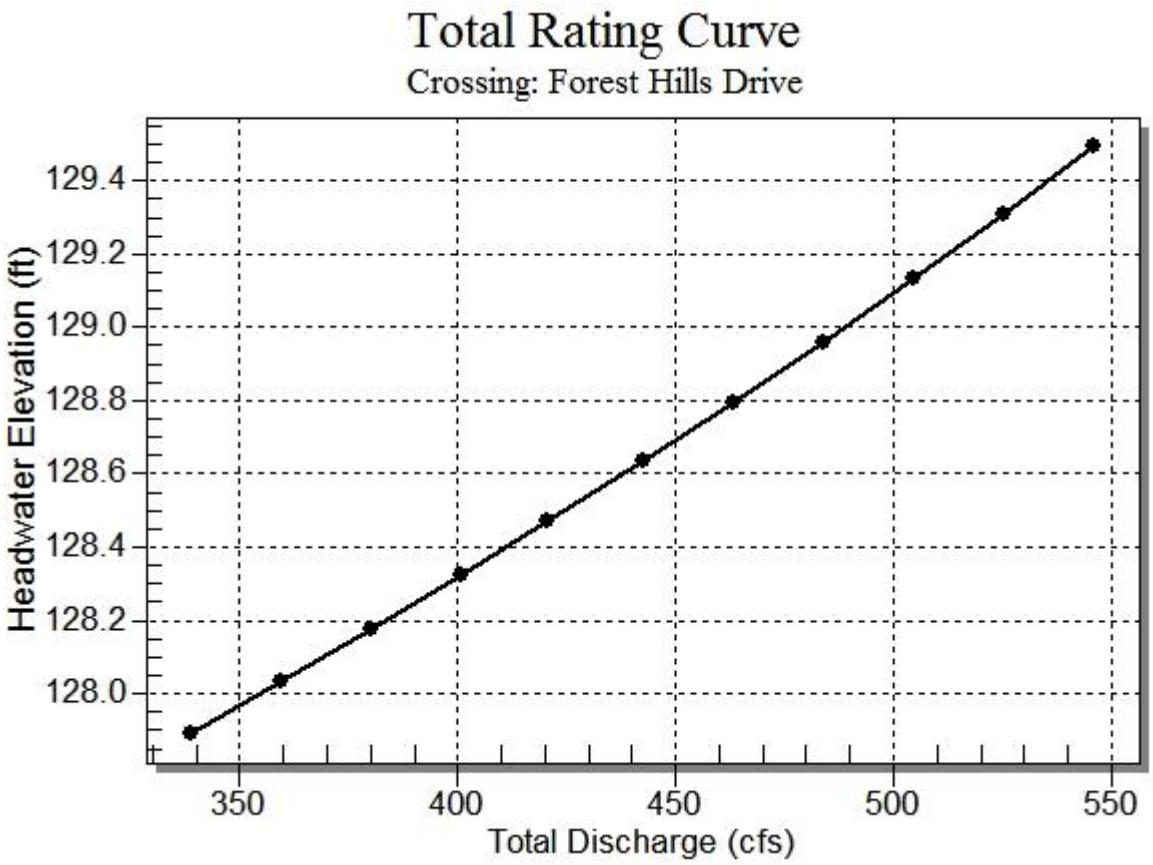
Outlet Control Option: Profiles

Crossing Notes: Forest Hills Drive

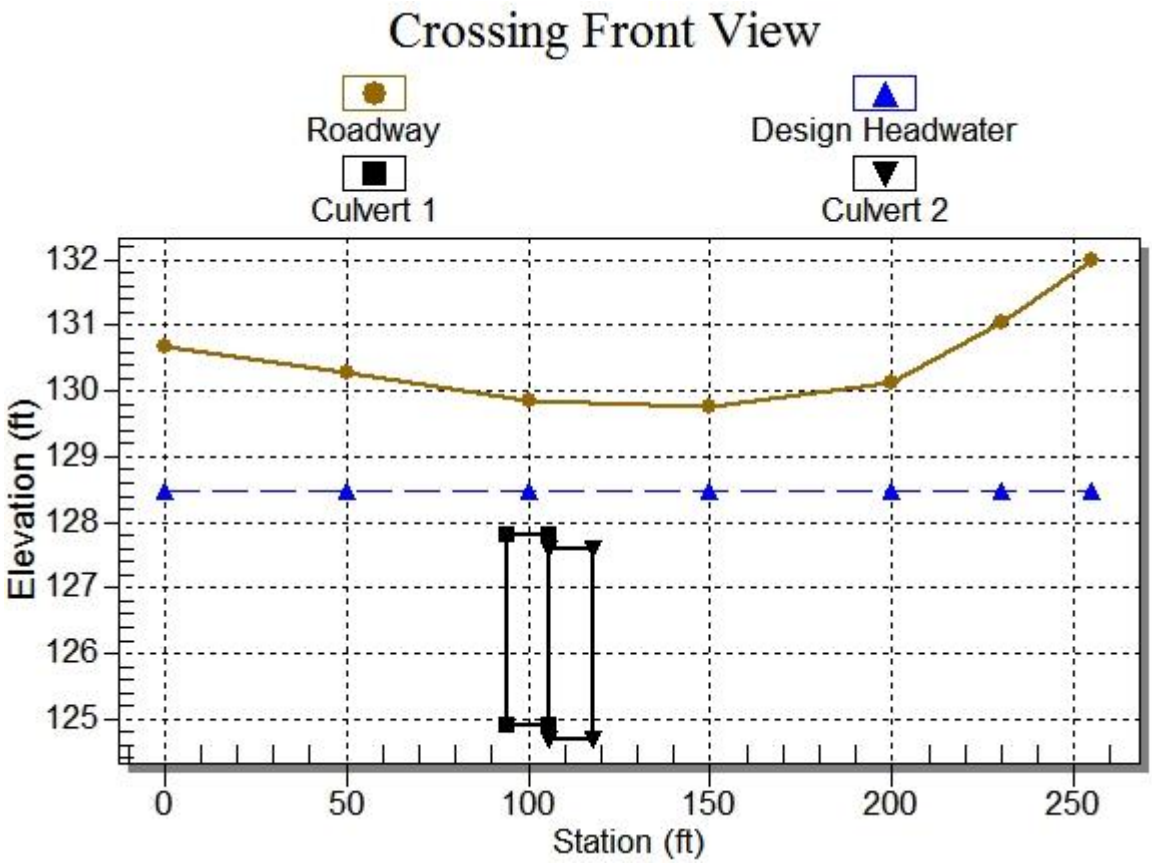
Table 1 - Summary of Culvert Flows at Crossing: Forest Hills Drive

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
127.89	338.80	162.38	176.71	0.00	10
128.03	359.51	172.69	186.85	0.00	3
128.18	380.22	183.21	197.04	0.00	3
128.33	400.93	193.72	207.23	0.00	3
128.47	420.70	203.78	216.94	0.00	3
128.63	442.35	214.81	227.57	0.00	3
128.79	463.06	225.39	237.70	0.00	3
128.96	483.77	235.92	247.88	0.00	3
129.13	504.48	246.45	258.00	0.00	3
129.31	525.19	256.96	268.11	0.00	5
129.49	545.90	267.48	278.23	0.00	8

Rating Curve Plot for Crossing: Forest Hills Drive



Crossing Front View (Roadway Profile): Forest Hills Drive



Culvert Notes: Culvert 1

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
338.80	162.38	127.89	2.993	2.993	5-S1f	0.819	1.789	1.789	4.000	7.565	0.000
359.51	172.69	128.03	3.132	3.132	5-S1f	0.855	1.864	1.864	4.000	7.722	0.000
380.22	183.21	128.18	3.277	3.277	5-S1f	0.887	1.939	1.939	4.000	7.875	0.000
400.93	193.72	128.33	3.425	2.936	4-FFf	0.917	2.012	0.917	4.000	17.598	0.000
420.70	203.78	128.47	3.570	3.025	4-FFf	0.946	2.081	0.946	4.000	17.948	0.000
442.35	214.81	128.63	3.733	3.128	4-FFf	0.978	2.156	0.978	4.000	18.308	0.000
463.06	225.39	128.79	3.894	3.232	4-FFf	1.008	2.226	1.008	4.000	18.632	0.000
483.77	235.92	128.96	4.060	3.340	4-FFf	1.038	2.295	1.038	4.000	18.935	0.000
504.48	246.45	129.13	4.232	3.454	4-FFf	1.068	2.362	1.068	4.000	19.222	0.000
525.19	256.96	129.31	4.409	3.572	4-FFf	1.099	2.429	1.099	4.000	19.493	0.000
545.90	267.48	129.49	4.593	3.695	4-FFf	1.129	2.495	1.129	4.000	19.749	0.000

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Inlet Elevation (invert): 124.90 ft, Outlet Elevation (invert): 123.00 ft

Culvert Length: 60.03 ft, Culvert Slope: 0.0317

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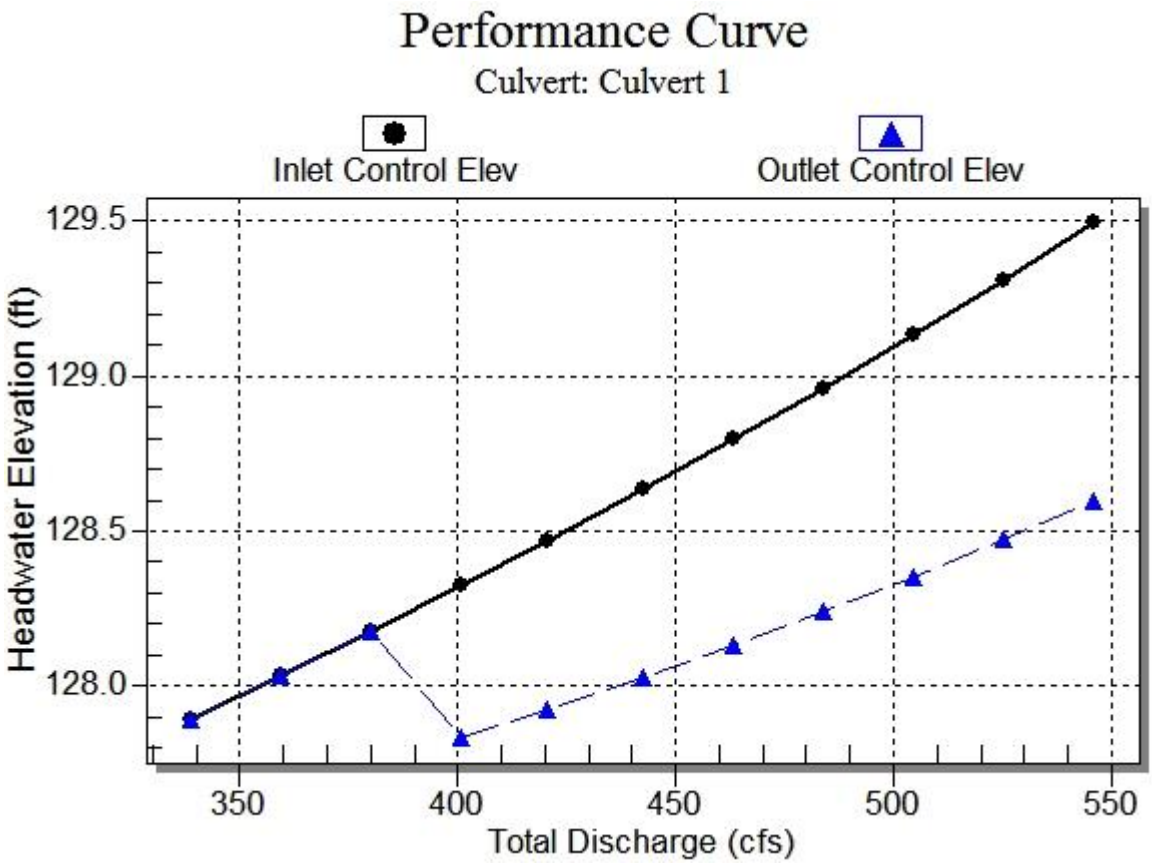
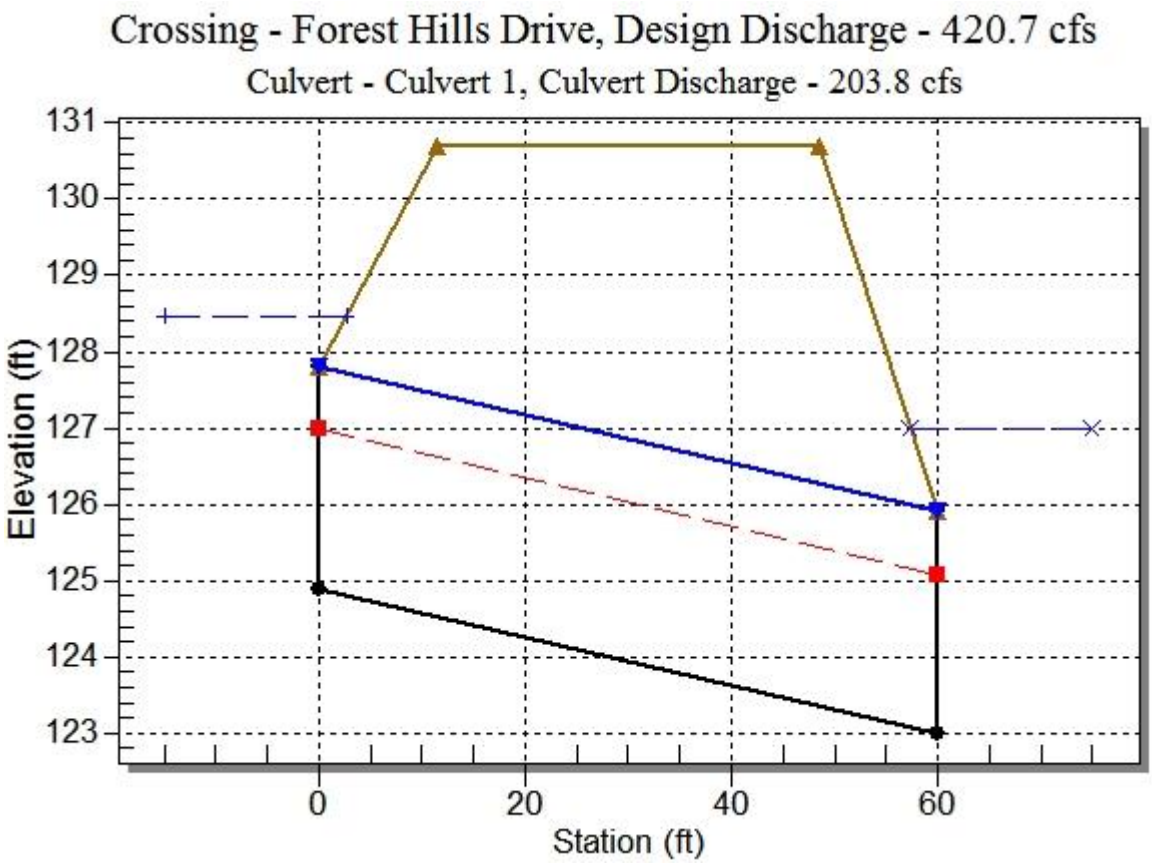
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 124.90 ft

Outlet Station: 60.00 ft

Outlet Elevation: 123.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 2.90 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0130

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (90º) Headwall

Inlet Depression: None

Culvert Notes: Culvert 2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
338.80	176.71	127.89	3.192	2.996	4-FFf	0.898	1.892	0.898	4.000	16.406	0.000
359.51	186.85	128.03	3.333	3.078	4-FFf	0.928	1.964	0.928	4.000	16.773	0.000
380.22	197.04	128.18	3.477	3.165	4-FFf	0.959	2.035	0.959	4.000	17.119	0.000
400.93	207.23	128.33	3.625	3.257	4-FFf	0.990	2.105	0.990	4.000	17.443	0.000
420.70	216.94	128.47	3.770	3.349	4-FFf	1.019	2.170	1.019	4.000	17.734	0.000
442.35	227.57	128.63	3.933	3.454	4-FFf	1.052	2.240	1.052	4.000	18.033	0.000
463.06	237.70	128.79	4.094	3.559	4-FFf	1.082	2.306	1.082	4.000	18.302	0.000
483.77	247.88	128.96	4.260	3.670	4-FFf	1.113	2.371	1.113	4.000	18.557	0.000
504.48	258.00	129.13	4.432	3.784	4-FFf	1.144	2.436	1.144	4.000	18.797	0.000
525.19	268.11	129.31	4.609	3.902	4-FFf	1.173	2.499	1.173	4.000	19.052	0.000
545.90	278.23	129.49	4.793	4.026	4-FFf	1.200	2.561	1.200	4.000	19.326	0.000

Table 3 - Culvert Summary Table: Culvert 2

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Inlet Elevation (invert): 124.70 ft, Outlet Elevation (invert): 123.00 ft

Culvert Length: 60.02 ft, Culvert Slope: 0.0283

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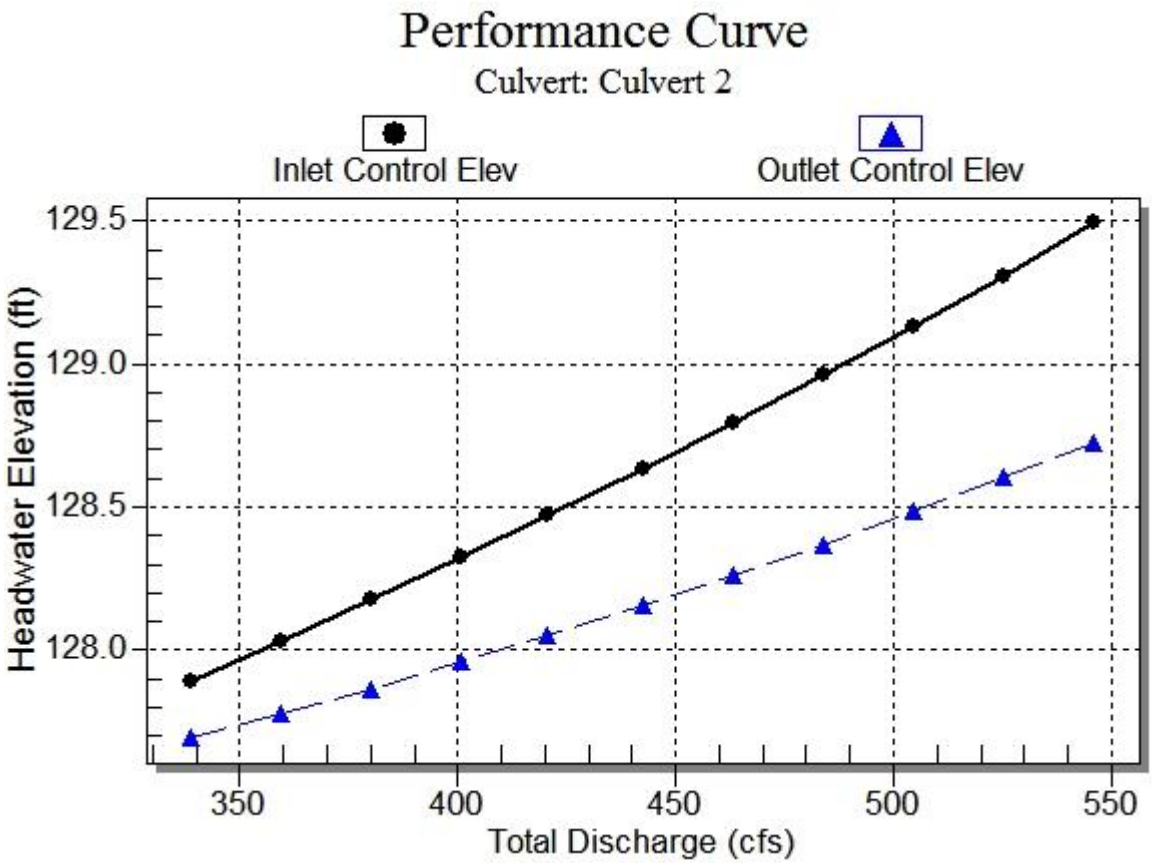
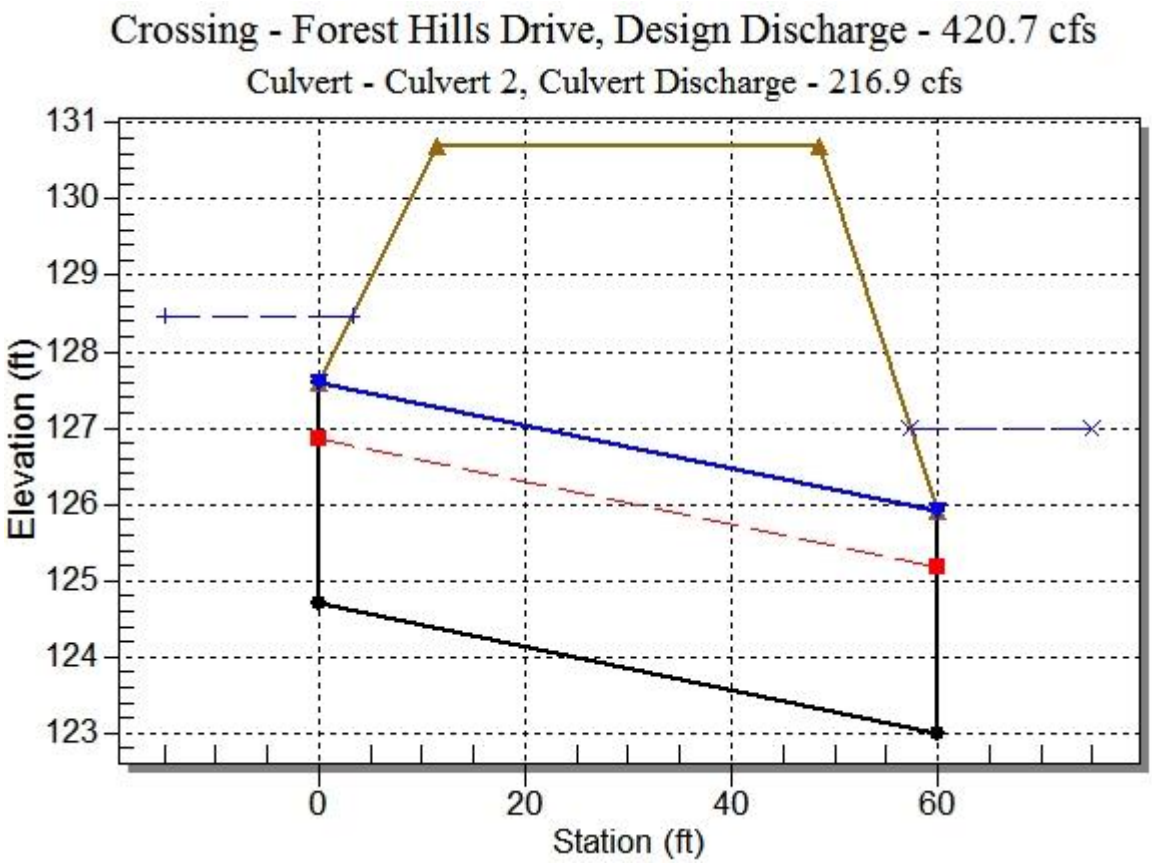
Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 124.70 ft

Outlet Station: 60.00 ft

Outlet Elevation: 123.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 2.90 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0130

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (90º) Headwall

Inlet Depression: None

Table 4 - Downstream Channel Rating Curve (Crossing: Forest Hills Drive)

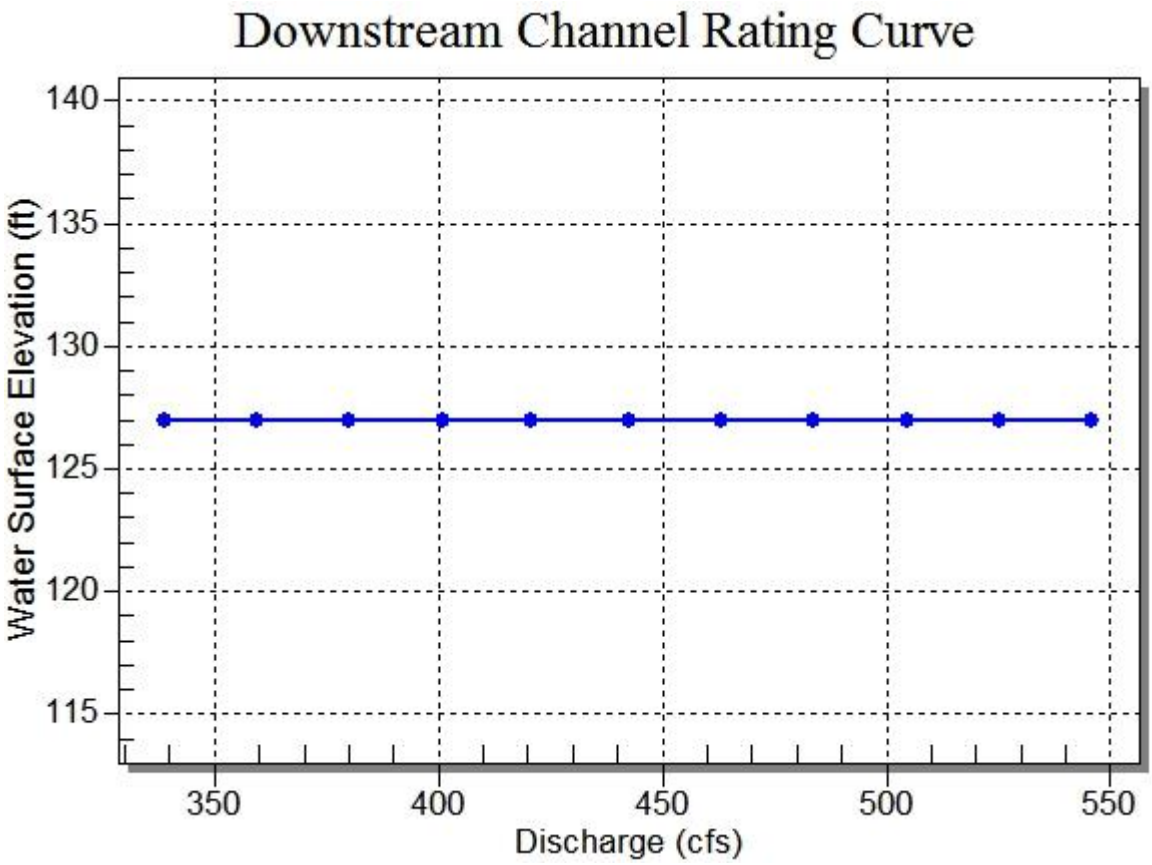
Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
338.80	127.00	4.00
359.51	127.00	4.00
380.22	127.00	4.00
400.93	127.00	4.00
420.70	127.00	4.00
442.35	127.00	4.00
463.06	127.00	4.00
483.77	127.00	4.00
504.48	127.00	4.00
525.19	127.00	4.00
545.90	127.00	4.00

Tailwater Channel Data - Forest Hills Drive

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 127.00 ft

Tailwater Rating Curve Plot for Crossing: Forest Hills Drive



Roadway Data for Crossing: Forest Hills Drive

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
1	0.00	130.69
2	50.00	130.27
3	100.00	129.84
4	150.00	129.76
5	200.00	130.12
6	230.00	131.06
7	255.00	131.98
8	275.00	132.74

Roadway Surface: Paved

Roadway Top Width: 37.00 ft