

**Preliminary Sizing Results
VT116 Culvert AOP Assessment
Hinesburg, Vermont**

LocalID	Existing Structure Type	Existing Structure Length (ft)	Channel Bankfull Width (ft)	Conveyance Design Type	Conveyance Design Size (in)	Conveyance Design Fish Passage Percent	Conveyance Design Low Flow AOP Barrier Type	Conveyance Design High Flow AOP Barrier Type	AOP Improvement Notes	Improved Type	Improved Size (in)	Improved Passage Percent	Improved Low Flow AOP Barrier Types	Improved High Flow AOP Barrier Types	AOP Design Type	Changes to Inlet and Outlet Elevations*	Changes to Structure Slope	Alignment	AOP Design Percent Fish Passage	AOP Design Low Flow Barrier Type	AOP High Flow Barrier Type	AOP Priority #				
1	24" round RCP	40	3	CPP	36	AOP not applicable. Limited habitat potential.																		19		
1b	4.3' x 3.2' concrete box	41	7	Box adequately sized for conveyance.	0	0	Depth, Outlet Drop, Pool	Depth, Outlet Drop, Pool, Velocity	Replace with 48" CMP. Embed 0.5'. Lower elevation 4 feet to eliminate drop.	CMP	48	100	None	None	7.3' x 5.3' Pipe Arch	Lower inlet 2.4' to reduce slope and lower outlet by 2.5' to eliminate drop. Modify downstream riffle to increase backwater by 1 foot.	No Change (EX = 1.2%, US = 10%).	Align with US channel by moving US end approximately 50 feet north. Realignment will increase length and skew angle with roadway.	100	None	None	7				
1c	24" round CMP	42	5	CPP	36	AOP not applicable. Limited habitat potential.																		14		
2	30" round CMP	45	3	Pipe adequately sized for conveyance.	0	AOP not applicable. Limited habitat potential.																			17	
3	42" round CMP	50	10	CMP	66	0	Depth, Outlet Drop	Outlet Drop, Velocity	Increase pipe size from 66" to 72". Embed 1 foot. Lower inlet 1.75', lower outlet 1.5', and decrease slope by 0.5% to eliminate outlet drop	CMP	72	100	None	None	10.7' x 6.9' Pipe Arch	Lower inlet 1.25' to reduce slope and lower outlet 1.5' to eliminate drop. Modify farm ford downstream to increase elevation by 0.5' to increase backwater.	Increase slope by 0.5% (PR = 1.5%, EX = 1.0%, US = 1.0%) to eliminate drop.	No Change. Naturally Straight.	100	None	None	2				
4	4' x 2.5' concrete box	37	10	CMP	54	100	None	None	Not Needed.	0	0	0	0	0	10.7' x 6.9' Pipe Arch	No Change.	No Change (EX = 0.5%, US = 1.7%).	No Change. Mild Bend.	100	None	None	10				
5	18" round RCP	50	3	CPP	30	AOP not applicable. Limited habitat potential.																		18		
6	7' x 4' concrete box	30	10	Box	14' x 7'	0	Depth	Depth, Velocity	Increase height by 1'. Embed 1'. Lower elevation 1' and reduce slope by 0.9% to 2.0% to reduce velocity and increase depth of flow.	Box	14' x 7'	100	None	None	14' x 8' Box	Lower inlet by 1.5' to reduce slope. Lower outlet by 1.0' to increase backwater depth.	Decrease slope by 0.9% (PR = 2%, EX = 2.9%, US = 1.7%) to reduce velocities.	No Change. Mild Bend.	100	None	None	4				
7	16' x 5.5' bridge opening	45	20.6	Bridges beyond scope of project.	0	Bridge not applicable.																			22	
8	36" round CMP	104	5	CMP	60	0	Depth, Outlet Drop, Pool	Depth, Outlet Drop, Pool, Velocity	Increase pipe size from 60" to 66". Embed 1'. Lower inlet 2.3', lower outlet 2.6', and increase slope by 0.3% to 1.5% to decrease velocity and increase depth. Increased tailwater elevation 1.5'.	CMP	66	96.6	Depth	None	13' x 5' Box	No change to inlet. Lower outlet by 2.1' to eliminate drop.	Increase slope by 2% (PR = 3.2%, EX = 1.2%, US = 4.5%) to eliminate drop.	Realign with DS channel to reduce Severe Skew. US & DS Channelized Straight. Work with Church to restore channel.	0	Depth	Depth	12				
9	36" round RCP	60	5	Pipe Arch	6.4' x 4.3'	AOP not applicable. Limited habitat potential.																			13	
10	36" round RCP	65	7	CMP	54	0	Depth	Depth, Velocity	Embed pipe 1 foot. Lower elevation by 1.0'. Decrease slope by 0.8% to 1.5%.	Conveyance Design	0	100	None	None	7.3' x 5.3' Pipe Arch	Lower inlet 1.35' to decrease slope. Lower outlet 0.5' to increase backwater.	Decrease slope by 1.3% (PR = 1.0%, EX = 2.3%, US = 13.0%) to increase water depth.	Severely Skewed. Sharp Bend. Would require landuse change because channelized against road US and field DS.	100	None	None	8				
10b	18" round RCP	57	1	Pipe adequately sized for conveyance.	0	AOP not applicable. Limited habitat potential.																			20	
11	18" round RCP	60	4	CPP	30	AOP not applicable. Limited habitat potential.																			16	
12	60" round CMP	65	10	Pipe adequately sized for conveyance.	0	0	Depth	Depth	Embed 1 foot. Lower elevation by 0.5'.	Existing Culvert	0	100	None	None	10.7' x 6.9' Pipe Arch	No Change.	Increase slope by 0.5% (PR = 1%, EX = 0.5%, US = 3.0%) to transition to steeper upstream channel.	No Change. Naturally Straight.	no calc	Depth	Depth	9				
13	2 x 10' arch pipes	52	22	Pipes adequately sized for conveyance.	0	0	Depth	Velocity	Beyond Scope - No Improvement	Beyond Scope of Project.	0	0	0	0	22' span bridge	No Change.	No Change (PR = 2.5%, EX = 2.5%, US = 2.5%).	No Change. Channelized Straight.	no calc	Depth	Depth, Velocity	6				
14	48" round RCP	75	11	CMP	66	0	Depth, Drop	Drop, Velocity	Increase pipe size from 66" to 72". Embed 1'. Lower inlet elevation by 0.6', lower outlet by 1', increase slope by 0.6% to 3.6% to eliminate drop and decrease length of depth barrier. Downstream culvert needs to be addressed also.	CMP	72	0	Depth	Depth, Velocity	11.4' x 7.3' Pipe Arch	Lower inlet by 0.5' to reduce slope and outlet by 1.0' to eliminate drop.	Increase slope by 0.6% (PR = 3.6%, EX = 3.0%, US = 3.6%) to eliminate drop.	Skewed. Sharp Bend. Channelized along road, difficult to improve alignment.	no calc	Depth	Depth, Velocity	3				
15	36" round RCP	100	6	CMP	42	0	Depth, Drop, Pool, Velocity	Drop, Pool, Velocity	Increase pipe size by 1' to 54". Lower inlet by 2.6' and outlet by 2.4'. Decrease slope from 7% to 5.8%. Increase slope of channel upstream by 2%. Increase tailwater downstream by 1'.	CMP	54	0	Depth, Velocity	Velocity	13.1' x 8.4' Pipe Arch	Lower outlet by 2.6' to reduce slope and outlet by 1.4' to decrease drop. Use grade control downstream to increase backwater by 1 foot.	Decrease slope by 1.2% (PR = 5.8%, EX = 7.0%, US = 2.5%, farther US = 4.5%) and restore and steepen channel us by 2% to help match ds grade.	Sharp Bend. US alignment is not perfect, but culvert length is already too long (100 ft). Skewing culvert is not recommended.	no calc	Depth	Depth, Velocity	11				
16	35" round CMP	95	10	CMP	60	0	Drop, Depth, Pool	Drop, Depth, Pool, Velocity	Lower elevation by 1.2' to eliminate drop and decrease length of depth barrier. Increase tailwater elevation by 1.5' to increase water depth.	Conveyance Design	0	0	Depth	Depth, Velocity	10.3' x 6.8' Pipe Arch	Lower inlet by 3.71' and outlet by 2' to eliminate drop. Modify downstream riffle to increase backwater by 1.0'.	Decrease slope by 1.8% (PR = 1.5%, EX = 3.3%, US = 5.0%) to increase water depth.	Sharp Bend. Sediment accumulation has filled channel and changed to a sharp bend alignment. Alignment may correct naturally if sediment conveyance increases.	100	None	None	1				
17	18" round RCP	50	4	CPP	36	AOP not applicable. Limited habitat potential.																			15	
18	36' bridge	50	34	Bridges beyond scope of project.	0	Bridge not applicable.																				21
19	42" round RCP	40	13	CMP	72	100	None	None	Not needed.	Conveyance Design	0	0	0	0	13' x 7' Box	No Change.	No Change (PR = 0.8%, EX = 0.8%, US = 1.0%).	No Change. Naturally Straight.	100	None	None	5				