BROCKWAY ENGINEERING PLLC

Memo

To: Sam Stahlnecker, Galena Engineering
From: Charles G. Brockway, P.E.
Cc:
Date: August 31, 2021
Re: Preliminary evaluation of inverted siphon for Lateral 75 subdivision

Design considerations:

- Inverted siphon to carry the west split of District canal across Glendale Road
- Design should be based on guidance in the Bureau of Reclamation's Design of Small Canal Structures.
- Design flow. Based on the daily diversion records for the District canal, 1979-2020, the peak annual diversion regularly comes close to 320 cfs. About 20% of the service area is served by the west split. Design flow = 0.20 x 320 plus 10%, or 70 cfs.
- Pipe length assumed to be 100 feet to allow for future road widening and intersection improvements (might get by with 80 feet)
- Available head loss: freeboard in canal is low, assume less than 0.75 feet of drop is available at this location.
- Pipe material: HDPE preferred, may need to use steel due to availability or cost.
- Concrete transitions at inlet and outlet, USBR Type 1, 3, or 4. Earth/rock transitions might be used to save cost, head loss would be greater.
- Grating over inlet, at least, for safety. Trash rack is possible but would require daily cleaning.

Conclusions:

- Single 54" HDPE IPS DR-21 could be used, head loss 0.54 feet
- Double 42" HDPE IPS DR-21 could be used, head loss 0.34 feet
- Concrete volume each transition: about 7 cy for single 54" pipe, 12 cy for double 42" pipe
- Riprap: 4 cy each end

Preliminary Inverted Siphon Evaluation

CGB 8/31/2021

Design flow	70	cfs		
Pipe length	100	ft		
Pipe inside diameter	48.549	37.76	in	HDPE IPS DR-21
Number of pipes	1	2		Single 54" or double 42"
Upstream canal velocity	3	3	ft/s	
Pipe absolute roughness	0.000005	0.000005	ft	
Calculations:				
Flow per pipe	70	35	cfs	
Pipe velocity	5.45	4.50	ft/s	
Pipe velocity head	0.46	0.31	ft	
Canal velocity head	0.14	0.14	ft	
Inlet convergence loss coeff	0.4	0.4		
Inlet convergence loss	0.13	0.07		
Outlet loss coeff	0.7	0.7		
Outlet loss	0.22	0.12		
Trash rack loss coeff (clean)	0.20	0.20		
Trash rack loss	0.06	0.03		
Pipe Re	1805715	1160827		
Pipe friction factor	0.0105	0.0113		
Pipe friction loss	0.12	0.11	feet	
Total head loss	**0.54**	**0.34**	**feet**	
(Inlet + outlet + friction + trash rack)				
Minimum seal	0.48	0.26	ft	
Head at minimum seal	2.50	1.84	ft	
Check orifice equation flow	98	101	cfs	
	ok	ok		

District Canal Daily Diversions 1979-2020