

22-07-2025 **System Curve Input**

Instructions: Input data to shaded cells only. Remaining cells are calculated

Calculation sheet developed by Jesse Nofziger, P.E., Seattle Public Utilities

Users are responsible for independently verifying results of all calculations.

Enter Per NAVD88	Invert at Discharge	
	Impeller Eye El	
	WW Transducer Tip El	
Enter Per Wonderware/ SCADA	Lead Off Setpoint	Static Head 0
	Lag Off Setpoint	0
	Lead On Setpoint	0
	Lag on Setpoint	0
	Overflow Setpoint	0
Response Time	High WW Setpoint	0
	WW Plan Area	0
	WW Storage Volume	0 gal
	Avg Inflow Rate, wet/dry	
	Response Time, hr	#DIV/0! #DIV/0!
Suction Piping	Material	
	Age	
	Hazen-Williams 'C'	
	Diameter, in	
	Suction Length, ft	
	Suction Area, ft ²	0.00
Individual Pump Discharge Piping	Material	
	Age	
	Hazen-Williams 'C'	
	Diameter, in	
	Length, ft	
	Area, ft ²	0.00
Force Main Segment 1	Material	
	Age	
	Hazen-Williams 'C'	
	Diameter, in	
	Length, ft	
	Area, ft ²	0.00
Force Main Segment 2	Material	
	Age	
	Hazen-Williams 'C'	
	Diameter, in	
	Length	
	Area, ft ²	0.00
Force Main Segment 3	Material	
	Age	
	Hazen-Williams 'C'	
	Diameter, in	
	Length	
	Area, ft ²	0.00
	Total Length, ft	0.00

Use Segment 1,
Segment 2, etc for
each diameter or
material change

Size Index

0.00

0.00

0.00

0.00

0.00

		Suction Piping 0.00		Force Main 1 0.00		Force Main 2 0.00		Force Main 3 0.00		Misc Fittings		Fitting Type Size, in K
		Velocity, ft/s	V ² /2g, ft	Velocity, ft/s	V ² /2g, ft	Velocity, ft/s	V ² /2g, ft	Velocity, ft/s	V ² /2g, ft	Velocity, ft/s	V ² /2g, ft	
Flow Rate, GPM	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	100	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	200	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	300	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	400	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	500	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	600	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	700	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	800	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	900	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	1000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	1100	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	1200	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	1300	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	1400	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	1500	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Note: for reducing/increasing fittings, use the exit size

All 'size' cells must be populated with a value even if not used to prevent DIV/0 errors.

Note: Enter values here, but suction and discharge losses are tabbed separately and subtracted from pump curves

[illegible]

This portion
accounted for
on pump curve
sheet

[illegible]

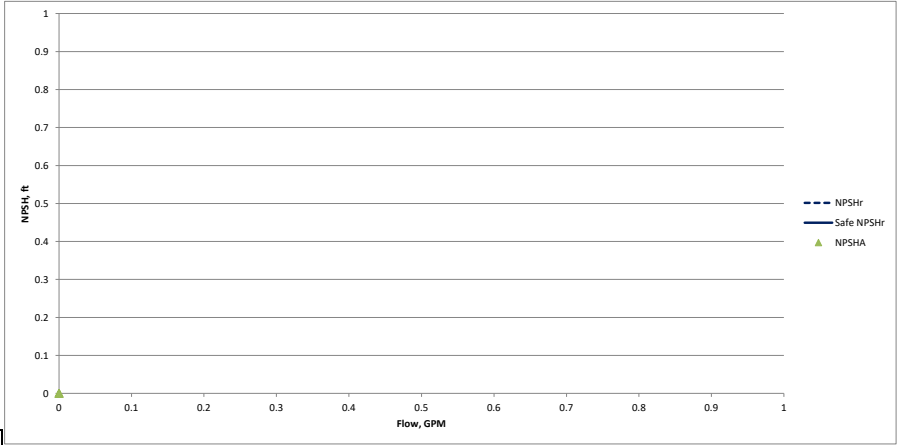
[illegible]

Pump Curve Input

Instructions: Input data to shaded cells only. Remaining cells are calculated.

Pump info	Make							
	Model							
Impeller Size	BEP							
	POR							
Manufacturer's Pump Curve	Head(ft)	Flow, GPM (1 Pump)	Flow, GPM (2 Pumps)	Derated Values (w/ Header Loss) Head 1 Pump, GPM 2 Pump, GPM				
				#DIV/0! 0 0				
				#DIV/0! 0 0				
				#DIV/0! 0 0				
				#DIV/0! 0 0				
				#DIV/0! 0 0				
				#DIV/0! 0 0				
				#DIV/0! 0 0				
				#DIV/0! 0 0				
				#DIV/0! 0 0				
Mfr's NPSHr Curve	NPSHr, ft	Flow, GPM (1 pump)	Safe NPSHr, ft					
Calculated NPSHa Curve @ Sea Level and 40° F	Operating Point	WW Level (NAVD88)	Flow, GPM	H _{atm}	H _{sub}	H _{vp}	H _L	NPSHA
	Lead off	0	0	33.96	0	0.3	#DIV/0!	#DIV/0!
	Lead on	0	0	33.96	0	0.3	#DIV/0!	#DIV/0!
	LeadLag off	0	0	33.96	0	0.3	#DIV/0!	#DIV/0!
	LeadLag on	0	0	33.96	0	0.3	#DIV/0!	#DIV/0!
	Overflow	0	0	33.96	0	0.3	#DIV/0!	#DIV/0!

Select sum of suction headlosses for the appropriate flow from the System Curve' sheet



BEP Chart

x y
0 0
0.0001 100

npshr coefficients

c3 #VALUE!
c2 #VALUE!
c1 #VALUE!
b #VALUE!

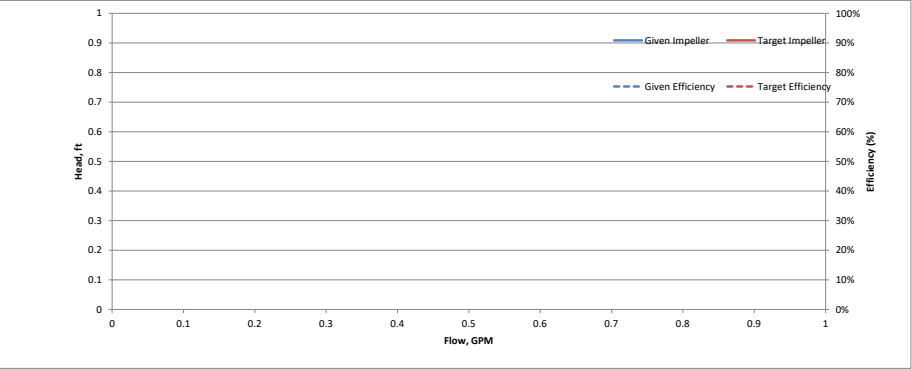
Affinity Law Calculator

Use to generate pump curves for a specific impeller diameter from a given diameter. Use the closest available curve.

Works only with constant casing and speed

Given Impeller in
Target Impeller in

Given Impeller			Target Impeller		
Head (ft)	Flow (GPM)	Efficiency (%)	Head (ft)	Flow (GPM)	Efficiency (%)
			#DIV/0!	#DIV/0!	#DIV/0!
			#DIV/0!	#DIV/0!	#DIV/0!
			#DIV/0!	#DIV/0!	#DIV/0!
			#DIV/0!	#DIV/0!	#DIV/0!
			#DIV/0!	#DIV/0!	#DIV/0!
			#DIV/0!	#DIV/0!	#DIV/0!
			#DIV/0!	#DIV/0!	#DIV/0!
			#DIV/0!	#DIV/0!	#DIV/0!
			#DIV/0!	#DIV/0!	#DIV/0!
			#DIV/0!	#DIV/0!	#DIV/0!



AOR Chart		
	x	y
1	0	0
2	0	50
3	0	0
4	0	50
5	0	0
6	0	50
7	0	0
8	0	50
9	0	0
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100	0	50

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200	0	50

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700	0	50

	x	y
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Pump Station Design Summary Sheet

Station #
Address
By

Input operating points in shaded cells from pump curves

Station	Storage Volume, gal	0				
	Inflow	Dry	Wet			
	Storage Time, hr	#DIV/0!	#DIV/0!			
Pump	Make	0				
	Model	0				
	Impeller Size, in	0				
	BEP, GPM	0				
	Preferred Operating Range, GPM	Min	Max			
		0	0			
Motor	Make					
	Model					
	Rated Capacity, HP					
	Efficiency					
Force Main	Material	0				
	Hazen-Williams 'C'	0				
	Age	0				
	Diameter, in	0.00				
	Length, ft	0				
System Performance	Operating Point	Lead Off	Lead On	Lead+Lag Off	Lead+Lag On	Overflow
	Static Head, ft	0	0	0	0	0
	Total Head, ft					
	Flow, GPM					
	% of BEP	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Velocity, ft/s	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	NPSHr, ft	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	NPSHa, ft	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Pump Efficiency, %					
	Pump BHP, HP	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	% Of Motor Capacity	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	System Efficiency	0%	0%	0%	0%	0%

Assumptions for Analysis:
System Curve includes Force Main Losses only
Modified pump curves include pump suction and discharge losses
Lead Off: Wet well level at which the lead pump turns off
Lead On: Wet well level at which the lead pump turns on
Lead+Lag Off: Wet well level at which the lag pump turns off (pumps in parallel)
Lead + Lag On: Wet well level at which the lag pump turns on (pumps in parallel)
Overflow: Maximum possible wet well level (pumps in parallel)

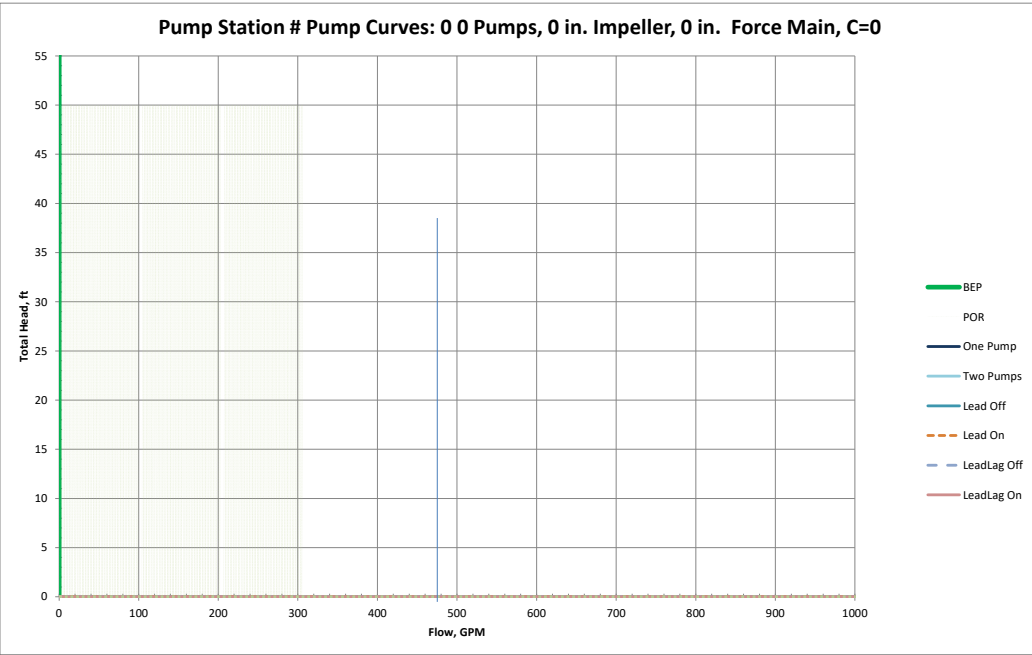


chart title
Pump Station #
Pump Curves:
Pumps,
Force Main,
C=
Impeller,
in.

Pump Station # Pump Curves: 0 0 Pumps, 0 in. Impeller, 0 in. Force Main, C=0