WIN:	26442.00	**Project Name:**	
Town:	Vassalboro	**Stream Name:**	Meadow Brook
Route No.	Bog Rd.	**Bridge Name:**	Meadow Brook Bridge
Asset ID:	5856	**Analysis by:**	ajs / csh
Lat:	44.44955 **Long:** -69.61941	**Date:**	6/10/2022

Peak Flow Calculations by USGS Regression Equations (Lombard/Hodgkins, 2021; Hodgkins, 1999 & Lombard/Hodgkins, 2015)

Enter data in blue cells only!

ver. 2021 Jan 01

	km²	mi²	ac	*Enter data in [mi²]*
A	9.30	3.59	2297.6	Watershed Area *DRNAREA*
W	2.25	0.9	556.5	Wetlands area (by NWI)

P_c	450733	4919839	watershed centroid (E, N; UTM 19N; meters)
County	Kennebec		*choose county from drop-down menu*

Worksheet prepared by:
Charles S. Hebson, PE
Environmental Office
Maine Dept. Transportation
Augusta, ME 04333-0016
207-557-1052
Charles.Hebson@maine.gov

Watershed Characteristics from StreamStats

STORNWI	24.22	NWI Wetlands %
SANDGRAVF	0.17	sand & gravel aquifer as decimal fraction of watershed A
ELEV	252.3	mean basin elevation (ft)
BSLDEM10M	5.22	mean basin slope (%)
COASTDIST	64.00	distance from the coast (mi)
ELEVMAX	445.4	maximum basin elevation (ft)
LC06WATER	0.25	percent of drainage basin land cover as open water
PRECIP	42.0	mean annual precipitation
STATSGOA	0.0412	mean basin percentage of hydrological soil group A

Ret Pd T (yr)	I24	Q_T (ft³/s) *1999 / 2015*	Q_T (ft³/s) *2021*	Q_T (ft³/s) *Design*
1.1			36	***35***
2	2.91	78	69	***70***
5	3.62	118	104	***105***
10	4.20	144	128	***130***
25	5.01	188	161	***160***
50	5.62	212	188	***190***
100	6.26	249	214	***215***
200	6.98	280	247	***245***
500	8.05	324	288	***290***

References:

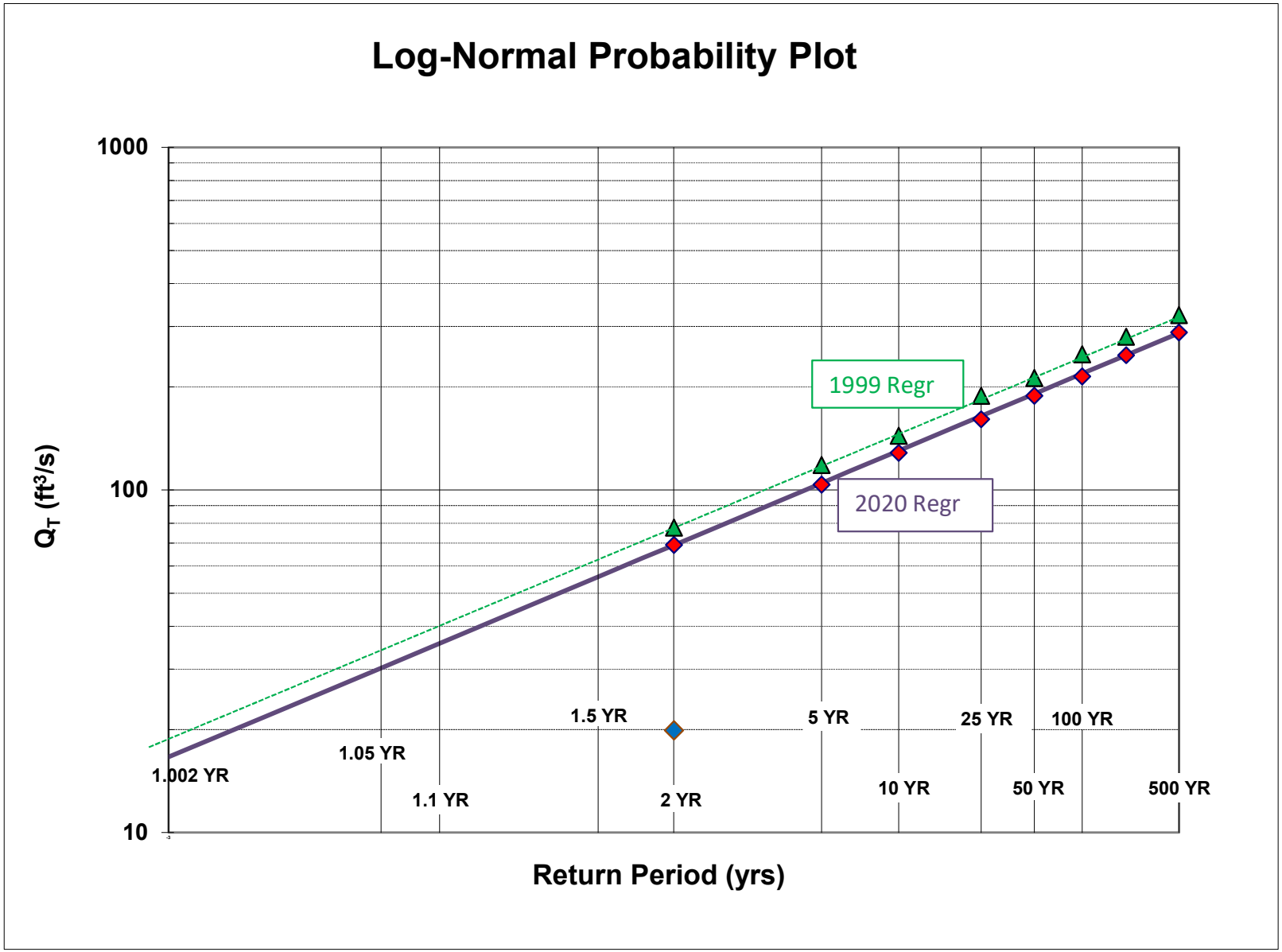
Hodgkins, G.A., 1999.
Estimating the magnitude of peak flows for streams in Maine for Selected Recurrence Intervals
WRIR 99-4008, USGS Augusta, ME

Lombard, P.J. & G.A. Hodgkins, 2015.
Peak flow regression equations for small, ungaged streams: in Maine: Comparing Map-Based to Field-Based Variables
SIR 2015-4059, USGS, Augusta, ME

Lombard, P.J. & G.A. Hodgkins, 2021.
Estimating Flood Magnitude and Frequency on Gaged and Ungaged Streams in Maine
SIR 2020-5092, USGS, Augusta, ME.

Instructions:

Enter values in blue cells only, watershed data from StreamStats
Copy I24 values from Stream Stats
Use results under "Design"
Check against gage data and FEMA studies if available
Questions? Check with ENV / Hydrology Section


Log-Normal Probability Plot
1000
100
10
Q_T (ft³/s)
1999 Regr
2020 Regr
1.002 YR
1.05 YR
1.1 YR
1.5 YR
2 YR
5 YR
10 YR
25 YR
50 YR
100 YR
500 YR
Return Period (yrs)

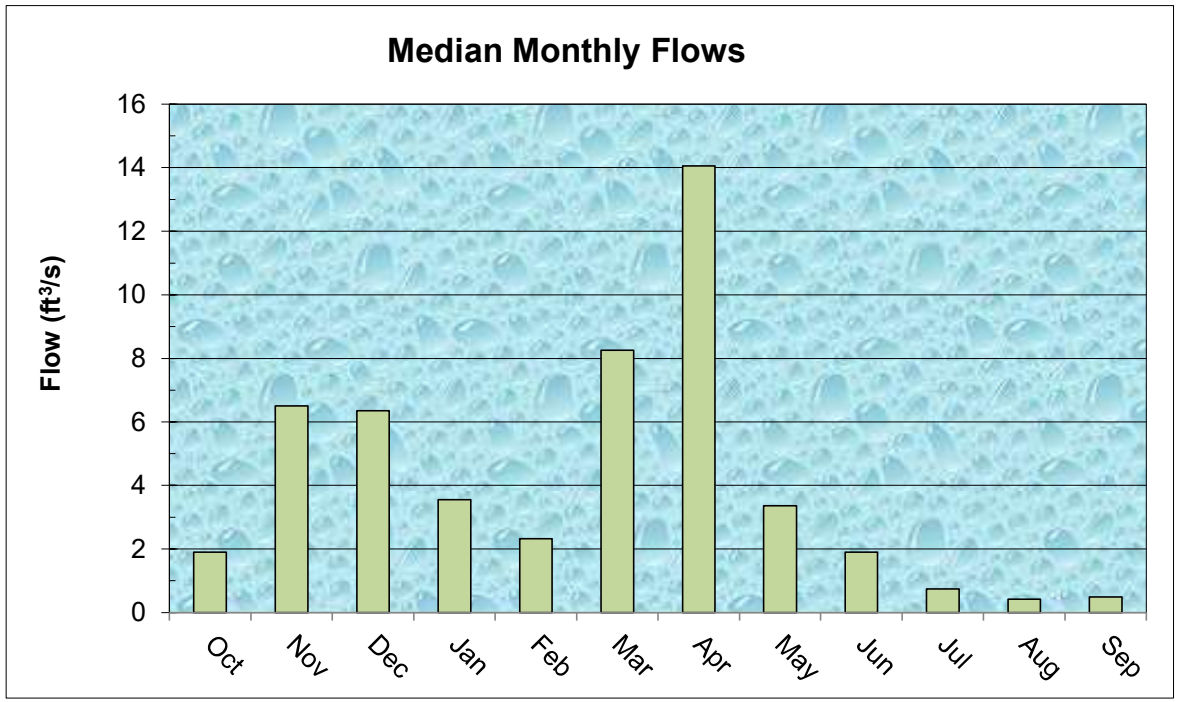
WIN:	26442.00	**Project Name:**	0
Town:	Vassalboro	**Stream Name:**	Meadow Brook
Route No.	Bog Rd.	**Bridge Name:**	Meadow Brook Bridge
Asset ID:	5856	**Analysis by:**	ajs / csh
Lat:	44.44955 **Long:** -69.61941	**Date:**	6/10/2022

DO NOT ENTER ANY DATA ON THIS PAGE; EVERYTHING IS CALCULATED

MAINE MONTHLY MEDIAN FLOWS and HYDRAULIC GEOMETRY BY USGS REGRESSION EQUATIONS (2004, 2013, 2015)

	Value	Variable	Explanation
	3.59	*A*	Area (mi^2)
450733	4919839	P_c	Watershed centroid (E,N; UTM; Zone 19; meters)
	63.47	*DIST*	Distance from Coastal reference line (mi)
	42.0	*pptA*	Mean Annual Precipitation (inches)
	0.00	*SG*	Sand & Gravel Aquifer (decimal fraction of watershed area)

Month	Q_{median} (ft3/s)	(m^3/s)
Jan	**3.55**	0.1007
Feb	**2.32**	0.0659
Mar	**8.26**	0.2340
Apr	**14.05**	0.3982
May	**3.36**	0.0953
Jun	**1.90**	0.0538
Jul	**0.74**	0.0209
Aug	**0.42**	0.0119
Sep	**0.49**	0.0139
Oct	**1.90**	0.0538
Nov	**6.50**	0.1842
Dec	**6.35**	0.1800



Q_{bf}	**19.9**	
ann avg	**8.6**	
ann med	**4.2**	
$Q_{1.002}$	**16.6**	
$Q_{1.01}$	**21.8**	
$Q_{1.05}$	**30.2**	
Q_{bf}	**67.3**	assume v = 4ft/s

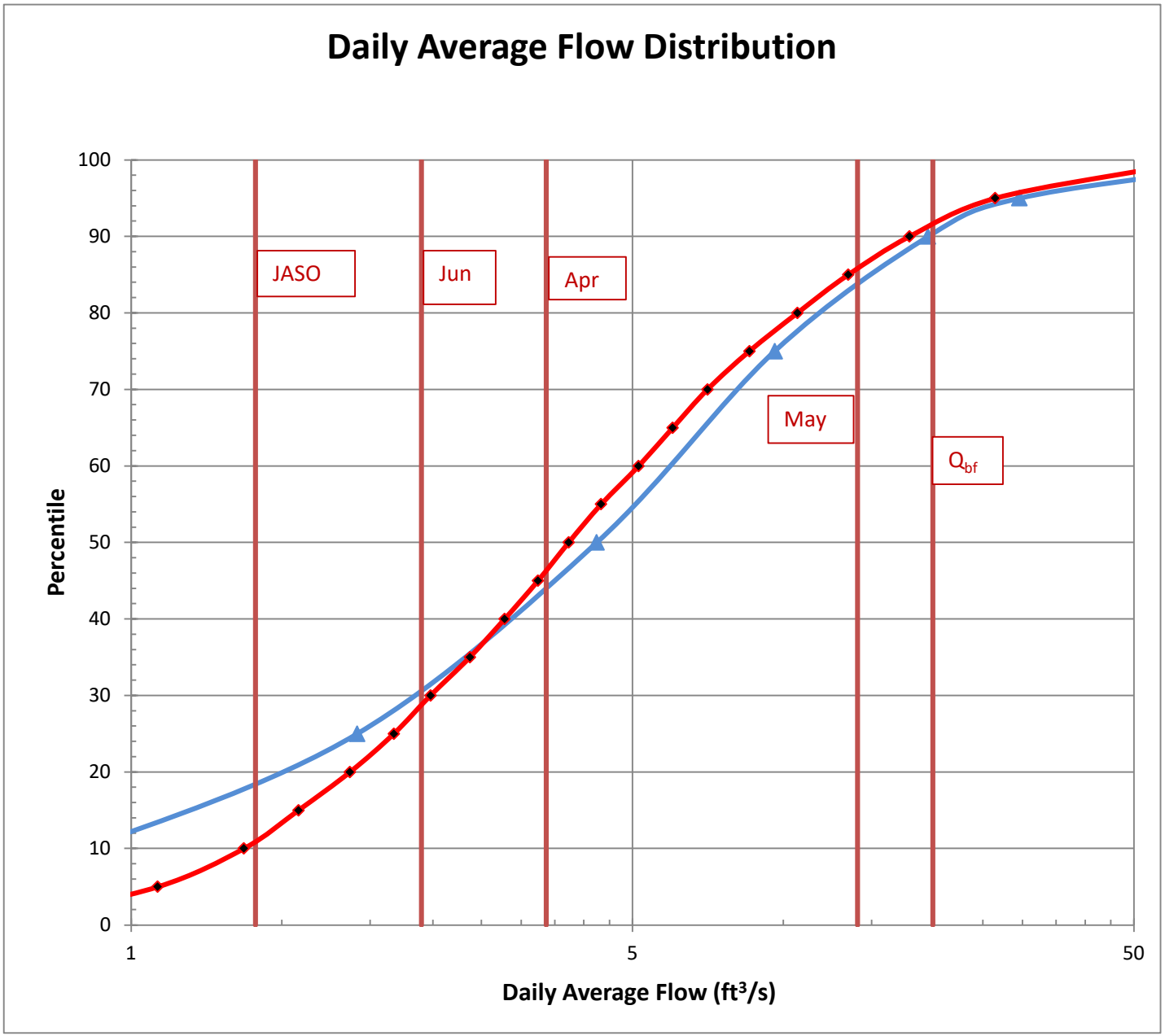
W_{bf}	**18.3**	estimated bankfull width (ft)
d_{bf}	**0.9**	estimated bankfull depth (ft)
A_{bf}	**13.7**	estimated bankfull flow area (ft^2)

References

Dudley, 2013. FY2013 Progress Report - Phase 1 …, USFWS QRP Project

Dudley, 2004. Estimating Monthly Streamflows … , SIR 2004-5026

Dudley, 2015. Regression Equations for Monthly & Annual Mean..., USGS SIR 2015-5151



	Daily Avg Flow Dist
A_{ws} = (mi^2)	3.6
Q (ft^3/s)	

Pctl	Median	84th pctl
1.00E-06	0.00	0.00
1	0.31	0.54
5	0.57	0.91
10	0.84	1.26
15	1.08	1.58
20	1.37	1.91
25	1.67	2.24
30	1.98	2.55
35	2.37	2.92
40	2.78	3.35
45	3.24	3.79
50	3.73	4.48
55	4.33	5.21
60	5.14	6.12
65	6.02	7.13
70	7.06	8.31
75	8.56	10.00
80	10.67	11.94
85	13.46	15.30
90	17.83	20.54
95	26.47	31.94
99	55.97	73.69

Q_{bf}	19.9
$Q_{1.002}$	16.6
$Q_{1.1}$	35.7
Q_2	69.1

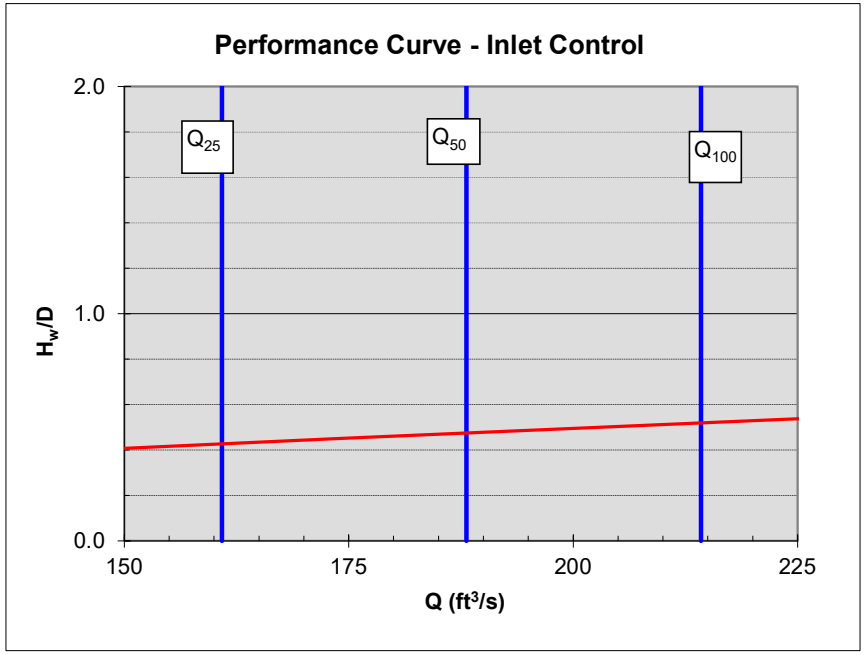
NOTE: ***This page is for preliminary sizing only.***
Final design should be done with HY8 or HDS-5

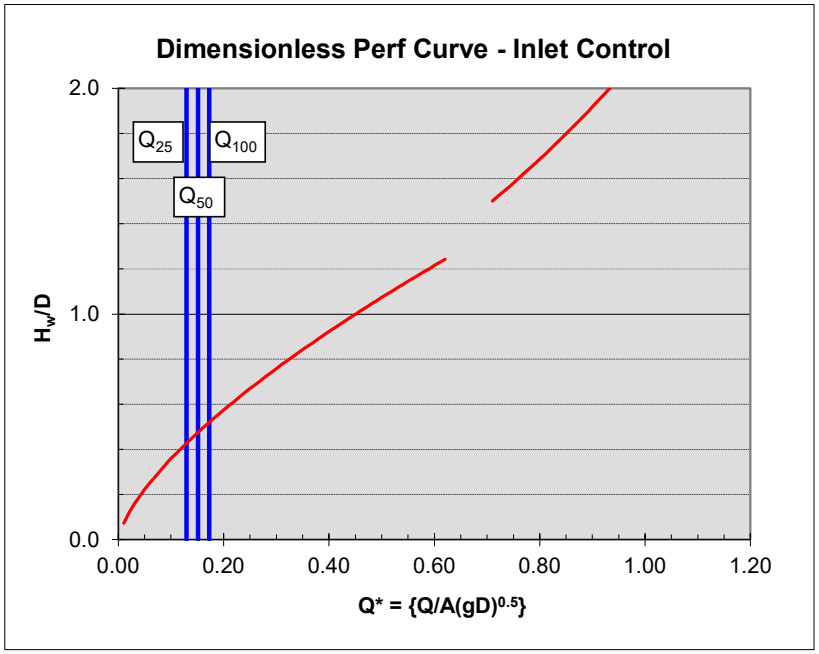
Note:
culvert dimensions are for open flow area; adjust for lost capacity due to embedding / backfilling (min {2' / 25% rise} embedment)
Finish analysis with HY-8

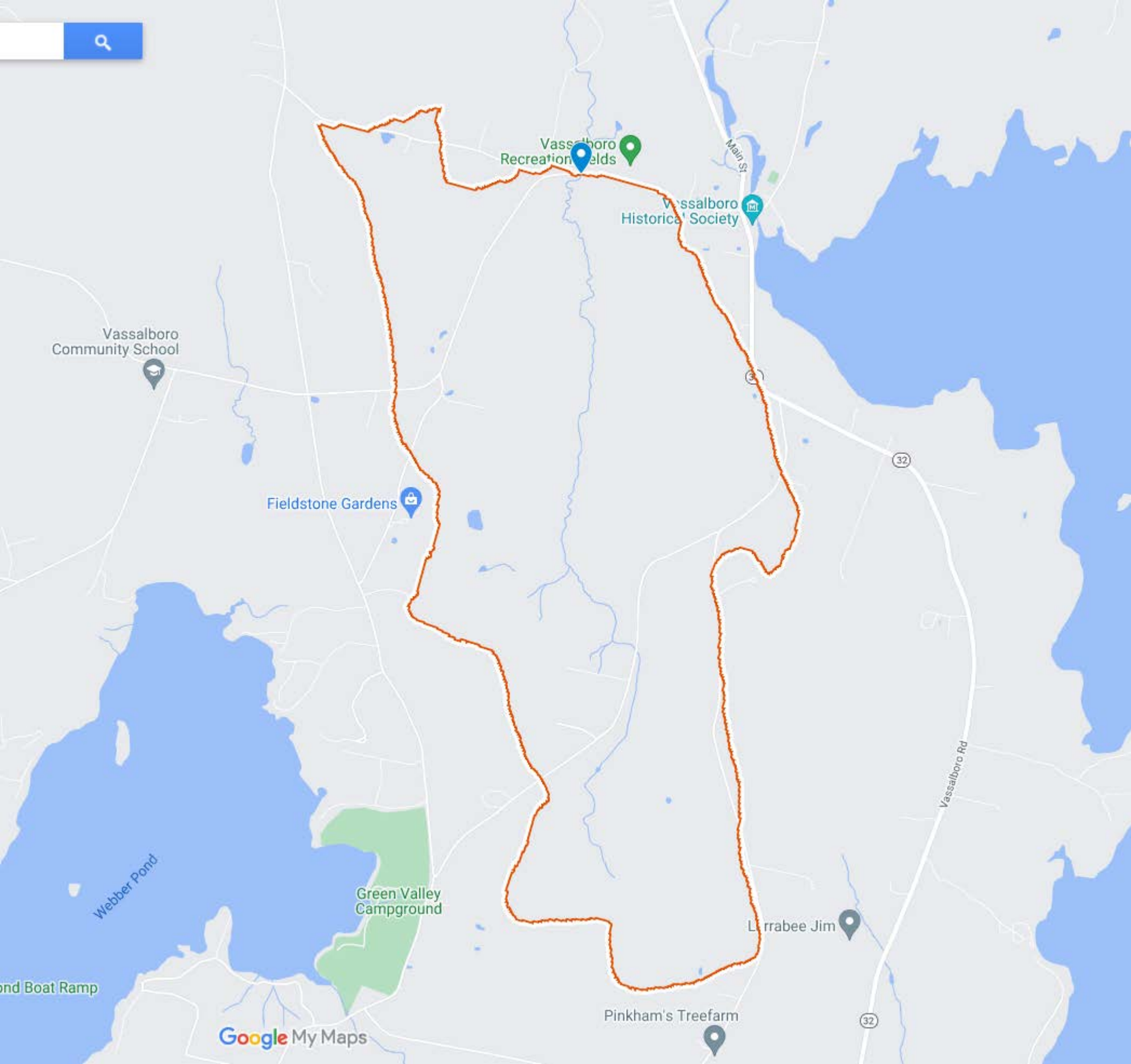
Preliminary Culvert Sizing - Round & Box Culverts

Choose shape and inlet type by pull-down menu in green cells

Shape:	Box					
Inlet Type:	Box 0 ww		Q_{25}	160.9		
D or R (ft)	6	*diam / rise*	Q_{50}	188.1	trial D / R =	6.7
w (ft)	*14.9*	*box span*	Q_{100}	214.3	trial w: BFW =	18.3
Slope (ft/ft)	0.01					
A (ft^2)	89.40					
g (ft/s^2)	32.2					

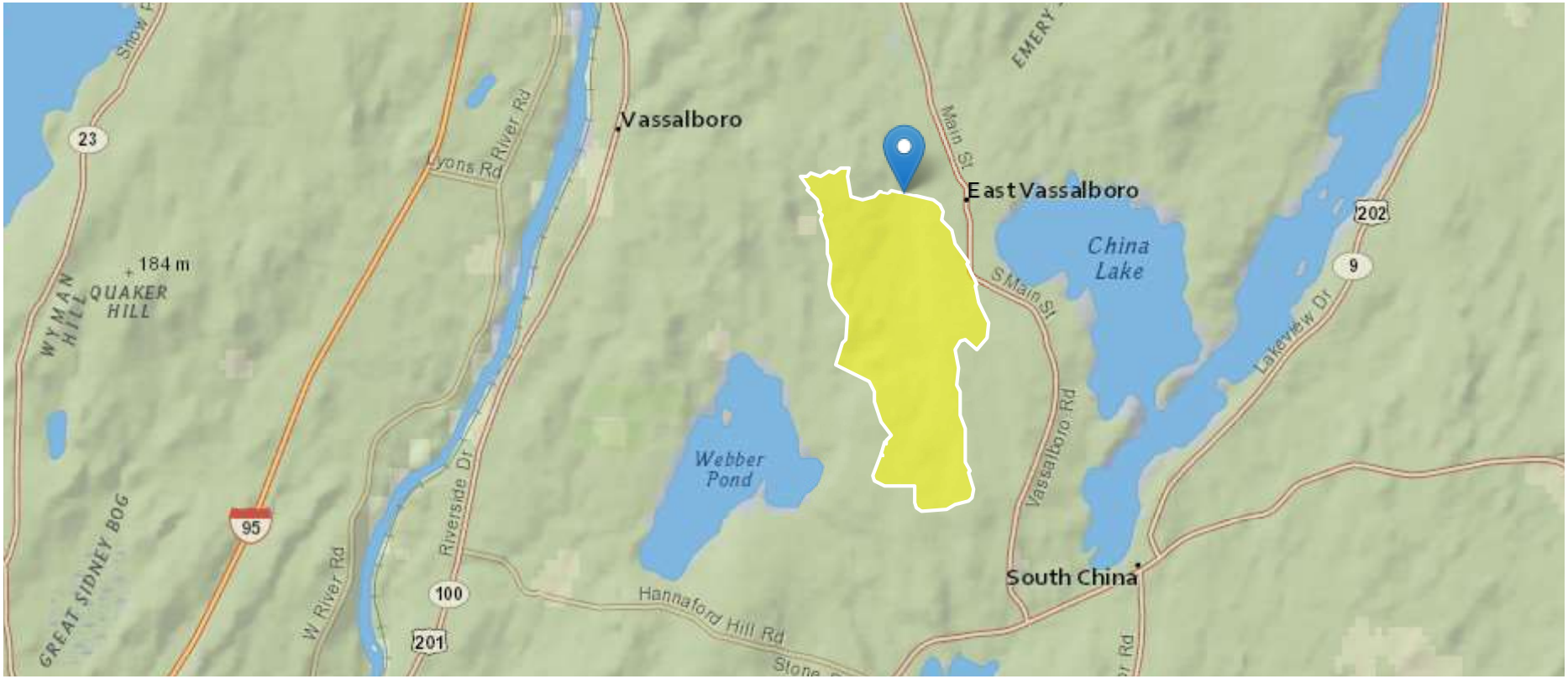





Vassalboro Recreation Fields
Main St
Vassalboro Historical Society
Vassalboro Community School
Fieldstone Gardens
32
Vassalboro Rd
Webber Pond
Green Valley Campground
Pinkham's Treefarm
Google My Maps

SS-Rpt-26442-Vassalboro

Region ID: ME
Workspace ID: ME20220610144816676000
Clicked Point (Latitude, Longitude): 44.44990, -69.61927
Time: 2022-06-10 10:48:40 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	5.22	percent
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	450733.46	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	4919839.46	meters
COASTDIST	Shortest distance from the coastline to the basin centroid	64	miles
DRNAREA	Area that drains to a point on a stream	3.59	square miles
ELEV	Mean Basin Elevation	252.3	feet
ELEVMAX	Maximum basin elevation	445.4	feet
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	6.26	inches
I24H10Y	Maximum 24-hour precipitation that occurs on average once in 10 years	4.2	inches
I24H200Y	Maximum 24-hour precipitation that occurs on average once in 200 years	6.98	inches
I24H25Y	Maximum 24-hour precipitation that occurs on average once in 25 years	5.01	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	2.91	inches
I24H500Y	Maximum 24-hour precipitation that occurs on average once in 500 years	8.05	inches
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	5.62	inches
I24H5Y	Maximum 24-hour precipitation that occurs on average once in 5 years	3.62	inches
LC06WATER	Percent of open water, class 11, from NLCD 2006	0.25	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	3.73	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.44	percent
PRDECFEB90	Basin average mean precipitation for December to February from PRISM 1961-1990	9.52	inches
PRECIP	Mean Annual Precipitation	42	inches

Parameter Code	Parameter Description	Value	Unit
SANDGRAVAF	Fraction of land surface underlain by sand and gravel aquifers	0.173	dimensionless
SANDGRAVAP	Percentage of land surface underlain by sand and gravel aquifers	17.3	percent
STATSGOA	Percentage of area of Hydrologic Soil Type A from STATSGO	0.0412	percent
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	26.462	percent
STORNWI	Percentage of strorage (combined water bodies and wetlands) from the Nationa Wetlands Inventory	24.22	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Statewide multiparameter peakflows SIR 2020 5092]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.59	square miles	0.26	5680
I24H2Y	24 Hour 2 Year Precipitation	2.91	inches	1.92	4.17
STORAGE	Percent Storage	26.462	percent	0	29.4
I24H5Y	24 Hour 5 Year Precipitation	3.62	inches	2.48	5.38
I24H10Y	24 Hour 10 Year Precipitation	4.2	inches	2.84	6.38
I24H25Y	24 Hour 25 Year Precipitation	5.01	inches	3.3	7.75
I24H50Y	24 Hour 50 Year Precipitation	5.62	inches	3.65	8.79
I24H100Y	24 Hour 100 Year Precipitation	6.26	inches	3.99	9.88
I24H200Y	24 Hour 200 YearPrecipitation	6.98	inches	5.26	11.1
I24H500Y	24 Hour 500 Year Precipitation	8.05	inches	5.95	13.1

Peak-Flow Statistics Flow Report [Statewide multiparameter peakflows SIR 2020 5092]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	ASEp
50-percent AEP flood	61.7	ft^3/s	32.6	117	39.1
20-percent AEP flood	92	ft^3/s	49.3	172	38.1
10-percent AEP flood	114	ft^3/s	60.2	216	38.9
4-percent AEP flood	143	ft^3/s	74.4	275	39.9
2-percent AEP flood	165	ft^3/s	84.4	322	39.7
1-percent AEP flood	189	ft^3/s	97.2	368	40.7
0.5-percent AEP flood	219	ft^3/s	109	441	42.8
0.2-percent AEP flood	254	ft^3/s	124	519	43.8

Peak-Flow Statistics Citations

Lombard, P.J., and Hodgkins, G.A.,2020, Estimating flood magnitude and frequency on gaged and ungaged streams in Maine: U.S. Geological Survey Scientific Investigations Report 2020–5092, 56 p. (https://doi.org/10.3133/sir20205092)

Flow-Duration Statistics

Flow-Duration Statistics Parameters [Statewide Annual SIR 2015 5151]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.59	square miles	14.9	1419
SANDGRAVAF	Fraction of Sand and Gravel Aquifers	0.173	dimensionless	0	0.212
ELEV	Mean Basin Elevation	252.3	feet	239	2120

Flow-Duration Statistics Disclaimers [Statewide Annual SIR 2015 5151]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Flow-Duration Statistics Flow Report [Statewide Annual SIR 2015 5151]

Statistic	Value	Unit
1 Percent Duration	0.0664	ft^3/s
5 Percent Duration	0.202	ft^3/s
10 Percent Duration	0.402	ft^3/s
25 Percent Duration	1.41	ft^3/s
50 Percent Duration	4.24	ft^3/s
75 Percent Duration	9.61	ft^3/s
90 Percent Duration	19.4	ft^3/s
95 Percent Duration	29.6	ft^3/s
99 Percent Duration	75.1	ft^3/s

Flow-Duration Statistics Citations

Dudley, R.W.,2015, Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015–5151, 35 p. (http://dx.doi.org/10.3133/sir20155151)

Annual Flow Statistics

Annual Flow Statistics Parameters [Statewide Annual SIR 2015 5151]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.59	square miles	14.9	1419
SANDGRAVAF	Fraction of Sand and Gravel Aquifers	0.173	dimensionless	0	0.212
ELEV	Mean Basin Elevation	252.3	feet	239	2120

Annual Flow Statistics Disclaimers [Statewide Annual SIR 2015 5151]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Annual Flow Statistics Flow Report [Statewide Annual SIR 2015 5151]

Statistic	Value	Unit
Mean Annual Flow	8.63	ft^3/s

Annual Flow Statistics Citations

Dudley, R.W.,2015, Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015–5151, 35 p. (http://dx.doi.org/10.3133/sir20155151)

Bankfull Statistics

Bankfull Statistics Parameters [Central and Coastal Bankfull 2004 5042]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.59	square miles	2.92	298

Bankfull Statistics Parameters [Appalachian Highlands D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.59	square miles	0.07722	940.1535

Bankfull Statistics Parameters [New England P Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.59	square miles	3.799224	138.999861

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.59	square miles	0.07722	59927.7393

Bankfull Statistics Flow Report [Central and Coastal Bankfull 2004 5042]

Statistic	Value	Unit
Bankfull Streamflow	19.9	ft^3/s
Bankfull Width	14.9	ft
Bankfull Depth	0.917	ft
Bankfull Area	13.7	ft^2

Bankfull Statistics Flow Report [Appalachian Highlands D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	25.8	ft
Bieger_D_channel_depth	1.62	ft
Bieger_D_channel_cross_sectional_area	42.4	ft^2

Bankfull Statistics Disclaimers [New England P Bieger 2015]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Bankfull Statistics Flow Report [New England P Bieger 2015]

Statistic	Value	Unit
Bieger_P_channel_width	36.1	ft
Bieger_P_channel_depth	1.82	ft
Bieger_P_channel_cross_sectional_area	66.4	ft^2

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	19.4	ft
Bieger_USA_channel_depth	1.58	ft
Bieger_USA_channel_cross_sectional_area	34.1	ft^2

Bankfull Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
Bankfull Streamflow	19.9	ft^3/s
Bankfull Width	14.9	ft
Bankfull Depth	0.917	ft
Bankfull Area	13.7	ft^2
Bieger_D_channel_width	25.8	ft
Bieger_D_channel_depth	1.62	ft

Statistic	Value	Unit
Bieger_D_channel_cross_sectional_area	42.4	ft^2
Bieger_P_channel_width	36.1	ft
Bieger_P_channel_depth	1.82	ft
Bieger_P_channel_cross_sectional_area	66.4	ft^2
Bieger_USA_channel_width	19.4	ft
Bieger_USA_channel_depth	1.58	ft
Bieger_USA_channel_cross_sectional_area	34.1	ft^2

Bankfull Statistics Citations

Dudley, R.W.,2004, Hydraulic-Geometry Relations for Rivers in Coastal and Central Maine: U.S. Geological Survey Scientific Investigations Report 2004-5042, 30 p (http://pubs.usgs.gov/sir/2004/5042/pdf/sir2004-5042.pdf)

Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G.,2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_campaign=PDFCoverPages)

Application Version: 4.9.0

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.0