SUMMARY OF EXISTING UPSTREAM AND DOWNSTREAM BRIDGES

Downstream - 0.17 miles **Town -** Franklin

Name - Unknown **Br. No. -** N/A

Hydraulic Opening - 6.25 ' Span x 4.6 ' Rise= 29 SF

Known Ice, Flooding, Scour, and Debris Concerns - Unknown

The Drainage Basin Characteristics for Alder Brook Bridge #5100 in Franklin on Route 182 over Alder Brook was provided by the Maine Department of Transportation Office of the Environment-Hydrology Section. The flows were computed using the 1999 USGS full regression equation. No other flow data is available such as gage data, existing studies, or reports from local residents. Therefore the hydrology data was used as provided and as follows:

Summary

Drainage Area =3.36 Square miles
Ordinary High Water ($Q_{1.1}$) = 91.5cfs
10 Year Flood (Q_{10}) = 473 cfs
Design Discharge (Q_{50}) = 768 cfs
Check Discharge (Q_{100}) = 912cfs
Q_{500} = 1286 cfs

Reported By: Michael Wight
Date: March 15, 2012

A formal complete hydrology and hydraulic analysis was not performed for Franklin, Alder Book Bridge # 5100. This project meets the following criteria for a level I qualitative analysis that requires no numerical analysis.

- No signs of serious scour or erosion problems
- No reports of flooding problems (i.e. overtopping)
- Relatively stable stream (vertically and laterally)
- No history of significant ice jams or debris problems
- No buildings or homes close to the stream.
- Fish passage will be maintained
- Adequate roadway alignment (horizontal and vertical)
- No history of accidents at the bridge location

I visited the project site on November 17, 2011 near low flow conditions. The existing bridge is a single 12'-6" span by 7'-11" rise by 78' long steel structural plate pipe arch. The opening area is 78 square feet. The water is barely moving with a velocity definitely less than 2 feet per second probably closer to 0.5 fps. The measured water depth was about 2'-6"+/-. The culvert has 1' to 1'-6" of material in the bottom. The underwater inspection reports in 1998 and 2003 notes that the outlet is filling in with sand and gravel. The recent survey has the streambed rising 6" to a 1' upward about 70' downstream from the outlet. Alder Brook meanders around with gentle bends crossing back and forth a wide swampy area. The flood plain on either side of the low flow channel is fairly level and hundreds of feet wide. The left and right over bank areas are only 6" to 1' higher than the water surface of the low flow channel. The side slopes above both ends of the culvert had minor erosion due to roadway drainage.

Tailwater/outlet conditions control the hydraulics at the site. Alder Brook near Route 182 has a very flat slope of about 0.001 ft/ft. The controlling hydraulic feature is the culvert in the former road. Route 182 was relocated in 1955 to its current location. The former road located 0.17 miles southerly has a 6'-3"span by 4'-6" rise cut stacked stone structure. The opening area of the granite culvert is about 28 square feet or 1/3 smaller. The finished grade of the old road is about elevation 115'+/-. The finished grade elevation at the centerline of Route 182 over the bridge is elevation 116.06'. The invert elevation is about 104.6' at the inlet and 105.2' at the outlet. The water surface elevation on November 17, 2011 was about 108.5'+/-. At low flow, the headwater to depth ratio is about 0.26. Due to the wide flood plains and the resulting large storage capacity, determining an accurate tailwater rating curve is very difficult.

To insure a minimum of 1'+/- of embedment compared to the streambed immediately upstream and downstream, the proposed invert elevation needs to be about 104'. The upstream thalweg elevations range between 104.95' and 105.0'.

The final decision on what alternative to use will be based on other factors besides hydraulics such as constructability, initial cost and life cycle cost. Please refer to the Summary of Preliminary Design for additional discussion about the proposed alternatives.

Reported By: Michael Wight, P.E.

Date: February 27, 2012

APPENDIX D

(Hydrology/Hydraulic Data)

Project Name:	Franklin	**PIN:**	19310
Stream Name:	Alder Brook	**Town:**	Franklin
Bridge Name:	Alder Brook Bridge	**Bridge No.**	5728
Route No.	182	**USGS Quad:**	
Analysis by:	AWM	**Date:**	9/28/2011

Peak Flow Calculations by USGS Regression Equations (Hodgkins, 1999)

Enter data in blue cells only!

	km²	mi²	ac
A	8.69	3.36	2148.2
W	0.17	0.06	40.9

P_c	561992	4941293
County	Hancock	
pptA	45.2	
SG	0.00	

A (km²)	8.69
W (%)	1.90

Conf Lvl 0.67

Enter data in [mi²]
Watershed Area
Wetlands area (by NWI)

watershed centroid (E, N; UTM 19N; meters)
choose county from drop-down menu
mean annual precipitation (inches; by look-up)
sand & gravel aquifer as decimal fraction of watershed A

Worksheet prepared by:
Charles S. Hebson, PE
Environmental Office
Maine Dept. Transportation
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Ret Pd T (yr)	Peak Flow Estimate Lower	Q_T (m³/s)	Upper	Q_T (ft³/s)
1.1		2.59		91.5
2	4.23	5.99	8.48	211.4
5	7.11	10.13	14.45	357.8
10	9.30	13.40	19.30	473.1
25	12.30	18.01	26.36	635.8
50	14.67	21.77	32.30	768.8
100	17.19	25.85	38.88	912.8
500	23.39	36.44	56.79	1286.8

Reference:

Hodgkins, G., 1999.
Estimating the magnitude of peak flows for streams in Maine for selected recurrence intervals
Water-Resources Investigations Report 99-4008
US Geological Survey, Augusta, Maine

$Q_T = b \times A^a \times 10^{-wW}$

Project Name:	Franklin	**PIN:**	19310
Stream Name:	Alder Brook	**Town:**	Franklin
Bridge Name:	Alder Brook Bridge	**Bridge No.**	3987
Route No.	182	**USGS Quad:**	
Analysis by:	AWM	**Date:**	9/28/2011

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

MAINE MONTHLY MEDIAN FLOWS BY USGS REGRESSION EQUATIONS (2004)

Worksheet prepared by:
Charles S. Hebson, PE
Chief Hydrologist
Maine Dept. Transportation
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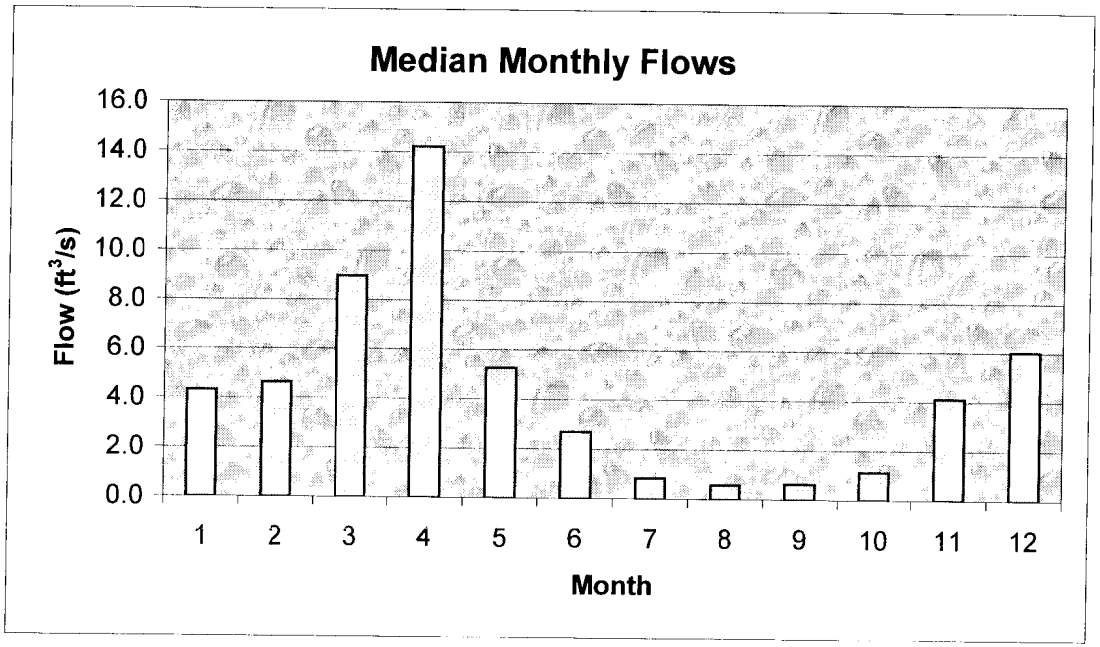
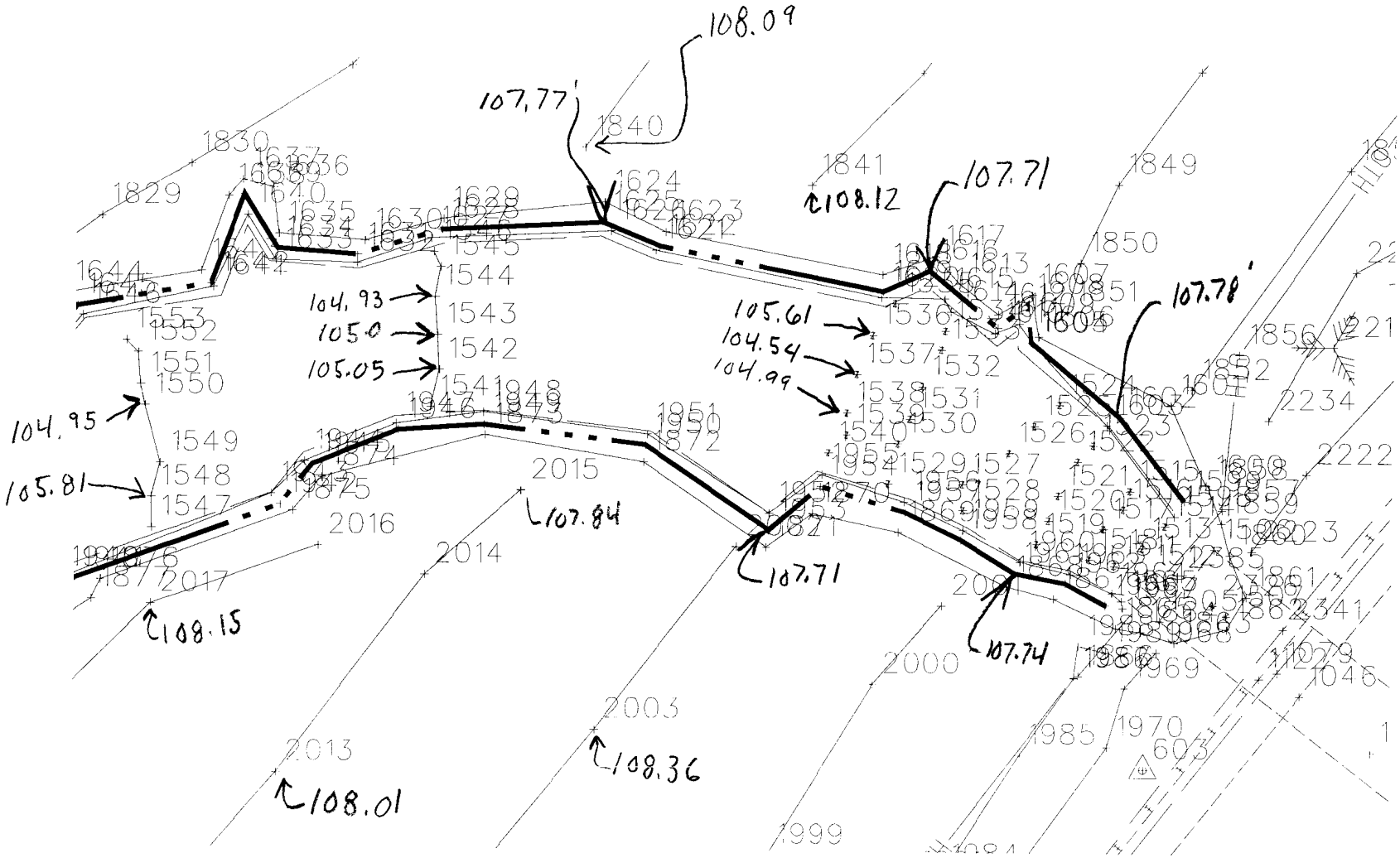
	Value	Variable	Explanation
	3.357	*A*	Area (mi^2)
561992	4941293	P_c	Watershed centroid (E,N; UTM; Zone 19; meters)
	40.58	*DIST*	Distance from Coastal reference line (mi)
	45.2	*pptA*	Mean Annual Precipitation (inches)
	0.00	*SG*	Sand & Gravel Aquifer (decimal fraction of watershed area)

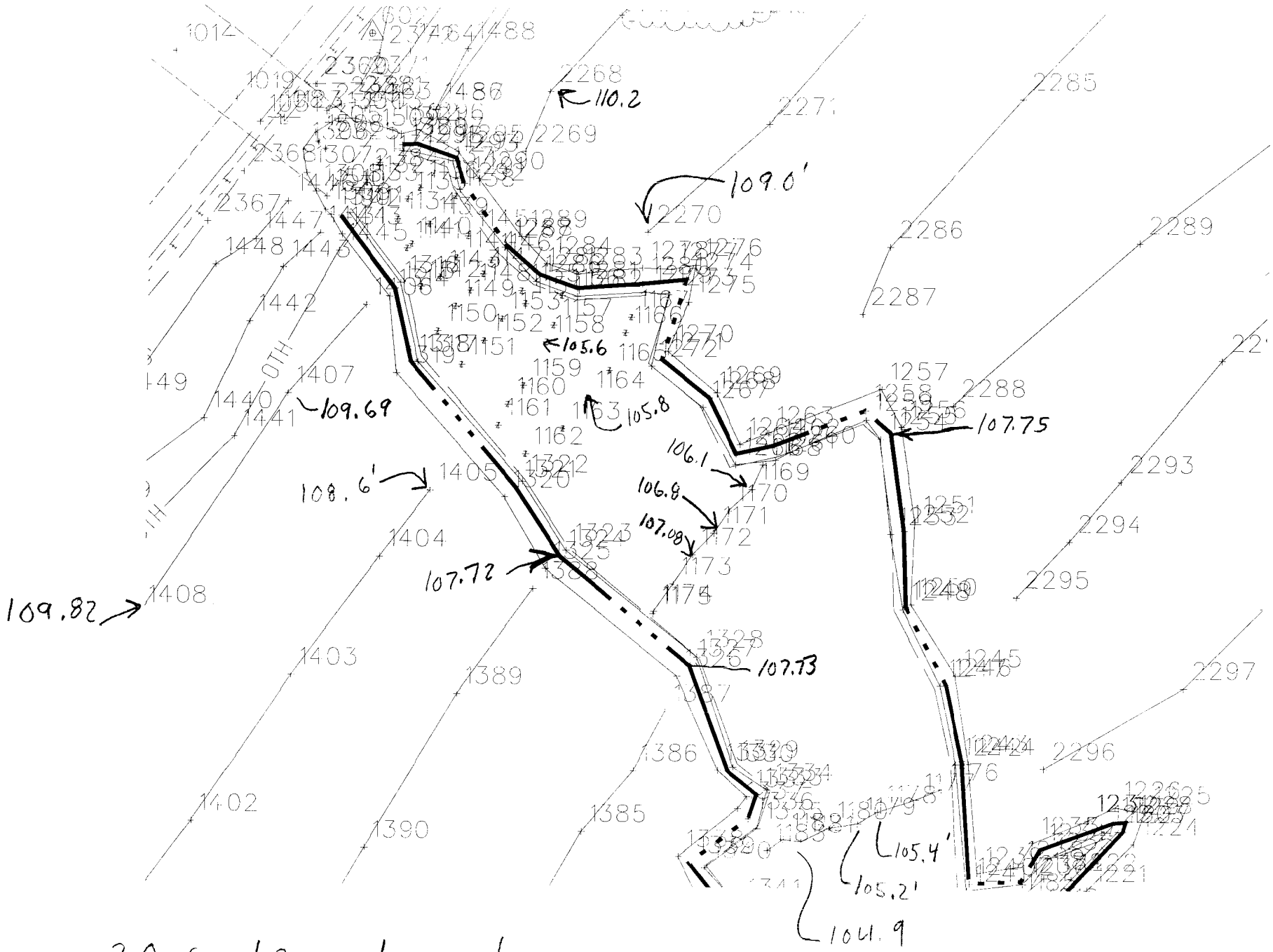
Month	Q_{median} (ft3/s)	(m^3/s)
Jan	**4.32**	0.1224
Feb	**4.64**	0.1314
Mar	**8.97**	0.2542
Apr	**14.22**	0.4029
May	**5.28**	0.1496
Jun	**2.70**	0.0765
Jul	**0.84**	0.0239
Aug	**0.59**	0.0167
Sep	**0.63**	0.0180
Oct	**1.13**	0.0319
Nov	**4.12**	0.1168
Dec	**6.03**	0.1708



Q_{bf}	**18.5**
ann avg	**7.0**
ann med	**3.6**
$Q_{1.002}$	**34.7**
$Q_{1.01}$	49.0
$Q_{1.05}$	74.1
W_{bf}	14.3
d_{bf}	1.1
Q_{bf}	63.8 assume v = 4ft/s



20 scale Upstream



20 scale downstream

INFORMATION FROM LOCAL RESIDENT

NAME: Douglas Stover, Code Enforcement officer

ADDRESS: _____

PHONE: 565-3663

YEARS OF RESIDENCE: _____

ADEQUACY OF OPENING: undersized ___ appropriate X oversized ___

HIGH WATER RELATIVE TO ROADWAY

Has water been over the road? No

Estimated depth over the road (if applicable): N/A

Flow over the road (velocity): N/A

Other information: _____

HIGH WATER RELATIVE TO BRIDGE

Distance from bottom of bridge: _____ above or below

Date of high water: _____

Cause of flood: _____
(ice, spring runoff, hurricane, cloudburst, heavy rain, backwater, debris)

Frequency of flooding:
none ____ seldom ____ occasional ____ frequent ____

Other information:

GENERAL COMMENTS:
In spring, overbank areas (i.e. swamp) is covered with water.

COMMENTS PERTAINING TO UPSTREAM OR DOWNSTREAM BRIDGES:

Reported by: Michael Wight Date: 12/22/2011