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LIST OF STANDARDS

D-2M	06/13/97
E-100A	01/02/04
E-100	01/02/04
E-101	05/30/03
E-102A	05/01/04
E-102	06/30/03
E-106	03/01/04
E-107A	08/08/95
E-107	06/30/03
E-121	08/08/95
E-143	06/15/04
E-150	05/01/04
E-155	05/01/04
E-160	05/20/99
G-1dM	01/03/00
G-1M	01/03/00
J-3M	06/13/97
SB-R6-82M	07/10/97

FINAL HYDRAULIC REPORT

HYDROLOGIC DATA

Date: 7-26-02

DRAINAGE AREA : 9.8 sq. km
 CHARACTER OF TERRAIN : Hilly, a mixture of forested and agricultural cover.
 STREAM CHARACTERISTICS : Small, sinuous, semi-alluvial, not braided or anabranching.
 NATURE OF STREAMBED : Mostly ledge through the bridge, some cobbles & boulders.

PEAK FLOW DATA

Q 2.33 =	4.8 cms	Q 50 =	19.8 cms
Q 10 =	10.6 cms	Q 100 =	24.8 cms
Q 25 =	14.7 cms	Q 500 =	40.0 cms

DATE OF FLOOD OF RECORD : Unknown
 ESTIMATED DISCHARGE : Unknown
 WATER SURFACE ELEV. : Unknown
 NATURAL STREAM VELOCITY : @ Q25 = 4.4 mps
 ICE CONDITIONS : Moderate
 DEBRIS : Moderate
 DOES THE STREAM REACH MAXIMUM HIGHWATER ELEV. RAPIDLY? Yes
 IS ORDINARY RISE RAPID? Yes
 IS STAGE AFFECTED BY UPSTREAM OR DOWNSTREAM CONDITIONS? No
 IF YES, DESCRIBE:

WATERSHED STORAGE: 1% HEADWATERS: UNIFORM: X
 IMMEDIATELY ABOVE SITE:

EXISTING STRUCTURE INFORMATION

STRUCTURE TYPE: Concrete slab bridge
 YEAR BUILT: Unknown
 CLEAR SPAN(NORMAL TO STREAM): 3.6 m
 VERTICAL CLEARANCE ABOVE STREAMBED: 3.9 m (Bot. of slab elev. 172.6 m)
 WATERWAY OF FULL OPENING: 14.0 sq. m
 DISPOSITION OF STRUCTURE: Remove
 TYPE OF MATERIAL UNDER SUBSTRUCTURE: Probably ledge.

WATER SURFACE ELEVATIONS AT:

Q2.33 =	169.6 m	VELOCITY =	3.7 mps
Q10 =	170.2 m	"	4.5 mps
Q25 =	170.6 m	"	4.9 mps
Q50 =	171.0 m	"	5.2 mps
Q100 =	171.4 m	"	5.5 mps

LONG TERM STREAMBED CHANGES: None noted or anticipated.

IS THE ROADWAY OVERTOPPED BELOW Q100: No
 FREQUENCY: Above Q100
 RELIEF ELEVATION: 171.8 m (Controlled by upstream channel banks)
 DISCHARGE OVER ROAD @Q100: None

UPSTREAM STRUCTURE

TOWN: Westford DISTANCE: 1460 m
 HIGHWAY#: T.H. 6 STRUCTURE #: 4
 CLEAR SPAN: 1.8 m CLEAR HEIGHT: 1.8 m
 YEAR BUILT: Unknown FULL WATERWAY: 5.3 sq. m
 STRUCTURE TYPE: ACCGMP

DOWNSTREAM STRUCTURE

TOWN: Westford DISTANCE: 980 m
 HIGHWAY#: T.H. 1 STRUCTURE #: 11
 CLEAR SPAN: 3.6 m CLEAR HEIGHT: 3.6 m
 YEAR BUILT: Unknown FULL WATERWAY: 13.4 sq. m
 STRUCTURE TYPE: box

LOAD FACTOR - LOAD RATING (METRIC TONS)

LOADING LEVELS	TRUCK						
	M	MS	3S2	6 AXLE	3A. STR.	4A. STR.	SA SEMI
INVENTORY	31	52					
POSTED	44	73	89		52	54	89
OPERATING		87	107	97	62	64	

COMMENTS: STRENGTH RFS = 1.5 M_{DL} / A X M_{LL+1}

TRAFFIC DATA

YEAR	ADT	DHV	% D	% T	ADTT
1999	370	50	66	3	<1
2019	500	70	66	4	<1

20 year ESAL for flexible pavement from to :
 40 year ESAL for flexible pavement from to :
 Design Speed : 60 km/h

PROPOSED STRUCTURE

STRUCTURE TYPE: Concrete slab bridge
 CLEAR SPAN(NORMAL TO STREAM): 7.8 m
 VERTICAL CLEARANCE ABOVE STREAMBED: 4.1 m
 WATERWAY OF FULL OPENING: 32 sq. m

WATER SURFACE ELEVATIONS AT:

Q2.33 =	169.6 m	VELOCITY =	3.0 mps
Q10 =	169.9 m	"	3.9 mps
Q25 =	170.2 m	"	4.3 mps
Q50 =	170.4 m	"	4.7 mps
Q100 =	170.6 m	"	4.9 mps

IS THE ROADWAY OVERTOPPED BELOW Q100: No
 FREQUENCY: Above Q100
 RELIEF ELEVATION: 171.8 m (Controlled by upstream channel banks)
 DISCHARGE OVER ROAD @Q100: None

AVERAGE LOW ELEVATION OF SUPERSTRUCTURE: 173.1 m
 VERTICAL CLEARANCE: @ Q100 = 2.5 m

SCOUR: Minimal scour due to ledge in the channel. Abutments will be poured on ledge.

REQUIRED CHANNEL PROTECTION: Stone Fill, Type III

PERMIT INFORMATION

AVERAGE DAILY FLOW: 0.2 cms DEPTH OR ELEVATION:
 ORDINARY LOW WATER: 0.1 cms 0.1 m
 ORDINARY HIGH WATER: 2.1 cms 0.3 m

TEMPORARY BRIDGE REQUIREMENTS

STRUCTURE TYPE: No temporary bridge. The road will be closed and traffic detoured.
 CLEAR SPAN (NORMAL TO STREAM):
 VERTICAL CLEARANCE ABOVE STREAMBED:
 WATERWAY AREA OF FULL OPENING:

ADDITIONAL INFORMATION

DESIGN CRITERIA

1. DESIGN LIVE LOAD AASHTO MS 22.5
2. DESIGN SPAN 8.75m BACK TO BACK
3. ALLOWABLE LOAD FOR SPREAD FOOTINGS ON SOIL 190 kPa
ON LEDGE 480 kPa
4. ALLOWABLE LOAD FOR PILING N/A
TYPE
ESTIMATED LENGTH
5. STRUCTURAL STEEL AASHTO M270MM270 GRADE N/A
6. REINFORCING STEEL GRADE 420
7. CONCRETE, HIGH PERFORMANCE CLASS A fc: 30 Mpa
CONCRETE, HIGH PERFORMANCE CLASS B fc: 25 Mpa
8. DESIGN SOIL UNIT WEIGHT 22.00 kN/m³
9. DESIGN LOAD FOR SPREAD FOOTINGS ON LEDGE 276 kPa

TRAFFIC MAINTENANCE

1. IS TRAFFIC TO BE MAINTAINED? NO
 IF YES, ON EXISTING STRUCTURE?
 OR ON TEMPORARY BRIDGE?
 ONE OR TWO-WAY TRAVEL?
2. TRAFFIC CONTROL SIGNALS REQUIRED? NO
3. ARE SIDEWALKS REQUIRED? NO
 IF SO, ON WHAT SIDE?

PROJECT NAME: WESTFORD

PROJECT NUMBER: TH2 9436

FILE NAME: I94j122StructuresIsj122pi.xls PLOT DATE: 02/23/2005
 PROJECT MANAGER: R. R. WHITCOMB DRAWN BY: J. GILMORE
 DESIGNED BY: C. CARLSON CHECKED BY: C. CARLSON
 PRELIMINARY INFORMATION SHEET SHEET 2 OF 56