Preliminary Design Report

Main Street Bridge #2501
over
East Branch Sebasticook River

Newport, Maine

BR-1562(500)X
PIN 015625.00

Maine Department of Transportation

Bridge Program

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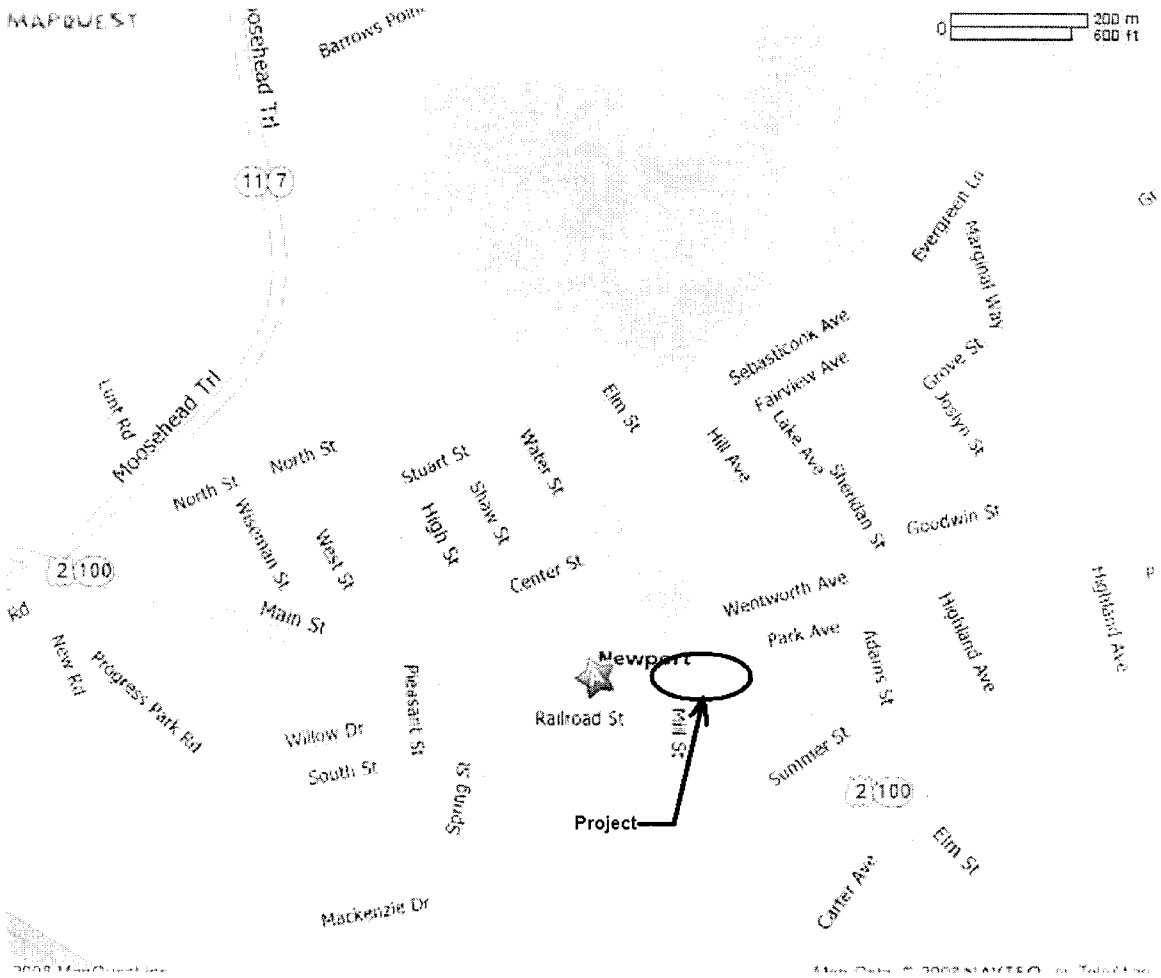
Location Map

Newport

Main Street Bridge #2501

PIN 015625.00

(Route 2 /100 over East Branch Sebasticook River)



Latitude 44^0 50' 06.5"
Longitude 69^0 16' 19.9"

HYDROLOGY REPORT

Preliminary Drainage Basin Characteristics for Main Street Bridge #2501 in Newport over Sebasticook Stream was developed by the Maine Department of Transportation Office of the Environment-Hydrology Section. Design Q_{50} flow was calculated to be 3,742 cfs.

The Town of Newport owns the dam at the outlet of Sebasticook Lake. They were contacted to determine if any flow data was available at that location. They have no flow information. No additional information is available.

The hydrology data is as follows:

Summary

Drainage Area	=	126 square miles
Ordinary High Water ($Q_{1.1}$)	=	941 cfs
Design Discharge (Q_{50})	=	3,742 cfs
Check Discharge (Q_{100})	=	4,200cfs
Superflood Q_{500}	=	5,273 cfs

The URS Corporation performed engineering for the Maine Department of Marine Resources (DMR) for the restoration of fish passage to the Sebasticook River above the Guilford Dam in Newport. This 2002 project involved the removal of the dam and the design and construction of fish passage measures upstream of the dam. DMR provided URS with minimum and maximum design flows of 240 cfs and 720 cfs (upper and lower bounds) for fish passage evaluation and design. These flows were evaluated to ensure that velocities were not substantially affected by this project.

Reported By: Edward Caswell
Date: January 30, 2009

HYDRAULIC REPORT

The existing Main Street Bridge #2501 is a five span, concrete T-Beam superstructure supported on concrete abutments and piers. One span crosses a separate canal approximately 110 feet from the four span bridge which spans the river. The four span total waterway opening is approximately 1,500 sf. The canal was assumed to carry no flow.

Approximately 900 feet upstream is the Middle Bridge #5277. It is a single span, steel stringer, open steel grid structure of 60 foot span. The clear total waterway opening is approximately 500 sf. Approximately 400 feet downstream is a two span railroad bridge, approx.100 foot span and a clear total opening of 1300 sf.

The dam immediately downstream of the bridge was removed in 2002 as part of a fish passage restoration project on the Sebasticook conducted by the Maine Department of Marine Resources (DMR). The dam was removed to just below streambed and shaped to the general contours of the river cross section. DMR's dam removal/fish passage project resulted in significant reworking of the streambed from the remains of the old dam immediately downstream to 100 feet more or less upstream from the bridge. Riprap was placed in the river in a structured manner to provide a natural fish ladder. URS Corporation sized the riprap specified for the construction of the fish passage to ensure stability up to velocities of 9 fps. Modeling of the river at high flows (Q50, Q100, Q500) shows velocities through the existing bridge to be between 10 to 11 fps. During the first season after the dam removal and the installation of the stone fish passage, stone movement was noted. The stone was redesigned and subsequently reinstalled. No problems have been reported with the redesigned measures.

The reach boundary conditions for the hydraulic analysis of the river were based upon "normal depth" (i.e., downstream conditions have reestablished their previous state prior to the obstruction.) The river slope was used as a boundary condition based on the values used by URS in their hydraulic analysis.

The URS Corporation graciously provided their HEC-RAS river model for our use, allowing a comparison of our model to that used to design the fish passage. The URS model's outlet velocities were approximately the same as predicted by our model. For Q50, the URS model predicted a maximum outlet velocity of 11.2 ft/sec and our model predicted 11.1 ft/sec. At the fish passage low flow check of 240 cfs, the URS model predicted 5.1 ft/sec, our model 5.2 ft/sec.

The following flow and tailwater data of the existing bridge was developed using a HEC-RAS model of the waterway from Middle Bridge to the downstream RR bridge:

	Design Flow	Tailwater El.
Discharge—Fish Passage Low	240 cfs	186.39 ft
Discharge—Fish Passage High	720 cfs	187.33 ft
Discharge @ $Q_{1.1}$	941 cfs	187.58 ft
Discharge @ Q_{50}	3,742 cfs	189.77 ft
Discharge @ Q_{100}	4,200 cfs	190.10 ft
Discharge @ Q_{500}	5,273 cfs	191.03 Ft

A bridge scour evaluation of the Main Street Bridge #2501 was performed by T.Y. Lin International in 1995. They found the channel stable horizontally and vertically. They found the bed material to be of gravel, sand and silt with a high potential for scour. However, since the structure was behind a dam they found no signs of scour and considered the bridge at low risk for scour. Their analysis results do not apply since the dam has been removed.

The proposed structure is a 120 foot span steel stringer/concrete deck structure supported on concrete integral abutments. The proposed project also includes the removal of the easterly, freestanding bridge span and filling of the roadway as it passes over the canal. Riprapped toe slopes are proposed for construction in front of the abutments. The new structure opening is approximately 75% of the existing bridge opening. The proposed straight abutment wings with coned toe slopes present a hydraulic improvement to the 90 degree return wings of the existing bridge. At high flows, the outlet velocities increase from 1% to 5% above the existing condition. At Q50, the velocity increases from 10.66 fps to 11.22 fps. The proposed structure maintains outlet velocities at less than 6 fps at low flows, thereby meeting DMR fish passage criteria. The structure should not affect fish passage if the existing fish passage measures are not disturbed during construction.

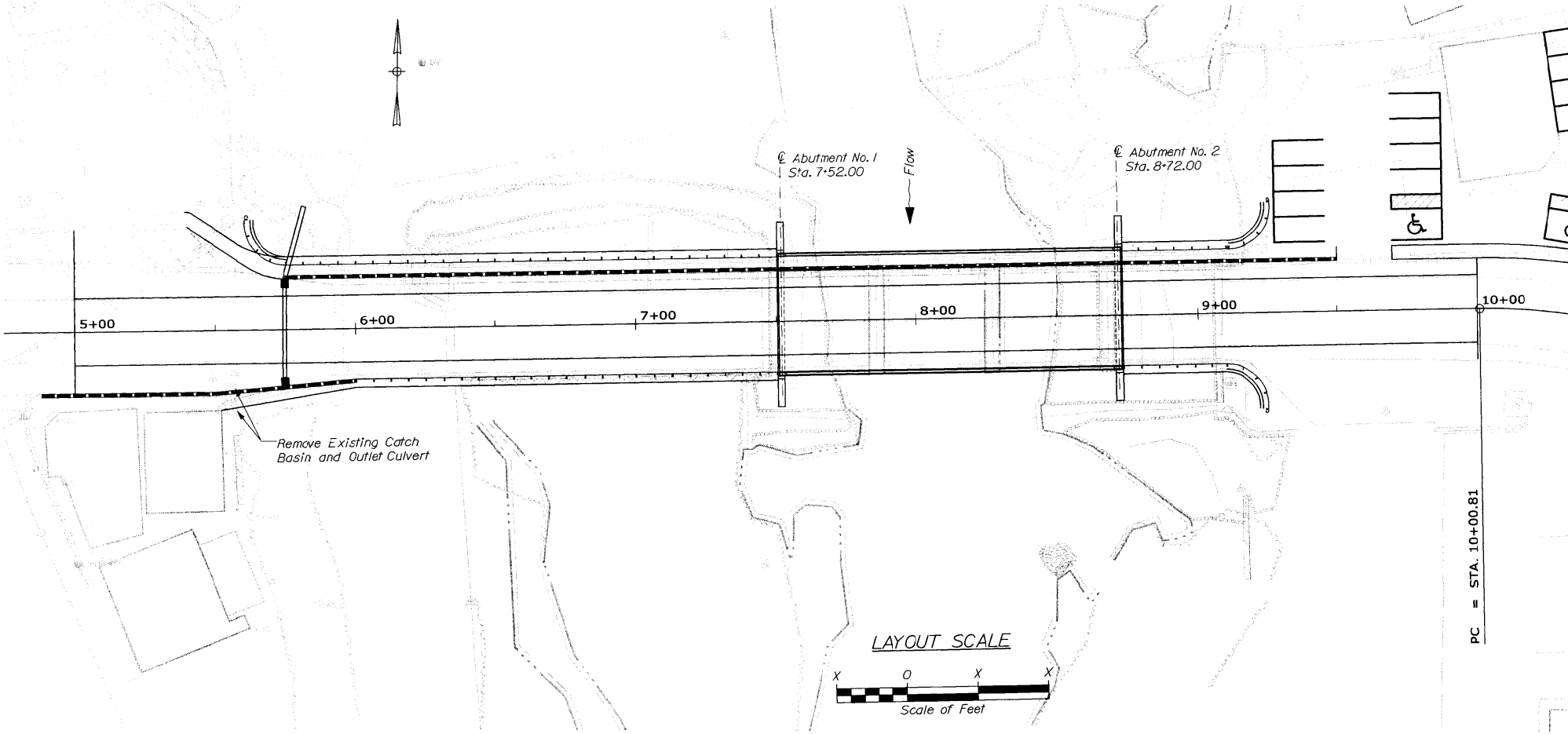
Armoring of the abutment slopes with heavy riprap is recommended based upon methods from FHWA Hydraulic Engineering Circular 23, Bridge Scour And Stream Instability Countermeasures, Experience, Selection, and Design Guidance, Second Edition, March 2001.

SUMMARY

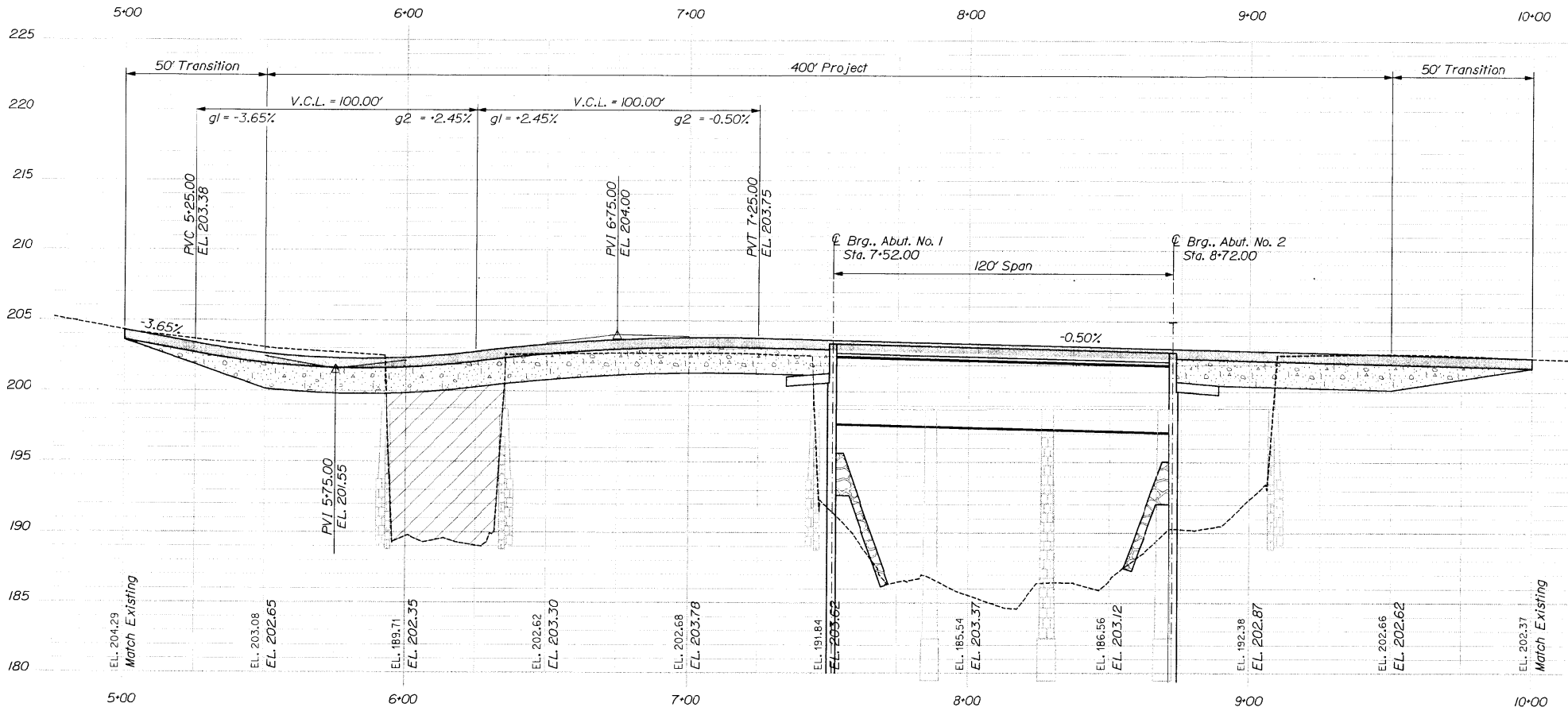
	Exist. Structure 160 ' span	Option 1 120 ' span Recommended
Total Area of Waterway Opening	1,500 ft^2	1,130 ft^2
Headwater Elevation @ 240 cfs	186.72 ft	186.62 ft
Headwater Elevation @ 720 cfs	187.92 ft	187.82 ft
Headwater Elevation @ $Q_{1.1}$	188.30 ft	188.20 ft
Headwater Elevation @ Q_{50}	191.40 ft	191.23 ft
Headwater Elevation @ Q_{100}	191.77 ft	191.59 ft
Headwater Elevation @ Q_{500}	192.48 ft	192.38 ft
Freeboard @ Q_{50}	6.94 ft	5.44 ft
Discharge Velocity @ 240 cfs	3.90's	5.23 ft/s
Discharge Velocity @ 720 cfs	5.57's	5.68 ft/s
Discharge Velocity @ $Q_{1.1}$	6.31's	6.11 ft/s
Discharge Velocity @ Q_{50}	10.66's	10.82 ft/s
Discharge Velocity @ Q_{100}	10.94's	11.09 ft/s
Discharge Velocity @ Q_{500}	10.81's	11.33 ft/s

Reported By: Edward Caswell, P.E.
Date: January 30, 2009

Note: All elevations based on North American Vertical Datum (NAVD) of 1988.


℄ Abutment No. 1
Sta. 7+52.00
Flow
℄ Abutment No. 2
Sta. 8+72.00
5+00
6+00
7+00
8+00
9+00
10+00
Remove Existing Catch Basin and Outlet Culvert
PC = STA. 10+00.81
LAYOUT SCALE
X 0 X X
Scale of Feet

Draft

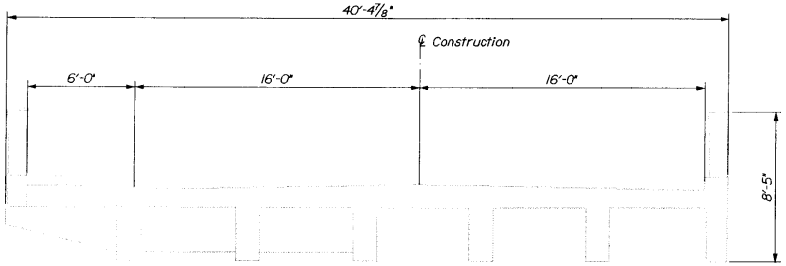


PRELIMINARY PROFILE

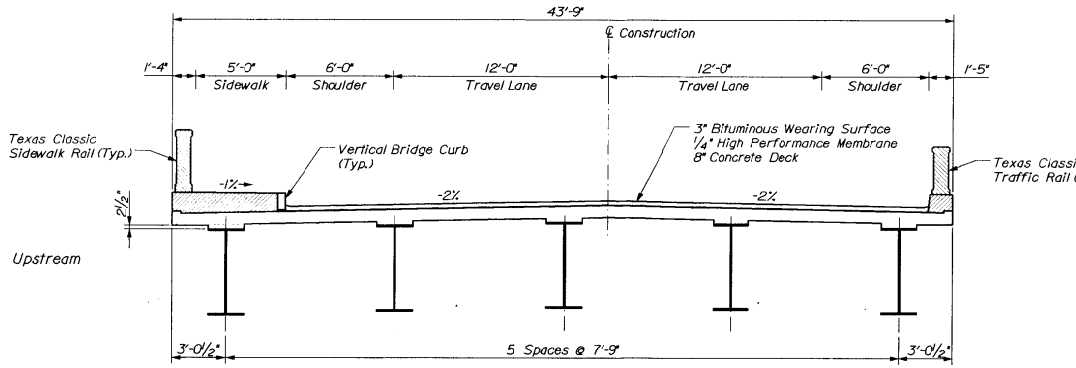
Horiz. 25 0 25 50

Vert. 5 0 5 10

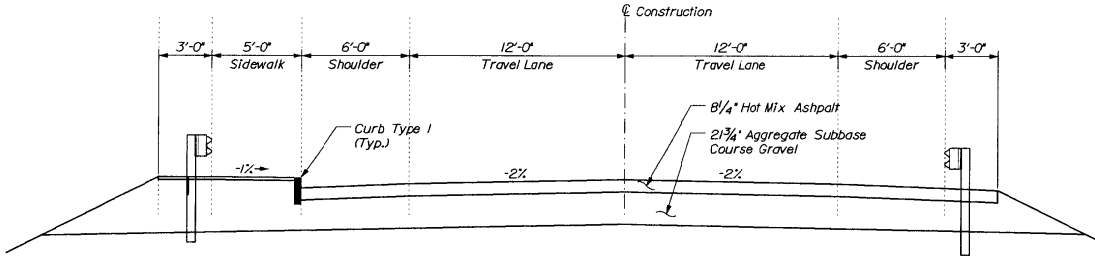
Scale of Feet



EXISTING SUPERSTRUCTURE SECTION



TYPICAL SUPERSTRUCTURE SECTION



TYPICAL APPROACH SECTION