BRIDGE SCOUR COUNTERMEASURES FIELD NOTES

Structure No.: S00205 014+0.518-1 Road: Manhattan Rd./S205 Watercourse: Gallatin River Site ID: 022

Location: 3 miles SE Manhattan GPS Lat/Long: 45 49 30.11 N, 111 16 18.00 W Date: 07/13/2016, 07/27/2016

Inspection Team: T. Dudunake, R. Fosness, S. Holnbeck, S. Lawlor, S. Buchmiller

DESCRIPTION OF FLOODPLAIN

Describe general topography of floodplain:

Ecoregions (US EPA, 2013): (17w) Townsend Basin

Stream properties for classification (Brice and Blodgett, 1978): Medium stream (30-150m), narrow floodplain (2-10x channel width).

Floodplain conditions at bridge site:

Floodplain	Developed				Forest/Wetlands			Undergrowth/Shrubs			Planted/Cultivated		Other
	Open	Low	Medium	High	Thin	Moderate	Thick	Thin	Moderate	Thick	Pasture	Crops	
U/S left	☐	☐	☐	☐	☒	☐	☐	☒	☐	☐	☐	☐	☐
U/S right	☐	☒	☐	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐
D/S left	☐	☐	☐	☐	☐	☒	☐	☐	☒	☐	☐	☐	☐
D/S right	☐	☒	☐	☐	☐	☐	☒	☐	☒	☐	☐	☐	☐

Other floodplain comments:

Parking lot for river access U/S RB.

COMMENTS

COUNTERMEASURES

Cabled Concrete Mattresses on pier 2 and 3. Large piles of woody debris present on U/S face of pier 2 and 3.

Countermeasures (geotextile and cable contrete mattress) not visible at the time of visit.

IN THE UPSTREAM CHANNEL

3 bridges located upstream. Large gravel bar throughout left channel between I90 bridge and HWY205 bridge

IN THE DOWNSTREAM CHANNEL

Large gravel bank. At the time of inspection, only one main channel present due to low water conditions.

UNDER THE BRIDGE

Large rocky bank from abutment to pier 2.

Is There Evidence of Road Overtopping? No ☒ / Yes ☐ Is There Evidence of Pressure F1ow? No ☒ / Yes ☐

Angle at Which Bridge is Skewed to Channel (degrees): 0 (+ = Pushes RB | – = Pushes LB)

Bend in Channel at Bridge: ☒ None ☐ Mild ☐ Moderate ☐ Severe

Describe: _____

Debris Accumulation: No ☐ / Yes ☒ Debris Trapping Potential: Medium (Low, Medium, High) U/S Debris Potential: Medium (Low, Medium, High)

Describe (type and location):

large piles of woody debris (branches) piled in front of bridge piers.
Cabled Concrete Mattresses on pier 2 and 3

DESCRIPTION OF SUBSTRUCTURE

Description of piers/bents:

Location	No. of piers/bents	Material				Shape						No. of columns
		Concrete	Steel	Timber	Other	Pointed	Square	Round	Cylinder	H-pile	Other	
Left overbank	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	1
Main channel	2	☒	☐	☐	☐	☒	☐	☐	☐	☐	☐	1
Right overbank	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	1

Description of abutments:

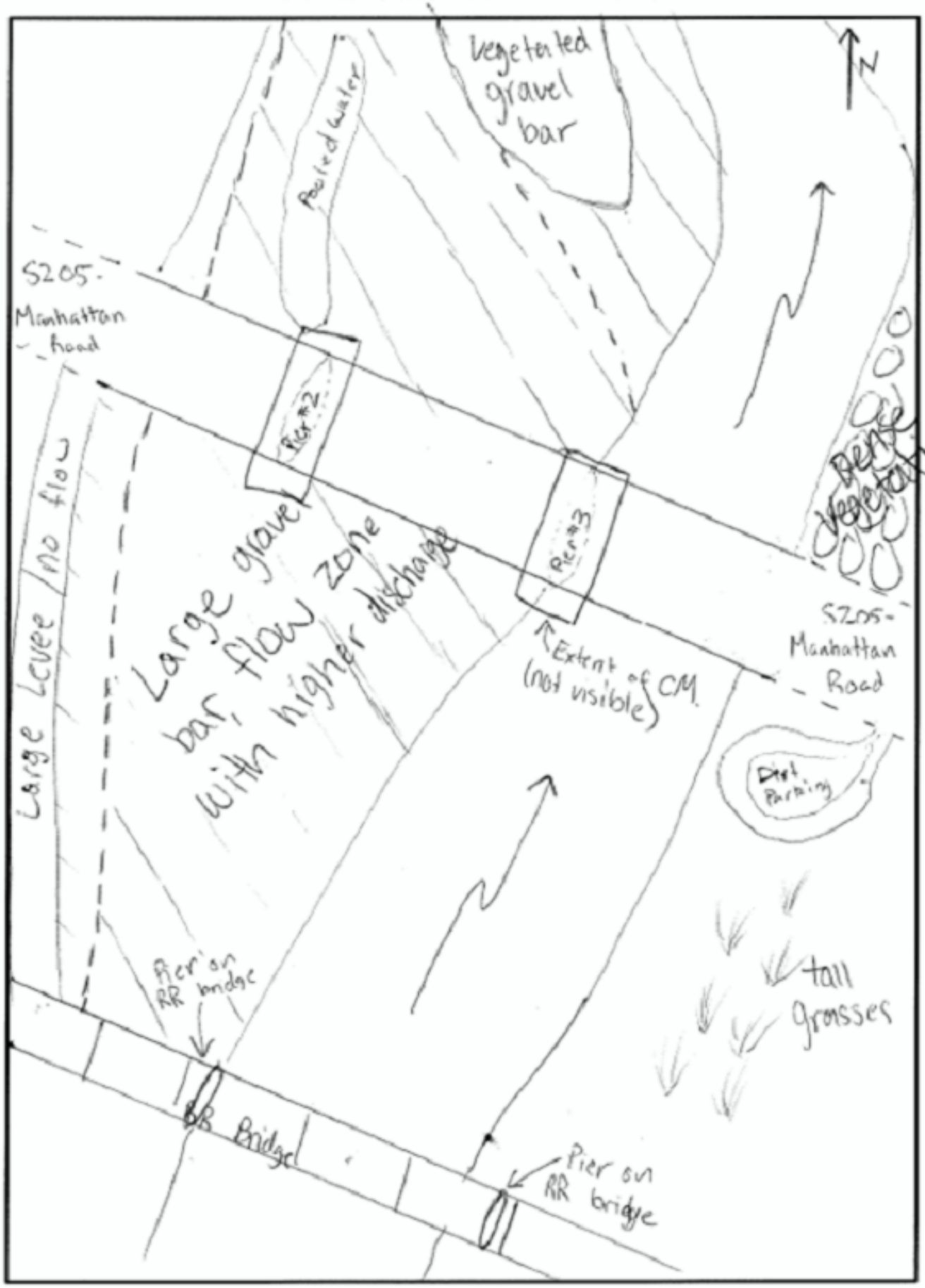
Abutment type	Vertical	Vertical w/ wingwalls	Spill-through	Other
	☒	☐	☐	☐

Other pier/bent and abutment comments:

Abutments are vertical with slope to water surface with placed rip-rap present at all abutment slopes.

SKETCH OF REPRESENTATIVE PIER/BENT

PLAN VIEW SKETCH AND DETAILED NOTES



PLAN VIEW SKETCH CHECKLIST

✓= Done ✖ = Not Appropriate

___North Arrow
___Flow Direction
___Streambanks
___Bridge Deck
___Angle of Approach
___Piers & Columns
___Footings or Encasements
___Abutments
___Wing Walls
___Tributary Confluences
___Meander Impacts/Cutbanks
___Bank Erosion
___Point Bars (extent, vegetation)
___Mid-Channel Bars (extent, vegetation)
___Downstream Blow Hole (banks impacted, dimensions)
___Debris (accumulation, type, horizontal and vertical position, trapping potential)
___Survey Extents
___Location of Cross Sections
___Water Surface Survey Points
___Scour Holes
___Max Water Depth at each Pier
___Countermeasures (type, dimensions, location, condition)
___Riprap (note quality and gradation)
___Filter Fabric or Geotextile
___Photo/Video Locations & Directions
___Reference Mark Location(s)

BRIDGE OPENING SKETCH WITH TAPEDOWN MEASUREMENTS

Additional data collected (ADCP, multibeam, T-LIDAR, etc.) with description (filename, S/N, location, coverage, etc.)

Ground points taken via optical survey with Trimble S6 due to low flows.

REQUIRED PHOTOS	Filename/number	Additional comments
1 channel-width U/S of bridge:		
• Upstream left bank	20160713_154333	
• Upstream right bank	_155530	
• Upstream looking D/S at bridge	_154630	
Immediately U/S of bridge:		
• Bridge opening from U/S side	_155743	
• Upstream left bank	_154903	
• Upstream right bank	_155052	
On/Under bridge:		
• On U/S side bridge looking 90° ⊥ to face	_154935	
• On/Under bridge looking U/S	_155052	
• On/Under bridge looking D/S	_155135	
Substructure:		
• Representative pier/bent	_154430	
• Left abutment	_155706	
• Right abutment	_154505	
Immediately D/S of bridge:		
• Downstream left bank	_155418	
• Downstream right bank	_155249	
• Bridge opening from D/S side	_160015	
1 channel-width D/S of bridge:		
• Downstream looking U/S at bridge	_160059	
• Downstream left bank	_155335	
• Downstream right bank	_155204	
Soil material:		
• Bed material	_154704	
• Bank material	_154742	

Other photos (if applicable):

- (e.g., piers, abutments, floodplain surface cover, tributary confluences, meander impacts/cutbanks, point bars, mid-channel bars, bank erosion, downstream blow hole, debris, countermeasures, riprap)

Woody debris present on pier (_155827)

OFFICE-BASED INFORMATION FROM DOT, USGS, AND FHWA:

Streamgage Information			
Agency	Site No.	Site Name	Lat/Long
USGS	06043500	Gallatin River near Gallatin Gateway, MT	45 29 50.28 N, 111 16 14.55 W

Flood Frequency and Design Flows		
FHWA / State Transportation Information (typically from H&H report or design data)		
Design-flow probability (recurrence interval)	Method(s)	Flow
USGS Information		
USGS methods (Bull. 17B / PeakFQ, USGS NSS, PSU IV, FIS, etc.)	Recurrence interval(s)	Flow
USGS NSS, DA-adjusted	2-yr (50% AEP)	6,140 cfs
USGS NSS, DA-adjusted	5-yr (20% AEP)	7,720 cfs
USGS NSS, DA-adjusted	10-yr (10% AEP)	8,660 cfs
USGS NSS, DA-adjusted	25-yr (4% AEP)	9,740 cfs
USGS NSS, DA-adjusted	50-yr (2% AEP)	10,500 cfs
USGS NSS, DA-adjusted	100-yr (1% AEP)	11,200 cfs
USGS NSS, DA-adjusted	200-yr (0.5% AEP)	11,800 cfs
USGS NSS, DA-adjusted	500-yr (0.2% AEP)	12,700 cfs

Comments

Retrieved peak flow file from USGS 06043500 (usgs_06043500_peak.txt). Contains annual peak streamflow values in cfs for water years 1890-2016. Peak-flow frequency statistics using total period of record which is unregulated was estimated and secondary streamflow-gaging station(s) used to augment records of primary streamflow-gaging station using methods from Sando et al. (2016).

Drainage area of gage = 819 sq. mi.; Drainage area of site = 970 sq. mi.
Used drainage-area ratio adjustment to correct peak-flow frequency estimates and 3 high flows from gage to site, using coefficients for UpperYellowstone.Central.Mountain (Region 7) from Sando et al. (2016).

Top three peak streamflows at site since CM installed in 2006:
6/30/2011: 9,360 cfs, ~4% AEP, coeff = 0.634
6/24/2011: 8,030 cfs, ~20% AEP, coeff = 0.761
5/29/2014: 7,460 cfs, ~20% AEP, coeff = 0.761

OFFICE DATA—CHECKLIST AND DISCLAIMER:

The following information should be collected and attached as part of this scour evaluation (place an X adjacent to the items obtained). The information should be reviewed prior to a site visit and field review.

DATA CHECKLIST	RECEIVED
Bridge general plan and elevation with foundations depicted.	
Scour countermeasure plans.	x
Bridge inspection reports.	
Topographic maps of the watercourse and surrounding area.	x
Aerial photographs (list years below).	x
Soils/geologic maps.	x
Streamgage data (peak flows, annual flows, monthly flows, rating, etc.).	x
USGS WaterWatch flood tracking chart, flow duration curve, and rating curve.	
Hydraulic/hydrologic or other studies of the watercourse.	
Other appropriate data (describe below).	
Comments	

Disclaimer: Unpublished data or information is attached for peer and/or courtesy review by the Federal Highway Administration (FHWA). In accepting the unpublished data or information, your agency agrees to be bound by the USGS non-disclosure policy for unpublished USGS work products. Please ensure that these materials are held in strict confidence while under review and prior to publication. Please do not disclose or release any results or conclusions (in any form), or make any public statements regarding the science before it has been approved and released by the USGS. The pre-publication information and reviews are considered deliberative and pre-decisional and are exempt from release through the Freedom of Information Act (FOIA) process. This non-disclosure policy arises from the USGS Fundamental Science Practices (FSP), which underlie USGS science activities, uphold the USGS's scientific reputation, and underscore its mandate to provide reliable science to address pressing societal issues.

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