I-70 ROCHEPORT

Bridge Replacement

Missouri River Corp, Coast Guard & Navigators
2020 ANNUAL MEETING
February 26, 2020

PROJECT LOCATION

Rocheport Interstate 70 Bridge
Cooper and Boone Counties, Missouri

Missouri River Mile 185.0

BRIDGE FACTS

- Continuous Through Truss Bridge
- Constructed in 1960, Rehab completed in 1993
- Spans Missouri River and the Katy Trail
- Main Span 551 ft., Total Length 3,018 ft.
- Critical to Freight and Commuter Needs
- Outlived its expected design life

PROJECT SUMMARY

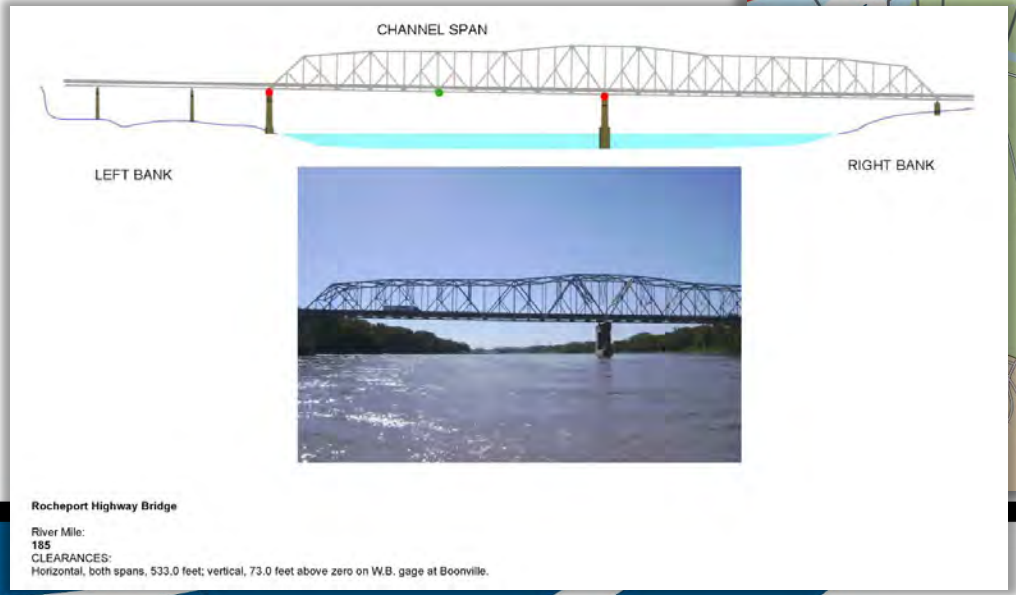
- Bridge Replacement
- Funding
  - Roughly $240M Replacement Cost
  - $80M INFRA Grant
  - Additional contributions from Boone County, Cooper County, City of Columbia, City of Boonville
- Project delivery by Design-Build method
- Preliminary Design Phase

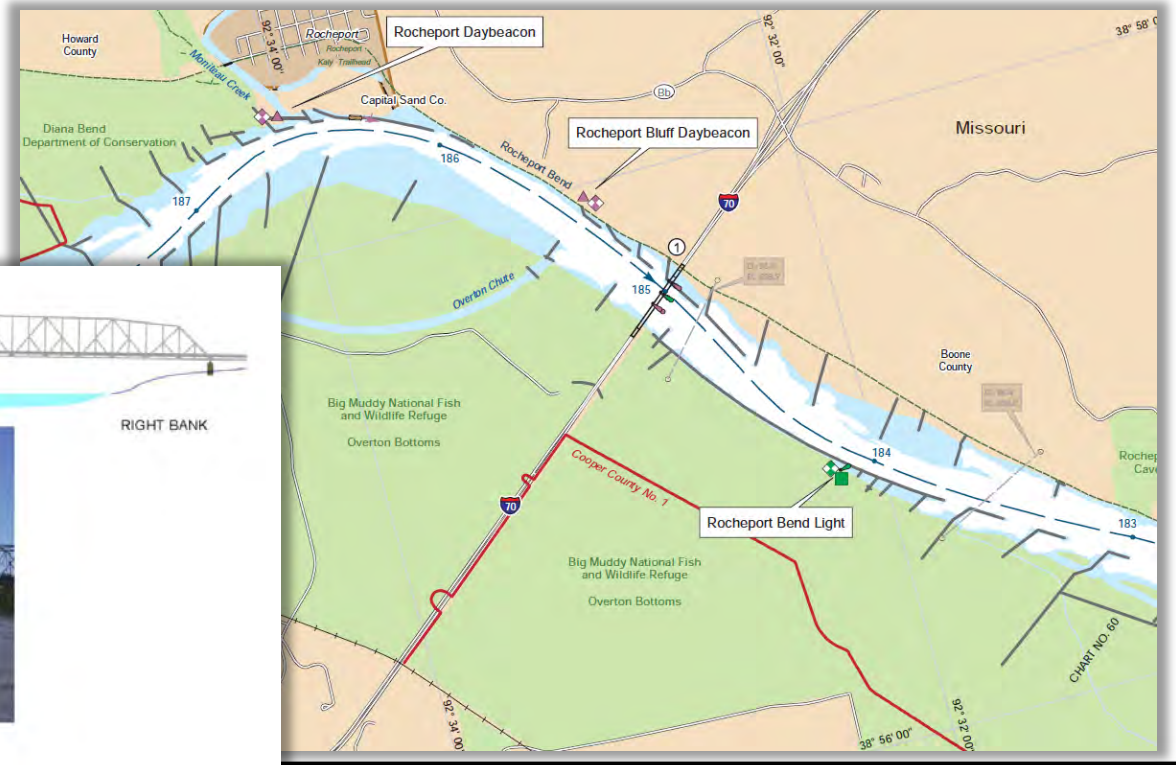
STATUS & DELIVERY OF PROJECT

- Environmental Re-evaluation complete in March 2020
- Preliminary Design
  - Clearing/Examining options within environmental re-evaluation limits
  - Provide creativity and flexibility for Design-Build teams
- Project Schedule
  - Award Design-Build Contract: July 2021
  - Project Completion: December 2024

EXISTING BRIDGE CONDITIONS

- Horizontal Clearance: 533 ft.
- Vertical Clearance: 55.1 ft.





PROJECT CONSTRAINTS

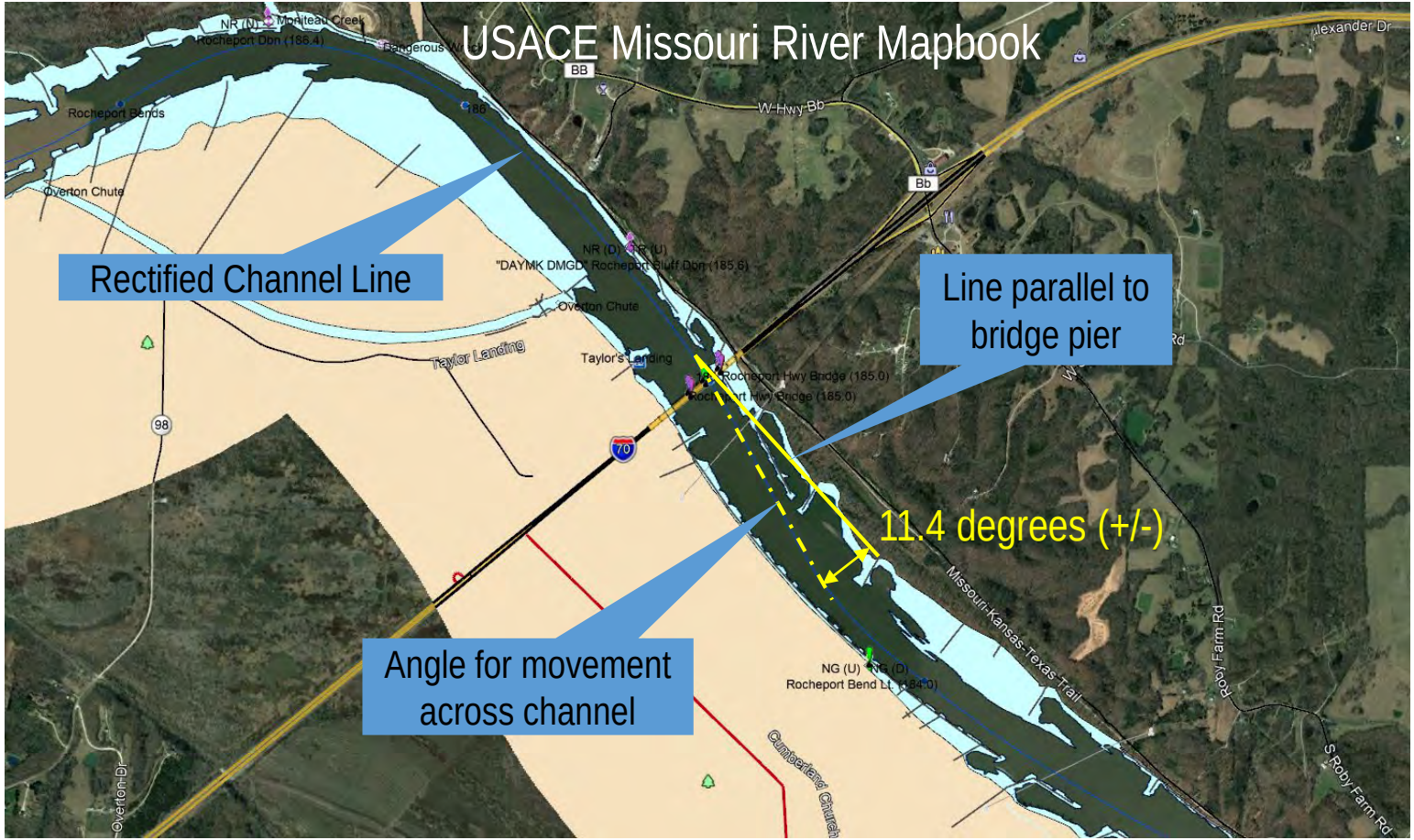
U.S. Army Corps of Engineers

- Environmental Issues
- USACE Requirements
- Navigation Clearances
- Existing Bridge Piers
- Temporary Shoring
- Construction Access
- Schedule

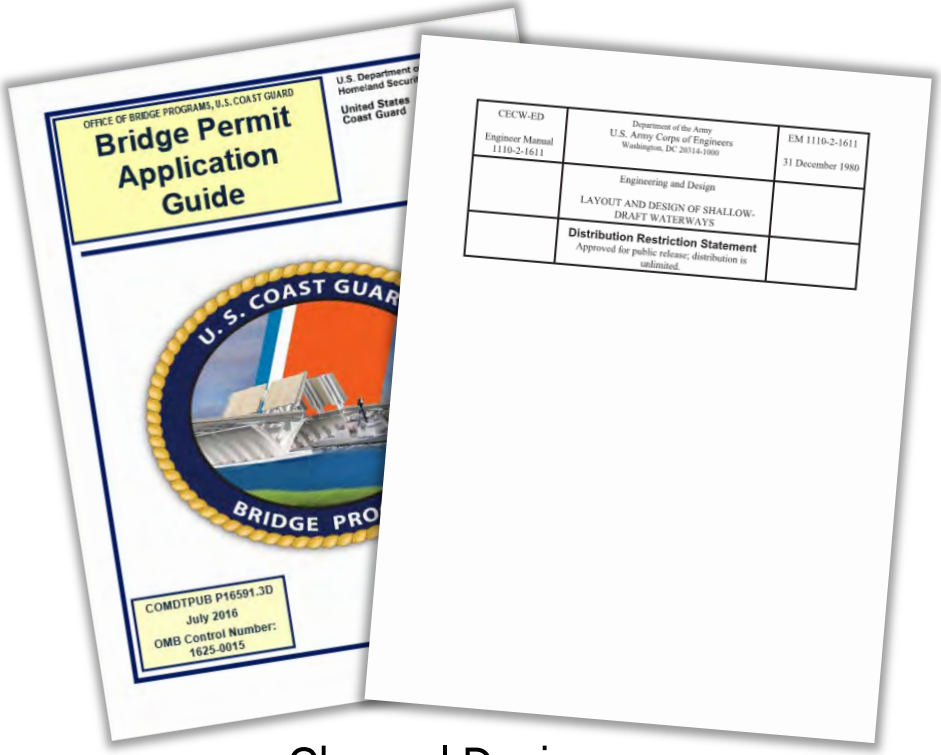
AFFECTS OF SPAN LENGTH

- Innovation/Flexibility
- Temporary Shoring
- Constructability
- Cost
- Schedule

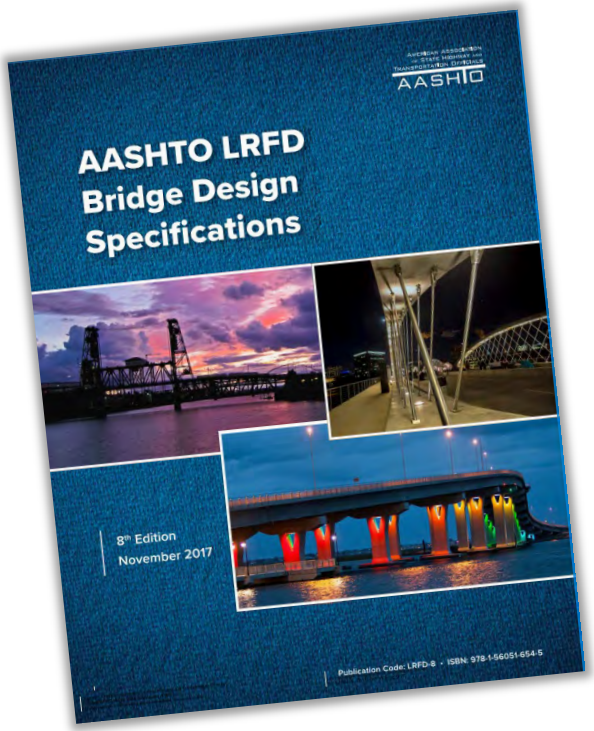
NAVIGATION CHANNEL



DESIGN CRITERIA



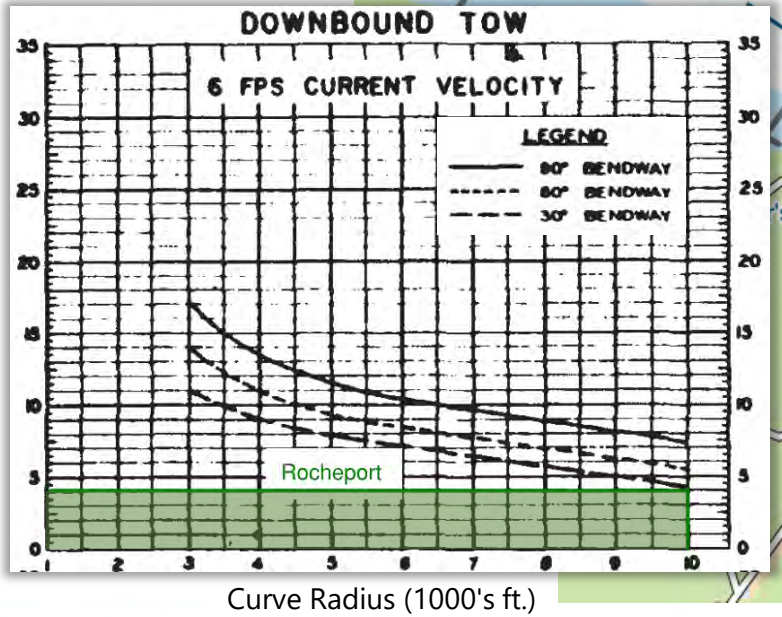
Channel Design

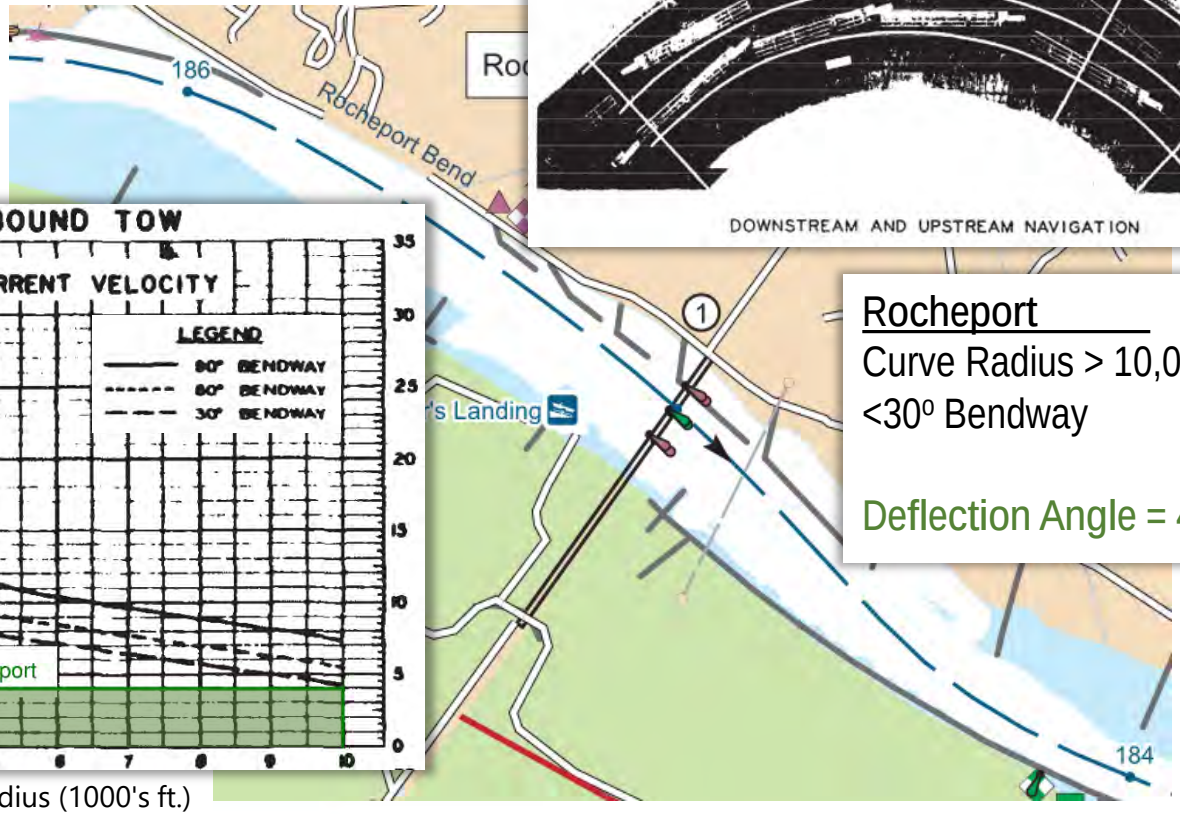


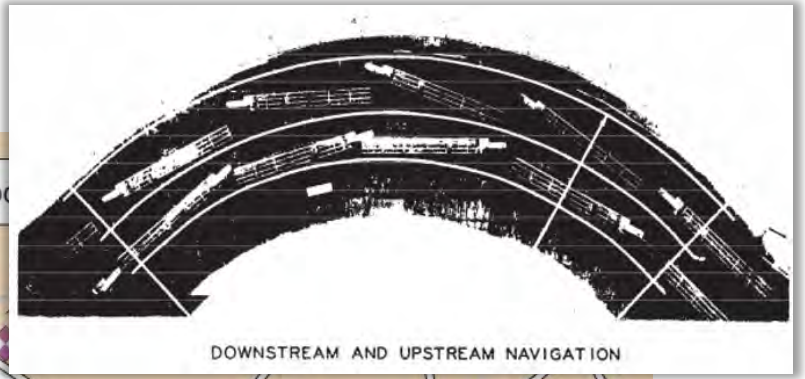
Vessel Collision

CHANNEL DESIGN

United States Army Corps of Engineers
Engineering Manual 1110-2-1611







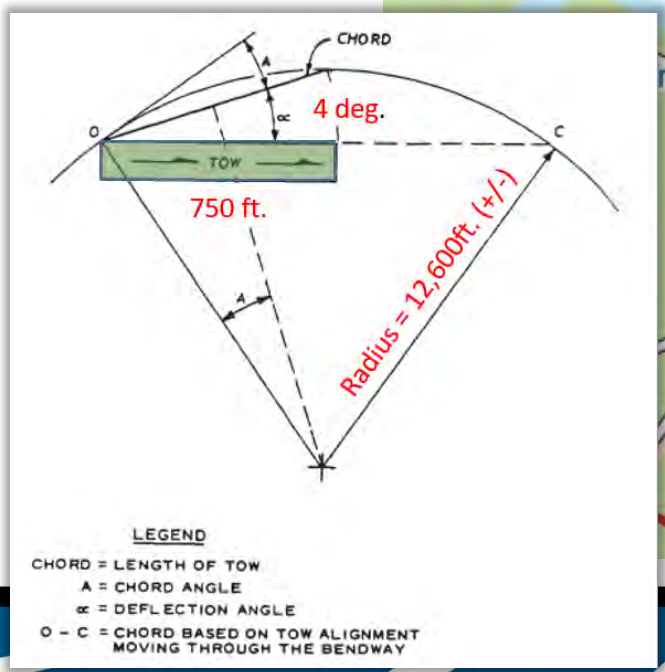
Rocheport

Curve Radius > 10,000 ft.

<30° Bendway

Deflection Angle = 4°

CHANNEL DESIGN



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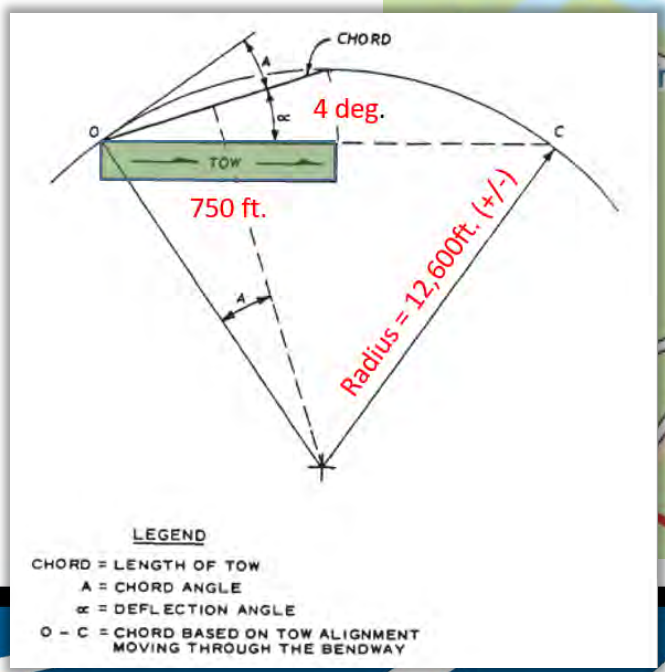

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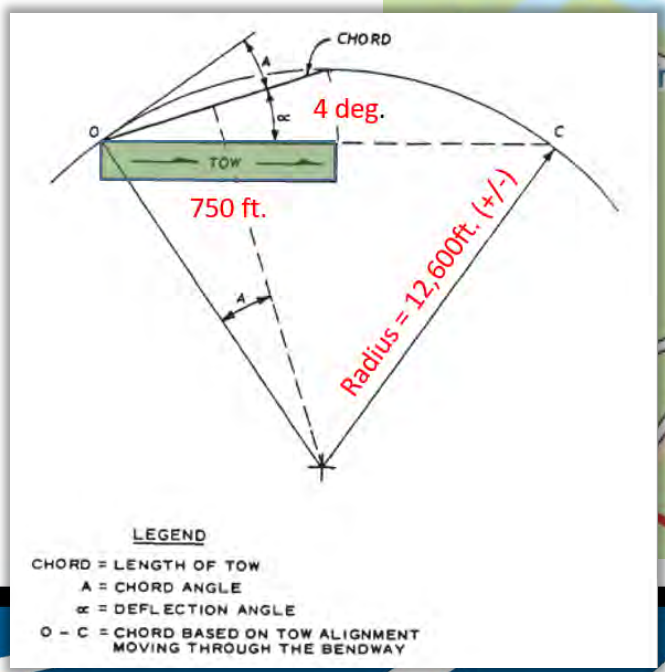

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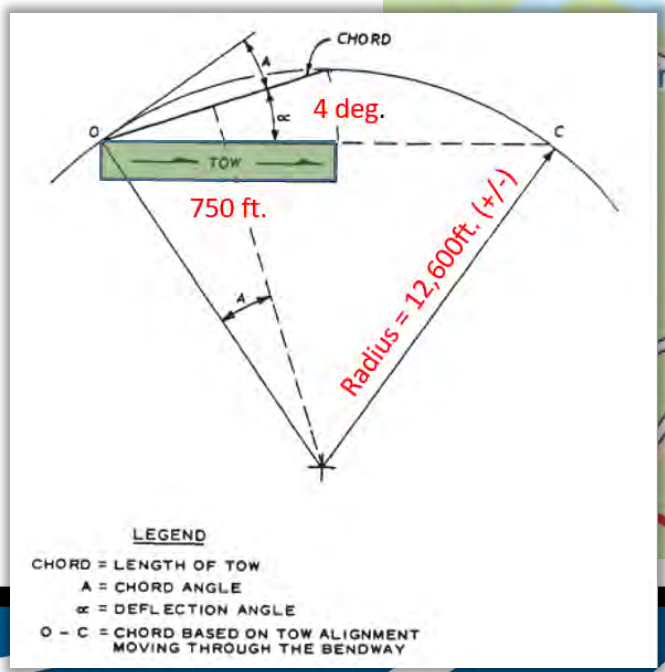

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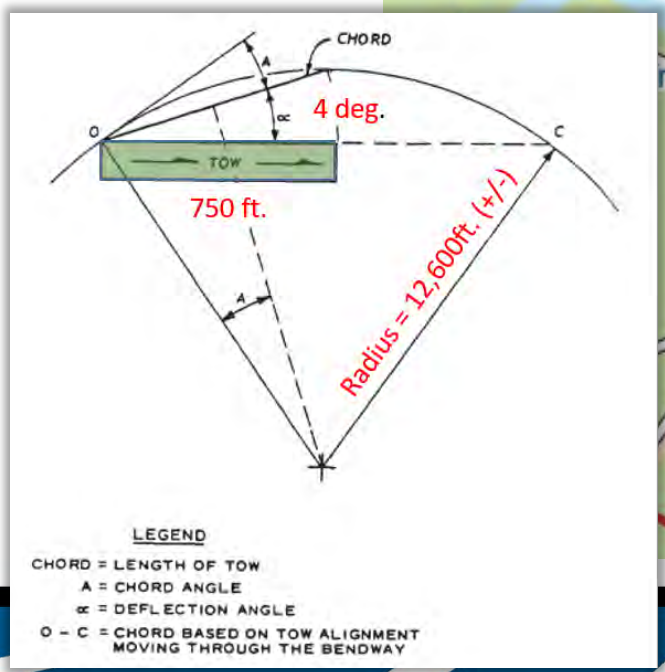
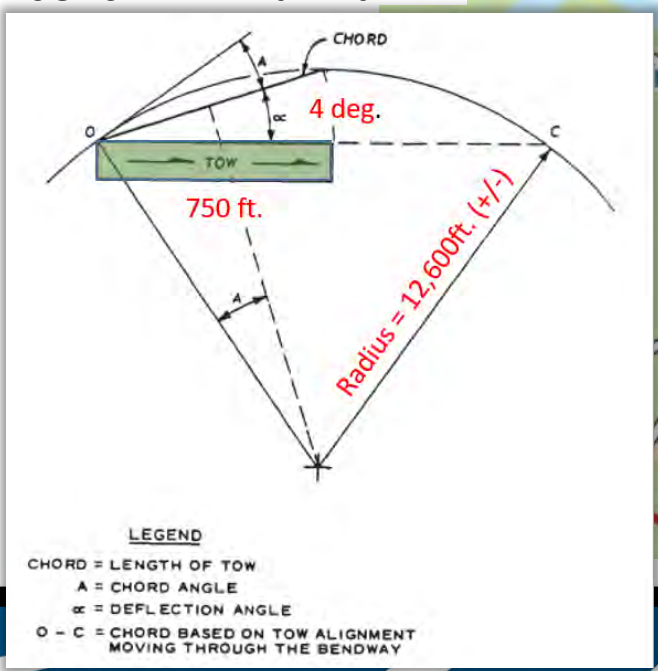
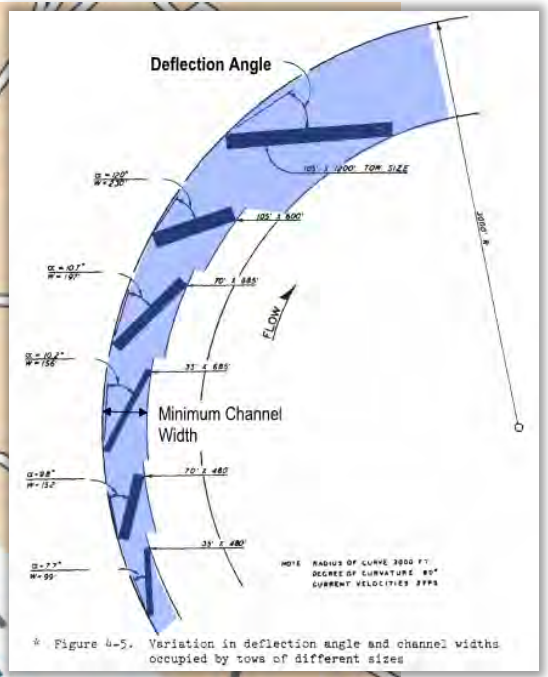


CHANNEL DESIGN

USACE EM 1110-2-1611

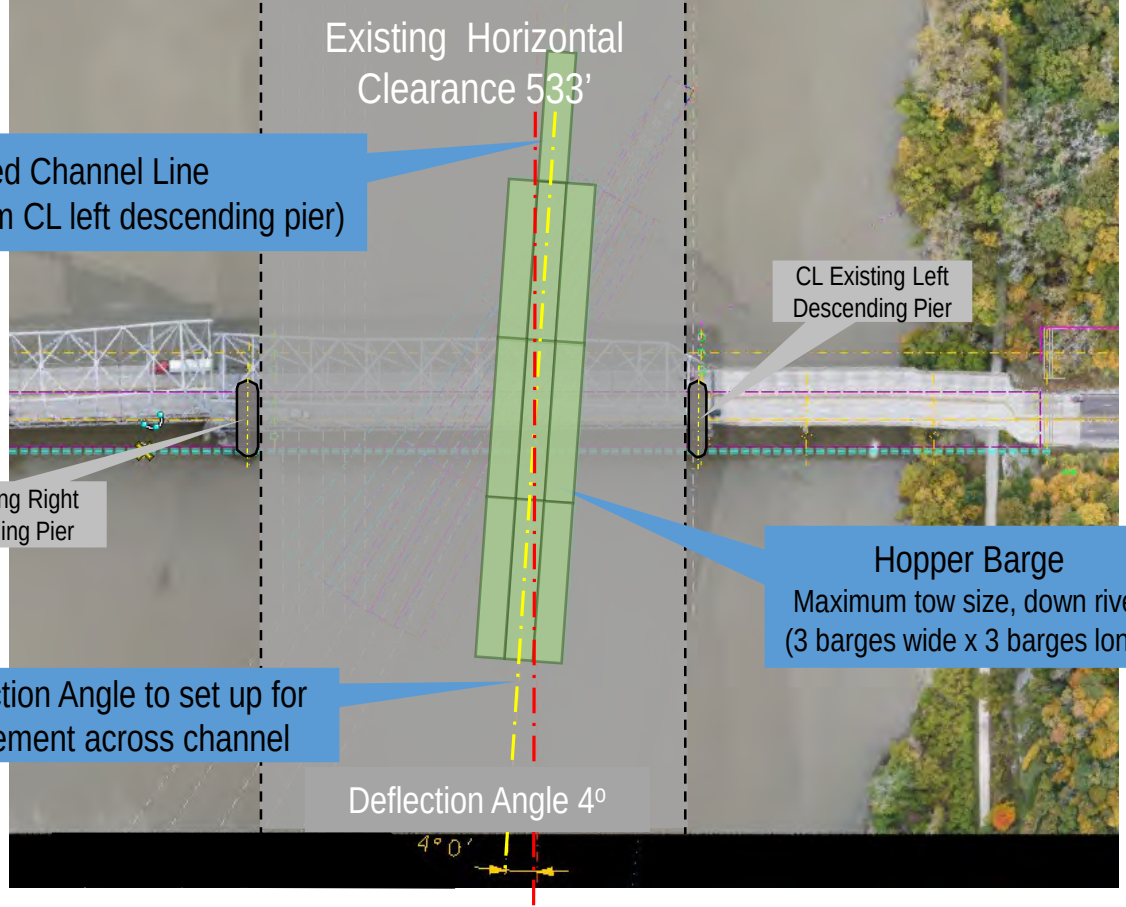




Minimum Horizontal Clearance = 320’

CHANNEL DESIGN

DEFLECTION ANGLE FACTOR OF SAFETY



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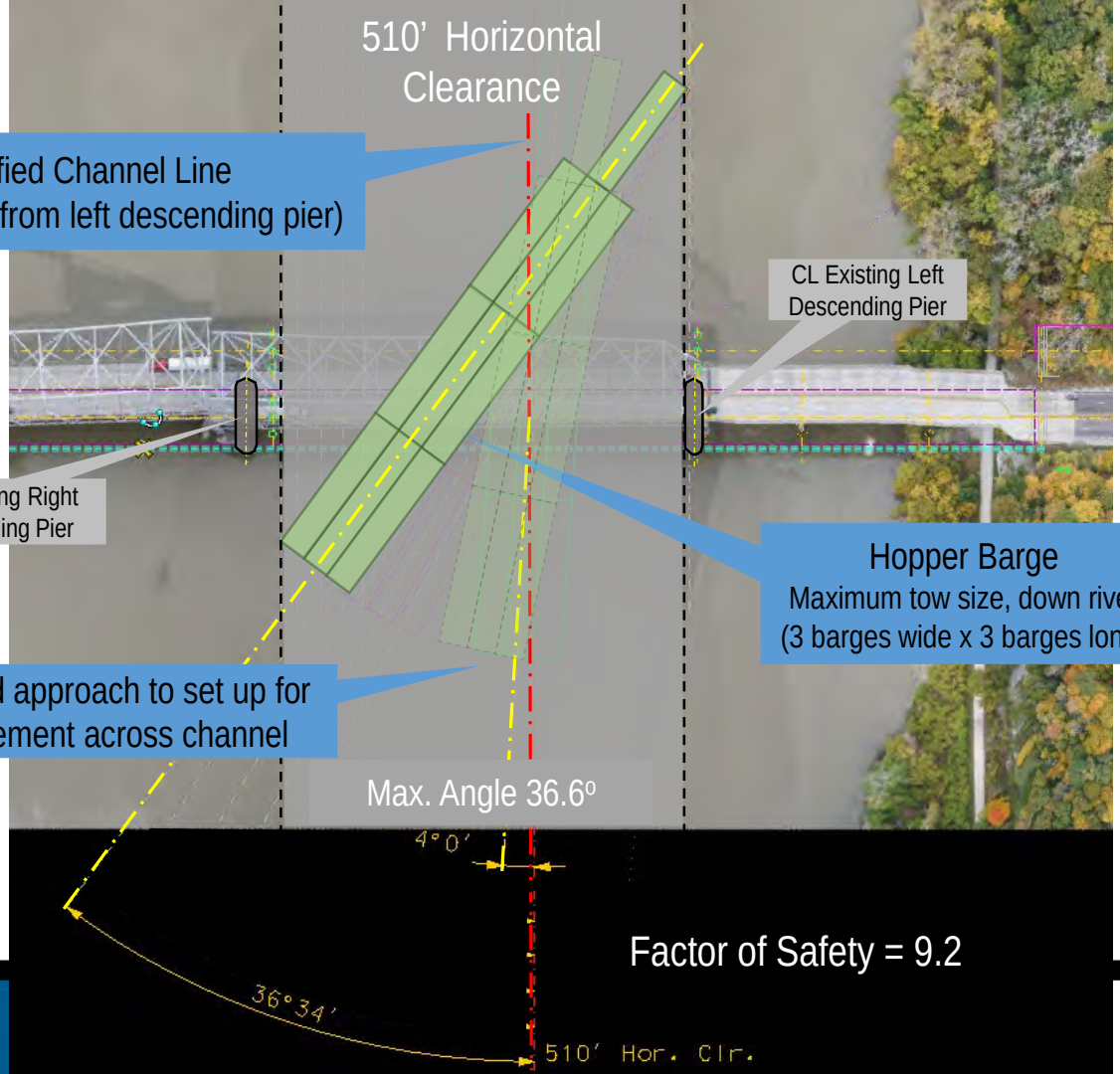
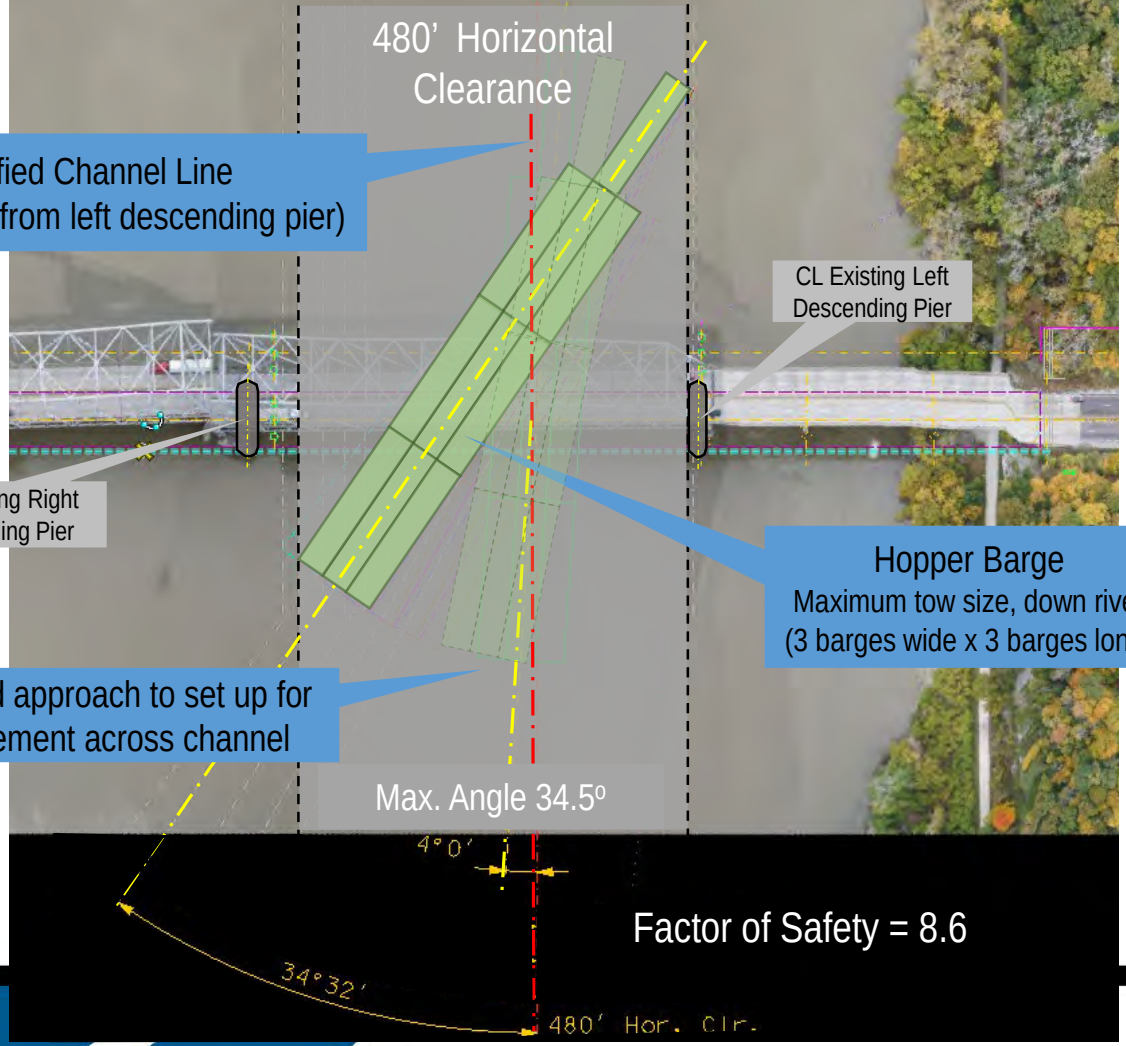


Factor of Safety = 9.2

CHANNEL DESIGN

DEFLECTION ANGLE FACTOR OF SAFETY



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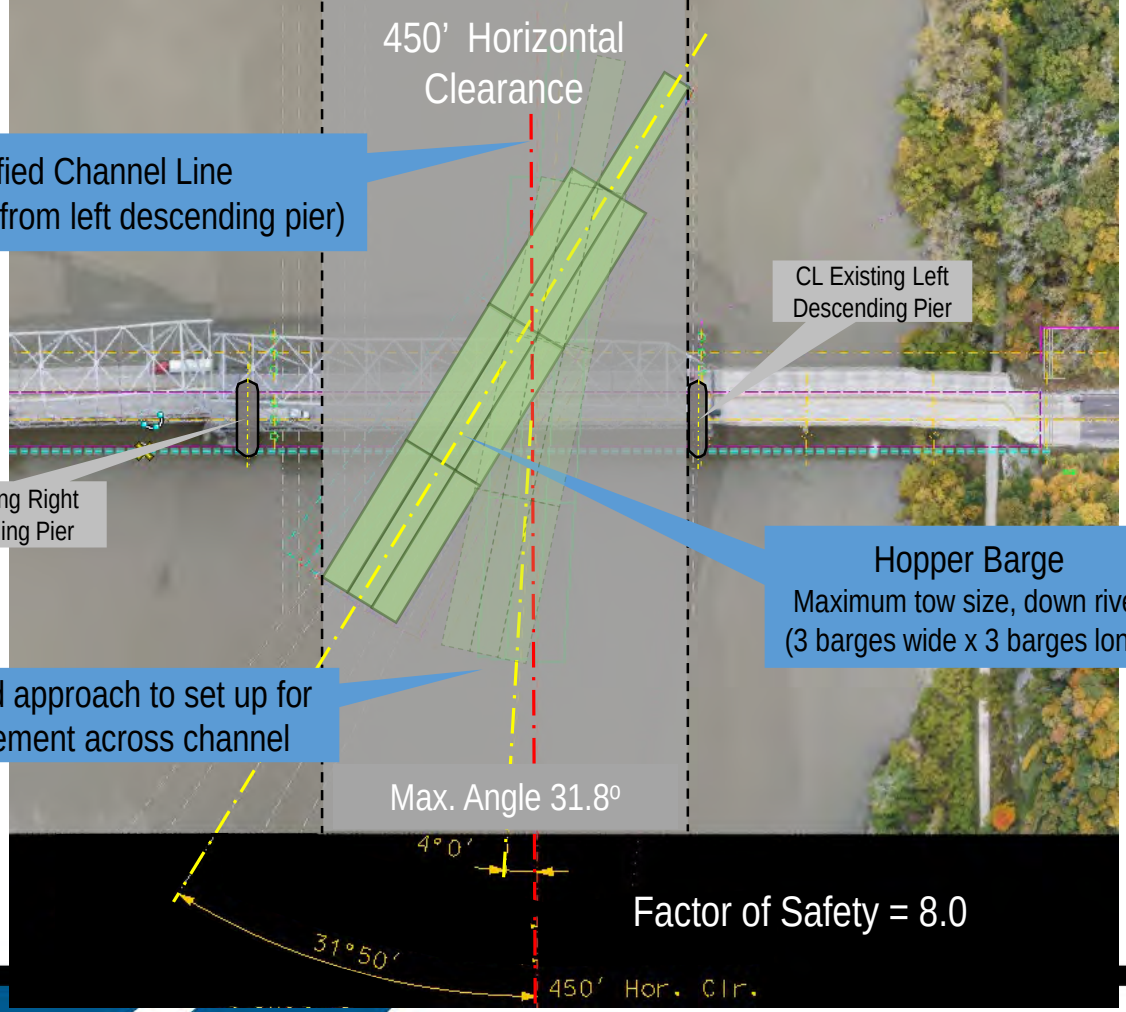
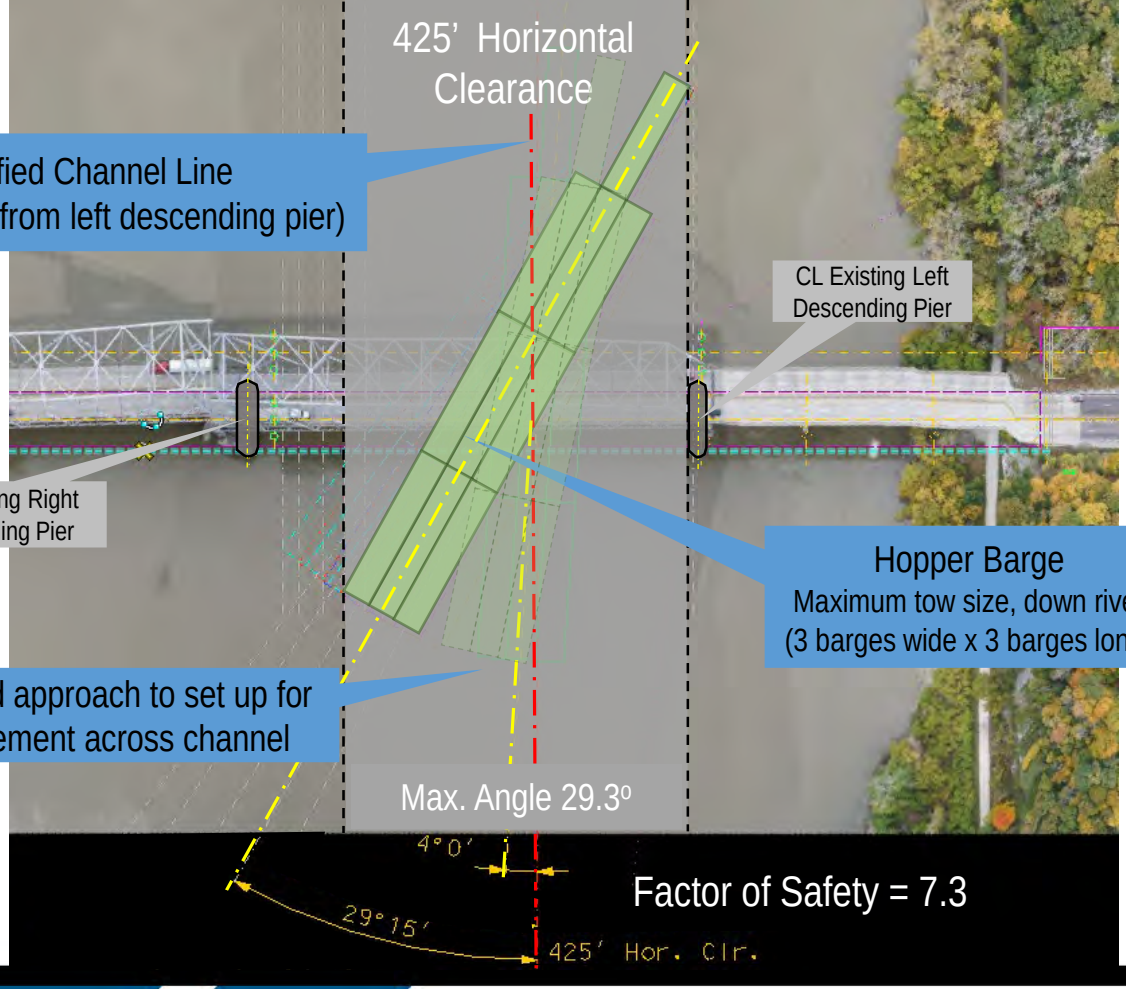
DEFLECTION ANGLE FACTOR OF SAFETY



Factor of Safety = 8.0

CHANNEL DESIGN

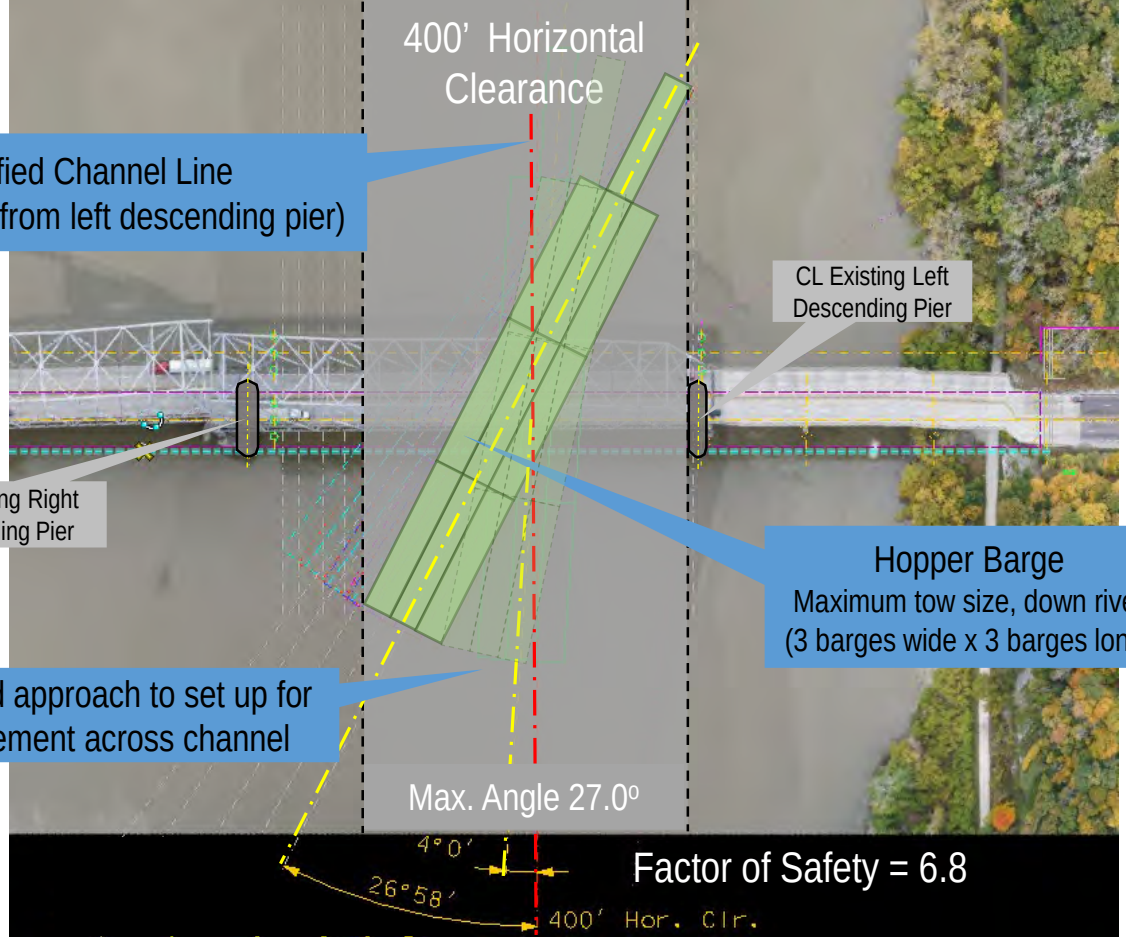
DEFLECTION ANGLE FACTOR OF SAFETY



Factor of Safety = 7.3

CHANNEL DESIGN

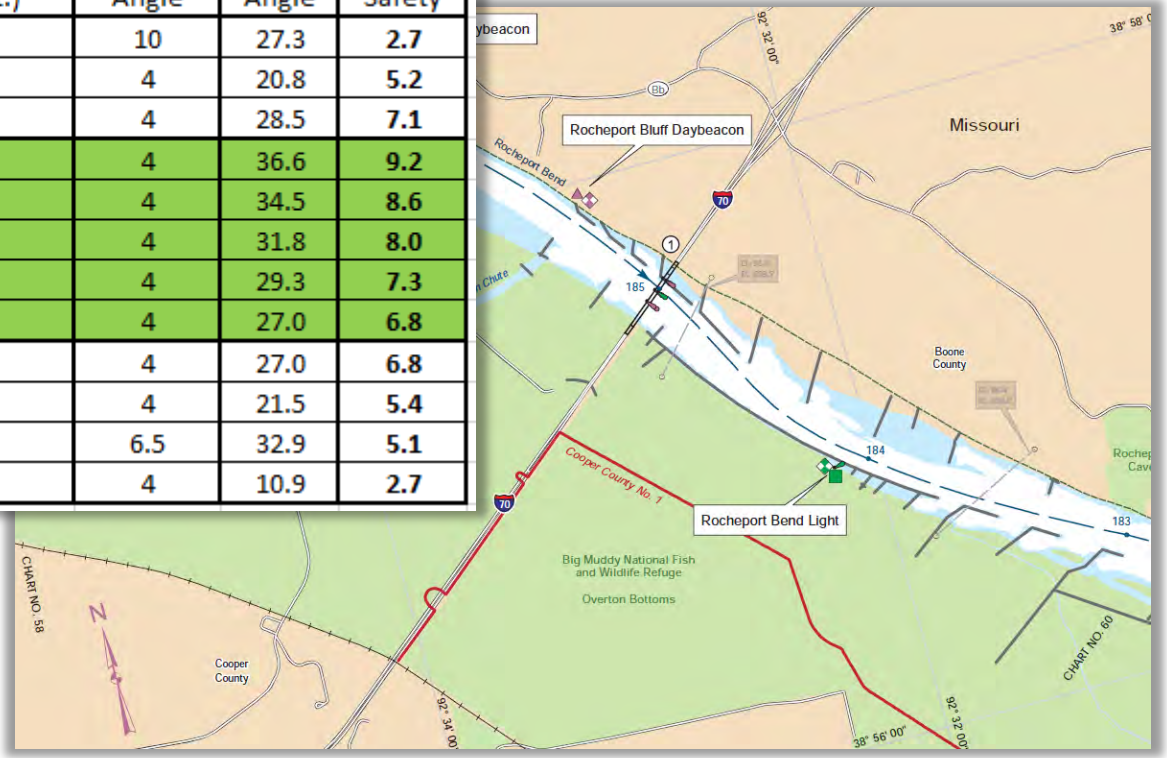
DEFLECTION ANGLE FACTOR OF SAFETY



CHANNEL DESIGN

EXISTING FACTOR OF SAFETY

Mile Marker	City	Navigation Channel Hor. Clr. (ft.)	Deflection Angle	Max. Angle	Factor Safety
262.6	Miami	404	10	27.3	**2.7**
226.3	Glasgow	330	4	20.8	**5.2**
196.6	Boonville	417	4	28.5	**7.1**
185.0	Rocheport	510	4	36.6	**9.2**
		480	4	34.5	**8.6**
		450	4	31.8	**8.0**
		425	4	29.3	**7.3**
		400	4	27.0	**6.8**
143.9	Jefferson City	400	4	27.0	**6.8**
97.9	Hermann	390	4	21.5	**5.4**
67.6	Washington	463	6.5	32.9	**5.1**
44.0	Chesterfield	447	4	10.9	**2.7**



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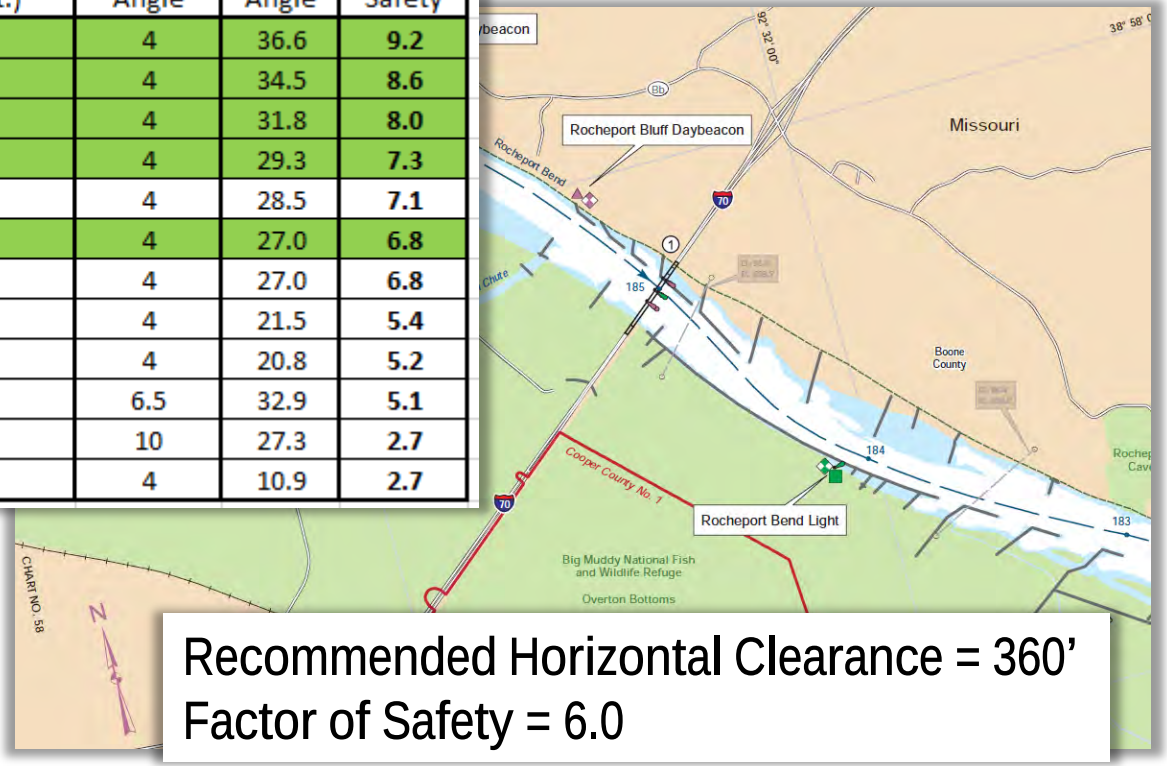
67.6	Washington	463	6.5	32.9	**5.1**
262.6	Miami	404	10	27.3	**2.7**
44	Chesterfield	447	4	10.9	**2.7**

Sorted by Factor of Safety

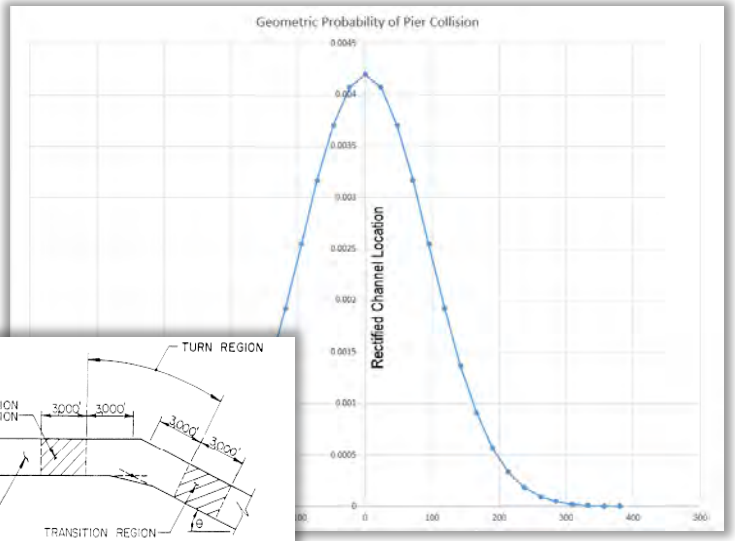


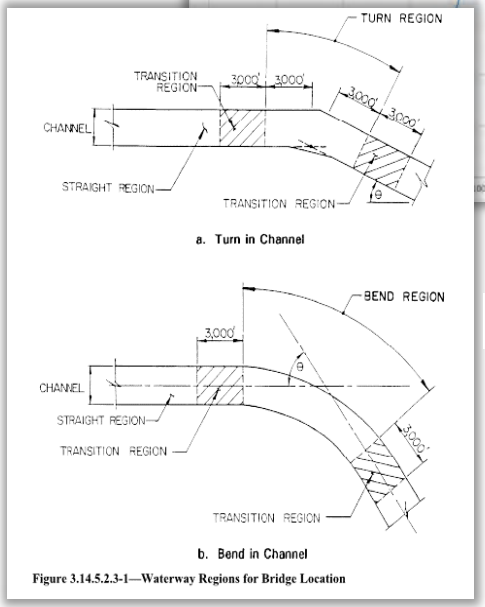
Recommended Horizontal Clearance = 360’
Factor of Safety = 6.0

VESSEL COLLISION

Dependent Upon:

- Number of max tows (150/yr. per USCG)
- Probability of Vessel Aberrancy (PA)
  - Navigation Conditions
  - Pilot Error
  - Mechanical Failure
- Geometric Probability (PG)
  - Geometry of waterway
  - Span clearances
  - Pier locations
  - Vessel dimensions

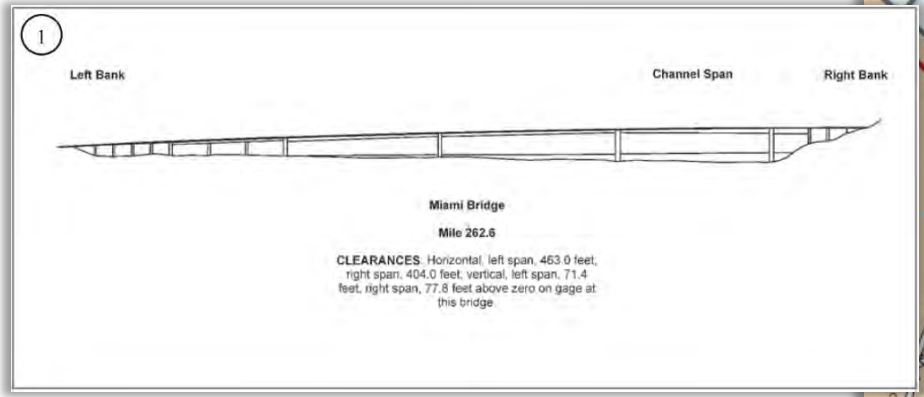


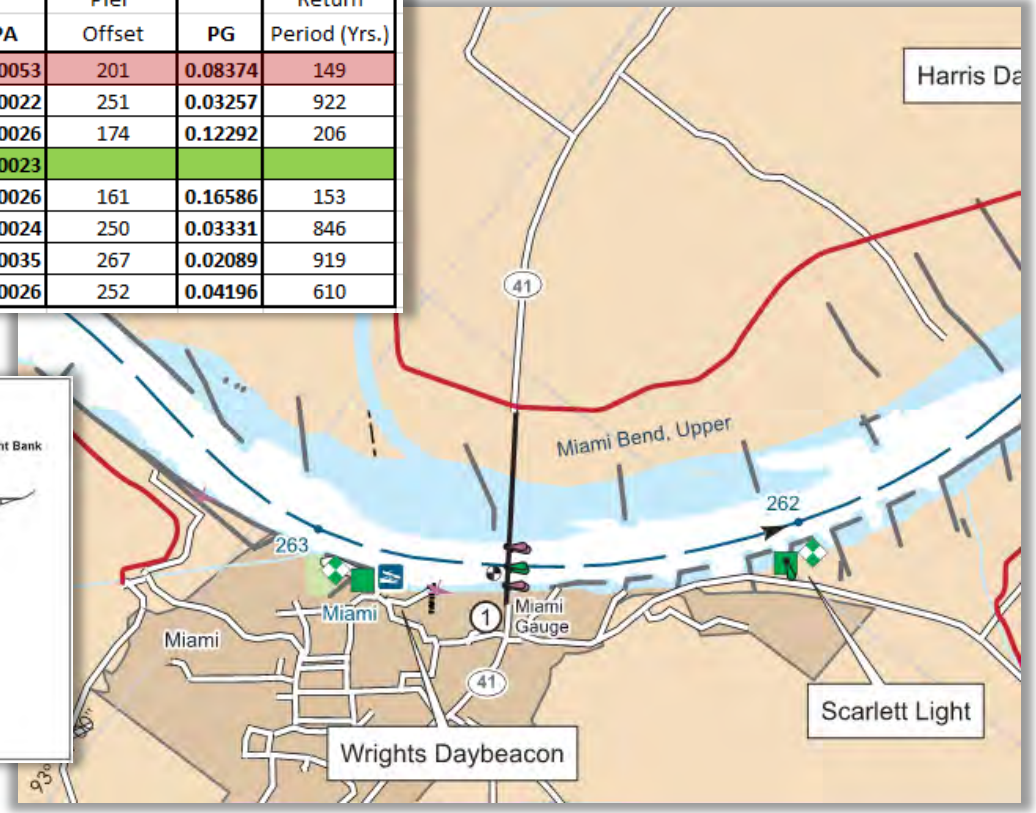


AASHTO Section 3.14

VESSEL COLLISION

Location		Navigation Channel	Channel	Channel			Pier		Return
Mile Marker	City	Hor. Clr. (ft.)	Alignment	Angle	R_B	**PA**	Offset	**PG**	Period (Yrs.)
262.6	Miami	404	Turn/Bend	86.5	2.92	**0.00053**	201	**0.08374**	149
226.3	Glasgow	330	Trans	19.5	1.22	**0.00022**	251	**0.03257**	922
196.6	Boonville	417	Turn/Bend	19.9	1.44	**0.00026**	174	**0.12292**	206
185.0	Rocheport	510	Turn/Bend	12.7	1.28	**0.00023**			
143.9	Jefferson City	400	Turn/Bend	19.6	1.44	**0.00026**	161	**0.16586**	153
97.9	Hermann	390	Trans	26.6	1.30	**0.00024**	250	**0.03331**	846
67.6	Washington	463	Turn/Bend	40.6	1.90	**0.00035**	267	**0.02089**	919
44.0	Chesterfield	447	Trans	38.4	1.43	**0.00026**	252	**0.04196**	610





VESSEL COLLISION

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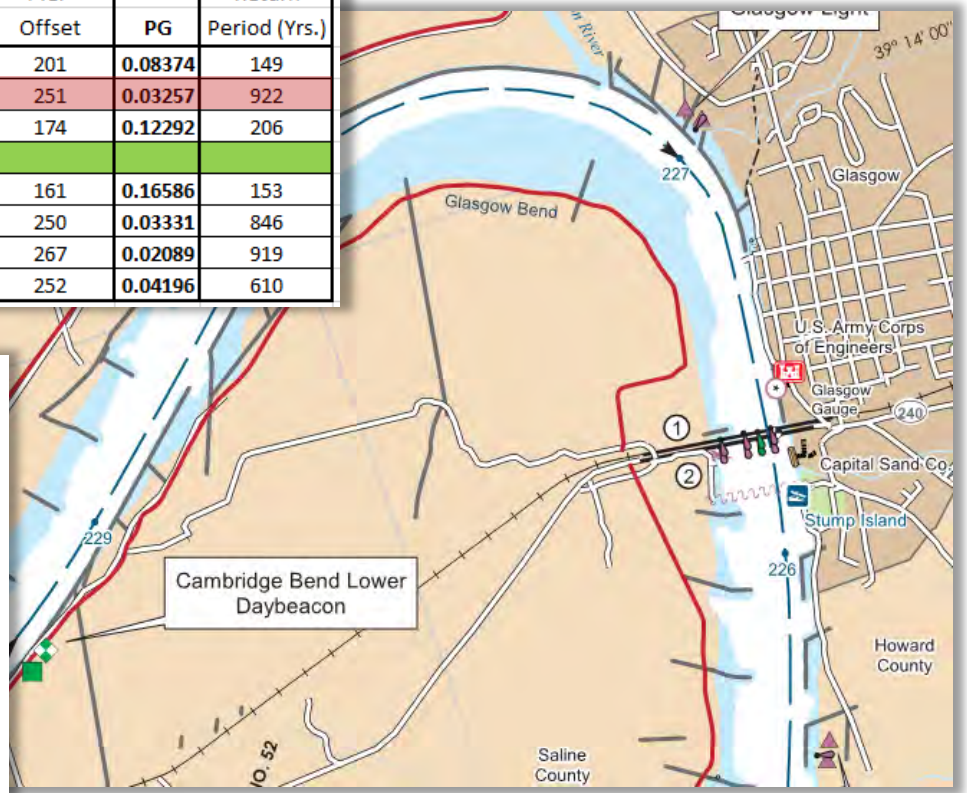
Glasgow Highway Bridge

River Mile:
226.3
CLEARANCES:
Horizontal, center main channel span, 330.0 feet, left span, 170.0 feet, right span, 302.0 feet; vertical, 78.8 feet above zero on W.B. at this mile.



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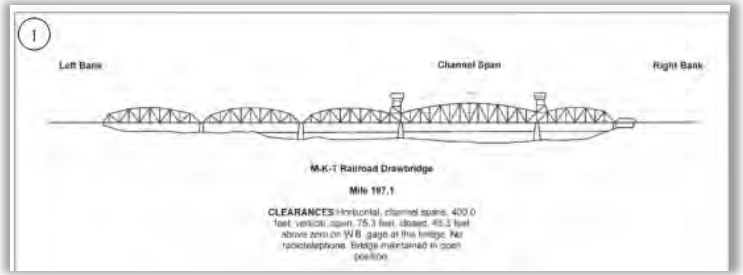

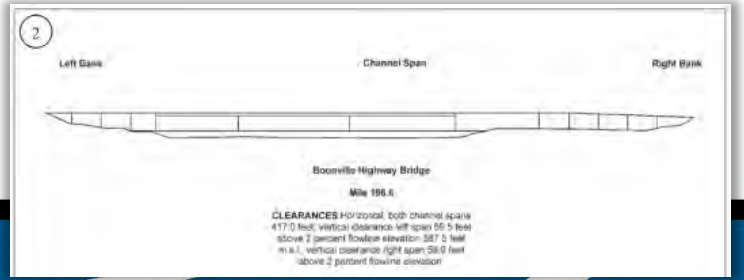

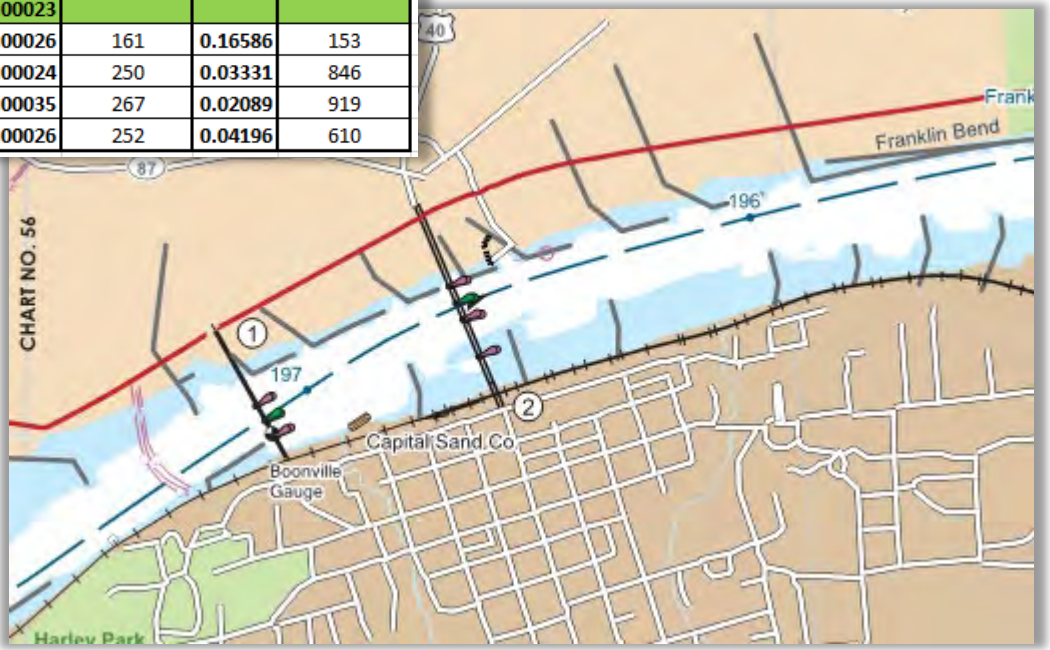

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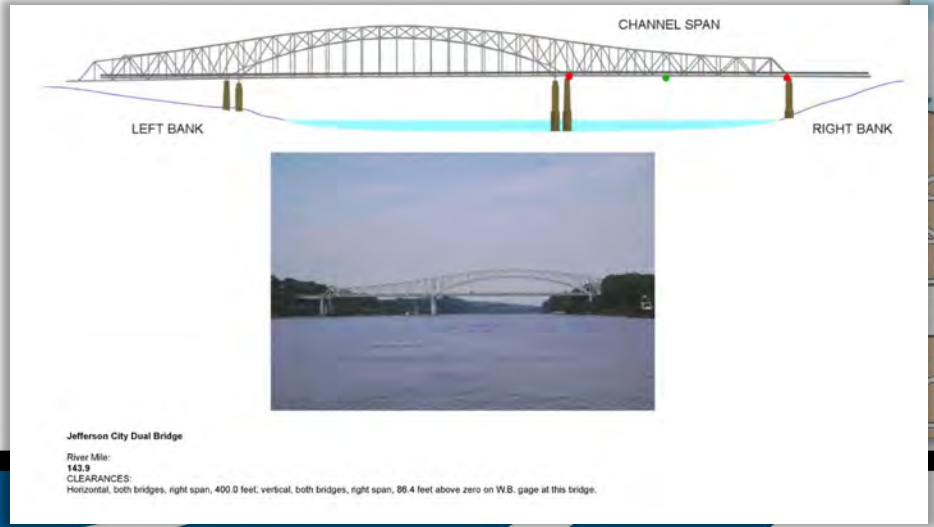

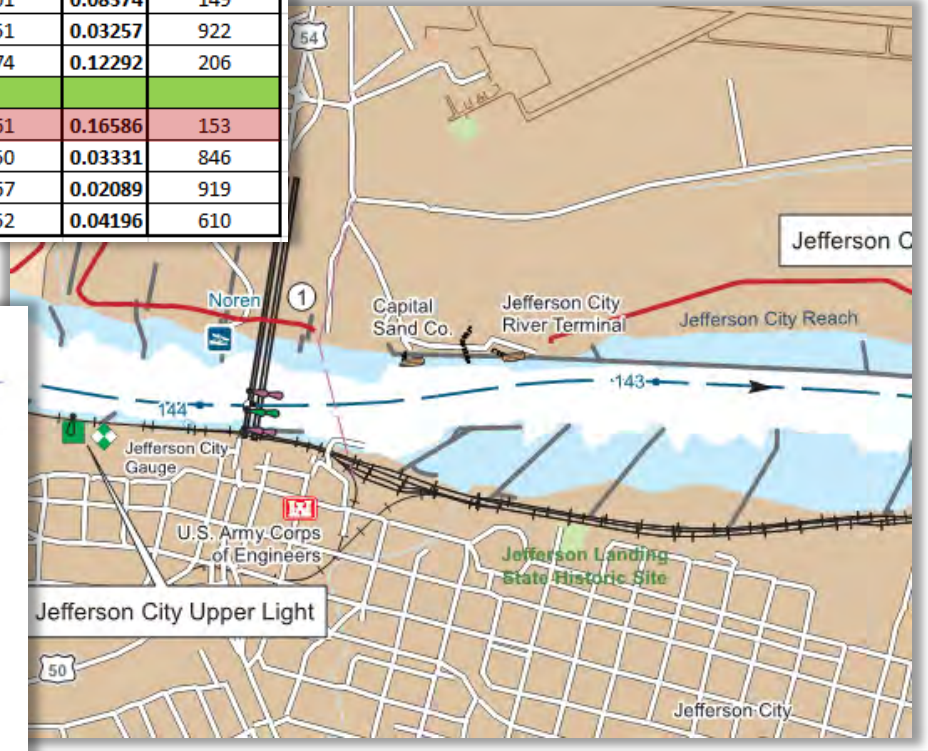

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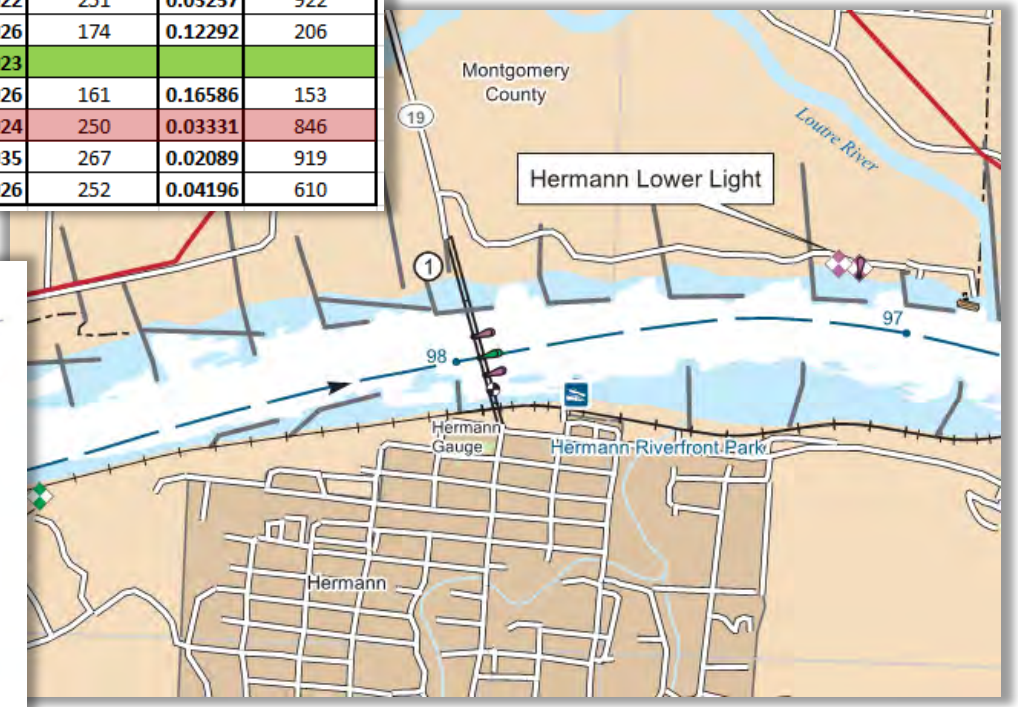

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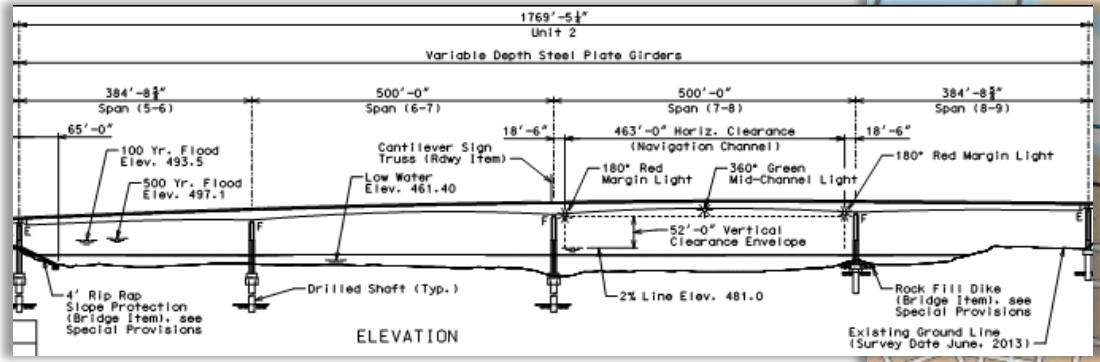
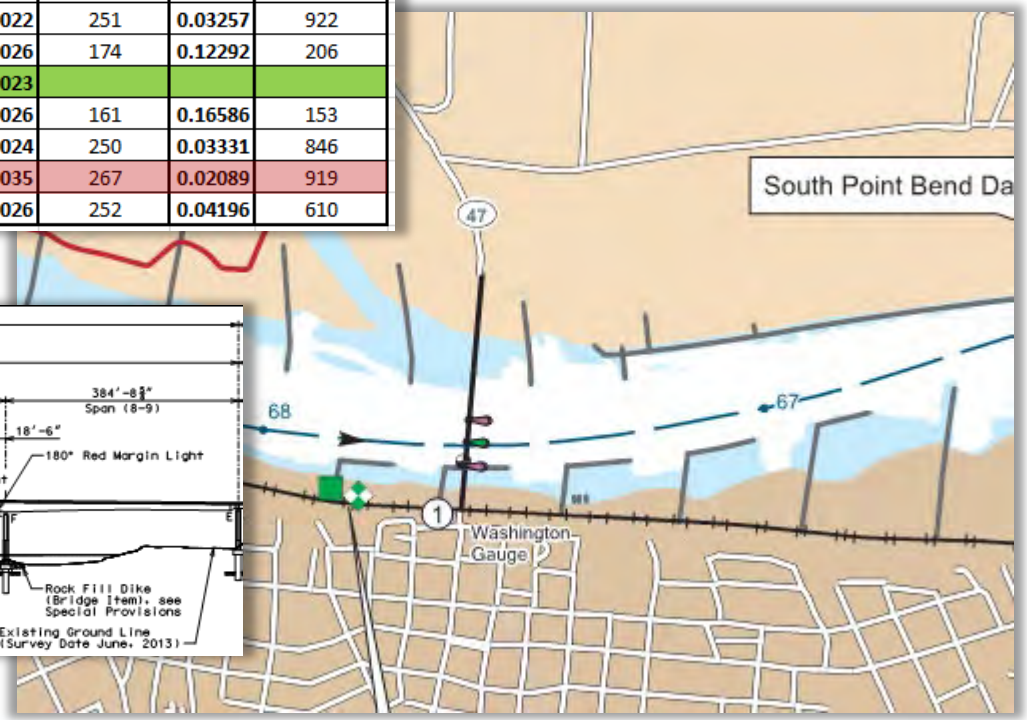
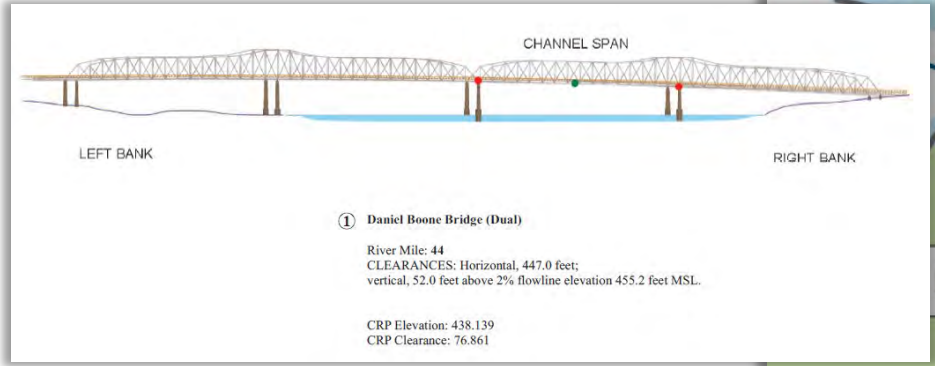
67.6	Washington	463	Turn/Bend	40.6	1.90	**0.00035**	267	**0.02089**	919
44.0	Chesterfield	447	Trans	38.4	1.43	**0.00026**	252	**0.04196**	610

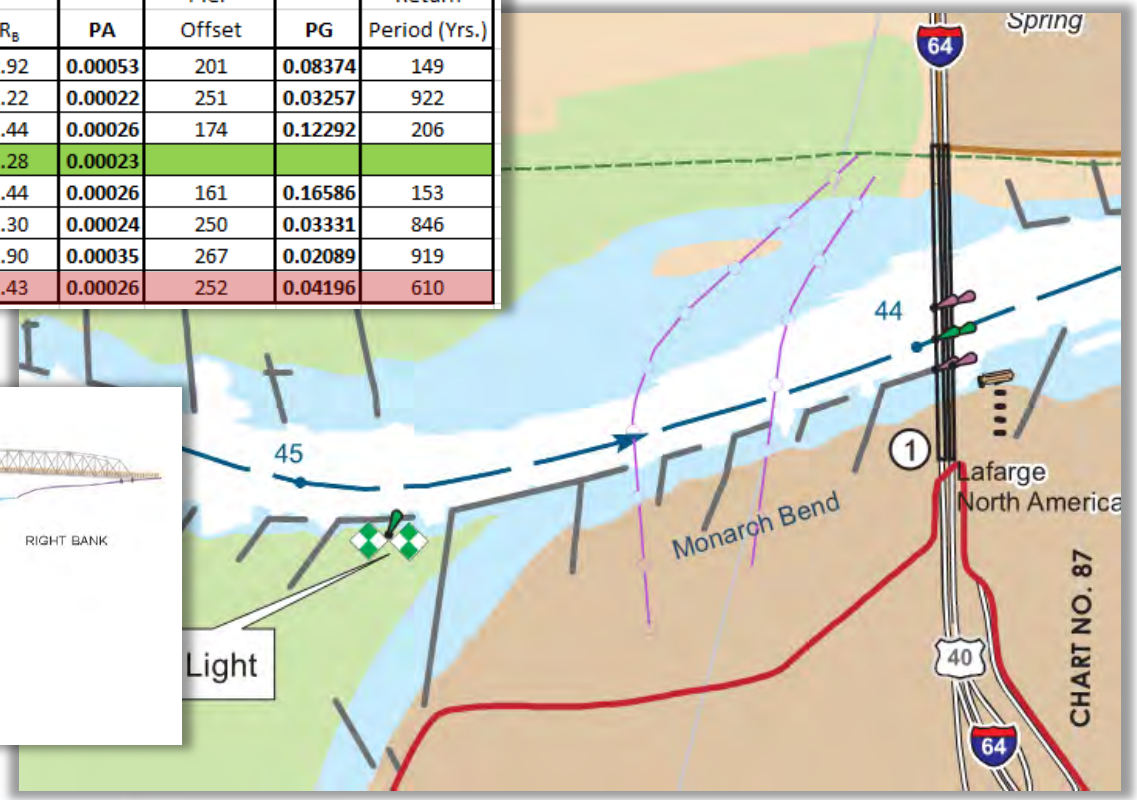




VESSEL COLLISION

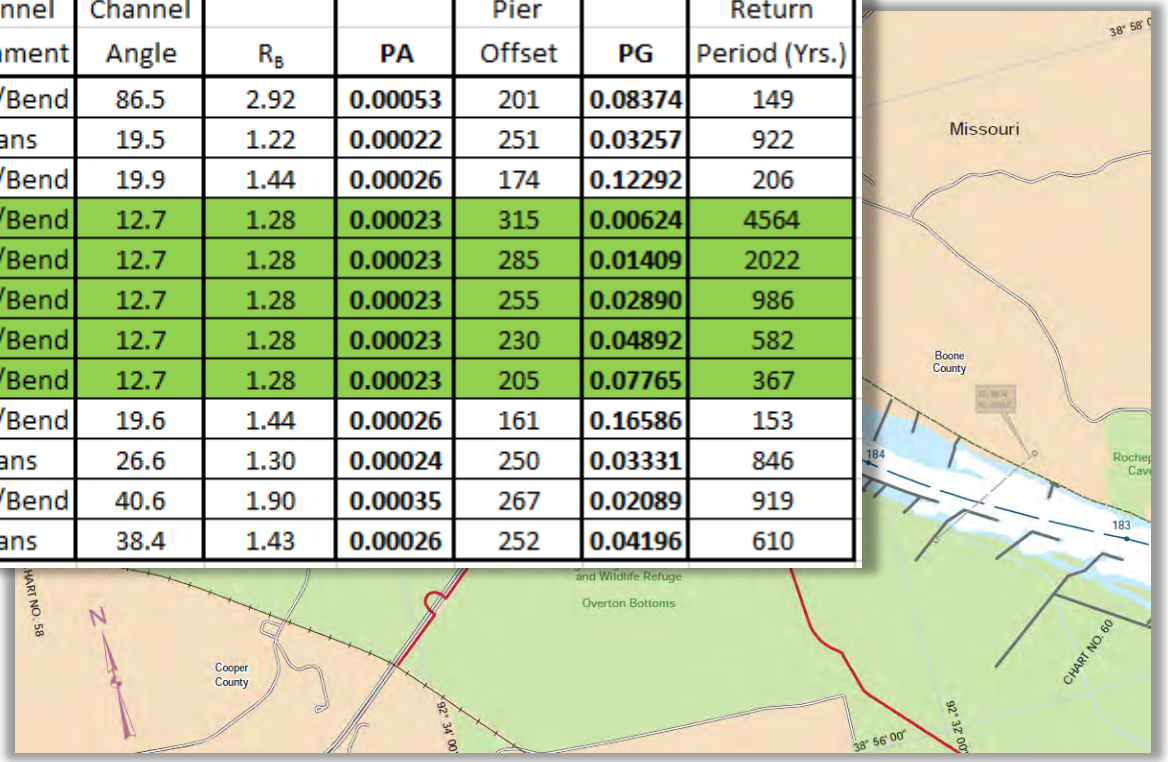
Location		Navigation Channel	Channel	Channel			Pier		Return
Mile Marker	City	Hor. Clr. (ft.)	Alignment	Angle	R_B	PA	Offset	PG	Period (Yrs.)
262.6	Miami	404	Turn/Bend	86.5	2.92	**0.00053**	201	**0.08374**	149
226.3	Glasgow	330	Trans	19.5	1.22	**0.00022**	251	**0.03257**	922
196.6	Boonville	417	Turn/Bend	19.9	1.44	**0.00026**	174	**0.12292**	206
185.0	Rocheport	510	Turn/Bend	12.7	1.28	**0.00023**			
143.9	Jefferson City	400	Turn/Bend	19.6	1.44	**0.00026**	161	**0.16586**	153
97.9	Hermann	390	Trans	26.6	1.30	**0.00024**	250	**0.03331**	846
67.6	Washington	463	Turn/Bend	40.6	1.90	**0.00035**	267	**0.02089**	919
44.0	Chesterfield	447	Trans	38.4	1.43	**0.00026**	252	**0.04196**	610





VESSEL COLLISION

Location		Navigation Channel	Channel	Channel			Pier		Return
Mile Marker	City	Hor. Clr. (ft.)	Alignment	Angle	R_B	**PA**	Offset	**PG**	Period (Yrs.)
262.6	Miami	404	Turn/Bend	86.5	2.92	**0.00053**	201	**0.08374**	149
226.3	Glasgow	330	Trans	19.5	1.22	**0.00022**	251	**0.03257**	922
196.6	Boonville	417	Turn/Bend	19.9	1.44	**0.00026**	174	**0.12292**	206
185.0	Rocheport	510	Turn/Bend	12.7	1.28	**0.00023**	315	**0.00624**	4564
		480	Turn/Bend	12.7	1.28	**0.00023**	285	**0.01409**	2022
		450	Turn/Bend	12.7	1.28	**0.00023**	255	**0.02890**	986
		425	Turn/Bend	12.7	1.28	**0.00023**	230	**0.04892**	582
		400	Turn/Bend	12.7	1.28	**0.00023**	205	**0.07765**	367
143.9	Jefferson City	400	Turn/Bend	19.6	1.44	**0.00026**	161	**0.16586**	153
97.9	Hermann	390	Trans	26.6	1.30	**0.00024**	250	**0.03331**	846
67.6	Washington	463	Turn/Bend	40.6	1.90	**0.00035**	267	**0.02089**	919
44.0	Chesterfield	447	Trans	38.4	1.43	**0.00026**	252	**0.04196**	610

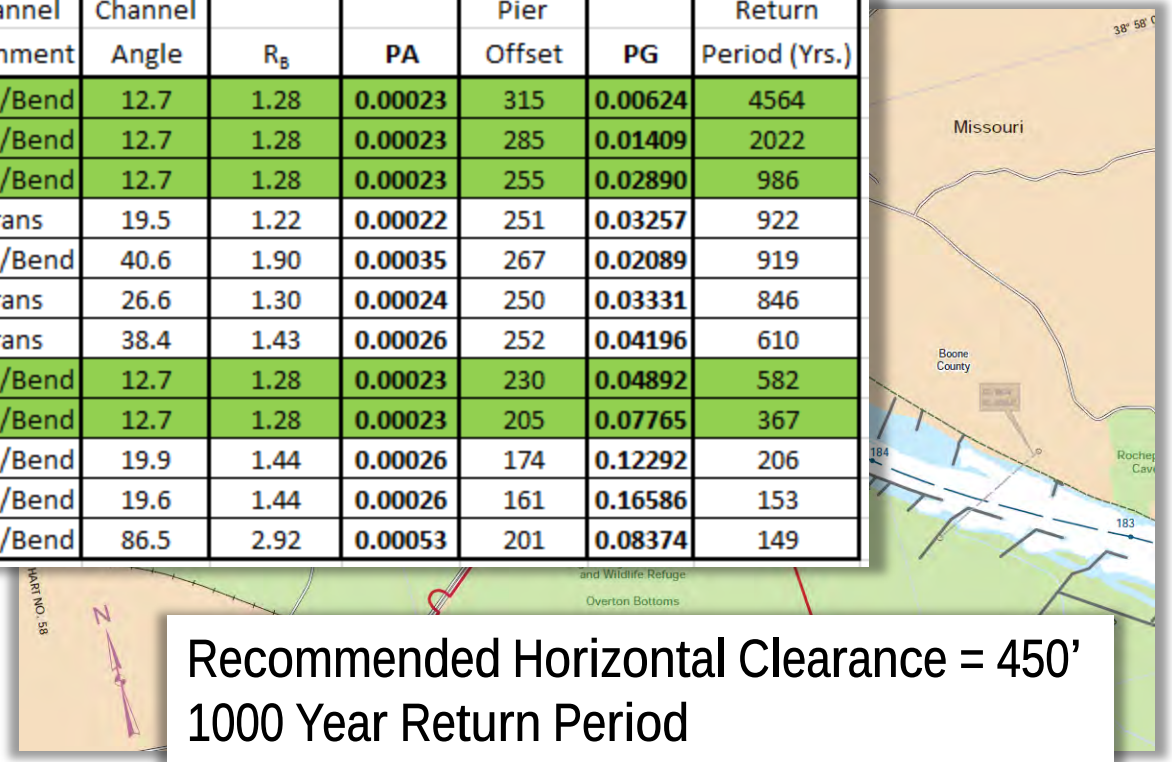


VESSEL COLLISION

AASHTO Section 3.14

Location		Navigation Channel	Channel	Channel			Pier		Return
Mile Marker	City	Hor. Clr. (ft.)	Alignment	Angle	R_B	PA	Offset	PG	Period (Yrs.)
185.0	Rocheport	510	Turn/Bend	12.7	1.28	**0.00023**	315	**0.00624**	4564
		480	Turn/Bend	12.7	1.28	**0.00023**	285	**0.01409**	2022
		450	Turn/Bend	12.7	1.28	**0.00023**	255	**0.02890**	986
226.3	Glasgow	330	Trans	19.5	1.22	**0.00022**	251	**0.03257**	922
67.6	Washington	463	Turn/Bend	40.6	1.90	**0.00035**	267	**0.02089**	919
97.9	Hermann	390	Trans	26.6	1.30	**0.00024**	250	**0.03331**	846
44.0	Chesterfield	447	Trans	38.4	1.43	**0.00026**	252	**0.04196**	610
		425	Turn/Bend	12.7	1.28	**0.00023**	230	**0.04892**	582
		400	Turn/Bend	12.7	1.28	**0.00023**	205	**0.07765**	367
196.6	Boonville	417	Turn/Bend	19.9	1.44	**0.00026**	174	**0.12292**	206
143.9	Jefferson City	400	Turn/Bend	19.6	1.44	**0.00026**	161	**0.16586**	153
262.6	Miami	404	Turn/Bend	86.5	2.92	**0.00053**	201	**0.08374**	149

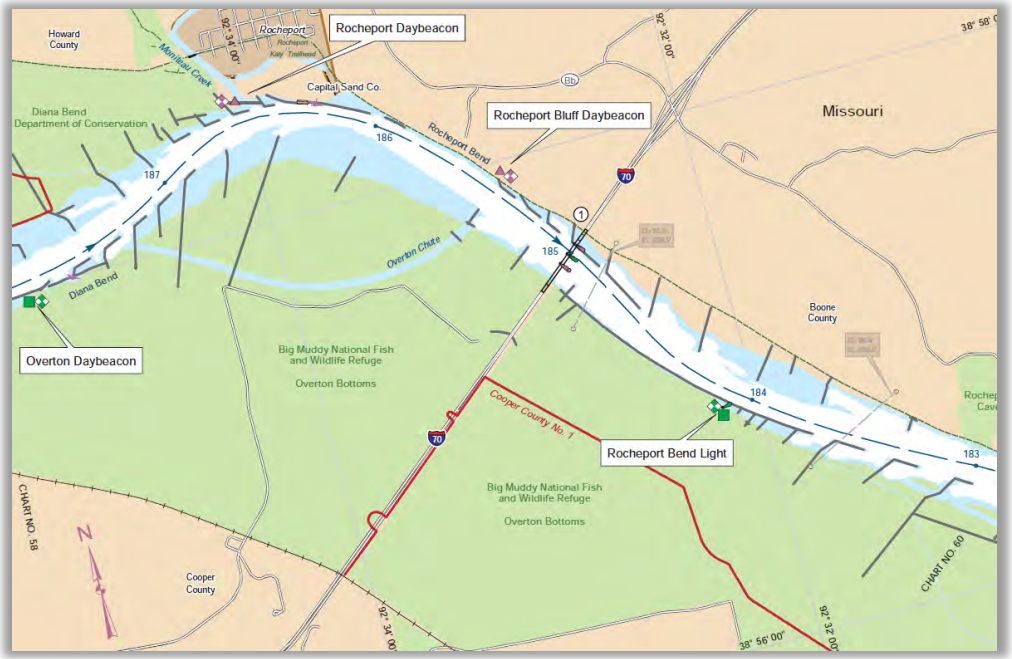
Sorted by Return Period



Recommended Horizontal Clearance = 450’
1000 Year Return Period
0.1% Probability Of Collision / Year

RECOMMENDED HORIZONTAL CLEARANCE

Based on USACE EM 1110-2-1611 = 320’
Based on Deflection Angle (FS = 6.0) = 360’
Based on AASHTO 3.14 (1000 Yr.) = 450’



Q&A