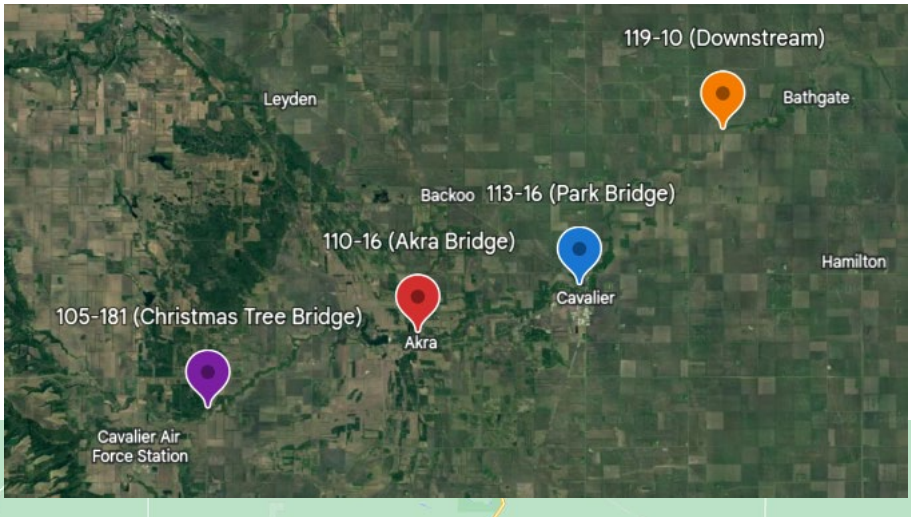
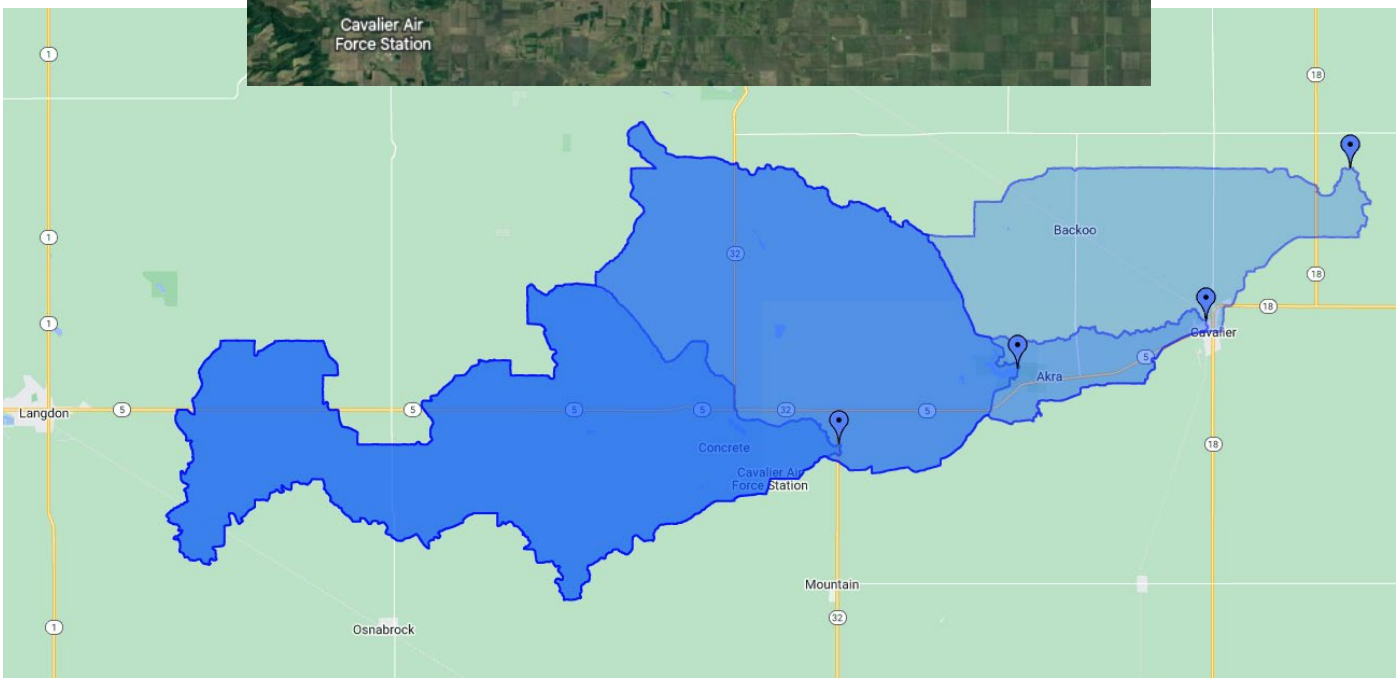
Cavalier River Watch Binder 2024





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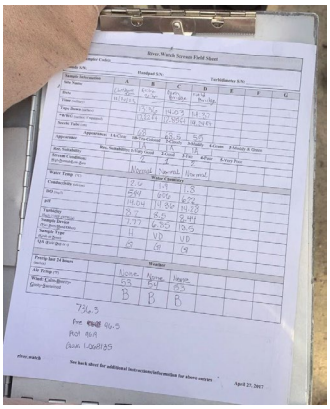
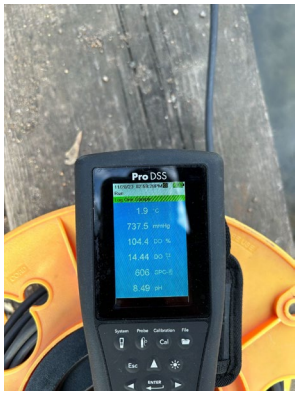
Sampling Guide

1. Learning about the equipment
    a. Secchi Tube
        i. Clear tube with a secchi disk - circular black and white disk tied inside of tube with a string. Used by slowly bringing secchi disk up until it is fully visible through the collected sample of water
    b. Van Dorn
        i. Water sampling tool. Connect clips from the two ends to the top of the Van Dorn, then slowly lower the Van Dorm from the bridge using the attached rope and keep one hand on the weight, rinse the Van Dorn twice by collecting water in it and lifting it above the water letting it run out, once rinsed collect water a third time and drop the weight to close the Van Dorn



    c. Data Sheet
        i. This is the sheet where all of the information will be collected
    d. Tape Down
        i. Measurement found by lowering a tape measure from the edge of the bridge until it reaches the surface of the water
    e. Tape Down Reference Point
        i. Point where tape down measurement is taken every time
    f. Turbidimeter
        i. Device that measures turbidity or the amount of floating objects reflecting light
    g. Sonde
        i. Sensor used to measure things such as pH, specific conductivity, water temperature and dissolved oxygen

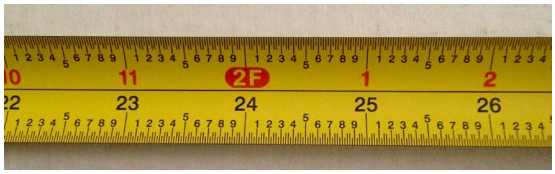


2. Record site name, date, time in military, temperature of air in degrees Fahrenheit, wind conditions, amount of precipitation in last 24 hours, suitability, and appearance of water on the data sheet
3. Use the Sonde to record the temperature of water in Celsius, specific conductivity in us/cm, dissolved oxygen in mg/l, and the pH on the data sheet

4. Collect a water sample by either using the Van Dorn or collecting by hand and record water collection method on data sheet
5. Use sample to completely fill Secchi Tube and test sample for turbidimeter
6. Stand with secchi tube in your shadow to get the most accurate measurement, use Secchi Tube by slowly dragging secchi disk up until disk is clearly shown and record measurement, then slowly let the disk disappear until it is fully gone and record measurement, average the two numbers and record that measurement in centimeters on the data sheet

7. Record distance in centimeters on the data sheet
8. After filling sample for turbidimeter, wipe away excess water from outside of glass and then polish glass with cloth
9. Then turn turbidimeter on and place sample in ensuring that the black triangle aligns with the turbidimeter
10. Cover turbidimeter to ensure maximum darkness and wait for calibration to take place

11. Record turbidity in NTUs (Nephelometric Turbidity Units) on the data sheet
12. Find tape down reference point and slowly unreel tape measure until end becomes level with surface of water
13. Ensure measurement is taken from the edge of the bridge
14. Record in feet on the data sheet, remember that tape measure is in tenths of inches instead of 12ths and measurement should be recorded accordingly



Watershed Overview

Since 2014, the Cavalier River Watch Team has been monitoring our river basin's water quality at four different sites on the Tongue River. The Tongue River is a subwatershed of the Pembina River Watershed. The Pembina River confluences with the Red river and flows north into Canada. Of special note, the Tongue River was part of a pilot watershed project through the PL 566 program that constructed a series of dams in the watershed during the 1950s and 1960s. This significantly changed the dynamics of the Tongue River and provided flood control to downstream communities.

Official Name: 110-16

Given Name: Akra Bridge

Historical Notes

In 1954, the river was excavated and the water course for the bridge was straightened. This project cost $1,131.14 and was completed by the Jordan Construction Company of Hensel. In 1960, channel snagging and clearing was conducted on the river up and downstream of the bridge. The current bridge was constructed in 1984 and is owned by the Pembina County Highway Department. The average daily traffic in 2014 was 270 vehicles with 10% of that being truck traffic. This bridge is inspected every 24 months; its last inspection was April 2022. The structural evaluation states that it is somewhat better than minimum adequacy to tolerate being left in place as is with a bridge condition of fair. The deck and superstructure of the bridge were in good condition with some minor problems. The substructure was in fair condition with all primary structural elements sound but having minor section loss, cracking, spalling or scour. The bank protection is being eroded with river control devices and/or embankment having major damage. It was reported that trees and brush were restricting the channel. There have been countermeasures installed to correct previously existing problems with scour. Since installation the bridge has been reported to no longer be scour critical. The bridge railings meet the currently acceptable standards. The transitions were reported to not be meeting currently acceptable standards or a safety feature is required and none was provided. The approach guardrail was reported to meet currently acceptable standards.

River

Tongue River

Latitude & Longitude

48°46'40"N 97°43'41"W

Site Description

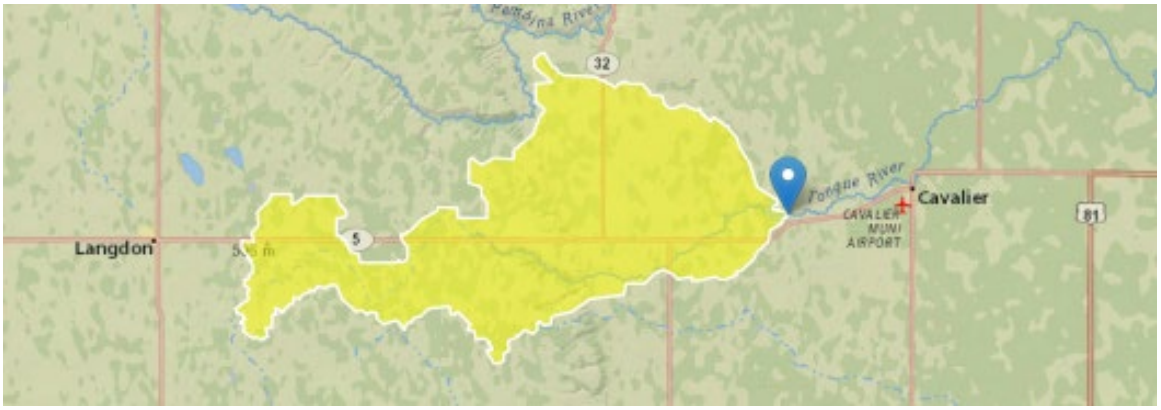
Road

136th Avenue Northeast

Bridge Description

Bridge is made of prestressed concrete. Design is either box beam or Girders - single or spread. The structure length is 1.52 meters. The length of the maximum span is 1.40 meters. The deck width is 0.99 meters. The deck structure type is a concrete cast-in-place. The type of wearing surface is bituminous.

Drainage Area



Reference Photos & Description

Downstream side of bridge, chiseled 3-sided square on cement portion, about 6 feet north of south end of concrete.

Upstream & Downstream

Upstream

Downstream

Satellite Image

Official Name: 105-181

Given Name: Christmas Tree Bridge

Historical Notes

This bridge was built in 1941 and is owned by the Pembina County Highway Department. In 2014, the average daily traffic was 50 vehicles. This bridge is inspected every 24 months; its last inspection was April 2022. The Bridge condition was reported to be fair. The structural evaluation stated that the bridge was equal to present minimum criteria. The deck geometry was reported to be somewhat better than the minimum adequacy to tolerate being left in place as is. The deck and superstructure were reported to be in satisfactory condition with structural elements showing some minor deterioration. The substructure was reported as being in good condition with some minor problems. During the inspection it was noted that the bank was beginning to slump. The river control devices and embankment protection had widespread minor damage. There was also minor stream bed movement evident. It was also noted that debris was restricting the channel slightly. Due to the bridge's "unknown" foundation that has not been evaluated for scour, the risk cannot be determined. Therefore the bridge is to be flagged for monitoring during flood events and if may need to be closed. The bridge railings, transitions, approach guardrail, and approach guardrail ends did not meet the currently acceptable standards or a safety feature was not provided. During this inspection the bridge was marked as possibly eligible for the National Register of Historic Places (requires further investigation before determination can be made) or the bridge is on a State or local historic register.

River

Tongue River

Latitude & Longitude

48°44'47"N 97°51'39"W

Site Description

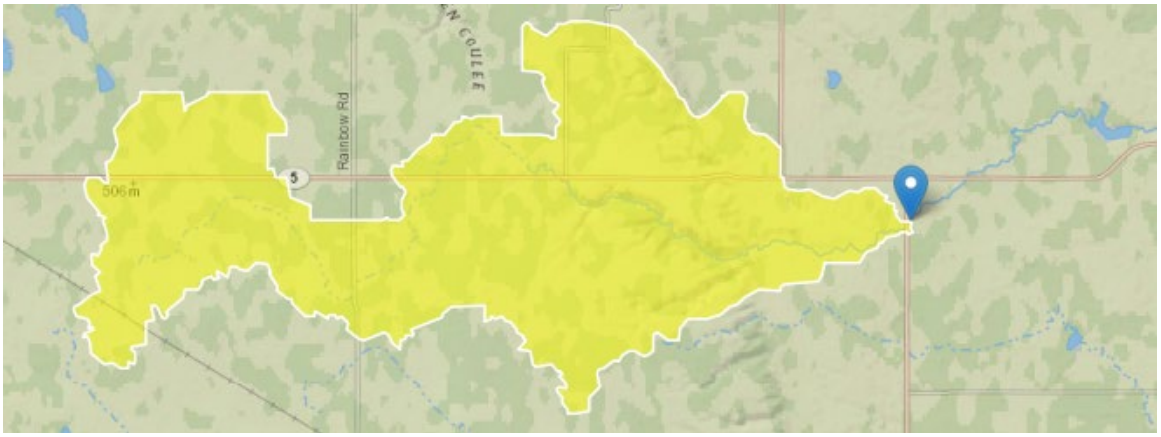
Road

92nd Street Northeast

Bridge Description

Bridge is made of steel. Design is either stringer/multi-beam or girder. The structure length is 0.91 meters. The length of the maximum span is 0.85 meters. The deck width is 0.77 meters. The deck structure type is a concrete cast-in-place. The type of wearing surface is bituminous.

Drainage Area



Reference Photos & Description

Downstream side of bridge, chiseled 3-sided square on cement portion, about 4 feet east of center pylon.

Upstream & Downstream

Upstream

Downstream

Satellite Image

Official Name: N/A (City Bridge)

Given Name: Park Bridge

Historical Notes

This bridge was constructed in 1975 and is owned by the City of Cavalier. During the winter of 1997, snagging and clearing throughout the city was conducted. This project cost $3,330. In 2009, a project directly upstream of the bridge was conducted. This project was to remove a low head dam and replace it with a rock ripple structure that allows for fish passage. After the 2013 flood, some bridge repairs were completed. In 2014, the average daily traffic was 800 vehicles with 4% of the traffic being truck traffic. In 2021, snagging and clearing was conducted again. This bridge is inspected every 24 months. The latest inspection was in April 2022. This inspection concluded that the bridge was structurally deficient. The structural evaluation stated that the bridge is basically intolerable requiring high priority of replacement. The deck geometry was reported to be basically intolerable requiring high priority of corrective action. The deck and substructure were reported to be in satisfactory condition with structural elements showing some minor deterioration. The superstructure was reported to be in good condition with some minor problems. During the inspection it was noted that the bank protection was in need of minor repairs. The river control devices and embankment protection had minor damage and the banks and/or channel had minor amounts of drift. Due to the bridge's "unknown" foundation that has not been evaluated for scour, the risk cannot be determined. Therefore the bridge is to be flagged for monitoring during flood events and if needed be closed. The bridge railings, transitions, approach guardrail, and approach guardrail ends did not meet the currently acceptable standards or a safety feature was not provided. The inspection concluded that replacement of the bridge was necessary because of substandard load carrying capacity of substandard bridge roadway geometry. The length of the structure improvement would be 3.72 meters. Bridge and roadway improvement costs would have a total sum of $251,000.

River

Tongue River

Latitude & Longitude

48°47'52"N 97°37'32"W

Site Description

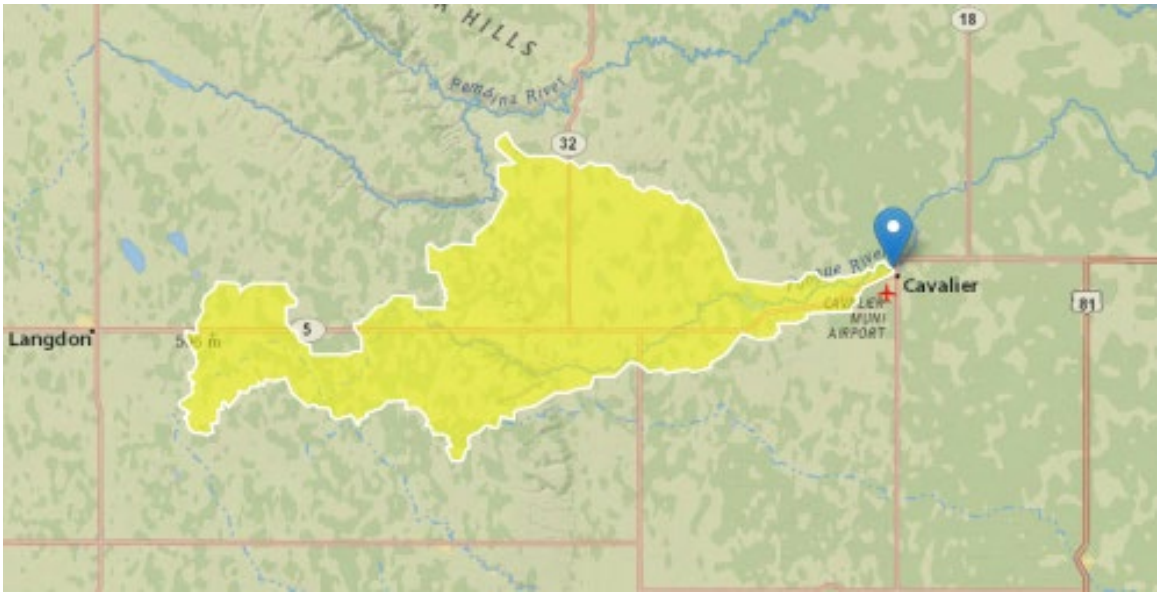
Road

West 2nd Avenue North

Bridge Description

Bridge is made of wood or timber. Design is either stringer/multi-beam or girder. The structure length is 1.68 meters. The length of the maximum span is 1.62 meters. The deck width is 0.68 meters. The deck structure type is wood or timber. The type of wearing surface is bituminous.

Drainage Area



Reference Photos & Description

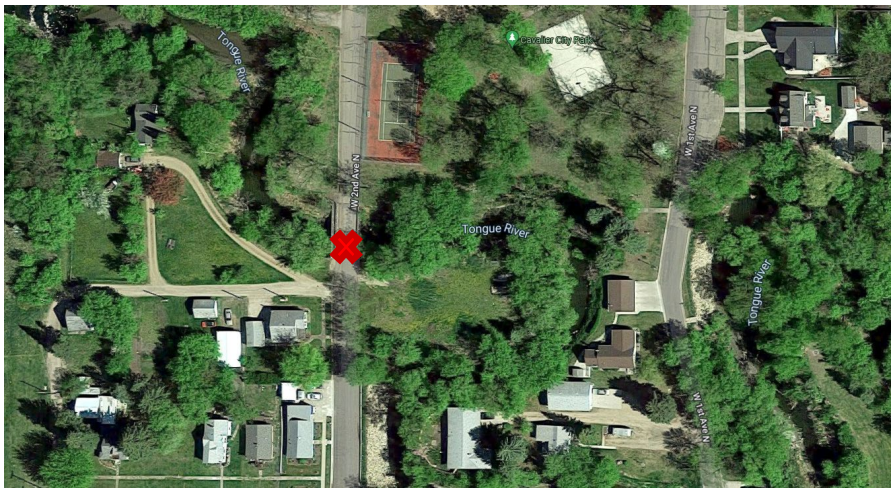
Downstream side of bridge, chiseled 3-sided square on bottom wooden portion, about 1 foot north of sixth pylon.

Upstream & Downstream

Upstream

Downstream

Satellite Image



Official Name: 119-10

Given Name: Downstream Bridge

Historical Notes

This bridge was constructed during the PL 566 watershed project. This project constructed 10 dams and did channel improvements. Specifically for this bridge, the PL 566 project widened and deepened the channel and then constructed the bridge in 1948. The bridge was then repaired in 1966 and is owned by the Pembina County Highway Department. In 2014, the average daily traffic on this bridge was 24 vehicles. In 2019, snagging and clearing was conducted. This bridge is inspected every 24 months; its latest inspection was May 2022. This inspection concluded that the bridge was in fair condition. The structural evaluation states that is somewhat better than the minimum adequacy to tolerate being left in place as is. The deck geometry was reported to be equal to the present minimum criteria. The deck was reported to be in satisfactory condition with structural elements showing some minor deterioration. The superstructure and the substructure were reported as being in fair condition with all primary structural elements being sound but having minor section loss, cracking, spalling or scour. During the inspection it was noted that the bank protection was being eroded and river control devices and/or embankment had major damages. It was also noted that trees and brush were restricting the channel. Due to the bridge's "unknown" foundation that has not been evaluated for scour, the risk cannot be determined. Therefore the bridge is to be flagged for monitoring during flood events and if needed be closed. The bridge railings, transitions, approach guardrail, and approach guardrail ends did not meet the currently acceptable standards or a safety feature was not provided.

River

Tongue River

Latitude & Longitude

48°51'45.252"N, 97°32'3.336"W

Site Description

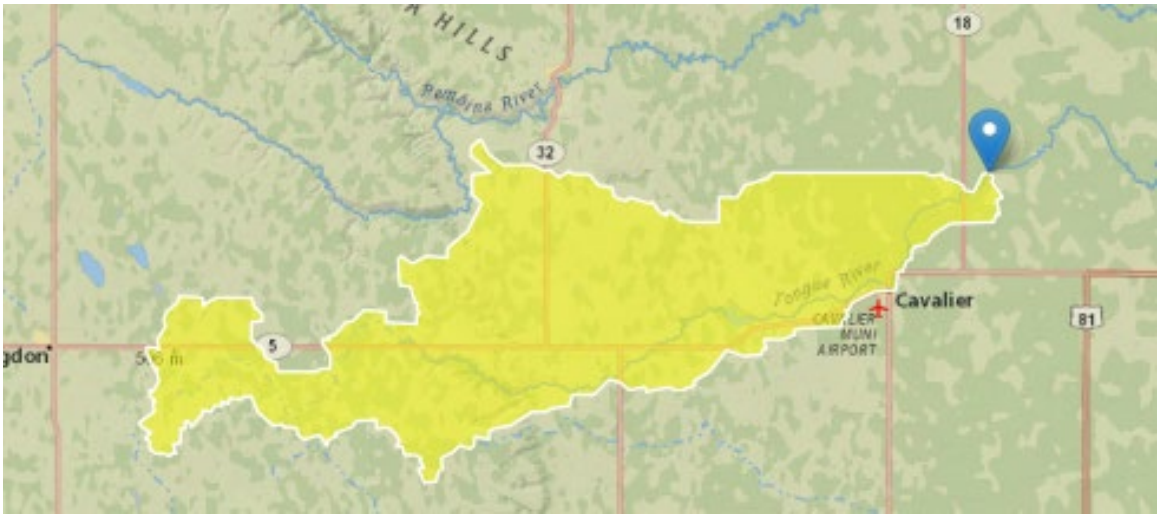
Road

100th Street

Bridge Description

Bridge is made of steel. Design is either stringer/multi-beam or girder. The structure length is 1.13 meters. The length of the maximum span is 1.07 meters. The deck width is 0.78 meters. The deck structure type is concrete cast-in-place. The type of wearing surface is gravel.

Drainage Area



Reference Photos & Description

Downstream side of bridge, chiseled 3-sided square on cement portion, about 12 feet east of west end of cement.

Upstream & Downstream

Upstream

Downstream

Satellite Image

Historical Data Sheets

River.Watch Stream Field Sheet

School (Sampler Code): Cavalier

Sonde S/N: _____ Handpad S/N: _____ Turbidimeter S/N: _____

Sample Information	A	B	C	D	E	F	G
Site Name	Christian Creek	Fridge Bridge	Park Bridge	Field Bridge			
Date	11/20/23						
Time (military)		13:36	14:03	14:37			
Tape Down (surface)		17.22ft	12.85ft	14.24ft			
*WWG (surface; if equipped)							
Secchi Tube (cm)		68	68.5	55			
Appearance: 1A-Clear 1B-Tea-Colored 2-Cloudy 3-Muddy 4-Green 5-Muddy & Green							
Appearance		1A	1A	1A			
Rec. Suitability: 1-Very Good 2-Good 3-Fair 4-Poor 5-Very Poor							
Rec. Suitability		2	1	2			
Stream Condition: High-Normal-Low-Zero		Normal	Normal	Normal			
Water Chemistry							
Water Temp (°C)		2.6	1.9	1.8			
Conductivity (uS/cm)		594	606	622			
DO (mg/l)		14.04	14.36	14.28			
pH		8.7	8.5	8.44			
Turbidity Hach 2100P (NTRUs)		7.77	6.85	10.5			
Sample Device (Van Dorn/Hand/Other)		H	VD	VD			
Sample Type (Grab or None)		G	G	G			
QA (Field Dup or -)							
Weather							
Precip last 24 hours (inches)		None	None	None			
Air Temp (°F)		53	54	53			
Wind: Calm-Breezy-Gusty-Sustained		B	B	B			

736.3

Pre 96.5

Post 96.9

Drain 1.068135

river.watch See back sheet for additional instructions/information for above entries April 27, 2017

FIELD NOTES: flow condition, debris in water, downstream channel control, measurement error(s) and reason (if applicable), additional weather, vegetation status (leaf out, cropping, harvest), land use, erosion, wildlife, ice condition, picture notes, etc.

A	Cool breezy day
B	Sign in bridge on a cool breezy day
C	Cool breezy day
D	Two dead deer carcasses on the upstream side of the bridge on a cool breezy day
E	
F	
G	

Site Name	Christian Creek bridge	Fridge Bridge	Park Bridge				
Date	September 14 2023	September 14 2023	September 14 2023				
Time (military)	13:20	13:51	14:11				
Tape Down (surface)	12.88 ft	17.73 ft	13.90 ft				
*WWG (surface; if equipped)							
Secchi Tube (cm)	100	91	64				
Appearance: 1A-Clear 1B-Tea-Colored 2-Cloudy 3-Muddy 4-Green 5-Muddy & Green							
Appearance	1A	1A	1A				
Rec. Suitability: 1-Very Good 2-Good 3-Fair 4-Poor 5-Very Poor							
Rec. Suitability	2	2	2				
Stream Condition: High-Normal-Low-Zero	L	L	L				
Water Chemistry							
Water Temp (°C)	20.3	15.3	15.6				
Conductivity (uS/cm)	663	509	654				
DO (mg/l)	11.14	8.37	7.38				
pH	8.45	7.91	8.15				
Turbidity Hach 2100P (NTRUs)	2.92	6.11	7.53				
Sample Device (Van Dorn/Hand/Other)	H	H	VD				
Sample Type (Grab or None)	G	G	G				
QA (Field Dup or -)							
Weather							
Precip last 24 hours (inches)	1/2 inch	1/2 inch	1/2 inch				
Air Temp (°F)							
Wind: Calm-Breezy-Gusty-Sustained							

96.1 96.7

730.0 1.047531

river.watch See back sheet for additional instructions/information for above entries April 27, 2017

FIELD NOTES: flow condition, debris in water, downstream channel control, measurement error(s) and reason (if applicable), additional weather, vegetation status (leaf out, cropping, harvest), land use, erosion, wildlife, ice condition, picture notes, etc.

A	
B	flow condition is calm.
C	
D	
E	
F	
G	

river.watch See back sheet for additional instructions/information for above entries April 27, 2017

FIELD NOTES: flow condition, debris in water, downstream channel control, measurement error(s) and reason (if applicable), additional weather, vegetation status (leaf out, cropping, harvest), land use, erosion, wildlife, ice condition, picture notes, etc.

A	Ice on water very low water. Gusty wind
B	Beaver Dam, High water, Dead Carcass & Hill Gusty wind & no ice
C	Leaves, Gusty wind, High water, Little Flow
D	Low, Fast Flow, Dead carcass,
E	
F	
G	

FIELD NOTES: flow condition, debris in water, downstream channel control, measurement error(s) and reason (if applicable), additional weather, vegetation status (leaf out, cropping, harvest), land use, erosion, wildlife, ice condition, picture notes, etc.

A	Breezy Chilly Low water leaves
B	Deer is gone, Flowing water leaves
C	Flowing water, Leaves Breezy chilly cloudy water
D	Fast moving cloudy
E	
F	
G	

If stream is out of banks, indicate location(s):	US Left Bank US Right Bank DS Left Bank US Right Bank	US Left Bank US Right Bank DS Left Bank US Right Bank	US Left Bank US Right Bank DS Left Bank US Right Bank	US Left Bank US Right Bank DS Left Bank US Right Bank	US Left Bank US Right Bank DS Left Bank US Right Bank
Type of debris in water?	leaves twigs branches large trees crop residue	leaves twigs branches large trees crop residue	leaves twigs branches large trees crop residue	leaves twigs branches large trees crop residue	leaves twigs branches large trees crop residue
Precip amount in last 24 hrs:	None	Mist	None		
Current Precipitation	none light rain heavy rain sleet snow	none light rain heavy rain sleet snow	none light rain heavy rain sleet snow	none light rain heavy rain sleet snow	none light rain heavy rain sleet snow
Air Temperature (F)	66	66	66		
Wind Conditions	calm breezy gusty sustained	calm breezy gusty sustained	calm breezy gusty sustained	calm breezy gusty sustained	calm breezy gusty sustained
Photos taken:	Yes No	Yes No	Yes No	Yes No	Yes No

Additional weather comments:

warm, sunny, breezy

Site specific Comments (runoff source - overland, tile, snowmelt; description of control condition)

A High water, muddy; downstream-cement pallet; upstream- metal pipe

B beaver dam-new;

C a lot of leaves, High

D

E

River.Watch Stream Field Sheet

School (Sampler Code): Cavalier RW

Sonde S/N: _____ Handpad S/N: _____ Turbidimeter S/N: _____

Sample Information	A	B	C	D	E	F	G
Site Name	Christmas tree	Fridge bridge	Park Bridge				
Date	5/1/23						
Time (military)							
Tape Down (surface)	9.48	12.10	9.60	10.10			
*WWG (surface; if equipped)							
Secchi Tube (cm)	5	8	5	3			
Appearance: 1A-Clear 1B-Tea-Colored 2-Cloudy 3-Muddy 4-Green 5-Muddy & Green							
Appearance	3	3	3	3			
Rec. Suitability: 1-Very Good 2-Good 3-Fair 4-Poor 5-Very Poor							
Rec. Suitability	4	4	4	4			
Stream Condition: High-Normal-Low-Zero	H	H	H	N			
Water Chemistry							
Water Temp (°C)	15	13.4	13.9	15.3			
Conductivity (uS/cm)	423.5	416	416.5	434.7			
DO (mg/l)	8.96	9.84	9.42	9.03			
pH	7.93	7.61	7.92	7.93			
Turbidity Hach 2100P (NTRUs)							
Sample Device (Van Dorn/Hand/Other)	VD	VD	VD	VD			
Sample Type (Grab or None)	G	G	G	G			
QA (Field Dup or -)							
Weather							
Precip last 24 hours (inches)	trace						
Air Temp (°F)	72						
Wind: Calm-Breezy-Gusty-Sustained	B						

7337

96.8 96.5

1.044689

river.watch See back sheet for additional instructions/information for above entries April 27, 2017

FIELD NOTES: flow condition, debris in water, downstream channel control, measurement error(s) and reason (if applicable), additional weather, vegetation status (leaf out, cropping, harvest), land use, erosion, wildlife, ice condition, picture notes, etc.

A	• Flow conditions high • debris in water
B	• Flow conditions high ◦ debris in water ◦ Cleaner than Christmas tree site due to dam being in between sites
C	• Flow conditions high ◦ water level high
D	
E	
F	
G	

river.watch See back sheet for additional instructions/information for above entries April 27, 2017

Watershed Pollutant Load Monitoring Network Field Sheet

Sampler name: Asher Kingery Sonde SN: 14C101667 Handpad SN: 14B101098

	A	B	C	D	E
EQuIS ID					
Hydstra ID					
Field Name	Christmas Tree Park	Fridge Bridge			
Date (MM/DD/YY)	9/22/16	9/22/16			
Military Time	13:53	14:22			
QA Sample (FD, FB)					
QA Sample Time					
Sample Device: Bottle; Van Dorn; Rod; Ice Rod; Bucket; Weighted Bucket					
Sample Device					
Stage Method	Staff WWG BTW	Staff WWG BTW	Staff WWG BTW	Staff WWG BTW	Staff WWG BTW
RM Used					
RP Elevation (ft)					
BTW (ft)	11.25	14.35	13.50		
Measured Stage (ft)					
Logger Gage Height (ft)					
Difference (MS-GH)					
Staff Gage (ft)					
Datum Offset (ft)					
Logger Voltage					
Error Range (ft)					
Error Range description	NA Windy Turbulent RM edge Kinked tape Other:	NA Windy Turbulent RM edge Kinked tape Other:	NA Windy Turbulent RM edge Kinked tape Other:	NA Windy Turbulent RM edge Kinked tape Other:	NA Windy Turbulent RM edge Kinked tape Other:
Control Type	Riffle Section Channel Overbank	Riffle Section Channel Overbank	Riffle Section Channel Overbank	Riffle Section Channel Overbank	Riffle Section Channel Overbank
Control Condition	Clear Ice Veg Debris Scour Deposition	Clear Ice Veg Debris Scour Deposition	Clear Ice Veg Debris Scour Deposition	Clear Ice Veg Debris Scour Deposition	Clear Ice Veg Debris Scour Deposition
Amount of Debris or Vegetation	Light Moderate Heavy	Light Moderate Heavy	Light Moderate Heavy	Light Moderate Heavy	Light Moderate Heavy
Type of Ice	Shore Anchor Sheet	Shore Anchor Sheet	Shore Anchor Sheet	Shore Anchor Sheet	Shore Anchor Sheet
Ice Cover (%)					
Ice Thickness (in)					
Backwater Present?	Yes No	Yes No	Yes No	Yes No	Yes No
Water Temp (°C)	14.49	15.68	14.48		
DO (mg/L)	9.61	9.39	9.63		
pH	8.17	8.05	8.03		
Sp. Conduct. (uS/cm)	702	621	619		
Secchi Tube (cm)	10.5	10.5	28.5		
Appearance: 1A-Clear 1B-Tea-colored 2-Cloudy 3-Muddy 4-Green 5-Muddy & Green					
Appearance	3	1A	2		
Recreational Suitability: 1-Very Good 2-Good 3-Fair 4-Poor 5-Very Poor					
Recreational Suitability	3	4	2		
Stream Condition: High, Normal, Low, Zero Flow / Swift, Moderate, Slow / Clear, Muddy, Other					
Stream Condition	High, N, M	H, S, C	H, M, C		
Turbidity	41.8	5.18	11.7		

FIELD NOTES: flow condition, debris in water, downstream channel control, measurement error(s) and reason (if applicable), additional weather, vegetation status (leaf out, cropping, harvest), land use, erosion, wildlife, ice condition, picture notes, etc.

A	Steady Flow, cropping season. Dry.
B	cropping season, Dry, Steady Flow
C	very low Clear water.
D	Steady Flow, normal river height. There's some Bridge
E	
F	
G	

river.watch See back sheet for additional instructions/information for above entries April 27, 2017