

BSDMS Summary Report

5 Tanana River at S.R. 2 at Big Delta, AK

Site Location:

Site ID: 5

Site Name: Tanana River at S.R. 2 at Big Delta, AK

County: Town of Big Delta

Nearest City: Big Delta

State: AK

Latitude: 643000

Longitude: 1461000

USGS Station ID:

Route Number: 2

Route Class: State

Service Level: Mainline

Route Direction: NA

Highway Mile Point: 281

Stream Name: Tanana River

River Mile:

Contact:
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Resources Division
218 E Street, Skyline Building
Anchorage, AK 99501

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Water-Resources Investigations 32-
75
Scour at Selected Sites in Alaska
By Vernon W. Norman
November 1975

Site Description:

This study site is located at bridge 524, which spans the Tanana River at mile 281 on the Richardson Highway, and is 0.5 miles northwest of Big Delta. The bridge at this site is 784 ft long and consists of one overhead-truss span 399 ft long and four girder spans each about 95 ft long, supported by four round-nosed concrete piers. Upstream from the bridge, the Tanana River channel is braided and contains gravel bars and islands. Immediately downstream from the bridge the Delta River empties into the Tanana River and forms a delta. This forces the Tanana River into a narrow channel against a bluff on the opposite bank, which creates turbulence and has caused the bed of the stream to scour a large hole to a depth of about 40 ft. The streambed in the vicinity of the bridge is composed of sand, gravel, and some cobbles. The drainage area of the bridge is about 13,500 square miles, a small part of which is covered by glaciers. Daily discharge was recorded at this site for 8 years during the period 1949 through 1957. The annual peaks observed during that time ranged from 37,600 cfs to 62,800 cfs. Mean-annual and 50-year peak flows were approximately 49,000 cfs and 67,000 cfs, respectively. Stage-discharge relations were very poor because of the alternate advance and retreat of the controlling delta. Most of the measurements in this data set were made in 1971.

Elevation Reference

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Datum: Gage

MSL (ft): 919.19

Description of Reference Elevation:

Stream Data

Drainage Area (sq mi):	13500	Floodplain Width:	Wide
Slope in Vicinity(ft/ft):	0.0006	Natural Levees:	Unknown
Flow Impact:	Right	Apparent Incision:	Unknown
Channel Evolution	Unknown	Channel Boundary:	Alluvial
Armoring:	Partial	Banks Tree Cover:	Low
Debris Frequency:	Unknown	Sinuosity:	Sinuuous
Debris Effect:	Unknown	Braiding:	Locally
Stream Size:	Wide	Anabranching:	Locally
Flow Habit:	Perennial	Bars:	Irregular
Bed Material:	Gravel	Stream Width Variability:	Wider
Valley Setting:	Moderate		

Roughness Data

Manning's n Values

	Left Overbank	Channel	Right Overbank
High:			
Typical			
Low:			

Bed Material

Measurement Number	Yr	Mo	Dy	Sampler	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	SP	Shape	Cohesion
1	1971	6	24	Drag	58	45	30	20	2.65		Unknown

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2 1971 7 16 Drag 86 42 14 5 2.65 Unknown

Bed Material Comments

Measurement No: 1

Only the D90=50 and D50=30 were reported with the data. The D95, D84, and D16 were computed from the provided data. The D84 was interpolated from the D90 and D50 using a log-probability interpolation. Sigma was computed as D84/D50. D95 and D16 were computed from the equation $D50 * \text{Sigma}^{\text{(standard normal deviate of 95 or 16)}}$. Sediment sample number 1 was collected at the bridge near pier 4 using a drag sampler. Sediment sample number 2 was collected in the approach section upstream from the bridge and is thought to be more representative than sample number 1.

Measurement No: 2

Only the D90=58 and D50=14 were reported with the data. The D95, D84, and D16 were computed from the provided data. The D84 was interpolated from the D90 and D50 using a log-probability interpolation. Sigma was computed as D84/D50. D95 and D16 were computed from the equation $D50 * \text{Sigma}^{\text{(standard normal deviate of 95 or 16)}}$. Sediment sample number 1 was collected at the bridge near pier 4 using a drag sampler. Sediment sample number 2 was collected in the approach section upstream from the bridge and is thought to be more representative than sample number 1.

Bridge Data

Structure No: 524

Length(ft): 784

Width(ft):

Number of Spans: 5

Vertical Configuration: Unknown

Low Chord Elev (ft):

Upper Chord Elev (ft):

Overtopping Elev (ft):

Skew (degrees): 35

Guide Banks: Unknown

Waterway Classification: Main

Year Built:

Avg Daily Traffic:

Plans on File: No

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Parallel Bridges No

Upstream/Downstream: N/A

Continuous Abutment: No

Distance Between Centerlines:

Distance Between Pier Faces:

Bridge Description:

This bridge is 784 ft long and consists of one overhead-truss span 399 ft long and four girder spans each about 95 ft long, supported by four round-nosed concrete piers. The piers, which taper from 2.5 ft wide at the cap to 5 ft wide at the footing, are perpendicular to the roadway but are skewed to the flow. At high stages the angle of attack varies from 35-40 degrees.

Abutment Data

Left Station: 0

Right Station: 0

Left Skew (deg): 0

Right Skew (deg) 0

Left Abutment Length (ft):

Right Abutment Length (ft)

Left Abutment to Channel Bank (ft):

Right Abutment to Channel Bank (ft):

Left Abutment Protection:

Right Abutment Protection

Contracted Opening Type: Unknown

Embankment Skew (deg): 0

Embankment Slope (ft/ft):

Abutment Slope (ft/ft)

Wingwalls: No

Wingwall Angle (deg): 0

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Pier Data

Pier ID	Bridge Station(ft)	Alignment	Highway Station	PierType	# Of Piles	Pile Spacing(ft)
1	90	0	0	Single	0	
2	185	0	0	Single	0	
3	280	0	0	Single	0	
4	371	0	0	Single	0	

Pier ID	Pier Width(ft)	Pier Shape	Shape Factor	Length(ft)	Protection	Foundation
1	5	Round		31	Unknown	Poured
2	5	Round		31	Unknown	Poured
3	5	Round		31	Unknown	Poured
4	5	Round		44.4	Unknown	Poured

Pier ID	Top Elevation(ft)	Bottom Elevation(ft)	Foot or Pile Cap Width(ft)	Cap Shape	Pile Tip Elevation(ft)
1				Square	
2				Square	
3				Square	
4				Square	

Pier Description

Pier ID 1

This pier's width tapers from 2.5 ft wide at the cap to 5 ft wide at the footing. It is perpendicular to the roadway but skewed approximately 35-40 degrees to the flow.

Pier ID 2

This pier's width tapers from 2.5 ft wide at the cap to 5 ft wide at the footing. It is perpendicular to the roadway but skewed approximately 35-40 degrees to the flow.

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Pier ID 3

This pier tapers from 2.5 ft wide at the cap to 5 ft wide at the footing. It is perpendicular to the roadway but skewed approximately 35-40 degrees to the flow.

Pier ID 4

This pier is a little bit bigger than the other ones. It tapers from 3 ft wide at the cap to 5 ft wide at the footing. The piers are perpendicular to the roadway but are skewed approximately 35-40 degrees to the flow.

Pier Scour Data

Pier ID	Date	Time	USOrDS					
1	7/16/71	0:00	Downstream					
2	7/16/71	0:00	Downstream					
3	7/16/71	0:00	Downstream					
4	7/16/71	0:00	Downstream					

Pier ID	Scour Depth	Accuracy (ft)	Side Slope (ft/ft)	TopWidth (ft)	Apprch Vel (ft/s)	Apprch Depth(ft)	Effective Pier Width	Skew to Flow(deg)
1	6	0.5			7.1	12	5	37
2	7	0.5			7.3	12	5	37
3	6	0.5			6.8	15	5	37
4	8	0.5			5.7	14	5	37

PierID	Sediment Transport	Bed Material	BedForm	Trough (ft)	Crest (ft)	Sigma	Debris Effects
1	Live-bed	Non-cohesive	Unknown			3	Moderate
2	Live-bed	Non-cohesive	Unknown			3	Moderate
3	Live-bed	Non-cohesive	Unknown			3	Moderate
4	Live-bed	Non-cohesive	Unknown			3	Moderate

PierID	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)
1	86	42	14	5
2	86	42	14	5
3	86	42	14	5
4	86	42	14	5

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Pier Scour Comments

Pier ID 1 **Time:** 0:00 **US/DS:** Downstream

Because of the skew to flow, water on the left side of the pier had a placid appearance, while the water surface on the right was extremely turbulent. The only characteristic of the streambed profiles common to all four piers is minimum streambed elevation, which apparently was on pier's downstream end.

Pier ID 2 **Time:** 0:00 **US/DS:** Downstream

Because of the skew to flow, water on the left side of the pier had a placid appearance, while the water surface on the right was extremely turbulent. The only characteristic of the streambed profiles common to all four piers is minimum streambed elevation, which apparently was on pier's downstream end of the pier.

Pier ID 3 **Time:** 0:00 **US/DS:** Downstream

Adjacent to this pier, the bed scoured down to the top of the footing for a length of at least 10 ft at the downstream end of the pier. The minimum streambed elevation occurred downstream of the pier. The depth of scour to be expected in the absence of the footing probably wouldn't be significant.

Pier ID 4 **Time:** 0:00 **US/DS:** Downstream

Because of the skew to flow, water on the left side of the pier had a placid appearance, while the water surface on the right was extremely turbulent. The only characteristic common to all four piers was the minimum streambed elevation, which apparently was located at the downstream end of the piers.

Abutment Scour

Contraction Scour

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Stage and Discharge Data

Peak Discharge					Flow (cfs)	Qacc	Peak Stage					Stage (ft)	Water Temp (C)	Return Period(yr)
year	mo	dy	hr	mi			year	mo	dy	hr	mi			
1971	7	16		0	46500	none	1971	7	16	0	66.5	9		
1971	8	13		0	52600	none	1971	8	13	0	66.2			
1971	6	24		0	27700	none	1971	6	24	0	65			
				0		none	1971	5	14	0	60			

Hydrograph

Hydrograph Number	Year	Month	Day	Hr	Min	Sec	Stage(ft)	Discharge (cfs)
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Supporting Files
