Loup River at Columbus, Nebraska
06794500

LOCATION

Latitude and Longitude

41.41797, -97.36791

Road Log

On the downstream side of the north bound U.S. Highway 30 and 81 bridge over the Loup River in Columbus, Nebraska. The gage is also 3.5 miles upstream from the mouth of the Loup River.

Equipment Details

Recording Gage

The recorder gage is a DCP consisting of a SL3 Sutron encoder hooked up to a Dome antenna and an OTT radar unit; in an 18" x 18" x 30" metal utility box. The power supply is a 12-volt battery with 10 W. solar panel with regulator.

External Gage

The reference gage is a wire weight mounted on the downstream rail of the pedestrian walkway of the bridge. Elevation of the check bar was set at 27.50' on June 25, 2019.

A south channel wire weight was installed on June 5, 2012. Elevation of the check bar was set at 30.82' on May 11, 2022.

As of June 5, 2012, there are dual wire weights, one on the north channel and one on the south channel. The south channel wire weight is used as reference for the Sutron encoder.

Benchmark and Reference Marks

Levels were run to the original U.S. Geological Survey Benchmark and Reference Marks to re-establish the National Weather Service wire weight on May 8, 2008. Levels were recently run by DNR survey crew on May 11th, 2022. The results are:

B.M. is a USGS brass tablet in the NW corner of the bridge.

Elevation 25.90 ft. (origin) Levels May 11th, 2022.

R.M. 1 is a chiseled X in the NE abutment wing wall.

Elevation 24.99 ft. Levels May 11th, 2022.

R.M. 2 is a chiseled ☐ in the concrete collar at a manhole 50 ft. east of the northeast bridge abutment.

Elevation 22.86 ft. Levels May 11th, 2022.

R.P.1 is an arrow chiseled in vertical support of walkway 325 ft. north of south riverbank.

Elevation 31.39 ft. Levels May 11th, 2022.

R.P.2 is an arrow chiseled in vertical support of walkway 62 ft. north of south riverbank.

Elevation 31.95 ft. Levels May 11th, 2022.

R.P.3 is an arrow chiseled in vertical support of walkway 105 ft. south of the NE abutment.

Elevation 29.79 ft. Levels May 11th, 2022.

North WWCB is located 110 ft. south of the NE abutment.

Elevation 27.50 ft. Levels June 25, 2019; not surveyed in 2022.

South WWCB is located at station 595.

Elevation 30.82 ft. Levels May 11th, 2022.

Gage datum is 1,429.239 ft. above mean sea level (NAVD88) as determined by levels on March 31, 2014.

Hydrology

Drainage Area

647 square miles , of which about 410 square miles contributes directly to surface runoff (from USGS Water Resources Data for Nebraska, Water Year 1975).

Channel and Control

Control conditions are highly variable and unstable. Flow in the Loup River at Columbus is considerably affected by operation of the Loup River Public Power District diversion to the Loup Power Canal near Genoa. The river channel bank to bank is very wide, but normal flow past the Power Canal is low enough that it forms several secondary channels at the gage separated by low sand bars. Shifting sand within the channels readily scours and fills with variable flow. Very high flows past the power canal diversion will have channel control and often causes major changes in the low water control.

Discharge Measurements

Most discharges can be waded in the vicinity of the gage due to generally low flow because the Loup Public Power District Power Canal diversion about 25 miles upstream near Genoa, Nebraska diverts most of the Loup River, except during high water and winter slush conditions. High water is measured from the pedestrian walkway on the east downstream side of the bridge.

Floods

Highest ranking major flood during USGS period of operation prior to October 1978 was flood of August 14, 1966, gage height at 14.42’ stage, instantaneous peak flow cfs of 119,000 cfs.

Extremes for Period of Record

Peak discharge 119,000 cubic feet per second August 14, 1966, gage height 14.42 feet, from USGS rating curve extended above 52,100 cubic feet per second by logarithmic plotting and volumetric study; minimum daily discharge 9.4 cubic feet per second July 30, 1974. Minimum daily flow during USGS period of gage operation was 1.8cfs on August 30 and 31, 1976.

Point of Zero Flow

Variable due to the shifting nature of the fine sand in the channel.

Observations of PZF since the gage was discontinued by USGS are as follows:

Date	Stage Elevation PZF	Remarks
September 24, 2007	1.85’	Used RP#3
August 11, 2008	1.92’	Used RP#2
July 15, 2009	2.30’	
August 5, 2010	1.05’	Scour from flood flows
July 26, 2011	1.87’	
September 1, 2011	2.22’	
August 1, 2012	2.45’	
August 17, 2013	2.84’	
September 19, 2013	2.62’	
September 18, 2015	2.15’	
September 7, 2016	2.09’	
September 21, 2018	2.18’	
Water Year 2019	----------	No PZF taken
Water Year 2020	----------	No PZF taken
August 24, 2021	-0.56’	Drought declared
Water Year 2022	0.54’	Drought declared
Water Year 2023	0.84’	Drought declared

Winter Flow

Subject to complete or partial ice cover. Ice jams do occur. Flow is somewhat diminished during irrigation season due to irrigation diversions upstream. Flow can suddenly fluctuate when the Loup Power Canal headgate diversion closes and opens.

Regulation and Diversions

There are numerous small pump diversions for irrigation in the Loup River Basin. There are nine irrigation diversions, including Sherman Reservoir Feeder Canal that generally divert water May through September. The Loup Power Canal near Genoa diverts year-round except during winter slush conditions and debris and high water.

Accuracy

Records are fair to good except for periods of ice effect, which are poor.

Establishment and History

Previously operated and published by the U.S. Geological Survey. Period of record under USGS operation was October 1894 to September 1915, March to September 1931, October 1933 to October 1978 when gage was discontinued by USGS.

The original National Weather Service wire weight was repaired and re-installed May 8, 2008 about 110 feet south of the north bridge abutment on the downstream rail of the pedestrian walkway.

The gage was officially re-established by the Nebraska Department of Natural Resources September 23, 2008.

On September 23, 2008 an 18”X18”X30” long metal utility box was installed over the south channel of the river near RP#2. Gage equipment installed in the box consisted of an H-500XL Design Analysis data logger connected to an H-3611 Design Analysis radar water level sensor. Power is provided by a 12 volt battery with 10 W. solar panel and regulator.

On November 13, 2008, after a high water event, the instruments were moved to the north channel near the wire weight.

On June 25, 2009 the H-500XL was removed and a GOES data collection platform was installed. The DCP consists of a Design Analysis H-522+ logger/GOES transmitter and a Microcom Design UB8 antenna.

On June 5, 2012, after a high water event, the instruments were moved back to the south channel. The radar water level sensor and associated recording equipment is moved back and forth from south channel to north channel as the water periodically migrates back and forth.

On June 26, 2017 the old H-522+ WaterLogger was retired and a new H-522+ WaterLogger was installed.

On May 26th, 2022: OTT radar and a Sutron SL3 was installed. Waterlog equipment was removed.

On June 6th, 2022: A second radar bracket was installed north of the gage box. This allows the radar to be transferred north or south to follow the main stem flow of the Loup River.

Revision History

Original description established by Guy H. Lindeman 03/09/2010

Revised by Wm. H. Birkel on 03/30/2011

Revised by Wm. H. Birkel on 06/15/2012

Revised by Wm. H. Birkel on 11/06/2013

Revised by Wm. H. Birkel on 03/02/2015

Revised by Wm. H. Birkel on 07/17/2015

Revised by Wm. H. Birkel on 07/14/2016

Revised by Wm. H. Birkel on 01/30/2017

Revised by Grant Beckman on 11/26/2018

Revised by A. Houser 09/30/2021

Revised by A. Houser 10/31/2022

Revised by A. Houser 10/05/2023