NEBRASKA
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DEPT. OF NATURAL RESOURCES

Elkhorn River at Neligh, Nebraska
06798500

LOCATION

Latitude and Longitude

42.12296 -98.04387

Road Log

Gage is located on left downstream abutment 30 feet downstream from the roadway on Nebraska Highway 14 bridge, one half mile southwest of Neligh, NE.

Nearby Features

Neligh Mills Historical Site and overflow channels downstream of present site.

Equipment Details

Recording Gage

Consists of a Waterlog H-522+ with a Waterlog H-3553 Bubbler. Orifice consists of an OTT radar gun in the middle of the bridge, downstream side. Satellite communications is obtained from the H-522+ recorder and transmitter. A rain gage is also collecting data at this site.

Real-time data can be accessed through the internet https://nednr.nebraska.gov/RealTime

External Gage

The base gage is a Type A wire weight gage mounted on the downstream side of the Nebraska Highway 14 bridge rail about 100’ right of the left abutment. The wire weight check bar elevation is set at 23.33 feet gage datum on June 26, 2019.

Bench Mark and Reference Marks

Reference marks at the old Nebraska Highway 14 bridge near the Neligh Historic mill: All of the old marks at the mill site may have been destroyed or moved in the flood of June 14, 2010. At this time, they have not been checked to see if they are there.

R.M. #1, R.M. #2, and R.M. #4 destroyed

R. M. #3 is standard bronze tablet in concrete post 33’ downstream from right end of bridge,11’ shoreward from concrete retaining wall and 10’ downstream from northeast corner of shelter. This R.M. was found to be unstable. Elevation at 16.50’, gage datum levels of November 15, 1984 - old gage site.

R.M. #5 is chiseled (square top) of rivet on stream ward side of lap in steel caisson on downstream bridge pier near ground line on right bank 25’ upstream from shelter. Top of

caisson has titled shoreward after 1970; therefore R.M. is unstable. Elevation at 7.32', gage datum levels of November 15, 1984 - old gage site.

R.M. #6 (basic) is standard bronze tablet set flush on top of old concrete retaining wall 9' stream ward and 28' downstream from northeast corner of shelter. Elevation 13.61' above gage datum (corrected) - old gage site.

R.M. #8 is a chiseled box in concrete located in SW corner of concrete south of the gage house shelter. Elevation is 17.09' above gage datum - old gage site.

R.P. is chiseled "v" on downstream handrail of bridge 33' left of wire weight gage. Established February 9, 1979. Elevation 22.98', gage datum levels of November 15, 1984. Datum of gage is 1,714.00' (corrected) National Geodetic Vertical Datum of 1929 - old gage site.

Nebraska Highway 14 bridge GAGE SITE: Reference marks established July 7, 12, 13, 1999.

R.M. #9 is a chiseled square on the upstream concrete bridge rail near the left end. Elevation is 25.59 feet above gage datum - levels as of October 26th, 2022.

R.M. #10 is a chiseled square on the downstream left wing wall. Elevation is 21.72 feet above gage datum - levels as of October 26th, 2022.

R.M. #11 is a chiseled arrow on the leg of the gage house shelter at the southeast corner. Elevation is 21.39 feet above gage datum - levels as of October 26th, 2022.

R.M. #12 is a brass table installed in the right downstream bridge rail near the right end. Elevation is 24.35 feet above gage datum - levels as of October 26th, 2022.

R. M. #13 is a chiseled "x" on the downstream left wing wall. This "x" mark is .4 feet southwest of R.M. #10 and was established by a Lincoln survey crew several months earlier. Elevation is 27.72 feet above gage datum - levels as of October 26th, 2022.

R.P. #3 is a chiseled arrow in the bridge rail 10 feet right of the wire weight and about 100 feet right of the left downstream bridge abutment. Elevation is 24.07 feet above gage datum - levels as of October 26th, 2022.

R.P. #4 is a chiseled "v" in the downstream bridge rail Camber Station 1+78. Elevation established at 24.09 feet above gage datum - levels as of October 26th, 2022.

R.P. #5 is a chiseled "v" in the downstream bridge rail Camber Station 0+67 elevation established at 24.10 feet above gage datum - levels as of October 26th, 2022.

WWCB elevation is 23.35 feet above gage datum - levels as of October 26th, 2022.

From survey of April 1, 2014, gage datum is 1,717.93 feet above MSL North American Vertical Datum of 1988 (**NAVD88**).

Hydrology

Drainage Area

2,200 square miles (includes about 400 square miles of closed basin in the Sandhills area of Nebraska for which the drainage is indeterminate), of which about 1,200 square miles contributes directly to surface runoff as measured from base maps of Nebraska State Planning Board, scale 1:125,000.

Channel and Control

Channel is straight for about 700 feet upstream and 1000 feet downstream from the gage. Both banks are high and timbered; subject to only occasional overflow. Bed of stream is composed of fine sand, which is constantly shifting. Sand bars may form at low flows resulting in sectional control. Channel control should prevail at mid-range and high flows.

Discharge Measurements

Low water can be measured by wading at a section 200 feet to 300 feet upstream or downstream of the bridge. Sometimes the best measuring section for low flow is the city park ½ mile downstream. High and medium stages are measured from downstream side of Nebraska Highway 14 bridge, which is marked at ten foot intervals; initial point for surroundings is at left abutment. *Do not fail to measure overflow*. There is a concrete overflow culvert about ¼ mile north (left) of the bridge.

Floods

The National Weather Service lists flood stage at Neligh as of 01/01/2019:

Major Flood Stage:	14 feet.
Moderate Flood Stage:	12 feet.
Flood Stage:	11 feet.
Action Stage:	9 feet.

Extremes for Period of Record

Peak discharge 42,500 cubic feet per second June 14, 2010, gage height 15.54 feet; minimum daily discharge 11 cubic feet per second August 31, 2013.

Point of Zero Flow

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

PZF = +0.14-feet for Water Year 2022.

Winter Flow

Subject to complete or partial ice cover. Ice jams seldom occur.

Regulation and Diversions

There are approximately 42 cubic feet per second of direct river irrigation diversions above the Neligh gage irrigating about 3,400 acres as of 1997. Well irrigation is much more prevalent in the basin above the Neligh gage irrigating an estimated 260,000 acres. The flow is totally unregulated due to the absence of major reservoirs upstream.

Accuracy

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

Establishment and History

Established by U.S. Geological Survey in October 1930 at the Neligh Mills site.

Discontinued in September 1958

Reestablished by U.S. Geological Survey August 8, 1960

October 1930 to April 16, 1933: Staff gage composed of enameled gage plates (0-9.11 feet) fastened to stream ward side of 12 inch piling, located on right bank 40 feet downstream from bridge

April 17, 1933 to January 23, 1939: Chain gage on downstream side of bridge. The original length of the chain was 23.34 feet but varied from 23.34 to 23.38 feet.

January 24, 1939 to October 9, 1958: A Stevens A-35 continuous recorder and chain gage (January 24, 1939 to April 30, 1957) or wire weight gage (wire weight gage installed May 1, 1957) wire weight check bar elevation established at 21.81 feet above gage datum.

Station discontinued October 9, 1958.

Station reestablished August 8, 1960.

August 3, 1960 to September 8, 1970 water-stage recorder in well gage 10 feet downstream from bridge.

On September 8, 1970 a manometer operated gage in a 5x5 metal Corps type shelter 30 feet downstream from the bridge replaced the well gage.

The Nebraska Department of Water Resources assumed sole operation of the gage on October 1, 1985 until October 1, 1986 when the gage was placed in the DNR/USGS Cooperation Program until October 1, 1994.

DNR reassumed sole operation of gage on about October 1, 1994 after USGS dropped the gage from the Cooperation Program.

On April 21, 1995 USGS removed their equipment from the gage, rendering the gage Inoperative.

As of April 26, 1995, DWR is the sole owner/operator of this gage.

On April 26, 1995 Department of Water Resources acquired the shelter from USGS and reinstalled DWR equipment to get the gage back into operation. This equipment consisted

of a servo-manometer with a purge gas system and a Stevens A-71 water stage recorder with 1:6 scale.

On June 10, 1997 the servo-manometer and purge gas system was replaced with Fluid Data Systems WaterGage G2-25 balance beam manometer and SafePurge bubble rate controller.

On June 16-18, 1999 all gage equipment except the wire weight was moved about ¾ mile upstream to the left, downstream side of the Nebraska Highway 14 bridge. A Design Analysis Assoc. H-510 data logger was installed as the primary recorder and a new wire weight was installed on the Nebraska Highway 14 bridge about 10 feet left of RP3. The wire weight check bar elevation was arbitrarily set to 23.33 feet.

On July 7 new RMs 9, 10, 11, and 12 were established and referenced to the assumed wire weight check bar elevation of 23.33 feet.

Profile levels were run July 12 and 13, 1999 from old gage site at the Mill to the Highway 14 site to establish sea level elevations. RMs and RPs were adjusted to gage datum.

On August 3, 1999 gage datum was raised from 1714.00 to 1717.5 feet NGVD of 1929. RPs were adjusted accordingly and the wire weight check bar was set to 23.31 feet.

Telephone access was installed August 4, 1999 using a Design Analysis Assoc. H-219 data modem connected to the H-510 data logger.

On June 18, 2002 the encoder and H-510 Data Logger were replaced.

On May 12, 2005 the gage system was hooked up to satellite retrieval for real-time data on Department of Natural Resources secure website.

September 1, 2010 the Fluid Data Systems Water Gage G2-25 with nitrogen purge gas system Safe Purge bubble rate controller, shaft encoder, and Stevens A-71 strip chart recorder was removed and new equipment was installed. An OTT CBS pressure transducer with self-enclosed air system is wired to a Design Analysis Assoc. H-500 electronic data logger with a Water Log H-222 GOES transmitter. A rain gauge is also collecting data at this site.

On April 1, 2014 the wire weight check bar elevation is set at 23.33 feet gage datum from Levels to establish gage datum 1,717.93 feet above MSL (NAVD88).

On January 14, 2016 new equipment installed, now consists of a Waterlog H-522+ with a Waterlog H-3553 Bubbler. Satellite retrieval is obtained from the H-522+. The base gage is a Type A wire weight gage mounted on the downstream side of the Nebraska Highway 14 bridge rail about 100 feet right of the left abutment.

July 7, 2020 an OTT radar gun was installed in the middle of the bridge, downstream side.

Revision History

Original description revised by G.B Engel on 10/10/1972

Revised by H.D. Stevenson 07/18/1979

Revised by Ken Meikle 03/11/1986

Revised by Wm. H. Birkel 08/20/1996

Revised by Wm. H. Birkel 05/14/1997

Revised by Wm. H. Birkel 06/16/1998

Revised by Wm. H. Birkel 03/31/1999

Revised by Guy H. Lindeman & Wm. H. Birkel 11/29/1999

Revised by Wm. H. Birkel 03/08/2001

Revised by Wm. H. Birkel 03/17/2003

Revised by Wm. H. Birkel 04/05/2004

Revised by Wm. H. Birkel 06/29/2005

Revised by Wm. H. Birkel 04/11/2007

Revised by Wm. H. Birkel 06/17/2008

Revised by Wm. H. Birkel 03/13/2009

Revised by Wm. H. Birkel 04/19/2010

Revised by J.A. Marburger 03/03/2011

Revised by Wm. H. Birkel 04/22/2013

Revised by Wm. H. Birkel 12/23/2013

Revised by J.A. Marburger 02/28/2014

Revised by Wm. H. Birkel 07/24/2015

Revised by Wm. H. Birkel 04/08/2016

Revised by Wm. H. Birkel 01/10/2017

Revised by Wm. H. Birkel 11/14/2017

Revised by S. Figuric 11/30/2017

Revised by Wm. H. Birkel 10/01/2018

Revised by A. Houser 10/10/2019

Revised by A. Houser 09/30/2021

Revised by A. Houser 10/31/2022