



Red River at Grand Forks, ND (05082500) water-level history

Water-level (stage) data has been collected on the Red River in Grand Forks since September of 1902. The stage data has been collected at eight different locations through the years. From September 1, 1902 to November 2, 1933, the stage data was obtained by manual reading of a staff gage or chain gage, once per day. From November 3, 1933 to present, the stage data has been collected using an automated continuous recorder with readings obtained hourly (or more frequently). The record is not complete and contains some incomplete and missing years.

The time period, location and reference datum of the stage readings is noted below:

1. **October 1, 2004 to present;** Continuous water-stage recorder on the downstream side of the Sorlie bridge, datum of gage is 779.00 ft above National Geodetic Vertical Datum of 1929 (NGVD of 1929).
2. **October 1, 1986 to September 30, 2004;** Continuous water-stage recorder on the right, upstream side of the Sorlie bridge, datum of gage was 779.00 ft above NGVD of 1929.
3. **October 1, 1983, to September 30, 1986:** Continuous water-stage recorder on the right upstream side of the Sorlie bridge, datum of gage (*changed from above*) was 780.00 ft (NGVD of 1929).
4. **April 14, 1965, to September 30, 1983:** Continuous water-stage recorder 1.9 mi downstream, datum of gage (*changed from above*) was 778.35 ft (NGVD of 1929)
5. **November 3, 1933, to April 13, 1965:** Continuous water-stage recorder 1.6 mi downstream, datum of gage was 778.35 ft (NGVD of 1929)
6. **October 16, 1926 to November 2, 1933:** Staff gages about 1.9 mi downstream, datum of gage was 778.35 ft (NGVD of 1929)
7. **September 1, 1902 to October 15, 1926:** Staff gage and chain gages on Northern Pacific Railway bridge 0.4 mi downstream, datum of gage was about 778.35 ft (NGVD of 1929)

Datum Discussion

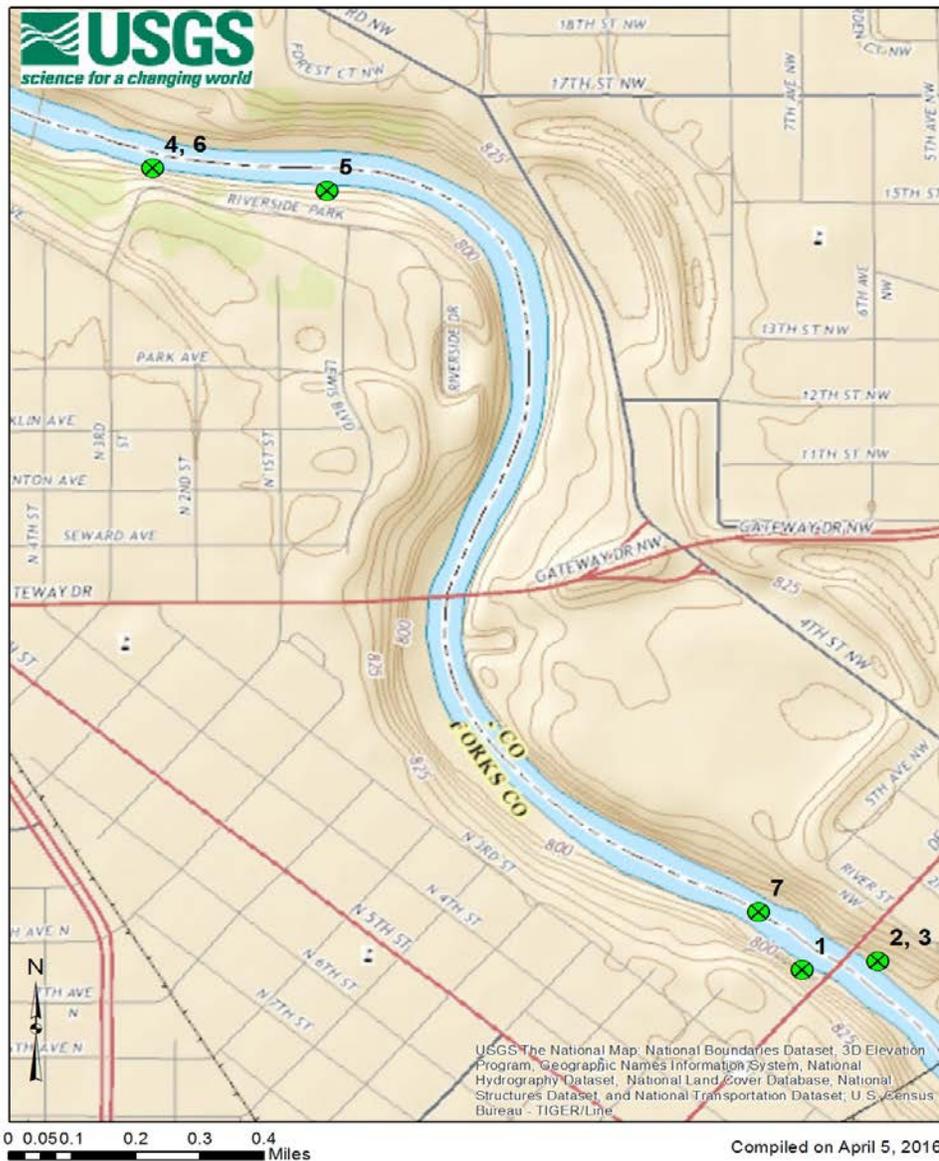
Prior to 2016, Water Supply Papers (WSP) and Annual Data Reports (ADR) originally noted datum as:

- a) **1882-92;** Gages near site of Great Northern Railroad bridge, 1.5 mi upstream, datum unknown;
- b) **1892 to October 15, 1926;** Staff and chain gages on Northern Pacific Railway bridge at datum about 5.5 ft higher but published at datum 0.5 ft higher, than present datum.
- c) **October 16, 1926 to November 2, 1933;** Staff gage near present site at datum 5 ft higher than present datum, but published at present datum.
- d) **November 3, 1933 to April 13, 1965;** Water stage recorder 0.3 mi upstream at present datum

Based on research completed by S.M. Robinson and G.J. Wiche, in April 2016, it appears that the above statement labelled “b” did not take the conversion from the 1912 adjustment to NGVD of 1929 into

account. Based on historical documentation it appears that NGVD of 1929 in 1934 is -0.67 ft lower than the 1912 adjustment (Gage history developed on January 30, 1934 by G.L. Oakland, Appendix 1).

05082500 Red River at Grand Forks - Historical gage locations



Based on the January 30, 1934 gage history the gage datum was 779.10 ft using the 1912 adjustment and 778.43 ft in NGVD of 1929. Therefore, the 0.5 ft higher should not be used as stated. The datum for 1965 when the “b” statement was developed was 778.35 ft so the “present datum” statement is correct. If the datum for the present time period (April 2016) is used, the datum should be noted as “0.65 ft lower than present datum”.

Both statements labelled “b” and “c” are a little confusing. In this time period there was a staff gage established by the USGS with a gage datum (gage zero) 5 feet lower than a staff gage operated by the US Army Corps of Engineers (USACE) and the US Weather Bureau (USWB). In order to avoid confusion and to keep the gage-heights published by the USGS in-line with those published gage-heights by the USACE and the USWB, 5.0 ft was added, in the office during records compilation, to all USGS observer readings. A letter from the WSC archives dated May 20, 1935, notes that, “datum of 784.10 ft as published in WSP 685, 710 and 730 is incorrect” and the correct datum is 778.43 ft (later corrected to

778.35 ft). The “5 ft higher than present datum” statement should be ignored and the current datum should be used.

Gage History prior to 1901

The USACE maintained a dredge boat from some time in the 1870's until about 1922. A staff gage was installed and read during open water periods for quite a few years. No description or location for this early gage is known. Following completion of the Northern Pacific Railroad bridge in around 1892, readings were made from a staff gage or chain gage attached to the downstream side of this bridge. Water level readings were obtained at this location until the completion of a municipal dam in the winter of 1925-26. The gage history completed in by Godfrey L. Oakland in January 30, 1934 mentions that stage records between 1873 and 1921 can be found in bound volumes at the USACE office in St. Paul, Mn, and documents known as “Daily Hydrographs Portfolio 9”.

This history of available stage record was compiled on April 21, 2016.

Appendix 1

Appendix 1 shows the gage history developed by Godfrey L. Oakland.

Red River @ Grand Forks, N. Dak.

Gage History

The U. S. Corps of Engineers in connection with dredging for navigation maintained a dredge boat at Grand Forks, N. Dak., from some time in the 1870's until about 1922. A gage was installed by them and read by some member of the crew of the dredge boat during open water periods for quite a few years. No description or location of this early gage is known but was probably a staff gage near the mooring site of the dredge boat. Following the completion of the N. P. R. R. bridge at about 1892, readings were made from a staff gage attached to the downstream sheer fence of this bridge, or from a chain gage also on this bridge. Readings were made at this location until the winter of 1925-26 when the municipal dam was constructed below the gage which destroyed the relation between stage and discharge. In 1926, a staff gage was installed below the municipal dam with low water section on the timber retaining wall and readings made on this gage until the fall of 1933. A continuous recording gage was installed at that time near the staff on retaining wall with the staff serving as outside gage and records obtained from recording gage after November 1933.

The gages established by the Corps of Engineers were maintained with zero at 784.90 m.s.l. as noted in each bound volume of gage heights. This elevation was the low water mark of 1881 which was then assumed to be the lowest stage likely to occur. Records during the following years disclosed the fact that the stage occasionally dropped below the zero of the gage. In April 1903 the U. S. Geological Survey attempted to change the datum, and placed a new gage with its zero five feet (5.00 feet) below the zero of the gages previously used, so as to eliminate negative readings. Ever since, all readings as published by the U. S. Geological Survey have been referred to the "U. S. Geological

of the gage as actually constructed and read but, to the gage readings for these years 5.00 feet has been added so the elevation of the "U. S. G. S. standard gage" during this period was 779.10 feet m.s.l. (1912 adj.) or 778.43 ft. m.s.l. (1929 adj.) The 1929 adjustment of levels by the Coast & Geodetic Survey gives the sea level elevation of Grand Forks as 0.67 ft. lower than the 1912 adjustment.

The U. S. Weather Bureau has published gage height records (but no discharge) from 1917 to date. They published the elevation of the zero of the gage as 786.4 for 1917-27 and zero of gage as 785.8' from 1927 -32. (1932 latest published volume.)

Records available.

Year	Period	Description	U.S. Engr. St. Paul	g. hts.	No. dis.
1873	Aug. Sept. Oct.	old gage books	"	"	"
1879	" " "	"	"	"	"
1882	Mar. 31 to Nov. 11	Daily hydrographs Portfolio 9	"	"	"
1883	Apr. 1 to Nov. 11	"	"	"	"
1886	Apr. 4 to Dec. 5	"	"	"	"
1886	Mar. 22 to Nov. 10	"	"	"	"
1887	Mar. 23 to Nov. 30	"	"	"	"
1888	Apr. 1 to Nov. 30	"	"	"	"
1889	Mar. 1 to Nov. 23	"	"	"	"
1896-1921	Bound volumes	U. S. Engineers Office St. Paul (in two sheets)	"	"	"
A few scattered float & current meter meas. made during years 1873-1921.					
1901 to date	published in U. S. G. S. water supply papers g. hts. & discharge				
1917 to date	published by U. S. Weather Bureau g. hts. no discharge.				

No records available as far as known

1874 78

1880-81

1884) These records formerly at St. Paul office U. S. Engrs. but have either
1890-95) been lost or destroyed. Were in large bound volumes.

According to W. S. papers (U.S.G.S.) records are available from 1882 to date. (Should be corrected.)

G.L.O.
1/30/34