THESE ARE REVISED DATA

See revised Data

9-197

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

File No. { Washington / Field

Sheet 2 of 2

Description Prepared revised 3-9-45 (Date)

by S.D.B. & W.H.G.

Description of Gaging Station on Brazos River/~~Creek~~

At ~~Near~~ Richmond State of Tex.

Prepare description in accordance with outline on back of Form 9-277. Plot cross section to scale. Use Form 9-213A for sketch and cross section. Initial and date all sheets.

see Note 2

Dept. Bulletin #20, p.120). Elev. above mean sea level, 93.~~863~~ 907 12/21/54 ft., datum of 1929.
Elev. above zero of gage, 52.96 feet.
Datum of gage is 40.94 feet above mean sea level, datum of 1929, supplementary adjustment of 1943.

Control.- Control for all except extremely high stages is sand, gravel and silt streambed and banks. After banks are overflowed contours of the flood plain and its vegetation will have some controlling effect. Control will shift for all stages. In addition, loop curves of varying dimensions will be experienced during most floods.

Discharge measurements.- Wading measurements can be made of discharge up to 700 to 1,000 sec.-ft. at control 2 miles below recorder. Regular measuring section is ~~cableway 270 feet downstream from gage. Cable is a one-inch 19 wire-galvanized plow steel tramway cable, designed for a 1500 lb. load concentraded at center. Span between towers is 592 feet. Unloaded sag is 9 feet at 0°F and 12 ft. at 100°F. Cable is anchored at each end to concrete deadmen of gravity surface type (see cross-section at cableway for anchorage detail). There is a standard open socket at right end and a closed bridge socket, with 36" take-up, at left end. Cable is supported by galvanized steel A-frames set on concrete pedestals; left A-frame is 30 feet high and right A-frame is 22 ft. high. Initial point for sounding stations is center of right A-frame. Cable is marked with one mark at 10, 2 at 50, and 3 at 100-foot stations. A cable car with reel mounted on side is kept at right A-frame.~~

~~For stages above about 38 feet, measurements can be made from~~ bridges on highway. There are 23 openings (to and including Oyster Creek at Sugarland) to left of main channel, some of which begin to carry water between 35 and 38 feet. These openings should be inspected whenever stage gets above 35 feet. Water will probably flow through these openings for several days after river at gage falls below overflow stage. Initial point for soundings (all bridges) is face of left abutment. Station numbers are marked on upstream edge of walkway on main channel bridge and on upstream guardrail for all other bridges. All bridges have been cross-sectioned. With exception of main channel bridge, datum is assumed to be 50.0 feet at center of road at center of each span.

Stream bed is of sand and silt, free of vegetation and subject to shift. There will be one channel up to a stage of 35 - 40 ft., when water will begin to flow to left of main channel. Above 35 - 40 ft., there will be several channels. At the elevation of December 1913 flood there was one channel several miles wide.

~~At cable the maximum depth of water is 6 feet more than gage-height. This figure may vary greatly due to shifting channel.~~

~~Flow is normal to cable; there may be a small angle at bridge.~~

Mean velocities range from less than 1 ft. per sec. at low stages to over 6 ft. per sec. at high stages. Flow is smooth.

Channel is comparatively straight for from 500 ft. above to 1,000 ft. below gage. ~~Right bank is high, clean, and not subject to be overflowed. Left bank is sloping,~~ partly covered with willow trees and is overflowed at about a 35-foot stage.

Cable destroyed by flood in May 1957. JNJ

0.2 depth method may be used above a stage of 14 feet gage height (discharge, about 20,000 sec.-ft.) in accordance with circular letter, "Measurements-current meter, 0.2 depth method for flood use", dated Sept. 26, 1944. The method will be used at ~~cableway~~ bridge.

Good measurements can be made from ~~cable~~ bridge except at very low or very high stages.

Floods.- Greatest flood ~~known~~ since at least 1852 occurred Dec. 10, 1913, reaching a stage of 48.2 ft. (present datum) at a point on right bank about 1,000 ft. above gage. This elevation determined by levels of Feb. 1, 1945, to marks in a blacksmith shop and in a lumber yard, both considered reliable, and which had elevations of 48.3 and 48.1 ft. respectively. Records of the Southern Pacific Railroad Co. show that this flood reached a stage of 47.5 feet, present datum, at their bridge 925 ft. above gage (see levels of 1/9/45). The figure of 48.2 ft., which is the mean elevation of the two highwater marks tied in by the levels of Feb. 1, 1945, will be used rather than the figure furnished by the So.Pac. RR. The figure of 45.4 ft. for the crest of the 1913 flood which was published from 1931 to 1943, was obtained by running levels to a board nailed to tree on left bank near gage purported to mark the crest of the flood, but it was undoubtedly in error. As the present recording gage is located at the downstream end of a concrete bridge pier, the crest stage obtained by it for a flood of like magnitude to the 1913 flood might be materially less than the figure of 48.2 ft. obtained upstream. However, no figure for the 1913 flood at the gage will be given until comparative water-surface elevations at both sites during a large flood can be obtained.

A stage of 40.6 ft., present datum, was reached June 6, 1929, determined by levels to floodmarks at right end of highway bridge at gage.

Additional highwater data from the So.Pac.RR Co. show the following stages to have been reached at the railroad bridge (present datum):

~~July 1899~~	45.6 ft.	
June 13, 1885	44.7 ft.	No correction applied for slope between railroad bridge and gage.
~~May 1884~~	43.7 ft.	
May 2, 1915	43.3 ft.	
~~May 9, 1922~~	40.9 ft.	

Point of zero flow.- 0.6 ± 0.2 ft., October 1939. Subject to change.

Regulation.- Low flow partly regulated by storage in Possum Kingdom Reservoir, capacity at spillway crest, 724,700 acre-feet.

Diversions.- Considerable water diverted above station for irrigation and municipal supply. See records of Brazos Valley Irrig. Co.'s canal nr. Fulshear, and Richmond Irrig. Co.'s canal nr. Richmond, Tex.

Accuracy.- Due to shifting control, records will be fair.

Cooperation.- Station maintained in cooperation with Texas Board of Water Engineers.

Note 1.- Daily records at Texas & New Orleans R. R. bridge, 925 feet upstream, June 14 to Nov. 3, 1901, published in U. S. Dept. of Agriculture, Office of Experiment Stations, Bulletin No. 119.

Note 2.- U.S.C&G.S BM T-804- About .4 mile east along U.S. Highway 59 from the courthouse at Richmond, Ft. Bend Co., at the bridge over the Brazos River in the southend of east abutment, 125 feet south of the ℄ of the highway and about level with the highway. A standard disk stamped "T 804 1943" Elev. 90.33 feet. datum of 1929, Houston supplementary adjustment of 1943, 49.09 ft. above gage datum. Elev. of datum of gage 40.94 feet above mean sea level, datum of 1929 Houston supplementary adjustment of 1943.

Oct., 1914 U. S. GOVERNMENT PRINTING OFFICE 6—7532

THESE ARE REVISED DATA

See Revised Data

9-197

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

File No. { Washington ..... Field .....

Sheet 1 of 2

Description Prepared: revised 3-9-45 (Date)

by S.D.B. & W.H.G.

Description of Gaging Station on Brazos River / Creek

At / Near Richmond State of Tex.

Prepare description in accordance with outline on back of Form 9-277. Plot cross section to scale. Use Form 9-213A for sketch and cross section. Initial and date all sheets.

Location.- Lat. 29°35', long. 95°45' (determined from USGS base map of Texas, scale 1:500,000) on downstream end of right main pier at bridge on U. S. Highway 59, 2 blocks east of courthouse in Richmond, Fort Bend County, and 925 feet downstream from bridge of Texas & New Orleans Railroad (formerly Galveston, Harrisburg & San Antonio Railway, and generally known as one of the Southern Pacific Lines).

Establishment & History.- January 1903 to June 1906: Estab. at Richmond 1/1/03 by T.U. Taylor, district hydrographer for U.S.G.S. Station discontinued June 30, 1906. This gage was at railroad bridge about 925 feet upstream from present gage at highway bridge. During 1903 gage heights were obtained by measuring down from a reference point on bridge with a weighted plumber's chain graduated in feet. During the period 1904-06, gage heights were obtained from a standard chain gage attached to bridge. (For a description of gages and bench marks, see Water-Supply Papers 99, 132 and 174). Zero of gage, 41.84 feet above mean sea level, datum of 1929.

Oct. 1, 1922 to Sept. 30, 1931: During this period a gaging station was maintained at highway bridge at Rosenberg, 7.6 miles upstream from present gage. Records are equivalent with those obtained at Richmond except for the diversions by the Richmond Irrigation Co.'s canal. This gage was a chain gage and was the property of the U.S. Weather Bureau; gage heights furnished by that agency. Datum of this gage was 44.9 feet above mean sea level, unadjusted.

June 7, 1931 to date: Station re-established at Richmond 6/7/31, by V.W.Rupp, USGS. Water-stage recorder housed in timber shelter over corrugated pipe well attached to downstream end of left main pier to highway bridge. This installation failed to obtain a satisfactory gage-height record at low stages because of the building up of a sand-bar around the pier to which the gage was attached. For the use of the Weather Bureau, a wire-weight gage was installed Jan. 31, 1935, by T. Dalrymple, USGS. Recording gage structure was removed from downstream end of left pier and recorder re-installed in a circular metal shelter over a corrugated metal pipe well attached to downstream end of right main pier of highway bridge on 10-23-43. Much of the low-water record from Jan. 31, 1935 to Oct. 23, 1943, was based on the once-daily readings of the Weather Bureau wire-weight gage. 40.94

All gages at Richmond in use after June 7, 1931, were set to same datum, ~~40.84~~ feet above mean sea level, datum of 1929, Houston supplementary adjustment of 1943. 11-16-54

Gage.- Water-stage recorder housed in a 42" circular metal house over a 24" circular galvanized corrugated metal stilling well; attached to downstream side of bridge pier near right edge of low water. Recorder will function from about -2.0 to 52.2 feet.

Elevations of various features of gage:

House and well:	Elev. above zero of gage, in feet
Bottom of well (cone)	- 2.5
Bottom of outside ladder	2.6
Top of lower platform	4.7
Bottom of cleanout door	6.6
Top of upper platform	49.6
Top of house floor	49.7
Top of instrument shelf	52.6

See Note 1.

Intake:

The well is "self-cleaning". There is a small cone, with one-inch opening, which fits in the bottom of well. The cone can be raised by a chain which is fastened to well near cleanout door.

Enameled gage sections, mounted on 2x6" cypress backing, are arranged as follows:

Outside gage:

9.1 ~~0.0~~ - 47.5, on downstream side of well
0.0 - 9.0 do 12/6/50

Inside gage:

3.4 - 10.1, on upstream side of well.

Recorder is equipped with float-tape gage which operates on recorder float wheel and is set to read same as inside gage and can be read to hundredths of a foot.

U.S.Weather Bureau wire-weight gage is attached to upstream handrail of bridge, to which recorder is attached, ~~150~~ 90 feet to left of recorder. Gage is set to recorder datum.

Elev. of checking bar by levels..... ~~xxxxxxxx~~ 58.60 ft. 8-20-46 9/15/48
do by disl..... ~~xxxxxxxx~~ 58.68 ft. do 9/15/48

Weather Bureau observer is Sanford J. Butler, Supt. City of Richmond Water Dept. He makes a daily report of stage to Houston office of Weather Bureau.

U.S.Dept. of Agriculture, under supervision of Mr. Dean Bloodgood, collects silt samples at this station. Mr. Butler is paid $12.00 per month for collecting silt samples, which are forwarded to Mr. Bloodgood at Austin, Tex.

Bench marks.- B.M.1 Abandoned 6-29-38 BM2 abandoned 11-16-54

~~B.M.2: Top of 1/2" round reinforcing bar set in left cable anchorage near eye-bar, and about 3/4" above top of anchor. Elev. above zero of gage, 41.96 feet.~~ 12/21/54

B.M.3: Top of right bolt in row of four anchor bolts in top of downstream end of pier about 0.3 foot above top of pier cap and 265 feet to left of recorder. Elev. above zero of gage, 49.315 feet.

B.M.4: Top of 1/2" round reinforcing bar set in right cable anchorage near eye-bar and about 3/4" above top of anchor. Elev. above zero of gage, ~~50.03 feet.~~ 49.96 ft. 88.9 mi/48 8/20/46

B.M.5: Std. USGS WR bronze tablet set in top of a 5" reinforced concrete post, set 32 ft. below and 0.5 feet above ground, 16 feet upstream from 36" pecan tree, 65 feet downstream from bridge, 180 ft. directly upstream from left cable anchorage and 545 feet to left of recorder. This monument is broken below ground; however, levels of October 1943 indicate no change in elevation. Elev. above zero of gage, 40.86 feet.

B.M.6: Std USGS WR bronze tablet set with sulphur in top of downstream end of right concrete abutment of bridge, to which gage is attached, located 4 feet below roadway and 220 feet to right of recorder. Elev.above zero of gage, 51.275 feet. 9/15/48 12/21/54

B.M.7: Top of a 5/8" galvanized bolt set horizontally in right side of downstream end of pier to which gage is attached. Elev.above zero of gage, 5.830 feet.

37M-1925: (Levels by Topo.Branch,USGS,cooperating with State Reclamation Dept.) State Reclamation Dept. bronze tablet set in concrete post, stamped "Prim.Sta. No. 37M-1925", along south edge of sidewalk, 3 feet west of inside sidewalk intersection at northeast corner of courthouse yard, 2 blocks west of gage. (State Reclamation

9-197

Station description prepared for the U. S. Weather Bureau.
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

File No. {Washington ____ Field ____

Description Prepared 3-13-35 (Date)

by T. D.

Description of Gauging Station on Brazos River Creek

At Near Richmond State of Texas

Prepare description in accordance with outline on back of Form 9-277. Plot cross section to scale. Use Form 9-213A for sketch and cross section. Initial and date all sheets.

On Feb. 1, 1935 a 1932 type wire-weight gage was installed on upstream handrail of footwalk on upstream side of highway bridge.

Location: At bridge on State highway from Richmond to Houston, in east edge of Richmond, Fort Bend County, two blocks east of court house and about 1,500 ft. downstream from the G.H.& S.A. (Southern Pacific) Ry. bridge.

Establishment: June 7, 1931 by USGS; gage maintained at Ry bridge 1,500 ft. upstream from January 1903 to June 1906. The USWB gage was installed Feb. 1, 1935.

Gage: The USWB gage is a 1932 type wire-weight on upstream side of handrail of footwalk on upstream side of bridge, about 130 ft. to right of left bridge pier, near center of main span. Elevation of checking bar is 58.60 ft.

The USGS gage is a continuous recorder housed in a wooden house mounted over a metal well on downstream side of left pier of main span of bridge. There is an outside gage of standard USGS enameled sections on wood backing fastened to bracing between pier and well, ranging from 0 to 50.9 ft.

USWB and USGS gages are to same datum.

The gage used by USGS from January 1903 to June 1906 at railway bridge was set to a datum 1.00 ft. higher than present datum.

Bench Marks: B.M.No.1 - USGS WR bronze tablet set in concrete at right side of right downstream 18" square concrete pile of 9 piles composing pier at left end of steel part of bridge, about 215 ft. to left of USGS gage.
Elevation above zero of gage = 41.72 ft.

B.M.No.2 - Top of $\frac{1}{2}$" round reinforcing bar set in left cable anchor near eye-bar, about $\frac{3}{4}$" above top of anchor.
Elevation above zero of gage = 42.00 ft.

B.M.No.3 - Top of right bolt in row of 4 anchor bolts in top of downstream end of pier to which gage is attached, about 0.3 ft. above top of pier cap.
Elevation above zero of gage = 49.29 ft.

B.M.No.4 - Top of $\frac{1}{2}$" round reinforcing bar set in right cable anchor near eye-bar, about $\frac{3}{4}$" above top of anchor.
Elevation above zero of gage = 50.02 ft.

Sea Level B.M.: (Levels by Topog. Branch USGS) State Reclamation Department bronze tablet in concrete post stamped "Prim. Sta. No. 37M-1925" along south edge of sidewalk 3 ft. west of inside sidewalk intersections at northeast corner of courthouse yard, 2 blocks west of gage. (See Texas Reclamation Dept. Bul. No. 20, page 120.)
Elevation above m.s.l. = 93.76 ft.
Elevation above zero of gage = 52.96 ft.

Elevation zero of gage above m.s.l. = 40.80 ft.

Oct.,1914

U. S. GOVERNMENT PRINTING OFFICE: 1916 6-7532

Control: Below a gage height of 4 ft, control is sand and gravel bars from $\frac{1}{2}$ to $1\frac{1}{2}$ miles below gage. Above 4 ft. control is bed and banks of stream. Control is subject to shift at all stages.

Discharge Measurements: (a) Regular measuring section is at cable 270 ft. downstream from gage. Above about 38 ft. measurements will be made from bridges on highway; there are 24 openings from Richmond to left edge of 1913 flood, a distance of about 9 miles. Below about 1,200 second-feet a wading section may be found at a gravel bar $1\frac{1}{8}$ miles below gage. For very low stages a wading section may be found about $\frac{3}{4}$ mile above gage.

(b) Initial point for soundings is center of right cable tower for cable section and is face of left abutment for all bridges. Station numbers are painted on cable and on downstream concrete guard rail of highway bridge.

(c) Bed of stream is of sand and gravel, clean and shifts badly.

(d) Flow is in one channel up to about 38 ft. when there will be a number of channels until water gets over highway and there will be one channel several miles wide. At cable depth of water is about 8 ft. greater than the gage height. Flow is smooth. Velocities fairly low at low stages and high for high stages. Flow is normal to cable section and at slight angle to normal at bridge.

(e) The channel is straight for 500 ft. above and 1,000 ft. below station.

(f) The right bank is high, clean, and will not be overflowed; the left bank is sloping, covered with willow and pecan trees and is overflowed at about a 38 ft. stage.

(g) Good measurements can be made except at low stages when measurement is made from cable and velocities are low; at extremely high stages when highway is overflowed no current meter measurement can be made.

Floods: The flood of December 1913 reached a stage of 45.4 ft., present datum (determined by levels Aug. 24, 1931 to mark on tree 75 ft. downstream from highway bridge and is considered reliable). The flood of 1899 reached about the same stage as that of December 1913. The flood of June 6, 1929 reached a stage of 40.6 ft., present datum (from flood marks on pier to which gage is attached).

Point of Zero Flow: Approximately zero gage height. Will probably shift considerably.

Winter Flow: No ice effect.

Regulation: None of consequence.

Diversions: The Richmond Irrigation Co. diverts not over 40,000 acre-feet per annum at a maximum rate of 355 second-feet, from a point on right bank 6 miles above gage; a record of this diversion is obtained by the USGS at a station on canal $1\frac{1}{2}$ miles below pump plant.

The Brazos Valley Irrigation Co. diverts not over 99,932 acre-feet per annum at a maximum rate of 685 second-feet, from a point on left bank 18 miles above gage; a record of this diversion is obtained by the USGS at a station on canal one mile below pump plant.

There are many small diversions above station; amount diverted not known.

Accuracy: Good records can be obtained; due to shifting control frequent discharge measurements should be made.

Cooperation: Cost of USWB gage and observer paid by U. S. Weather Bureau. Discharge measuring station built and maintained by USGS in cooperation with the Texas Board of Water Engineers.

Notify Norquest 2 weeks in advance. Abandoned Rosenberg Gage. Equip belongs to U.S.G.S. Austin.

RICHMOND, TEXAS

The Weather Bureau requests the Geological Survey to install a wire-weight gage at Richmond. Mr. A. L. King visited the place in July, 1934, and recommends a location 100 feet riverward from the Geological Survey recorder on left bank pier. He states that at a 2-foot stage the water was about 4 feet deep at this point.

Mr. King furnished no BM data for this gage. The zero datum should be the same as the recorder.

River and Flood Division,
August 22, 1934.