

Received on Feb. 15, 1940  
R. J. McMalum

R E P O R T

COVERING THE DAILY TIDE OBSERVATIONS TAKEN BY THE UNITED STATES  
ENGINEERING DEPARTMENT AT FORT POINT, GALVESTON COUNTY, CITY OF  
GALVESTON, TEXAS.

PERIOD COVERED - JANUARY 1st, 1916 to DECEMBER 31st, 1936

OFFICE OF J. S. BOYLES, C.E.

601-4 Stewart Bldg.,  
Houston, Texas

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AUTHORITIES AND CONCLUSIONS

Under date of September 29th, 1930, Hon. W. W. Caves, Ass't. Attorney General, in an opinion to the Hon. Dan Moody, states: "You are also advised that the expression 'within tide water limits' includes all land lying seaward from the line of ordinary high tide, and that it is covered from time to time by such tide---". This paragraph is taken from a letter dated February 16th, 1935, addressed to J. Stuart Boyles, County Surveyor, Houston, Texas and signed J. H. Walker, Commissioner of the General Land Office.

WAR DEPARTMENT  
UNITED STATES ENGINEER OFFICE  
Galveston, Texas

June 1, 1935

Mr. J. Stewart Boyles,  
County Surveyor,  
Houston, Texas.

Dear Sir:

The elevation of the ordinary water surface at Galveston above mean low Gulf level, the datum plane used by the U. S. Engineer Department in prosecuting river and harbor construction, depends on the force and direction of the wind and varies from an elevation of about +.5 foot to about +3.0 feet. During strong north winds the water surface is at times as low as elevation -2.0 feet, and during exceptionally strong winds from the south it is higher than +3.0 feet.

This office has hourly tide gage readings taken at Fort Point. It is suggested that you call at this office and examine these records with a view to selecting the reading which you consider to be the ordinary high tide.

The ordinary high tide at Dickinson Bayou would, under normal conditions, be at less elevation than at Galveston.

The datum plane (mean low Gulf level) used by the U. S. Engineer Department is .89 foot below the datum (mean sea level) used by the U. S. Coast and Geodetic Survey.

For and in absence of District Engineer:

Very truly yours,

F. E. Cothran  
1st Lieut., Corps of Engineers  
Assistant

On August 26th, 1935 the following information was obtained from Mr. C. A. Ridenour, Ass't. Engineer in Charge, U. S. Engineering Department Office at Corpus Christi, Texas:

Location bench mark - City National Bank Bldg., Corpus Christi, Texas	
U. S. Engineering Department elevation -	10.55
U. S. Coast and Geodetic Survey elevation -	<u>9.72</u>
Difference U.S.E.D. above U.S.C.& G.	0.83

As of August 26th, 1935, there were available 939 daily readings covering a period from January 11th, 1932 to August 31st, 1934 which gave an average greatest diurnal tide of 0.979 at Corpus Christi. There were available 961 daily readings at Port Aransas, Texas, covering a period from February 15th, 1932 to October 5th, 1934, which gave an average G.D.T. of 1.40.



A check between the plane of reference as used by the U.S.C. & G. Survey and the U.S.E.D. plane of reference in the Galveston area shows the U.S.C. & G. plane of reference to be 0.96 above plane of reference of the U.S.E.D.

As the U.S.C. & G. datum is consistent throughout the United States, and is recognized as the most accurate information, I believe that their datum should be used rather than the U.S.E.D. datum which is assumed from very minor observations at various points differing materially at New Orleans, Beaumont, Galveston, Corpus Christi and Brownsville.

Quoting from U. S. Engineers Reports, Galveston District:

1889 Wm. C. Langfitt, Page 1539, Appendix V

Location	G. D. T.		I. D. T.		S. D. T.		M. T.	
	M. H.	M. L.	M. H.	M. L.	M. H.	M. L.	M. H.	M. L.
Gov. Wharf	1.53		0.63		1.206		1.034	
Morgans Point	0.82		0.45		0.69		0.61	

The 1889 report states bench mark used on the Hendley Building established at 6.879 above the mean low or plane of reference from the tidal observations by Mr. H. C. Ripley, Ass't. Engineer, from his tidal observations of 1872 and 1873, quote: "The records so far accumulated are of insufficient extent for a proper determination of the tidal movement". Special notice should be given to the exceedingly short period of time from which this datum was determined, and this whole report should be carefully studied.

1890 Wm. C. Langfitt, Page 1771, Appendix V:

Location	G. D. T.		I. D. T.		S. D. T.		M. T.	
	M. H.		M. H.		M. H.		M. H.	
Gov. Wharf	1.57		0.67		1.16		1.05	
Morgans Point	0.81		0.42		0.67		0.60	

1891 Wm. C. Langfitt, Page 1883, Appendix U:

Location	G. D. T.		I. D. T.		S. D. T.		M. T.	
	M. H.	M. L.	M. H.	M. L.	M. H.	M. L.	M. H.	M. L.
Gov. Wharf	1.63	0.60	1.53	0.37	1.36	0.70	1.49	0.37
Red Fish S.	1.60	0.47	1.51	0.60	1.43	0.99	1.51	0.70
Red Fish N.	1.49	0.69	1.38	0.72	1.25	0.95	1.38	0.78
Morgans Point	1.29	0.47	1.25	0.59	1.10	0.69	1.21	0.61

1892 Wm. C. Langfitt, Page 1528, Appendix U:

Location	G. D. T.		I. D. T.		S. D. T.		M. T.	
	M. H.	M. L.	M. H.	M. L.	M. H.	M. L.	M. H.	M. L.
Gov. Wharf	1.68	0.70	1.54	0.34	1.38	0.72	1.53	0.41
Red Fish S.	1.55	0.39	1.45	0.51	1.34	0.89	1.45	0.60
Red Fish N.	1.46	0.67	1.36	0.71	1.25	0.94	1.37	0.76
Morgans Point	1.29	0.47	1.25	0.59	1.10	0.69	1.21	0.61

Observations from which this data obtained as follows:

Morgans Point May 1887, March 1890 with 8 months records lost.  
 Red Fish N. July, 1889, June 1891 with 6 ½ months records lost.  
 Red Fish S. July, 1889, June 1891 with 7 months records lost.  
 Gov. Wharf May 1887, December, 1891 with 5 months records lost.



From the above records the following tabulations of greatest diurnal tide:

Year	Gov. Wharf	Red Fish N.	Red Fish S.	Morgans Point
1889	1.53			0.82
1890	1.57			0.81
1891	1.63	1.49	1.60	1.29
1892	1.68	1.46	1.55	1.29
	<u>6.41</u>	<u>2.95</u>	<u>3.15</u>	<u>4.21</u>
Average	1.605	1.475	1.575	1.052
Average of Red Fish North and South 1.525				

These last figures reveal a difference of 0.080 feet between the G.D.T. at Government Wharf and the average of the G.D.T.'s of Red Fish North and Red Fish South. Since the two last above mentioned gauges are the nearest to Dickinson Bayou and being the only official record from which a comparison can be made, it is to be presumed that the G.D.T. at or near Dickinson Bayou would be the same, or substantially the same, as at the Red Fish gauges, or 0.080 feet below the G.D.T. at Government Wharf. It should be noted that subsequent to the dates wherein the Red Fish gauge data was obtained, the Red Fish bars, prior to 1936, have been practically dredged away and that both the Texas City and Houston Ship Channels have been constructed. These two features should mitigate in favor of lessening the difference between the G.D.T. at Government Wharf and Red Fish and therefore at Dickinson Bayou.

The computation of G.D.T. at Government Wharf and covering a period of 21 years from January 1st, 1916 to December 31st, 1936, results in 2.0417. If the difference of 0.080 between the G.D.T. at Government Wharf and Red Fish be applied for the 21 year period, we have 1.9617 as the average G.D.T. at Red Fish or in turn at Dickinson Bayou.

The data recently compiled by me and covering 21 years shows a G.D.T. average of 2.0417 and an S.D.T. of 0.577. On the other hand, the Government report of 1889 shows a G.D.T. of 1.53, in 1890 a G.D.T. of 1.57, in 1891 a G.D.T. of 1.63, and in 1892 a G.D.T. of 1.68. Each year of the Government report from 1889 to 1891, as a greater period of time is taken into consideration, shows an increase in the G.D.T., and therefore the fallacy of attempting to fix any kind of an average tide over a short period of time.

G.D.T. means greatest declination tide.  
 S.D.T. " smallest declination tide.  
 I.D.T. " intermediate declination tide.  
 M.T. " mean tide arrived at by adding  
 the sums of G.D.T., S.D.T., and  
 I.D.T. and dividing by 3.

Government Wharf is the same and identical with Fort Point.

The Fort Point records disclose 7017 days out of 7610 in which the tide at sometime during the 24 hours was greater than 1.22 feet above the U.S.E.D. plane of reference.

4172 days on which the tide at sometime during the 24 hours was 2.0 feet or more above the U.S.E.D. plane of reference.

3763 days on which the tide at sometime during the 24 hours was between 2.0 and 3.0 feet above the U.S.E.D. plane of reference.

383 days on which the tide at sometime during the 24 hours was between 3.0 and 4.0 feet above the U.S.E.D. plane of reference.

31 days on which the tide at sometime during the 24 hours was over 4.0 feet above the U.S.E.D. plane of reference.

These figures do not include what has been marked on the daily charts as storm tides.



Under date of July 10th, 1917, Page 900 of the Biennial Report of the Attorney General of the State of Texas, from September 1st, 1916 to August 31st, 1918, Hon. B. F. Looney, Attorney General, is recorded the report of the Hon. Arthur A. Stiles, State Reclamation Engineer. In this report Mr. Stiles has adopted a mean high tide at Morgans Point of 1.22 feet; mean low tide of 0.64 foot. While Mr. Stiles' report does not cover the Dickinson Bayou area, it does cover an arm or extension of the same tidal waters.

Quoting from the said Stiles Report: "Ordinary High Tide. This expression is assumed to signify the "mean" or average high tide, or a height of the tide that might reasonably be expected to occur in the neighborhood during ordinary, normal conditions of the weather, the same being a tide height not the result of storms of unusual winds".

This definition insofar as it effects the tidal lands of the State of Texas is not consistent with that part of Ass't. Attorney General Cave's definition as rendered September 29th, 1930, which said Cave's definition includes all land lying seaward from the line of ordinary high tide that is covered from time to time by such a tide. Does this mean arriving at a tide elevation which is determined by averaging the highest and lowest diurnal tide under only normal conditions uneffected by prevailing winds or does ordinary high tide mean the averaging of the highest daily high tides over a long period of time, taking the same irrespective of wind conditions, excepting only therefrom such daily high tides as would be caused by storm or cyclonic winds? If the tide which sometimes during the 24 hours of each day and from time to time and day to day submerges certain areas, then in my opinion, this is the tide, the average of the daily highest tides over a long period of time, which is the true mean high tide and satisfies the Attorney General's definition.

From 1916 to 1936 there have been continuous, though spasmodic tides, regardless of how they have been occasioned, which extend to a greater elevation, more than twice of 1.22 feet as determined by the Hon. Arthur A. Stiles. If due credence is not given this greater tide elevation, then the State of Texas would be escheated from vast areas of lands actually submerged at some time of the day by the tide waters of the sea. Certainly, when the records reveal 4172 days out of a possible 7610 days in which the tide reached an elevation of 2.0 feet or more, then it is most fallible to attempt to apply an elevation of 1.22 feet as being correct, and would not satisfy the intent of the statutes.

It is a matter of common knowledge that surveys made prior to the effective date of the introduction of common law (in Texas) in April, 1840 are governed by the Civil Laws as applied in Spain and Mexico. Raparian Land Grants on the Gulf are within tide water limits, carry title up to the line of the HIGHEST WINTER TIDE, and the State owns all land BELOW the line of the highest winter or storm tide. See City of Galveston vs. Menard, 23rd Texas Reports, Maury vs. Robison 56th Southwestern Reports (2nd).

On surveys made since 1840 the common law governs and the State only owns tide water lands up to the MEAN AVERAGE HIGH TIDE and not to the high winter or storm tide as under the Spanish Civil Law.

In my opinion, the adoption of the common law in April, 1840 and relative to tide lands, did not intend to break away from the Spanish definition of tidal lands, but to clarify by averaging all of the daily highest tides into a mean or average highest tide as against a possible exceptionally high tide in the winter.



YEAR	DAYS	NO. DAYS RECORD AVAILABLE	PLUS	H I G H NO. DAYS		L O W NO. DAYS		
				O.00	MINUS	PLUS	O.00	MINUS
1916	366	365	365	0	0	210	32	123
1917	365	363	362	1	0	164	27	172
1918	365	365	365	0	0	220	13	132
1919	365	354	354	0	0	279	22	53
1920	366	359	358	1	0	290	15	54
1921	365	358	358	0	0	281	20	57
1922	365	364	364	0	0	338	4	22
1923	365	357	357	0	0	342	7	8
1924	366	358	357	1	0	310	14	34
1925	365	363	362	1	0	330	6	27
1926	365	361	360	0	1	289	14	58
1927	365	361	361	0	0	340	6	15
1928	366	365	365	0	0	315	13	37
1929	365	364	364	0	0	328	11	25
1930	365	363	363	0	0	311	19	33
1931	365	364	363	1	0	294	13	57
1932	366	365	364	1	0	302	17	46
1933	365	365	365	0	0	300	15	50
1934	365	365	364	0	0	241	24	100
1935	365	365	364	0	1	258	21	86
1936	<u>366</u>	<u>366</u>	<u>365</u>	<u>0</u>	<u>1</u>	<u>285</u>	<u>15</u>	<u>66</u>
TOTAL	7671	7610	7601	6	3	6027	328	1255

TOTAL NUMBER OF DAYS IN THIS PERIOD 7671

TOTAL NUMBER OF DAYS WHEREIN READINGS AVAILABLE 7610

NUMBER OF DAYS NO RECORD OF READINGS AVAILABLE 61

THERE WERE 7601 DAYS ON WHICH THE HIGHEST TIDE WAS ABOVE 0.00

THERE WERE 6 DAYS ON WHICH THE HIGHEST TIDE WAS EXACTLY 0.00

THERE WERE 3 DAYS ON WHICH THE HIGHEST TIDE WAS BELOW 0.00

THERE WERE 6027 DAYS ON WHICH THE LOWEST TIDE WAS ABOVE 0.00

THERE WERE 328 DAYS ON WHICH THE LOWEST TIDE WAS EXACTLY 0.00

THERE WERE 1255 DAYS ON WHICH THE LOWEST TIDE WAS BELOW 0.00



HIGHEST HIGH TIDE DATA

SUM TOTAL OF THE HIGHEST DAILY TIDES 15,538.05

AVERAGE DAILY OR MEAN DAILY HIGHEST TIDE 2.0417

<u>MONTH</u>	<u>NO. DAYS</u>	<u>TOTAL READINGS HIGH</u>	<u>MONTHLY AVERAGE</u>
January	648	1,134.60	1.75092
February	593	1,047.20	1.76593
March	649	1,191.40	1.83574
April	627	1,291.50	2.05980
May	645	1,441.00	2.23411
June	623	1,344.80	2.15858
July	646	1,245.45	1.92794
August	644	1,237.95	1.92228
September	622	1,472.95	2.36809
October	645	1,574.20	2.44062
November	622	1,332.45	2.14220
December	646	1,224.55	1.89558
Total	7610	15,538.05	24.50179

Note: By this method the average daily high is 2.04181 ✓

<u>MONTH</u>	<u>YEAR</u>	<u>HIGHEST HIGH</u>	<u>LOWEST HIGH</u>	<u>YEAR</u>
January	1932	77.80	33.85	1918
February	1932	77.50	33.50	1917
March	1929	73.00	42.80	1918
April	1929	84.90	46.80	1936
May	1930	86.40	54.60	1924
June	1929	82.40	51.20	1917
July	1929	83.20	45.25	1917
August	1929	76.50	40.75	1917
September	1929	89.70	52.05	1920
October	1923	89.80	54.20	1917
November	1925	82.60	36.95	1917
December	1931	74.30	44.75	1917

1929 is the year with the total highest tide of 932.80<sup>2</sup>  
1917 is the year with the total lowest high tide of 566.20<sup>2</sup>

LOWEST LOW TIDE DATA

SUM TOTAL OF THE LOWEST DAILY TIDES 4,391.15

AVERAGE DAILY OR MEAN LOWEST TIDE 0.577

<u>MONTH</u>	<u>NO. DAYS</u>	<u>TOTAL READINGS HIGH</u>	<u>MONTHLY AVERAGE</u>
January	648	114.15	0.17616
February	593	152.15	0.25489
March	649	242.25	0.37327
April	627	377.45	0.60199
May	645	465.80	0.72217
June	623	391.75	0.62881
July	646	283.55	0.43893
August	644	362.25	0.56250
September	622	696.05	1.11905
October	645	726.35	1.12614
November	622	384.15	0.61760
December	646	195.25	0.30224
Total	7610	4391.15	6.92375

Note: By this method the average daily low is 0.57697 ✓



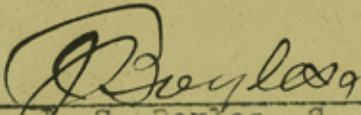
<u>MONTH</u>	<u>YEAR</u>	<u>HIGHEST LOW</u>	<u>LOWEST LOW</u>	<u>YEAR</u>
January	1932	28.20	-24.35	1918
February	1932	33.40	-15.20	1917
March	1923	29.90	- 5.70	1916
April	1923	41.60	- 1.20	1916
May	1929	38.10	6.10	1931
June	1929	35.60	0.00	1916
July	1929	36.80	- 7.90	1917
August	1936	40.30	- 6.90	1917
September	1928	50.10	16.00	1918
October	1923	53.10	10.35	1917
November	1922	42.40	- 9.95	1917
December	1926	25.40	- 7.70	1917

1929 is the year with the total highest low tide of 377.10  
 1917 is the year with the total lowest low tide of -4.40

LOW TIDE YEARLY DATA BY MONTHS

<u>MONTH</u>	<u>NO. YEARS</u>	<u>PLUS</u>	<u>NO. YEARS</u>	<u>MINUS</u>	<u>NO. YEARS</u>	<u>0.00</u>
January	15	170.60	6	-56.45		
February	14	194.45	7	-42.30		
March	17	250.30	4	- 8.05		
April	20	378.65	1	- 1.20		
May	21	465.80	0			
June	20	391.75	0		1	
July	19	293.15	2	- 9.60		
August	20	369.15	1	- 6.90		
September	21	696.05	0			
October	21	726.35	0			
November	19	395.10	2	-10.95		
December	17	212.15	4	-16.90		

THE BASIS FROM WHICH THIS DATA HAS BEEN CALCULATED IS THE EXTREME DAILY HIGH TIDE READING AND THE EXTREME DAILY LOW TIDE READING AS SHOWN BY THE DAILY CHARTS UPON WHICH THE READINGS ARE SHOWN FOR EACH HOUR OF THE TWENTY FOUR.

  
 J. S. Boyles, C. E.

January 22nd, 1937



CALY. CO. SH. FL. NO 40.

REPORT

COVERING THE DAILY TIDE  
OBSERVATION TAKEN BY  
THE U. S. ENGRS DEPT  
AT FORT POINT, CALY CO  
PERIOD COVERED

JAN 1-1916 TO DEC 31-1936

SUBMITTED

BY J. S. BOYLES C. E.

FEB 16-1940 U. S.