

GALVESTON BAY

BOLIVAR ROADS

GULF OF MEXICO

**SAMUEL PARR SURVEY
A-162**

**HORSESHOE LAKE
(C)**

(F) FRENCH TOWN BRIDGE
(A) POINT OF BEGINNING
N 13707022.2360
E 3313062.9120

Project Tide Guage (B)

PORT BOLIVAR LIGHTHOUSE RESERVE (E)

FORT TRAVIS (D)

NGS MONUMENT CG 11 (C)

- NOTES:**
- All bearings are Lambert Grid Bearings and all coordinates are in feet unless otherwise shown, and refer to the Texas State Plane Coordinate System, South Central Zone, as defined by Article 21.071 of the Natural Resources Code of the State of Texas, NAD 88 (1993 adjustment) as tied to NGS Monument CG 11 with the following Published Coordinates: North 4,177,027.755 M. East 1,011,692.202 M.
 - All distances are Grid Distances. To convert to surface distances multiply by a scale factor of 1.0001366.
 - The Mean Higher High Water Elevation was determined by project tide guage located at POINT (B). The elevations were adjusted to the Pier 21 Control Tide Guage (NOAA Station 8771450) located in Galveston, Texas. The adjustment was required to reflect the loss of tide range due to the culvert construction of French Town Bridge (F).
 - Line Calls L 78, L 261, L 321 and L 337 are crossing calls. They leave the Mean Higher High Water Line to cross artificial fills then reconnect to the Mean Higher High on the other side of the filled areas. These areas are State or County fills and were not surveyed.
 - "NOTICE: This survey was performed in accordance with Section 33.136, Natural Resources Code, for the purpose of evidencing the location of the shoreline in the area depicted in this survey as that shoreline existed before commencement of erosion response activity, as required by Chapter 33, Natural Resources Code. The line depicted on this survey fixes the shoreline for the purpose of locating a shoreline boundary, subject to movement landward as provided by Section 33.136, Natural Resources Code."

July 1-27, 2002

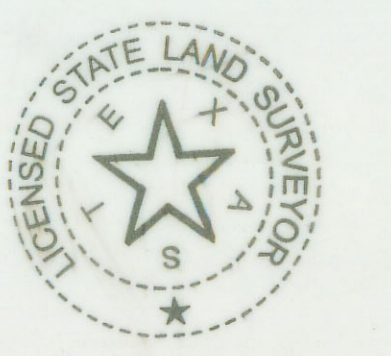
I hereby certify that the above described property was surveyed in the field according to law, by me on the above referenced dates, and that the above map together with dimensions and coordinates is true and correct as of the above date.

COASTAL SURVEYING OF TEXAS

TEXAS GENERAL LAND OFFICE
Art. 33.136, Natural Resources Code
Co. Galveston, sketch No. 43, Sheet 1
File Date 12-6-2006 by D.J.H.

Sidney Bouse
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"SERVING GALVESTON COUNTY OVER 90 YEARS"

**Mean Higher High Water Line Survey of Horseshoe Lake
out of the Samuel Parr Survey, Abstract 162, Galveston County, Texas
4.9 Miles N 16°E from Galveston Texas**

SURVEYORS REPORT ON THE
MEAN HIGHER HIGH WATER LINE SURVEY OF THE
SAMUEL PARR SURVEY
GALVESTON COUNTY ABSTRACT 162

I surveyed the line of Mean Higher High Water of Horseshoe Lake in the Samuel Parr Survey in Galveston County, Texas, as authorized by the Houston Audubon Society of Houston, Texas and in my capacity as Licensed State Land Surveyor for the State of Texas.

TEXAS GENERAL LAND OFFICE
Art. 33.136, Natural Resources Code

HISTORY Co. Galveston, Sketch No. 43, Sheet 3

File Date 12-6-2006 by D.J.H.

The Samuel Parr Survey, a First Class Headright from the Republic of Texas out of Liberty Land District- presently Galveston County-Abstract 162 was performed by M. A. Hardin Deputy Surveyor of Liberty County in February of 1838. His chain carriers were B.W. Huntin, Silas Bragg, Milton Yates and Doel Scott. The field notes (Exhibit 1) have a sketch (with out a scale) that depicts the Survey with Magnetic Declination of 9° 17' E and the Beginning Point of the description shown.

The Field notes begin at the "Extreme Westernmost point of the said Bolivar Point and at the mouth of what is called Crab Bayou". They read as follows:

" A stake for corner from which a Prickly Ash Marked S.P. bears N 60 1/2°E, 70 4/10 Varas, and a Hackberry marked X bears N 51 1/2°E 34 8/10 Vrs, Thence along the Gulf of Mexico with its meanders; South 700 vrs; S 83 1/2°E 2000 varas, N 63°E 560 vrs; N 50°E, 1800vrs; N49°E 2090 vrs; N45°E 2561vrs; to corner on the margin of the said Gulf of Mexico, a mound and Post for corner. Thence N 29°W, across the prairie at 3220 varas East Bay and corner, a mound and a post, Thence along the shore of the Sd. East Bay, S47°W. 340 vrs; S 35°W 250 vrs; S 41 1/2° W 1900 vrs; S80°W. 470 vrs; S 59°W 700 vrs; S 45°W. 770 vrs; S70°W 840 vrs; S 72°W, 900 vrs; S22°W 385 vrs; S 15°W 700 vrs; S 11°W, 640 vrs; S 2°W, 290 vrs; S 19°W, 600 vrs; S 14°W, 570 vrs to beginning corner containing about Six Labors as the balance pasture land".

Research

The above referenced field notes can be found in the Archives and Records Division of the General Land Office, 1700 N. Congress, Austin, Texas. The County Surveyors records as found in the office of the County Engineer, 123 Rosenberg, Galveston, Texas 77550 were also researched. R. M. Sais, County Surveyor of Galveston County, in December of 1892 ran cross-sections around the area of the Port Bolivar Lighthouse (E). The records also contain information on Fort Travis (D) as well as various lot surveys done within the Townsite of Port Bolivar, but the records do not contain any previous work done on Horseshoe Lake (G) or Crab Bayou (E).

"Exhibit 3" is a copy of a 1930's Tobin Aerial Photograph showing the Samuel Parr Survey. The photo shows "Crab Bayou" (E) and it's connection to Horseshoe Lake (G). Fort Travis (D) can also be clearly seen.

CONSTRUCTION

My first question about Horseshoe Lake is the question of ownership. Was the lake originally an inland lake and therefore private property, or has it always been an arm of the Gulf of Mexico.

Next, if it was an inland lake and private, was Crab Bayou, tidal or was it an annual stream that only flowed after rain would fill the watershed basin to overflowing?

M. A. Hardin Deputy Surveyor of Liberty County found the bayou to be relevant enough to begin his survey of the Samuel Parr grant at the "mouth of what is called Crab Bayou". This indicates to me the bayou was a known landmark and reputed to contain crabs. Without any evidence to the contrary, it is my opinion that the Bayou and lake were saltwater bodies and tidal. Once the Bayou and lake are considered tidal, the question of ownership of the lake and bayou is answered in favor of the State.

Even though the original grant was from the Republic of Texas, Mexican Civil Law was in effect at the time of the original Survey (February 1838). Therefore the tidal boundary of the Republic of Texas and subsequently the State of Texas is and has been the line of Mean Higher High Water on the arms of the Gulf of Mexico.

The present boundary of Horseshoe Lake is influenced by past erosion, accretion, subsidence and fill.

Subsidence and artificial fills do not change the littoral boundary. The Harris Galveston County Subsidence District, the National Geodetic Society (NGS) and National Oceanic and Atmospheric Administration (NOAA) were all contacted and subsidence information was requested. I was informed that although subsidence is believed to have occurred, there have been no long-term subsidence studies on the Bolivar Peninsula and therefore no publishable data is available. Subsidence was not factored into this survey. The area known as French Town Road (H) and 7th Street (I) were areas filled to build roads. Lines were drawn across these roadbeds to connect the Mean Higher High Water lines on either side of these roads.

The possibility of erosion and accretion effects was researched. The present French Town Bridge was constructed from 2 Railroad cars for culverts in December of 1971, according to Ross Maxey, County Road Administrator for Galveston County at the time. Pryor to that, there was a wooden bridge at relatively the same location. This restricted flow into and out of the lake by the French Town Bridge (F) makes erosion and/or accretion highly limited.

The restricted flow into and out of the lake does change the elevation of the Mean Higher High Water of the lake relative to the Mean Higher High Water of Bolivar Roads and Galveston Bay. A Tide Gauge was placed at location (B) as shown on the survey. Elevations were taken on June 17th, 18th and 19th. The tidal data was compared to the published Galveston Pier 21 Tide Gauge information for the Pier 21 Tide Gauge over the same period. The information was not conclusive enough to give a reliable picture of the Lake's tidal cycle. Tide data was then collected on June 23rd, 24th, 25th and 26th. This data was compared to the Galveston Pier 21 Tide Gauge information for those days. Using the USGS (now NGS) publication TIDAL DATUM PLANES by H. A. Marmer reprinted in 1977, the value for the Mean Tide Line was computed, and the value for Mean

Higher High Water was calculated from the Mean Tide Line. The calculated Mean Higher High Water line was transferred to the shoreline and surveyed on the ground between July 1st and July 27th 2002.

The adjoining map represents the location of the line so located on these days. Included with this report are the various data sheets and notes associated with this project.

The Map pages 1&2 were recorded in the Office of the County Clerk, Galveston County, Texas and recorded in Book I, Page 218 County Surveyors records, Galveston County, Texas on October 10, 2002.



Sidney Bouse
Licensed State Land Surveyor
RPLS 5287



SAMUEL PARR

DATE	(A) STATION TIME	(A) STATION TIME	(B) STATION TIME	(B) STATION TIME	(A)-(B) TIME	(A)-(B) DIFFERENCE	(A) STATION HEIGHT	(A) STATION HEIGHT	(B) STATION HEIGHT	(B) STATION HEIGHT	(A)-(B) HEIGHT	(A)-(B) DIFFERENCE
	HW	LW	HW	LW	HW	LW	HW	LW	HW	LW	HW	LW
06-17-02	11:48						1.3					
06-17-02			16:24						6.06		-4.76	
06-17-02					4.6							
06-18-02	11:36						1.59					
06-18-02			14:48						6.15		-4.56	
06-18-02					3.2							
06-19-02	10:30						1.63					
06-19-02			13:18						6.43		-4.8	
06-19-02					2.8							
06-24-02	4:18	22:00					2.16	-0.28				
06-24-02			12:36						6.7		-4.54	
06-24-02					8.3							
06-25-02		22:30		1:42				-0.05		5.4		-5.68
06-25-02						3.7						
06-26-02				2:45						5.62		-5.67
06-26-02		23:00						-0.45				
06-27-02		23:24						-0.19				
06-28-02	9:12						1.57					
06-28-02			15:12						6.42		-4.85	
06-28-02				3:48					5.46		-5.65	
06-28-02					6	3.4						
SUMS							9.55		31.76		23.51	
MEANS							1.91		6.352		4.702	
SUMS								-0.97		16.5		17
MEANS								-0.242		5.5		-5.667
LINE 10	6.352	Mn HW					LINE 11	5.5	Mn LW			
LINE 12	0.852	Mn					LINE 13	5.926	MTL			

Galveston Co. NRC Art. 33.136 Sketch 43, Sheet 6, small format

STATION (A)= PIER 21 STATION (B)= 7TH STREET

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SAMUEL PARR SURVEY, GALVESTON COUNTY, TEXAS

R= Range on day of observation

Mn=19-year equivalent mean range

MHW=19-year equivalent mean high water

MLW=19-year equivalent mean low water

TL=Tide level on day of observation

MTL= 19-year equivalent mean tide level

C= control station - PIER 21, GALVESTON CHANNEL

P=project staff- 7TH STREET, HORSESHOE LAKE, BOLIVAR PENINSULA

	Project Elevations (ft)	Control Elevations (ft)
MHHW	6.15	1.102
MHW	6.11	1.060
MSL		0.620
MTL	5.92	0.571
MLW	5.73	0.082
MLLW	5.60	0.00
Mn	0.384	

Project Staff Elevation of 6.15 was transferred using conventional leveling methods to the shoreline and to a nail set in the centerline of 7th street for a reference benchmark.

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National Oceanic and Atmospheric Administration
National Ocean Service

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Station ID: 8771450	PUBLICATION DATE: 01/14/2000
Name: GALVESTON PIER 21, GALVESTON CHANNEL TEXAS	
NOAA Chart: 11323	Latitude: 29° 18.6' N
USGS Quad: GALVESTON	Longitude: 94° 47.6' W

To reach the tidal bench marks from the Post Office on the west side of Rosenberg Avenue (25th Street) between Winnie Street (Avenue G) on the south and Church Street (Avenue F) on the north, proceed north on Rosenberg Avenue for 0.40 km (0.25 mi) to the intersection of Strand (Avenue B) and Rosenberg Avenue, turn right on Strand and proceed east for 0.3 km (0.2 mi) to 22nd Street (Kempner Avenue), then turn left and proceed north for 0.2 km (0.1 mi) to Fishermans Wharf Restaurant. The bench marks are on the seawall behind Fishermans Wharf Restaurant, at the foot of 16th Street, on 20th Street, and on Avenue B. The tide gage and staff are on the north end of the dock for mooring the historical ship ELLISA.

T I D A L B E N C H M A R K S

PRIMARY BENCH MARK STAMPING: 7.151
DESIGNATION: 7.151
ALIAS: 35 USE

MONUMENTATION:	Survey disk	VM#: 843
AGENCY:	US Army Corps of Engineers (COE)	PID#: AW0433
SETTING CLASSIFICATION:	Sidewalk	

The primary bench mark is a disk set in the sidewalk near the NE corner of the Hendley Building at the corner of The Strand Street (Avenue B) and 20th Street, 12.00 m (39.4 ft) west of the centerline of 20th Street, 4.00 m (13.1 ft) south of the centerline of the alley that runs behind the Hendley Building, and 0.10 m (0.3 ft) SE of the NE corner of the Hendley Building.

<http://www.co-ops.nos.noaa.gov/benchmarks/8771450.html>

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Galveston Co. NRC Art. 33.136 Sketch 43, Sheet 8, small format

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National Oceanic and Atmospheric Administration
National Ocean Service

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Station ID: 8771450 PUBLICATION DATE: 01/14/2000
Name: GALVESTON PIER 21, GALVESTON CHANNEL
TEXAS
NOAA Chart: 11323 Latitude: 29° 18.6' N
USGS Quad: GALVESTON Longitude: 94° 47.6' W

T I D A L B E N C H M A R K S

BENCH MARK STAMPING: 32 1913
DESIGNATION: 877 1450 TIDAL 32

MONUMENTATION: Tidal Station disk VM#: 846
AGENCY: U. S. Coast and Geodetic Survey (USC&GS) PID#: AW0436
SETTING CLASSIFICATION: Granite Base

The bench mark is a disk set in the top and along the east edge of the west granite base of a pillar at the entrance of 2324 The Strand Street (Avenue B), at the Sealy Building at the NE corner of the intersection of The Strand and 24th Street, 29.47 m (96.7 ft) east of the centerline of 24th Street, 12.19 m (40.0 ft) north of the centerline of The Strand Street, 11.58 m (38.0 ft) west of the SE corner of the building, 3.20 m (10.5 ft) west of the easterly most column, and 0.46 m (1.5 ft) above the sidewalk.

BENCH MARK STAMPING: J 305 1935
DESIGNATION: J 305

MONUMENTATION: Bench Mark disk VM#: 847
AGENCY: U. S. Coast and Geodetic Survey (USC&GS) PID#: AW0437
SETTING CLASSIFICATION: Granite Cornerstone

The bench mark is a disk set vertically in the SE corner of the Shearn Moody Plaza Building at the corner of 25th Street and Santa Fe Place, 16.79 m (55.1 ft) east of the center of a doorway entrance on the south side of the building, 12.20 m (40.0 ft) NNW of the centerline of Santa Fe Place, 5.91 m (19.4 ft) west of the west curb of 25th Street, 1.01 m (3.3 ft) west of the SE corner of the building, and 1.01 m (3.3 ft) above the sidewalk.

<http://www.co-ops.nos.noaa.gov/benchmarks/8771450.html>

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Galveston Co. NRC Art. 33.136 Sketch 43, Sheet 9, small format

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National Oceanic and Atmospheric Administration
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Station ID: 8771450	PUBLICATION DATE: 01/14/2000
Name: GALVESTON PIER 21, GALVESTON CHANNEL TEXAS	
NOAA Chart: 11323	Latitude: 29° 18.6' N
USGS Quad: GALVESTON	Longitude: 94° 47.6' W

T I D A L B E N C H M A R K S

BENCH MARK STAMPING: 40 1935 RESET
DESIGNATION: 877 1450 TIDAL 40 RESET

MONUMENTATION:	Tidal Station disk	VM#: 848
AGENCY:	U. S. Coast and Geodetic Survey (USC&GS)	PID#: AW0569
SETTING CLASSIFICATION:	Concrete Valve Pit	

The bench mark is a disk set on the south edge of a 3.00 m x 3.00 m (9.8 ft x 9.8 ft) concrete valve pit foundation at the north end of 16th Street, in a small triangular patch of grass at the NE side of a large parking lot for trucks at the loading docks, 12.31 m (40.4 ft) SE of the NE corner of the scale, 10.40 m (34.1 ft) west of the western rail of the two parallel railroad tracks on the west side of Pier 15, 9.70 m (31.8 ft) south of a power pole with two transformers and a street light, 9.00 m (29.5 ft) ENE of the NE edge of the concrete parking lot, 6.20 m (20.3 ft) north of the NW corner of a small metal building for the scale, and 0.60 m (2.0 ft) west of a fiberglass witness post.

BENCH MARK STAMPING: 41 1935 RESET 1961
DESIGNATION: 877 1450 TIDAL 41 RESET

MONUMENTATION:	Tidal Station disk	VM#: 849
AGENCY:	U. S. Coast and Geodetic Survey (USC&GS)	PID#: AW0570
SETTING CLASSIFICATION:	Building column	

The bench mark is a disk set vertically in the south face of the SE concrete corner column of Pier 18 Building, 16.18 m (53.1 ft) west of the west side of Pier 15 Warehouse, 14.20 m (46.6 ft) east of the center of DOOR 16, 0.30 m (1.0 ft) west of the SE corner of the warehouse, and 0.91 m (3.0 ft) above the loading platform.

<http://www.co-ops.nos.noaa.gov/benchmarks/8771450.html>

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National Oceanic and Atmospheric Administration
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Station ID: 8771450 PUBLICATION DATE: 01/14/2000
Name: GALVESTON PIER 21, GALVESTON CHANNEL
TEXAS
NOAA Chart: 11323 Latitude: 29° 18.6' N
USGS Quad: GALVESTON Longitude: 94° 47.6' W

T I D A L B E N C H M A R K S

BENCH MARK STAMPING: 42 1943
DESIGNATION: 877 1450 TIDAL 42

MONUMENTATION: Tidal Station disk VM#: 850
AGENCY: U. S. Coast and Geodetic Survey (USC&GS) PID#: AW0434
SETTING CLASSIFICATION: Concrete sea wall

The bench mark is a disk set in the top of the center of a sea wall behind the Fishermans Wharf Restaurant at the north end of 22nd Street and the west end of Pier 21, 9.36 m (30.7 ft) WSW of the SW face of the walk ramp to the Texas State Museum, 7.50 m (24.6 ft) NNE of the second single cleat on the sea wall edge, and 0.21 m (0.7 ft) SE of the edge of sea wall.

BENCH MARK STAMPING: NO 2 1974
DESIGNATION: 877 1450 TIDAL 2

MONUMENTATION: Tidal Station disk VM#: 851
AGENCY: National Ocean Survey (NOS) PID#: AW1894
SETTING CLASSIFICATION: Concrete sea wall

The bench mark is a disk set flush in the top of a concrete sea wall behind the Fisherman's Wharf Restaurant, Pier 22, at the north end of 22nd Street, 45.1 m (148 ft) east of the NW corner of the Fisherman's Wharf Restaurant, 15.80 m (51.7 ft) west of an angle point in the sea wall, and 0.27 m (0.9 ft) south of the sea wall edge. NOTE - mark is obstructed by a deck and can not be leveled.

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Station ID: 8771450 PUBLICATION DATE: 01/14/2000
Name: GALVESTON PIER 21, GALVESTON CHANNEL
TEXAS
NOAA Chart: 11323 Latitude: 29° 18.6' N
USGS Quad: GALVESTON Longitude: 94° 47.6' W

T I D A L B E N C H M A R K S

BENCH MARK STAMPING:

DESIGNATION: 877 1450 TIDAL 19
ALIAS: 19 USE/NO STAMPING 1

MONUMENTATION: Bolt VM#: 852
AGENCY: US Army Corps of Engineers (COE) PID#: AW0432
SETTING CLASSIFICATION: Granite Column in Building

The bench mark is a bolt set vertically in the NE corner of the Hendley Building located on The Strand Street (Avenue B) between 20th Street and 21st Street, 12.00 m (39.4 ft) west of the centerline of 20th Street, 3.10 m (10.2 ft) south of the centerline of the alley that runs behind the Hendley Building, 0.20 m (0.7 ft) west of the NE corner of the building, and 1.30 m (4.3 ft) above the sidewalk.

BENCH MARK STAMPING: 1450 A 1989
DESIGNATION: 877 1450 A

MONUMENTATION: Tidal Station disk VM#: 853
AGENCY: National Ocean Service (NOS) PID:
SETTING CLASSIFICATION: Sidewalk

The bench mark is a disk set flush in the concrete apron at the NW corner of the intersection of Harborside Drive and 20th Street, 22.40 m (73.5 ft) SE of the southeasternmost light pole in the parking lot of Pier 21, 4.70 m (15.4 ft) north of the north curb of Harborside Drive, 4.40 m (14.4 ft) west of the west curb of 20th Street, and 0.21 m (0.7 ft) above the sidewalk.

<http://www.co-ops.nos.noaa.gov/benchmarks/8771450.html>

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Galveston Co. NRC Art. 33.136 Sketch 43, Sheet 12, small format

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Station ID: 8771450 PUBLICATION DATE: 01/14/2000
Name: GALVESTON PIER 21, GALVESTON CHANNEL
TEXAS
NOAA Chart: 11323 Latitude: 29° 18.6' N
USGS Quad: GALVESTON Longitude: 94° 47.6' W

T I D A L D A T U M S

Tidal datums at GALVESTON PIER 21, GALVESTON CHANNEL based on:

LENGTH OF SERIES: 5 YEARS
TIME PERIOD: January 1990 - December 1994
TIDAL EPOCH: 1960-1978
CONTROL TIDE STATION:

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in METERS:

HIGHEST OBSERVED WATER LEVEL (09/08/1900)	=	4.129
MEAN HIGHER HIGH WATER (MHHW)	=	0.430
MEAN HIGH WATER (MHW)	=	0.400
MEAN SEA LEVEL (MSL)	=	0.255
MEAN TIDE LEVEL (MTL)	=	0.252
MEAN LOW WATER (MLW)	=	0.104
NORTH AMERICAN VERTICAL DATUM-1988 (NAVD)	=	0.052
MEAN LOWER LOW WATER (MLLW)	=	0.000
LOWEST OBSERVED WATER LEVEL (01/11/1908)	=	-1.906

Bench Mark Elevation Information	In METERS above:	
	MLLW	MHW
Stamping or Designation		
7.151	1.529	1.129
32 1913	2.078	1.678
J 305 1935	2.277	1.877
40 1935 RESET	1.811	1.411
41 1935 RESET 1961	3.970	3.570
42 1943	1.468	1.068
NO 2 1974	1.459	1.059
877 1450 TIDAL 19	2.638	2.238
1450 A 1989	1.796	1.396

<http://www.co-ops.nos.noaa.gov/benchmarks/8771450.html>

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Station ID: 8771450	PUBLICATION DATE: 01/14/2000
Name: GALVESTON PIER 21, GALVESTON CHANNEL TEXAS	
NOAA Chart: 11323	Latitude: 29° 18.6' N
USGS Quad: GALVESTON	Longitude: 94° 47.6' W

Foot Notes:

Galveston Bay, Texas has anomalous relative sea level trends compared to most other geographic regions in the United States. This is due to a general subsidence of land in the area, which has been occurring at a rapid rate. Because of the magnitude of the sea level trends in these areas, NOAA has adopted a procedure for computing accepted tidal datums for the National Water Level Observation Network, (NWLON) using the last several years of sea level data rather than the 19 - year tidal epoch. The tide ranges are still based on the 1960 - 1978 National Tidal Datum Epoch (NTDE) and are applied to the five year (1990 - 1994) mean tide level (MTL) to compute other tidal datums. The adoption of this procedure was necessary to ensure that these tidal datums accurately represent the existing stand of sea level.

<http://www.co-ops.nos.noaa.gov/benchmarks/8771450.html>

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Galveston Co. NRC Art. 33.136 Sketch 43, Sheet 14, small format

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National Oceanic and Atmospheric Administration
National Ocean Service

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Station ID: 8771450 PUBLICATION DATE: 01/14/2000
Name: GALVESTON PIER 21, GALVESTON CHANNEL
TEXAS
NOAA Chart: 11323 Latitude: 29° 18.6' N
USGS Quad: GALVESTON Longitude: 94° 47.6' W

D E F I N I T I O N S

Mean Sea Level (MSL) is a tidal datum determined over a 19-year National Tidal Datum Epoch. It pertains to local mean sea level and should not be confused with the fixed datums of North American Vertical Datum of 1988 (NAVD 88).

NGVD 29 is a fixed datum adopted as a national standard geodetic reference for heights but is now considered superseded. NGVD 29 is sometimes referred to as Sea Level Datum of 1929 or as Mean Sea Level on some early issues of Geological Survey Topographic Quads. NGVD 29 was originally derived from a general adjustment of the first-order leveling networks of the U.S. and Canada after holding mean sea level observed at 26 long term tide stations as fixed. Numerous local and wide-spread adjustments have been made since establishment in 1929. Bench mark elevations relative to NGVD 29 are available from the National Geodetic Survey (NGS) data base via the World Wide Web at [National Geodetic Survey](http://NationalGeodeticSurvey.gov).

NAVD 88 is a fixed datum derived from a simultaneous, least squares, minimum constraint adjustment of Canadian/Mexican/United States leveling observations. Local mean sea level observed at Father Point/Rimouski, Canada was held fixed as the single initial constraint. NAVD 88 replaces NGVD 29 as the national standard geodetic reference for heights. Bench mark elevations relative to NAVD 88 are available from NGS through the World Wide Web at [National Geodetic Survey](http://NationalGeodeticSurvey.gov).

NGVD 29 and NAVD 88 are fixed geodetic datums whose elevation relationships to local MSL and other tidal datums may not be consistent from one location to another.

The Vertical Mark Number (VM#) and PID# shown on the bench mark sheet are unique identifiers for bench marks in the tidal and geodetic databases, respectively. Each bench mark in either database has a single, unique VM# and/or PID# assigned. Where both VM# and PID# are indicated, both tidal and geodetic elevations are available for the bench mark listed.

The NAVD 88 elevation is shown on the Elevations of Tidal Datums Table Referred to MLLW only when two or more of the bench marks listed have NAVD 88 elevations. The NAVD 88 elevation relationship shown in the table is derived from an average of several bench mark elevations relative to tide station datum. As a result of this averaging, NAVD 88 bench mark elevations computed indirectly from the tidal datums elevation table may differ slightly from NAVD 88 elevations listed for each bench mark in the NGS database.

<http://www.co-ops.nos.noaa.gov/benchmarks/8771450.html>

10/10/2002

Galveston Co. NRC Art. 33.136 sketch 43, sheet 15, small format

Counter 87170

Oct 10 2002 12:09

6-MINUTE WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 8771450
Name: GALVESTON PIER 21, GALVESTON CHANNEL, TX
Note: [] Inferred Water Level Value
DCP#: 1 Sensor ID: A1

T.M.: 90 W
Units: Feet
Datum: MLLW
Quality: Raw

Date	Hr	00	06	12	18	24	30	36	42	48	54
Jun 21 2002	0	1.38	1.40	1.39	1.44	1.53	1.58	1.55	1.54	1.61	1.63
Jun 21 2002	1	1.59	1.60	1.57	1.58	1.64	1.67	1.63	1.61	1.63	1.67
Jun 21 2002	2	1.65	1.61	1.57	1.60	1.62	1.62	1.60	1.57	1.57	1.57
Jun 21 2002	3	1.56	1.58	1.57	1.53	1.55	1.60	1.59	1.56	1.52	1.53
Jun 21 2002	4	1.56	1.53	1.54	1.53	1.53	1.54	1.54	1.49	1.46	1.47
Jun 21 2002	5	1.50	1.50	1.45	1.43	1.46	1.48	1.44	1.38	1.41	1.42
Jun 21 2002	6	1.45	1.43	1.43	1.45	1.46	1.44	1.44	1.43	1.44	1.42
Jun 21 2002	7	1.43	1.44	1.48	1.50	1.51	1.50	1.47	1.46	1.35	1.43
Jun 21 2002	8	1.43	1.39	1.35	1.36	1.38	1.42	1.40	1.34	1.28	1.35
Jun 21 2002	9	1.38	1.31	1.32	1.35	1.40	1.40	1.36	1.38	1.44	1.42
Jun 21 2002	10	1.44	1.43	1.43	1.45	1.44	1.42	1.37	1.51	1.51	1.53
Jun 21 2002	11	1.49	1.54	1.58	1.57	1.55	1.56	1.56	1.58	1.58	1.58
Jun 21 2002	12	1.55	1.58	1.58	1.60	1.60	1.64	1.64	1.68	1.59	1.60
Jun 21 2002	13	1.57	1.53	1.53	1.48	1.38	1.36	1.40	1.37	1.35	1.30
Jun 21 2002	14	1.26	1.20	1.15	1.15	1.13	1.10	1.08	1.07	1.01	1.00
Jun 21 2002	15	1.02	0.99	0.97	0.95	0.94	0.89	0.84	0.80	0.80	0.77
Jun 21 2002	16	0.76	0.74	0.67	0.66	0.63	0.57	0.53	0.52	0.46	0.40
Jun 21 2002	17	0.38	0.37	0.31	0.28	0.26	0.24	0.21	0.20	0.17	0.15
Jun 21 2002	18	0.15	0.13	0.10	0.10	0.09	0.05	0.03	0.04	0.06	0.07
Jun 21 2002	19	0.03	0.00	-0.01	0.00	0.00	0.00	0.00	-0.03	0.02	0.08
Jun 21 2002	20	0.10	0.10	0.05	0.10	0.12	0.15	0.14	0.15	0.19	0.25
Jun 21 2002	21	0.31	0.35	0.34	0.37	0.39	0.45	0.46	0.47	0.48	0.52
Jun 21 2002	22	0.58	0.63	0.65	0.69	0.72	0.76	0.77	0.79	0.79	0.82
Jun 21 2002	23	0.84	0.92	0.96	0.98	1.00	1.03	1.09	1.12	1.12	1.11
Jun 22 2002	0	1.15	1.19	1.21	1.25	1.34	1.39	1.41	1.45	1.43	1.44
Jun 22 2002	1	1.46	1.51	1.55	1.56	1.60	1.61	1.65	1.69	1.72	1.73
Jun 22 2002	2	1.73	1.73	1.76	1.80	1.78	1.78	1.82	1.86	1.87	1.86
Jun 22 2002	3	1.86	1.87	1.88	1.86	1.83	1.83	1.85	1.86	1.84	1.81
Jun 22 2002	4	1.81	1.84	1.83	1.79	1.76	1.77	1.77	1.81	1.79	1.75
Jun 22 2002	5	1.76	1.79	1.79	1.69	1.65	1.70	1.71	1.67	1.63	1.66
Jun 22 2002	6	1.67	1.67	1.63	1.66	1.66	1.69	1.73	1.64	1.62	1.72
Jun 22 2002	7	1.71	1.69	1.71	1.68	1.69	1.77	1.66	1.65	1.67	1.65
Jun 22 2002	8	1.70	1.74	1.67	1.62	1.72	1.71	1.67	1.64	1.62	1.71

Galveston Co. NRC Art. 33.136 Sketch 43. Sheet 16, small format

Jun 22 2002 9	1.70	1.62	1.73	1.76	1.70	1.75	1.73	1.76	1.78	1.81
Jun 22 2002 10	1.78	1.79	1.80	1.83	1.84	1.79	1.81	1.81	1.85	1.85
Jun 22 2002 11	1.82	1.86	1.86	1.80	1.82	1.83	1.81	1.82	1.82	1.83
Jun 22 2002 12	1.81	1.78	1.79	1.78	1.79	1.79	1.80	1.79	1.82	1.80
Jun 22 2002 13	1.77	1.78	1.77	1.76	1.72	1.70	1.72	1.76	1.76	1.70
Jun 22 2002 14	1.64	1.67	1.74	1.67	1.61	1.58	1.60	1.60	1.58	1.49
Jun 22 2002 15	1.52	1.55	1.53	1.47	1.42	1.39	1.38	1.36	1.32	1.25
Jun 22 2002 16	1.19	1.18	1.17	1.15	1.11	1.06	1.09	0.98	0.97	0.98
Jun 22 2002 17	0.91	0.90	0.87	0.84	0.82	0.77	0.73	0.68	0.64	0.64
Jun 22 2002 18	0.60	0.53	0.53	0.53	0.53	0.50	0.45	0.42	0.41	0.37
Jun 22 2002 19	0.36	0.34	0.32	0.32	0.31	0.29	0.27	0.30	0.26	0.24
Jun 22 2002 20	0.27	0.26	0.28	0.28	0.26	0.29	0.31	0.31	0.29	0.30
Jun 22 2002 21	0.30	0.35	0.36	0.32	0.38	0.37	0.37	0.39	0.44	0.49
Jun 22 2002 22	0.51	0.50	0.52	0.56	0.58	0.60	0.62	0.65	0.72	0.74
Jun 22 2002 23	0.79	0.84	0.88	0.92	0.92	0.94	0.96	1.00	1.04	1.08

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6-MINUTE WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 8771450
Name: GALVESTON PIER 21, GALVESTON CHANNEL, TX
Note: [] Inferred Water Level Value
DCP#: 1 Sensor ID: A1

T.M.: 90 W
Units: Feet
Datum: MLLW
Quality: Raw

Date	Hr	00	06	12	18	24	30	36	42	48	54
Jun 23 2002 0		1.11	1.14	1.19	1.24	1.24	1.22	1.25	1.27	1.32	1.33
Jun 23 2002 1		1.37	1.43	1.47	1.51	1.56	1.59	1.59	1.60	1.63	1.65
Jun 23 2002 2		1.73	1.76	1.79	1.84	1.88	1.89	1.91	1.94	1.96	1.94
Jun 23 2002 3		1.97	1.98	1.98	1.99	2.00	2.01	2.07	2.03	2.05	2.02
Jun 23 2002 4		2.05	2.12	2.06	1.98	2.04	2.05	2.05	2.03	2.06	2.04
Jun 23 2002 5		2.08	2.04	2.04	2.01	2.01	2.04	2.02	2.01	1.99	2.00
Jun 23 2002 6		1.99	2.00	1.96	1.96	1.95	1.94	1.93	1.93	1.96	1.90
Jun 23 2002 7		1.88	1.88	1.93	1.92	1.91	1.88	1.87	1.89	1.86	1.83
Jun 23 2002 8		1.85	1.86	1.85	1.86	1.88	1.90	1.88	1.89	1.87	1.87
Jun 23 2002 9		1.88	1.91	1.83	1.82	1.86	1.88	1.84	1.83	1.86	1.86
Jun 23 2002 10		1.87	1.80	1.79	1.82	1.88	1.83	1.83	1.84	1.84	1.83
Jun 23 2002 11		1.80	1.79	1.79	1.82	1.81	1.77	1.77	1.81	1.80	1.81
Jun 23 2002 12		1.80	1.74	1.72	1.74	1.71	1.66	1.70	1.75	1.74	1.72
Jun 23 2002 13		1.75	1.74	1.73	1.70	1.67	1.65	1.66	1.68	1.66	1.66
Jun 23 2002 14		1.69	1.71	1.66	1.62	1.60	1.56	1.60	1.58	1.57	1.53
Jun 23 2002 15		1.56	1.47	1.52	1.47	1.43	1.41	1.38	1.37	1.32	1.27
Jun 23 2002 16		1.23	1.18	1.20	1.22	1.16	1.06	1.03	1.02	0.98	0.94
Jun 23 2002 17		0.89	0.91	0.86	0.82	0.70	0.74	0.66	0.69	0.63	0.57
Jun 23 2002 18		0.55	0.50	0.56	0.49	0.40	0.44	0.40	0.38	0.32	0.30
Jun 23 2002 19		0.29	0.28	0.25	0.22	0.19	0.21	0.15	0.14	0.11	0.14

Galveston Co. NRC Art. 33.136 Sketch 43, Sheet 17, small format

Jun 23 2002 20	0.11	0.08	0.06	0.02	0.02	0.04	0.06	0.06	0.04	0.06
Jun 23 2002 21	0.07	0.06	0.04	0.02	0.05	0.05	0.11	0.14	0.18	0.19
Jun 23 2002 22	0.21	0.26	0.28	0.31	0.30	0.27	0.30	0.32	0.34	0.37
Jun 23 2002 23	0.41	0.45	0.49	0.54	0.57	0.58	0.57	0.54	0.55	0.58
Jun 24 2002 0	0.61	0.61	0.72	0.76	0.81	0.85	0.85	0.89	0.91	0.91
Jun 24 2002 1	0.93	0.99	1.06	1.09	1.13	1.17	1.23	1.26	1.30	1.33
Jun 24 2002 2	1.35	1.39	1.43	1.49	1.56	1.63	1.70	1.73	1.77	1.81
Jun 24 2002 3	1.81	1.78	1.82	1.86	1.89	1.86	1.85	1.84	1.92	1.99
Jun 24 2002 4	2.02	2.03	2.08	2.16	2.09	1.98	1.96	2.00	2.02	2.01
Jun 24 2002 5	2.00	2.00	2.02	2.00	1.98	1.97	1.95	1.95	1.92	1.84
Jun 24 2002 6	1.98	1.93	1.90	1.87	1.86	1.87	1.90	1.90	1.82	1.80
Jun 24 2002 7	1.84	1.86	1.84	1.84	1.84	1.82	1.89	1.82	1.80	1.78
Jun 24 2002 8	1.81	1.82	1.77	1.70	1.74	1.81	1.75	1.73	1.67	1.68
Jun 24 2002 9	1.68	1.70	1.64	1.68	1.70	1.74	1.77	1.71	1.68	1.68
Jun 24 2002 10	1.78	1.76	1.69	1.69	1.76	1.81	1.78	1.73	1.78	1.78
Jun 24 2002 11	1.76	1.70	1.77	1.77	1.77	1.75	1.74	1.74	1.76	1.76
Jun 24 2002 12	1.72	1.65	1.60	1.64	1.64	1.69	1.68	1.68	1.63	1.63
Jun 24 2002 13	1.63	1.63	1.62	1.63	1.62	1.66	1.68	1.61	1.62	1.60
Jun 24 2002 14	1.57	1.56	1.59	1.57	1.53	1.55	1.51	1.48	1.48	1.47
Jun 24 2002 15	1.49	1.53	1.46	1.39	1.40	1.42	1.38	1.35	1.32	1.30
Jun 24 2002 16	1.28	1.26	1.22	1.19	1.19	1.14	1.05	1.01	1.01	1.01
Jun 24 2002 17	0.98	0.97	0.93	0.87	0.84	0.81	0.75	0.73	0.73	0.65
Jun 24 2002 18	0.60	0.59	0.55	0.54	0.45	0.44	0.45	0.39	0.38	0.30
Jun 24 2002 19	0.21	0.22	0.19	0.16	0.15	0.10	0.08	0.07	0.04	-0.06
Jun 24 2002 20	-0.07	-0.08	-0.06	-0.08	-0.13	-0.19	-0.20	-0.23	-0.22	-0.22
Jun 24 2002 21	-0.23	-0.23	-0.23	-0.25	-0.24	-0.25	-0.26	-0.25	-0.26	-0.23
Jun 24 2002 22	-0.28	-0.25	-0.21	-0.20	-0.22	-0.25	-0.17	-0.12	-0.14	-0.15
Jun 24 2002 23	-0.11	-0.06	-0.05	-0.03	-0.01	0.06	0.10	0.11	0.10	0.13

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6-MINUTE WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 8771450
Name: GALVESTON PIER 21, GALVESTON CHANNEL, TX
Note: [] Inferred Water Level Value
DCP#: 1 Sensor ID: A1

T.M.: 90 W
Units: Feet
Datum: MLLW
Quality: Raw

Date	Hr	00	06	12	18	24	30	36	42	48	54
Jun 25 2002 0		0.19	0.21	0.22	0.27	0.31	0.32	0.34	0.40	0.46	0.47
Jun 25 2002 1		0.50	0.54	0.58	0.62	0.67	0.70	0.76	0.76	0.85	0.91
Jun 25 2002 2		0.96	0.95	0.98	1.06	1.14	1.17	1.19	1.26	1.35	1.39
Jun 25 2002 3		1.39	1.40	1.43	1.48	1.58	1.62	1.56	1.66	1.69	1.70
Jun 25 2002 4		1.71	1.75	1.78	1.81	1.79	1.81	1.84	1.86	1.86	1.90
Jun 25 2002 5		1.94	1.96	1.94	1.92	1.95	2.01	2.08	2.18	2.04	1.85

Galveston Co. NRC Art. 33.136 Sketch 43, Sheet 18, Small format

Jun 25 2002 6	1.76	1.95	2.04	1.96	1.93	1.91	1.85	1.82	1.85	1.90
Jun 25 2002 7	1.92	1.89	1.84	1.82	1.85	1.88	1.87	1.85	1.85	1.80
Jun 25 2002 8	1.78	1.80	1.82	1.82	1.79	1.70	1.73	1.77	1.80	1.78
Jun 25 2002 9	1.79	1.73	1.74	1.75	1.70	1.75	1.81	1.89	1.80	1.78
Jun 25 2002 10	1.80	1.83	1.80	1.80	1.77	1.77	1.76	1.78	1.81	1.81
Jun 25 2002 11	1.82	1.78	1.75	1.72	1.77	1.79	1.78	1.79	1.80	1.75
Jun 25 2002 12	1.72	1.71	1.72	1.72	1.75	1.78	1.76	1.76	1.77	1.80
Jun 25 2002 13	1.77	1.75	1.75	1.71	1.70	1.71	1.71	1.73	1.70	1.69
Jun 25 2002 14	1.70	1.73	1.76	1.73	1.69	1.67	1.65	1.64	1.63	1.64
Jun 25 2002 15	1.67	1.72	1.74	1.68	1.66	1.65	1.68	1.65	1.63	1.60
Jun 25 2002 16	1.60	1.58	1.53	1.54	1.55	1.51	1.43	1.36	1.33	1.41
Jun 25 2002 17	1.38	1.33	1.26	1.25	1.32	1.27	1.15	1.07	1.12	1.07
Jun 25 2002 18	1.02	0.97	0.95	0.95	0.94	0.91	0.86	0.73	0.73	0.69
Jun 25 2002 19	0.63	0.62	0.58	0.58	0.60	0.55	0.48	0.50	0.44	0.40
Jun 25 2002 20	0.36	0.32	0.29	0.30	0.28	0.23	0.21	0.20	0.13	0.13
Jun 25 2002 21	0.14	0.04	0.07	-0.01	0.01	0.01	0.00	-0.01	-0.01	0.02
Jun 25 2002 22	0.00	-0.02	-0.03	-0.02	-0.03	-0.05	0.01	-0.01	-0.02	0.00
Jun 25 2002 23	0.01	0.01	0.02	0.03	0.02	0.06	0.09	0.12	0.10	0.11
Jun 26 2002 0	0.16	0.19	0.23	0.20	0.20	0.26	0.29	0.32	0.32	0.37
Jun 26 2002 1	0.40	0.44	0.48	0.50	0.52	0.55	0.61	0.61	0.66	0.73
Jun 26 2002 2	0.73	0.77	0.80	0.86	0.89	0.93	1.02	1.03	1.03	1.07
Jun 26 2002 3	1.14	1.20	1.25	1.28	1.29	1.32	1.36	1.43	1.50	1.57
Jun 26 2002 4	1.62	1.63	1.66	1.69	1.73	1.76	1.78	1.80	1.85	1.88
Jun 26 2002 5	1.88	1.88	1.93	1.98	2.01	2.02	1.95	2.00	2.07	2.10
Jun 26 2002 6	2.14	2.08	2.04	2.05	2.09	2.07	1.99	1.94	2.00	1.99
Jun 26 2002 7	1.91	1.95	1.98	1.99	2.00	2.03	1.95	1.90	1.90	1.94
Jun 26 2002 8	2.02	1.93	1.92	1.95	1.97	1.93	1.89	1.88	1.93	1.88
Jun 26 2002 9	1.87	1.88	1.95	1.91	1.82	1.79	1.79	1.79	1.76	1.76
Jun 26 2002 10	1.74	1.70	1.71	1.69	1.67	1.65	1.63	1.66	1.73	1.79
Jun 26 2002 11	1.79	1.74	1.67	1.63	1.63	1.68	1.70	1.75	1.78	1.77
Jun 26 2002 12	1.72	1.76	1.77	1.75	1.71	1.63	1.63	1.64	1.65	1.69
Jun 26 2002 13	1.67	1.66	1.66	1.66	1.61	1.69	1.54	1.48	1.57	1.58
Jun 26 2002 14	1.58	1.60	1.65	1.70	1.59	1.52	1.56	1.55	1.52	1.46
Jun 26 2002 15	1.47	1.49	1.50	1.48	1.48	1.48	1.45	1.43	1.43	1.41
Jun 26 2002 16	1.38	1.40	1.50	1.50	1.47	1.41	1.38	1.37	1.32	1.24
Jun 26 2002 17	1.17	1.21	1.27	1.30	1.29	1.26	1.23	1.20	1.16	1.05
Jun 26 2002 18	1.03	1.12	1.11	1.11	1.08	0.98	0.94	0.91	0.94	0.90
Jun 26 2002 19	0.82	0.71	0.73	0.77	0.78	0.68	0.63	0.62	0.59	0.55
Jun 26 2002 20	0.45	0.42	0.49	0.48	0.39	0.30	0.32	0.35	0.32	0.23
Jun 26 2002 21	0.16	0.16	0.15	0.09	0.00	-0.05	-0.04	-0.05	-0.08	-0.12
Jun 26 2002 22	-0.13	-0.16	-0.21	-0.25	-0.30	-0.32	-0.35	-0.42	-0.43	-0.41
Jun 26 2002 23	-0.45	-0.45	-0.43	-0.43	-0.43	-0.45	-0.43	-0.41	-0.43	-0.44

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6-MINUTE WATER LEVEL DATA

Galveston Co. NRC Art. 33.136 Sketch 43, Sheet 19, small format

National Ocean Service (NOAA)

Station: 8771450
 Name: GALVESTON PIER 21, GALVESTON CHANNEL, TX
 Note: [] Inferred Water Level Value
 DCP#: 1 Sensor ID: A1

T.M.: 90 W
 Units: Feet
 Datum: MLLW
 Quality: Raw

Date	Hr	00	06	12	18	24	30	36	42	48	54
Jun 27 2002	0	-0.40	-0.31	-0.26	-0.24	-0.21	-0.19	-0.15	-0.16	-0.12	-0.09
Jun 27 2002	1	-0.07	-0.03	0.05	0.13	0.13	0.13	0.16	0.19	0.20	0.28
Jun 27 2002	2	0.31	0.32	0.31	0.34	0.37	0.46	0.50	0.56	0.54	0.60
Jun 27 2002	3	0.84	0.95	0.91	0.80	0.80	0.91	0.94	1.09	1.07	1.03
Jun 27 2002	4	1.07	1.25	1.24	1.22	1.34	1.49	1.49	1.52	1.50	1.59
Jun 27 2002	5	1.74	1.84	1.73	1.59	1.74	1.84	1.81	1.80	1.84	1.99
Jun 27 2002	6	2.08	1.98	1.85	1.92	1.99	1.96	1.80	1.75	1.82	1.89
Jun 27 2002	7	1.87	1.86	1.88	1.89	1.89	1.78	1.64	1.65	1.63	1.68
Jun 27 2002	8	1.72	1.80	1.80	1.77	1.75	1.68	1.62	1.59	1.55	1.54
Jun 27 2002	9	1.62	1.58	1.53	1.63	1.66	1.65	1.62	1.68	1.70	1.70
Jun 27 2002	10	1.67	1.54	1.53	1.57	1.56	1.52	1.54	1.52	1.48	1.54
Jun 27 2002	11	1.52	1.52	1.55	1.60	1.61	1.56	1.43	1.55	1.60	1.56
Jun 27 2002	12	1.45	1.44	1.39	1.31	1.37	1.44	1.51	1.56	1.48	1.37
Jun 27 2002	13	1.37	1.34	1.30	1.21	1.25	1.41	1.48	1.33	1.29	1.47
Jun 27 2002	14	1.53	1.41	1.29	1.36	1.48	1.41	1.47	1.57	1.67	1.64
Jun 27 2002	15	1.59	1.48	1.51	1.55	1.49	1.51	1.60	1.57	1.47	1.52
Jun 27 2002	16	1.59	1.56	1.43	1.39	1.38	1.45	1.41	1.34	1.31	1.35
Jun 27 2002	17	1.34	1.24	1.14	1.18	1.22	1.20	1.10	1.12	1.12	1.13
Jun 27 2002	18	1.13	1.14	1.10	1.01	0.97	1.00	0.99	0.95	0.90	0.94
Jun 27 2002	19	0.98	0.94	0.85	0.75	0.79	0.78	0.70	0.66	0.72	0.79
Jun 27 2002	20	0.73	0.61	0.56	0.54	0.53	0.53	0.51	0.46	0.45	0.47
Jun 27 2002	21	0.49	0.46	0.39	0.34	0.31	0.34	0.31	0.32	0.28	0.24
Jun 27 2002	22	0.22	0.23	0.17	0.09	0.01	-0.06	-0.15	-0.14	-0.08	-0.03
Jun 27 2002	23	-0.02	-0.01	-0.05	-0.12	-0.19	-0.19	-0.17	-0.15	-0.11	-0.07
Jun 28 2002	0	-0.09	-0.09	-0.06	-0.06	-0.04	-0.03	-0.04	-0.05	-0.05	0.03
Jun 28 2002	1	0.07	0.06	0.02	0.08	0.07	0.09	0.09	0.05	0.04	0.08
Jun 28 2002	2	0.13	0.20	0.25	0.23	0.28	0.29	0.28	0.28	0.36	0.44
Jun 28 2002	3	0.45	0.46	0.46	0.54	0.61	0.66	0.70	0.67	0.69	0.77
Jun 28 2002	4	0.72	0.74	0.76	0.83	0.88	0.93	0.94	0.92	0.95	1.01
Jun 28 2002	5	1.09	1.10	1.03	0.92	0.93	0.96	0.97	0.94	0.90	0.94
Jun 28 2002	6	1.00	1.05	1.10	1.03	0.98	1.09	1.18	1.19	1.18	1.20
Jun 28 2002	7	1.22	1.21	1.20	1.27	1.33	1.41	1.41	1.33	1.34	1.44
Jun 28 2002	8	1.41	1.40	1.44	1.51	1.55	1.56	1.51	1.46	1.49	1.53
Jun 28 2002	9	1.53	1.54	1.57	1.55	1.55	1.53	1.51	1.47	1.47	1.45
Jun 28 2002	10	1.46	1.46	1.49	1.44	1.34	1.35	1.37	1.40	1.34	1.32

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Jun 28 2002 11	1.36	1.42	1.39	1.32	1.25	1.30	1.31	1.32	1.29	1.36
Jun 28 2002 12	1.41	1.44	1.47	1.54	1.56	1.54	1.52	1.54	1.39	1.35
Jun 28 2002 13	1.46	1.55	1.56	1.56	1.48	1.50	1.53	1.52	1.43	1.36
Jun 28 2002 14	1.39	1.47	1.47	1.44	1.42	1.41	1.39	1.35	1.36	1.40
Jun 28 2002 15	1.46	1.43	1.40	1.35	1.27	1.25	1.27	1.33	1.31	1.30
Jun 28 2002 16	1.25	1.25	1.25	1.26	1.23	1.17	1.15	1.14	1.18	1.23
Jun 28 2002 17	1.26	1.22	1.15	1.16	1.06	1.03	1.02	1.01	1.01	1.02
Jun 28 2002 18	1.04	1.07	1.12	1.09	1.03	1.00	1.02	0.96	0.85	0.89
Jun 28 2002 19	0.96	1.00	0.97	0.94	0.93	0.88	0.85	0.81	0.74	0.78
Jun 28 2002 20	0.78	0.77	0.73	0.73	0.69	0.61	0.62	0.60	0.56	0.57
Jun 28 2002 21	0.53	0.49	0.47	0.49	0.45	0.41	0.37	0.32	0.30	0.34
Jun 28 2002 22	0.37	0.34	0.29	0.26	0.25	0.22	0.22	0.24	0.27	0.31
Jun 28 2002 23	0.33	0.27	0.24	0.26	0.22	0.18	0.16	0.14	0.16	0.20

Galveston Co. NRC Art. 33.136 Sketch 43, Sheet 21, small format