

# Tidal Datum Errors for West Coast of the United States (California, Oregon, Washington)

Standard deviation (or accuracy) of Tidal Datum Computations:

The time period necessary to incorporate all of the major astronomical tide producing cycles into the computation of a tidal datum is 19-years. All tidal datums are referenced to specific 19-year National Tidal Datum Epochs (NTDE). First reduction tidal datums are determined directly by averaging values of the tidal parameters over a 19-year NDTE. Errors in determination of tidal datums using First Reduction for the 19-year NTDE are theoretically zero. NTDE datums for short-term subordinate stations are computed and adjusted to a 19-year NTDE equivalent using simultaneous comparison with an appropriate nearby control station (NOS, 2003, Swanson, 1974, and Marmer, 1951). See Gill and Fisher, 2008:

[http://tidesandcurrents.noaa.gov/publications/Technical\\_Memorandum\\_NOS\\_COOPS\\_0048.pdf](http://tidesandcurrents.noaa.gov/publications/Technical_Memorandum_NOS_COOPS_0048.pdf) for the areas of coverage for tidal datum computation for each National Water Level Observation Network (NWLON) control tide station.

Errors in determination of tidal datums at short-term stations through the method of simultaneous comparison are known to be generally correlated with the length of the subordinate station observations, with geographic distance from the control station and with difference in range of tide and time of tide between control and subordinate stations. In applied research performed by Bodnar (1981), multiple curvilinear regression equations estimating the accuracy of computed 19-year equivalent tidal datums were developed. The formulas for Mean Low Water were adopted for use in estimating tidal datum errors because the low water differences express the effects of shallow water and bottom friction better than MHW. Although these regression equations are the best available estimate of the datum accuracy they may be unreliable in areas which have widely divergent characteristics.

The table below provides datum error estimates using the standard deviation of the estimate (in feet). To estimate the 95% Confidence Interval of the errors, multiply the standard deviation by 1.96.

Station Name	STATION ID	Latitude	Longitude	Error in Meters	Error in Feet
IMPERIAL BEACH, PACIFIC OCEAN	9410120	32.578300	-117.135000	0.008	0.03
SAN DIEGO, SAN DIEGO BAY	9410170	32.714190	-117.173583	0.000	0.00
LA JOLLA, PACIFIC OCEAN	9410230	32.866700	-117.258000	0.000	0.00
OCEANSIDE HARBOR	9410396	33.210000	-117.395000	0.012	0.04
NEWPORT BEACH, NEWPORT BAY ENTRANCE	9410580	33.603300	-117.883000	0.002	0.01
CABRILLO BEACH	9410650	33.706700	-118.273000	0.007	0.02
LOS ANGELES, OUTER HARBOR	9410660	33.720000	-118.272000	0.000	0.00
LONG BEACH, TERMINAL ISLAND	9410680	33.751700	-118.227000	0.004	0.01
KING HARBOR, SANTA MONICA BAY	9410738	33.846700	-118.398000	0.015	0.05
SANTA MONICA, PACIFIC OCEAN	9410840	34.008300	-118.500000	0.000	0.00
BECHERS BAY, SANTA ROSA ISLAND	9410962	34.008300	-120.047000	0.017	0.05
PRISONERS HARBOR, SANTA CRUZ IS.	9410971	34.020000	-119.683000	0.015	0.05
RINCON ISLAND, PACIFIC OCEAN	9411270	34.348300	-119.443000	0.004	0.01
SANTA BARBARA, PACIFIC OCEAN	9411340	34.408300	-119.685000	0.004	0.01

Station Name	STATION ID	Latitude	Longitude	Error in Meters	Error in Feet
GAVIOTA STATE PARK, PACIFIC OCEAN	9411399	34.469389	-120.228306	0.015	0.05
OIL PLATFORM HARVEST (TOPEX PROJECT)	9411406	34.468300	-120.673000	0.005	0.02
PORT SAN LUIS, SAN LUIS OBISPO BAY	9412110	35.176700	-120.760000	0.000	0.00
SAN SIMEON	9412553	35.641700	-121.188000	0.019	0.06
Mansfield Cone, Pacific Ocean	9412802	35.949528	-121.481944	0.018	0.06
MONTEREY, MONTEREY HARBOR	9413450	36.605000	-121.888000	0.000	0.00
MOSS LANDING,OCEAN PIER	9413616	36.801700	-121.790000	0.013	0.04
ELKHORN SLOUGH, ENTRANCE BRIDGE	9413623	36.810000	-121.785000	0.015	0.05
ELKHORN SLOUGH AT ELKHORN	9413631	36.818300	-121.747000	0.013	0.04
TIDAL CREEK, ELKHORN SLOUGH	9413643	36.833330	-121.745000	0.013	0.04
KIRBY PARK, ELKHORN SLOUGH	9413651	36.841330	-121.745278	0.014	0.04
ELKHORN SLOUGH RAILROAD BRIDGE	9413663	36.856670	-121.755000	0.014	0.05
PILLAR POINT, HALF MOON BAY	9414131	37.502500	-122.482167	0.016	0.05
SAN FRANCISCO, SAN FRANCISCO BAY	9414290	37.806694	-122.465000	0.000	0.00
PIER 22 1/2, SAN FRANCISCO	9414317	37.790000	-122.387000	0.014	0.05
HUNTERS POINT, S.F. BAY	9414358	37.730000	-122.357000	0.012	0.04
OYSTER POINT MARINA, SAN FRANCISCO BAY	9414392	37.665000	-122.377000	0.015	0.05
SAN MATEO BRIDGE, WEST SIDE	9414458	37.580000	-122.253000	0.007	0.02
DUMBARTON BRIDGE, SAN FRANCISCO BAY	9414509	37.506700	-122.115000	0.017	0.06
MOWRY SLOUGH, SAN FRANCISCO BAY	9414519	37.493300	-122.042000	0.022	0.07
REDWOOD CITY, WHARF 5, S. F. BAY	9414523	37.506700	-122.210000	0.003	0.01
PALO ALTO YACHT HARBOR, S. F. BAY	9414525	37.458300	-122.105000	0.015	0.05
GOLD STREET BRIDGE, ALVISO SLOUGH	9414551	37.423300	-121.975000	0.026	0.08
COYOTE CREEK, ALVISO SLOUGH	9414575	37.465000	-122.023000	0.016	0.05
ALAMEDA CREEK, SAN FRANCISCO BAY	9414632	37.595000	-122.145000	0.017	0.06
SAN LEANDRO MARINA, SAN FRANCISCO BAY	9414688	37.695000	-122.192000	0.012	0.04
OAKLAND AIRPORT, SAN FRANCISCO BAY	9414711	37.731700	-122.208000	0.013	0.04
OAKLAND/ALAMEDA PARK ST. BRIDGE	9414746	37.771700	-122.235000	0.011	0.04
ALAMEDA, SAN FRANCISCO BAY	9414750	37.771667	-122.298333	0.000	0.00
OAKLAND INNER HARBOR, SAN FRANCISCO BAY	9414764	37.795000	-122.282000	0.011	0.04
ALAMEDA NAS, NAVY FUEL PIER	9414767	37.793300	-122.315000	0.011	0.04
OAKLAND MIDDLE HARBOR, PIER 40	9414777	37.805000	-122.338000	0.012	0.04
YERBA BUENA ISLAND, SAN FRANCISCO BAY	9414782	37.810000	-122.360000	0.012	0.04
SAUSALITO, SAN FRANCISCO BAY	9414806	37.846700	-122.477000	0.009	0.03
BRADMOOR ISLAND, NURSE SLOUGH	9414811	38.183300	-121.923000	0.010	0.03
BERKELEY,S.F.BAY	9414816	37.865000	-122.307000	0.015	0.05
ANGEL ISLAND, EAST GARRISON, S.F. BAY	9414818	37.863300	-122.420000	0.011	0.04
SAUSALITO, COE DOCK, S.F. BAY	9414819	37.865000	-122.493000	0.011	0.04
BORDEN HIGHWAY BRIDGE, MIDDLE RIVER	9414835	37.891700	-121.488000	0.018	0.06
POINT CHAUNCEY, RICHARDSON BAY	9414837	37.891700	-122.443000	0.012	0.04
RICHMOND INNER HARBOR, SAN FRANCISCO BAY	9414849	37.910000	-122.358000	0.015	0.05
RICHMOND, CHEVRON OIL PIER	9414863	37.928300	-122.400000	0.002	0.01
BORDEN HIGHWAY BRIDGE, SAN JOAQUIN RIVER	9414867	37.936700	-121.333000	0.017	0.06
POINT SAN QUENTIN, SAN FRANCISCO BAY	9414873	37.945000	-122.475000	0.015	0.05
CORTE MADERA CREEK	9414874	37.943300	-122.513000	0.012	0.04
BOLINAS, BOLINAS LAGOON	9414958	37.907956	-122.678544	0.009	0.03
POINT SAN PEDRO, SAN FRANCISCO BAY	9415009	37.993300	-122.447000	0.014	0.05
POINT REYES, DRAKES BAY	9415020	37.996100	-122.976700	0.000	0.00
GALLINAS, GALLINAS CREEK	9415052	38.015000	-122.503000	0.018	0.06
DUTCH SLOUGH	9415053	38.011700	-121.638000	0.020	0.06
PINOLE POINT, SAN PABLO BAY	9415056	38.015000	-122.363000	0.015	0.05
ANTIOCH, SAN JOAQUIN RIVER	9415064	38.020000	-121.815000	0.014	0.05
HERCULES WHARF	9415074	38.023300	-122.292000	0.016	0.05
PITTSBURG, NEW YORK SLOUGH, SUISUN BAY	9415096	38.036700	-121.880000	0.018	0.06

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Martinez-Amorco Pier, Carquinez Strait	9415102	38.034639	-122.125194	0.014	0.05
BENICIA, CARQUINEZ STRAIT	9415111	38.043300	-122.130000	0.007	0.02
MALLARD ISLAND, SUISUN BAY	9415112	38.043300	-121.918000	0.012	0.04
HAMILTON AFB OUTSIDE GAUGE	9415124	38.048300	-122.498000	0.016	0.05
HAMILTON AIR FORCE BASE INSIDE GAUGE	9415126	38.048300	-122.498000	0.011	0.04
CROCKETT, CARQUINEZ STRAIT	9415143	38.058300	-122.223000	0.013	0.04
PORT CHICAGO, SUISUN BAY	9415144	38.056000	-122.039500	0.000	0.00
PRISONERS POINT, SAN JOAQUIN RIVER	9415149	38.061700	-121.555000	0.021	0.07
THREE MILE SLOUGH,SAN JOAQUIN R.	9415193	38.086700	-121.685000	0.024	0.08
MONTEZUMA SLOUGH, SUISUN BAY	9415205	38.076700	-121.885000	0.017	0.06
MARE IS.NAVAL SHIPYARD,CARQUINEZ STRAIT	9415218	38.070000	-122.250000	0.007	0.02
INVERNESS, TOMALES BAY	9415228	38.113300	-122.868000	0.014	0.05
PETALUMA RIVER ENTRANCE	9415252	38.111700	-122.498000	0.014	0.05
SUISUN SLOUGH ENTRANCE	9415265	38.128300	-122.073000	0.012	0.04
PIERCE HARBOR,GOODYEAR SLOUGH	9415266	38.126700	-122.100000	0.011	0.04
MEINS LANDING, MONTEZUMA SLOUGH	9415307	38.136700	-121.907000	0.014	0.05
RIO VISTA, SACRAMENTO RIVER	9415316	38.145000	-121.692000	0.017	0.06
REYNOLDS, TOMALES BAY	9415320	38.146700	-122.883000	0.018	0.06
SONOMA CK.ENTR.,SAN PABLO BAY	9415338	38.156700	-122.407000	0.015	0.05
JOICE ISLAND, SUISUN SLOUGH	9415379	38.180000	-122.045000	0.012	0.04
EDGERLEY ISLAND, NAPA RIVER	9415415	38.191700	-122.312000	0.019	0.06
LAKEVILLE, PETALUMA RIVER	9415423	38.198300	-122.547000	0.024	0.08
SKAGGS ISLAND, HUDEMAN SLOUGH	9415438	38.205000	-122.373000	0.024	0.08
SONOMA CREEK, WINGO	9415447	38.210000	-122.427000	0.024	0.08
SAND POINT, TOMALES BAY	9415477	38.231700	-122.968000	0.015	0.05
NEW HOPE BRIDGE, MOKELUMNE RIVER	9415478	38.226700	-121.490000	0.018	0.06
SUISUN CITY, SUISUN SLOUGH	9415498	38.236700	-122.030000	0.013	0.04
PETALUMA RIVER, UPPER DRAWBRIDGE	9415584	38.228300	-122.613000	0.026	0.08
NAPA, NAPA RIVER	9415623	38.298300	-122.280000	0.021	0.07
SACRAMENTO, SACRAMENTO RIVER	9416174	38.580000	-121.507000	0.011	0.04
Green Cove, Pacific Ocean	9416409	38.704333	-123.449389	0.014	0.05
ARENA COVE, PACIFIC OCEAN	9416841	38.913300	-123.708000	0.000	0.00
HOOKTON SLOUGH,HUMBOLDT BAY	9418686	40.686700	-124.222000	0.015	0.05
FIELDS LANDING, HUMBOLDT BAY	9418723	40.723300	-124.222000	0.011	0.04
RED BLUFF, HUMBOLDT BAY	9418739	40.740000	-124.212000	0.018	0.06
NORTH SPIT, HUMBOLDT BAY	9418767	40.766700	-124.217000	0.000	0.00
BUCKSPORT, HUMBOLDT BAY	9418778	40.778300	-124.197000	0.015	0.05
FRESHWATER SLOUGH, HUMBOLDT BAY	9418799	40.798300	-124.120000	0.015	0.05
EUREKA, HUMBOLDT BAY	9418801	40.806700	-124.167000	0.015	0.05
EUREKA SLOUGH, HUMBOLDT BAY	9418802	40.806700	-124.142000	0.018	0.06
SAMOA, HUMBOLDT BAY	9418817	40.826700	-124.180000	0.012	0.04
MAD RIVER SLOUGH, ARCATA BAY	9418865	40.865000	-124.148000	0.018	0.06
UPPER MAD RIVER SLOUGH	9418983	40.898300	-124.135000	0.019	0.06
TRINIDAD HARBOR	9419059	41.056700	-124.147000	0.008	0.03
CRESCENT CITY, PACIFIC OCEAN	9419750	41.745000	-124.183000	0.000	0.00
PYRAMID POINT, SMITH RIVER	9419945	41.945250	-124.200917	0.013	0.04
Gold Beach, Rogue River	9431011	42.421639	-124.418722	0.014	0.05
PORT ORFORD, PACIFIC OCEAN	9431647	42.738970	-124.498278	0.001	0.00
BANDON, COQUILLE RIVER	9432373	43.120000	-124.413000	0.025	0.08
CAPE ARAGO LIGHTHOUSE	9432771	43.341700	-124.367000	0.012	0.04
CHARLESTON, COOS BAY	9432780	43.345000	-124.322000	0.000	0.00
ISTHMUS SLOUGH, COOS BAY	9432796	43.351700	-124.192000	0.016	0.05
SITKA DOCK, COOS BAY	9432879	43.376700	-124.297000	0.012	0.04
NORTH BEND, COOS BAY	9432895	43.410000	-124.218000	0.015	0.05

Station Name	STATION ID	Latitude	Longitude	Error in Meters	Error in Feet
Half Moon Bay, Umpqua River	9433445	43.675000	-124.192000	0.015	0.05
FLORENCE USCG PIER, SUISLAW RIVER	9434098	44.002111	-124.123000	0.016	0.05
DRIFT CREEK, ALSEA RIVER	9434938	44.413300	-123.990000	0.017	0.05
WALDPORT, ALSEA BAY	9434939	44.434361	-124.058083	0.014	0.05
WEISER POINT, YAQUINA RIVER	9435308	44.593300	-124.008000	0.028	0.09
TOLEDO	9435362	44.616700	-123.937000	0.026	0.09
SOUTH BEACH, YAQUINA RIVER	9435380	44.625000	-124.043000	0.000	0.00
YAQUINA USCG STA, NEWPORT	9435385	44.626700	-124.055000	0.010	0.03
DEPOE BAY	9435827	44.810000	-124.058000	0.005	0.02
CASCADE HEAD, SALMON RIVER	9436381	45.047944	-124.007306	0.016	0.05
NETARTS, NETARTS BAY	9437262	45.430000	-123.945000	0.026	0.08
DICK POINT, TILLAMOOK BAY	9437381	45.481700	-123.902000	0.016	0.05
Garibaldi, Tillamook Bay	9437540	45.554530	-123.918944	0.008	0.03
MULTNOMAH CHANNEL, COLUMBIA RIVER	9438125	45.811700	-122.827000	0.025	0.08
SEASIDE (12TH AVE. BRIDGE)	9438478	46.000000	-123.922000	0.017	0.06
Cathcart Landing, Youngs River	9438772	46.124250	-123.804333	0.012	0.04
FORT STEVENS	9439008	46.206700	-123.950000	0.012	0.04
HAMMOND, COLUMBIA RIVER	9439011	46.201700	-123.945000	0.009	0.03
ASTORIA, YOUNGS BAY	9439026	46.171700	-123.842000	0.013	0.04
ASTORIA, TONGUE POINT, COLUMBIA RIVER	9439040	46.207310	-123.768306	0.000	0.00
KNAPPA	9439069	46.186700	-123.588000	0.015	0.05
WAUNA, COLUMBIA RIVER	9439099	46.160000	-123.405000	0.014	0.05
BEAVER	9439135	46.181700	-123.180000	0.020	0.07
ROCKY POINT, MULTNOMAH CHANNEL	9439189	45.696700	-122.868000	0.021	0.07
ST. HELENS, COLUMBIA RIVER	9439201	45.865000	-122.797000	0.021	0.07
PORTLAND, MORRISON STREET BRIDGE	9439221	45.510000	-122.673000	0.031	0.10
VANCOUVER, COLUMBIA RIVER	9440083	45.631700	-122.697000	0.022	0.07
LONGVIEW, COLUMBIA RIVER	9440422	46.106111	-122.954167	0.012	0.04
SKAMOKAWA, COLUMBIA RIVER	9440569	46.266700	-123.452000	0.013	0.04
ALTOONA, COLUMBIA RIVER	9440571	46.265000	-123.653000	0.013	0.04
JETTY A, COLUMBIA RIVER	9440572	46.268300	-124.037000	0.017	0.06
NORTH JETTY	9440574	46.273300	-124.072000	0.015	0.05
KNAPPTON	9440575	46.268300	-123.827000	0.013	0.04
NASALLE RIVER SWING BRIDGE	9440691	46.430000	-123.903000	0.019	0.06
NAHCOTTA, WILLAPA BAY	9440747	46.501700	-124.023000	0.018	0.06
BAY CENTER, PALIX RIVER, WILLAPA BAY	9440846	46.623300	-123.945000	0.014	0.04
SOUTH BEND	9440875	46.663300	-123.798000	0.015	0.05
TOKE POINT, WILLAPA BAY	9440910	46.707470	-123.966917	0.000	0.00
Westport, Grays Harbor	9441102	46.904310	-124.105083	0.008	0.03
POINT BROWN	9441156	46.950000	-124.128000	0.023	0.07
ABERDEEN, GRAYS HARBOR	9441187	46.968300	-123.853000	0.013	0.04
LA PUSH, QUILLAYUTE RIVER	9442396	47.913300	-124.637000	0.007	0.02
MAKAH BAY	9442861	48.296700	-124.672000	0.012	0.04
NEAH BAY, STRAIT OF JUAN DE FUCA	9443090	48.366670	-124.611667	0.000	0.00
SEKIU, CLALLAM BAY	9443361	48.263300	-124.297000	0.013	0.04
CRESCENT BAY	9443826	48.161700	-123.725000	0.024	0.08
PORT ANGELES, STRAIT OF JUAN DE FUCA	9444090	48.125000	-123.440000	0.000	0.00
EDIZ HOOK, PORT ANGELES	9444122	48.140000	-123.413000	0.019	0.06
PORT TOWNSEND, ADMIRALTY INLET	9444900	48.111700	-122.758000	0.000	0.00
FOULWEATHER BLUFF, TWIN SPITS	9445016	47.926700	-122.617000	0.018	0.06
LOFALL	9445088	47.815000	-122.657000	0.017	0.06
BANGOR	9445133	47.748300	-122.727000	0.010	0.03
WHITNEY POINT	9445246	47.761700	-122.850000	0.017	0.05
QUILCENE, DABOB BAY, HOOD CANAL	9445272	47.800000	-122.858000	0.017	0.06

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SEABECK, HOOD CANAL	9445296	47.641700	-122.828000	0.016	0.05
LYNCH COVE DOCK	9445441	47.418300	-122.900000	0.018	0.06
UNION, HOOD CANAL	9445478	47.358300	-123.098000	0.016	0.05
HANSVILLE	9445526	47.918300	-122.545000	0.015	0.05
POULSBO	9445719	47.725000	-122.638000	0.010	0.03
BROWNSVILLE	9445832	47.651700	-122.615000	0.015	0.05
BREMERTON	9445958	47.561700	-122.623000	0.012	0.04
ALLYN	9446281	47.383300	-122.823000	0.022	0.07
GREEN POINT	9446451	47.301700	-122.682000	0.020	0.07
TACOMA, COMMENCEMENT BAY	9446484	47.266670	-122.413333	0.002	0.01
ARLETTA	9446491	47.280000	-122.652000	0.020	0.07
TACOMA	9446545	47.255000	-122.432000	0.017	0.06
BALLOW	9446583	47.246700	-122.862000	0.022	0.07
YOMAN POINT, ANDERSON ISLAND	9446705	47.180000	-122.675000	0.015	0.05
BARRON POINT, LITTLE SKOOKUM INLET ENT	9446742	47.156700	-123.008000	0.024	0.08
BUDD INLET, SOUTH OF GULL HARBOR	9446807	47.098300	-122.895000	0.016	0.05
OLYMPIA, BUD INLET, PUGET SOUND	9446969	47.060000	-122.903000	0.016	0.05
LOCKHEED SHIPYARD	9447110	47.585000	-122.362000	0.009	0.03
SEATTLE, PUGET SOUND	9447130	47.602639	-122.339306	0.000	0.00
EDMONDS	9447427	47.813300	-122.383000	0.015	0.05
EVERETT	9447659	47.980000	-122.223000	0.017	0.06
TULALIP, TULALIP BAY	9447773	48.065000	-122.288000	0.015	0.05
GLENDALE, POSSESSION SOUND	9447814	47.940000	-122.357000	0.017	0.05
BUSH POINT WHIDBEY ISLAND	9447854	48.033300	-122.607000	0.020	0.07
HOLLY HARBOR FARMS	9447855	48.026700	-122.535000	0.017	0.06
SANDY POINT, SARATOGA PASSAGE	9447856	48.035000	-122.377000	0.017	0.06
CRESCENT HARBOR, WHIDBEY ISLAND	9447952	48.286700	-122.617000	0.020	0.07
TULARE BEACH, PORT SUSAN	9448043	48.106806	-122.347278	0.015	0.05
LA CONNER, SWINOMISH SLOUGH	9448558	48.391700	-122.497000	0.022	0.07
SNEEOOSH POINT, SKAGIT BAY	9448576	48.400000	-122.548000	0.023	0.08
BOWMAN BAY, FIDALGO ISLAND	9448614	48.415000	-122.652000	0.009	0.03
TURNER BAY, SIMILK BAY	9448657	48.445000	-122.555000	0.022	0.07
VILLAGE POINT, LUMMI ISLAND	9449161	48.716700	-122.708000	0.015	0.05
BELLINGHAM	9449211	48.745000	-122.495000	0.014	0.04
SANDY POINT, LUMMI BAY	9449292	48.790000	-122.708000	0.013	0.04
CHERRY POINT, STRAIT OF GEORGIA	9449424	48.863300	-122.758000	0.000	0.00
BLAINE, DRAYTON HARBOR	9449679	48.991700	-122.765000	0.011	0.04
HANBURY POINT, SAN JUAN ISLAND	9449828	48.581700	-123.170000	0.014	0.05
FRIDAY HARBOR, SAN JUAN CHANNEL	9449880	48.546667	-123.010000	0.000	0.00
ARMITAGE ISLAND	9449932	48.535000	-122.797000	0.009	0.03
RICHARDSON, LOPEZ ISLAND	9449982	48.446700	-122.900000	0.009	0.03