Alaska Tideland Surveys

"Who, What, When, Where, How, Why"

A Paper Presented at the

37th Annual Alaska Surveying and Mapping Conference

By

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ABSTRACT

Alaska Tideland Surveys – the 5 w's. Surveys of tideland parcels are unique in several ways. Typically all corners are monumented with witness corners. DNR is usually the fee owner of the parcel, and the landward boundary is usually the mean high water line. Frequently, the line is fixed and limiting, because of avulsion, or placement of fill. This paper will briefly discuss how an applicant applies for a tideland lease or conveyance and how to conduct the survey and obtain state approval. Presenter: Gerald Jennings

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Alaska Tideland Surveys

Introduction – who what why?

Title to most of the tide and submerged lands surrounding Alaska was vested in the State of Alaska under the Submerged Lands Act of May 22, 1953. Most of those lands remain in state ownership and in most cases, the state will lease, but retain fee title. As a surveyor, you will be contacted about Alaska Tideland Surveys (ATS) by a public or private party who desires to lease or acquire tidelands for various reasons such as construction of docks, bridges, harbors, log transfer facilities, etc.

Another situation in which you may need to conduct an ATS is to facilitate conveyance of tide and submerged lands to local communities under AS 38.05.820 or .825.

What are tidelands? The DNR Fact Sheet Titled: Tide & submerged Land Ownership (appendix A) discusses tideland ownership and what are tide and submerged lands. Tidelands are those lands between the mean high and the mean low tide lines. State owned submerged lands are located seaward of the mean low tide line and extending out three nautical miles. A definition of tidelands is also found in AS 38.05.965.

Why are tideland surveys required? For lease or patent, it is required under AS 38.04.045(b) "Before the issuance of a long-term lease under AS 38.05.070 or of a patent for state land, an official cadastral survey shall be accomplished, unless a comparable, approved survey exists that has been conducted by the federal Bureau of Land Management."

When? The Application Process

Your client calls up and tells you that they need a survey. They want to build a dock and the state's telling them that they need a survey. You respond, "I'll be glad to help. At what step is your application at DNR?". Sometimes applicants go for the survey too early. If you call the survey unit, we will ask for the ADL number, and we will check for a final decision. If the decision hasn't been done yet, it is usually too early to get survey instructions, but not always. Occasionally, we will issue instructions based on an approved preliminary decision, but rarely before any decision is issued. We will need verification from the division's adjudicator for instructions to go out before the final decision.

How To Conduct A Tideland Survey – Field Procedures

Before beginning the field survey, obtain survey instructions from DNR –see below.

Monumentation: For the "normal" ATS survey you will set four monuments, two on the upland extension of each sideline. Typically, the upland owner is the tideland applicant, however if not, you need to obtain permission for setting monuments on the uplands.

Monuments are to meet the standards for primary monuments (11AAC53.), which includes a requirement for setting accessories. However, we will entertain requests to waive accessories in areas of dense monumentation.

Monument Marking: There has been some confusion on this subject over the years. The confusion is the marking of the two witness corners which are set on a sideline's upland extension. Occasionally a survey will show one of the two monuments marked as a witness corner to the nearest true corner, with the second monument as witnessing the seaward corner. This works, but is not preferred. What doesn't work, is sometimes a survey shows both WC monuments as witnessing the same corner, with no differentiation of markings on the two witness monuments. If one is lost, it is difficult to determine which is remaining.

The preferred marking is to label the witness corners as wc 1 and wc 2 to the nearest true meander corner. This way, lining up the two monuments will give the lay person an approximation of the ATS survey parcel's sideline as it crosses the water. But if the true location became critical, it would be determined by grant boundary adjustment between the true meander corners on the opposite sidelines of the survey. This is because the two witness corners are typically set too close together to be dependable as an extension seaward.

How to determine the landward boundary: Often, there are two lines which need to be compared, the existing line of mean high water (MHW), and the record line as per the adjacent upland survey.

The approximate location of the true mean high water line is determined by the use of National Geodetic Survey tidal bench marks (or any other bench marks that have been determined from that source), and the MHW datum for the immediate body of water. Ref: 11AAC53.120(1). If no such bench marks exist within one mile, then tidal observations may be taken and used in conjunction with official tide tables for the immediate body of water. A note shall be placed on the plat stating either:

> Mean high tide was determined by time coordinated tidal observations on mth day yr as extrapolated from the NOAA Publication for the predictions of high and low waters for (year).

or

> Mean high tide was determined from ________________ tidal bench mark on mth day yr from data supplied by NOAA. Bench Mark Elev.:

So, how exactly is this done in the field? Typically, you will set a temporary bench mark near the project and run levels from NGS bench mark or if there is no bench mark within one mile, you take time coordinated tide readings. See appendices B, C and D; "DETERMINING MEAN HIGH TIDE WHERE AN NGS BENCH MARK EXISTS" and "DETERMINING MEAN HIGH TIDE IN AREAS WHERE NO NGS BENCH

MARKS EXIST". The published MHW elevation for a particular body of water can be found on NOS Nautical Charts, NOS Tidal Bench Mark Data Sheets, or from the predicted tide tables.

To determine the meander line of record, it is necessary to tie monumentation from the record survey. You tie the nearest monument of the record survey in each direction, and using grant boundary adjustment procedures, fit the record meanders between the recovered monuments.

Once you've established the two lines, what do you do with them? This will ordinarily be addressed in the survey instructions. State regulations 11AAC53.120 set the guidelines for whether to set the upland boundary at the one line or the other.

In cases where it is determined that there has been an avulsive event, such as fill placed, or uplift (or subsidence), etc, the best evidence of the last location of the MHW prior to the event is used to set the line as a fixed and limiting boundary. This is usually the last survey of record, although sometimes aerial photography, surveys not of record or other evidence may be used.

A 50 foot public access easement is required by AS 38.05.127 and 11AAC51.045. Unless the easement is specifically waived in the final decision, it is required to be shown on the plat. The easement is along the <u>existing</u> mean high water line. There has been confusion on this in the past as the easement is to follow the existing MHW, not necessarily the landward boundary of the survey, which sometimes follows the record MHW line instead.

Note that the public access easement is applied 50 feet seaward and 50 upland of the existing MHW on uplands owned by the state. Thus, those surveys which because of fill, extend upland of the existing MHW, will have the easement applied both directions.

Other Issues

Apportionment of tidelands: In cases of negotiated leases, the applicant's tideland parcel is limited to tidelands adjacent to his upland parcel. Depending on the configuration of the shore, the surveyor may not be able to simply extend the upland boundary seaward, but should typically extend at the angle which bisects the shoreline meander. The surveyor must be aware of the adjacent upland owner's rights to the tidelands.

How does accretion and erosion to the upland parcel's affect the tidelands parcel? Where the landward boundary is ambulatory, the seaward boundary is fixed. Thus accretion to uplands, "erodes" away the tidelands parcel. Over time, a tideland parcel can disappear. On the other hand, erosion of the upland parcel, increases the size of the tideland parcel.

Where Do You Get Survey Instructions?

You have received a final decision, and you would like to get the lands surveyed, how do you get started? Send a request for survey instructions to DNR's Land Survey Unit. The request should include the ADL number, a description of the lands which you want to have surveyed at this time, and the $225 fee. It is preferable that you only request for lands that you actually plan to survey, as they have a two year expiration, after which they would have to be extended or completely reissued depending on how much things have changed.

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Depending on our workload, it may take a couple of months to get the instructions prepared. When the field work is complete, submit the project to DNR surveys for review. The review fee is $200 for the first tract, plus $50 per additional parcel.

If within a city or borough that exercises platting authority, you will need to go through the platting board for approval of the survey. When the survey meets DNR and local approval, the final plat will be signed by various parties and submitted for recording. The recording fee is $20 for sheet 1, plus $5 per additional sheet.

These fees are set out in 11 AAC 05.010 (a)(13) survey and platting.
(13) survey and platting
(A) issuance or amendment of survey instructions, $50 for a remote recreational cabin site lease, replat, or right-of-way vacation, and $225 for any other type of survey;
(B) plat review under AS 38.04.045 ,
(i) first review of first parcel or tract per plat, $200, and $50 for each additional parcel or tract per plat, with the second review at no charge;
(ii) third and each additional review of first parcel or tract per plat, $300 each, and $100 for each additional parcel or tract per plat;

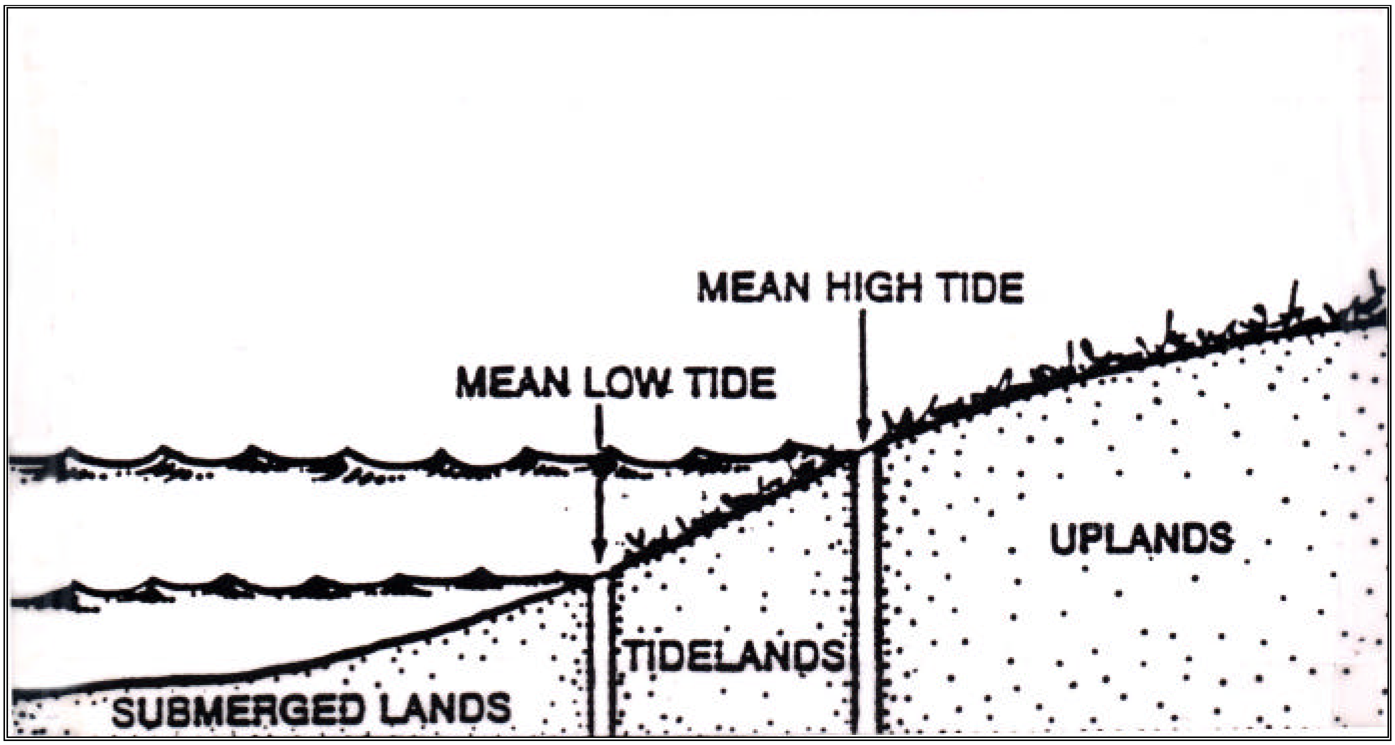
Fact Sheet

Title: Tide & Submerged Land Ownership

Alaska Department of NATURAL RESOURCES
Division of Mining, Land & Water
January 2000

What are "tide and submerged" lands?

Tidelands include the land between mean (average) high and mean low tide. Submerged lands are seaward of mean low tide to three miles offshore. The tide and submerged lands include all land between the mean high tide line and three miles offshore of the mean low tideline.



Who owns tide and submerged lands in Alaska?

The State of Alaska owns most of the tide and submerged lands along its coastline. The submerged Lands Act of May 22, 1953 states that all lands permanently or periodically covered by tidal waters up to, but not above, the line of mean high tide and seaward to a line three geographical miles distant from the coast mean low tideline is owned by the state.

Can the state sell or lease its tide and submerged land?

As a general rule, the State cannot sell tide and submerged land. However, certain cities and individuals or corporations may acquire title to tide and submerged land occupied or developed on or before January 3, 1959, the date Alaska was admitted to the union. There are several programs under which a lease of state tidelands may be acquired.

Can I use state tide and submerged lands, even if the state doesn't own the uplands?

Yes, you can use state tide and submerged land, even if the uplands are not owned by the state. However, you must remember that you only have the right to use the land from mean high water seaward. You are also expected to respect the upland owner's rights and treat the land with care.

Does the federal government own tidelands adjacent to its conservation units, such as National Parks?

The question has been raised that the United States may own tidelands adjacent to certain federal withdrawals that exist prior to statehood. However, that question was answered on June 8, 1987 when the U.S. Supreme Court issued its decision in Utah v. United States. This decision established that federal land withdrawals made prior to statehood did not include land under navigable waters.
In that decision, the Supreme Court affirmed the longstanding policy that the federal government holds land under navigable waters for the ultimate benefit of a future state. In order for this not to be the case, congress would have to specifically include the land and clearly state that it intended that the state would not have title to it.

Tide and submerged lands were not included in any pre-statehood federal withdrawals within Alaska and there is no indication that Congress intended to take away the State of Alaska's title. The state therefore received title to all the tide and submerged lands at statehood.

Additionally, in the Alaska National Interest Lands Conservation Act, Congress did not take away the state's power to regulate state-owned submerged lands within or adjacent to federal Conservation System Units in Alaska. Many provisions in ANILCA recognize and respect the state's authority over state-owned land.

Where the uplands are within federal conservation units, the state has cooperated with federal land managers wherever possible. As a result, some special use restrictions may apply. Sometimes this cooperation is formally set out in a memorandum of understanding that discusses management issues and how they will be resolved.

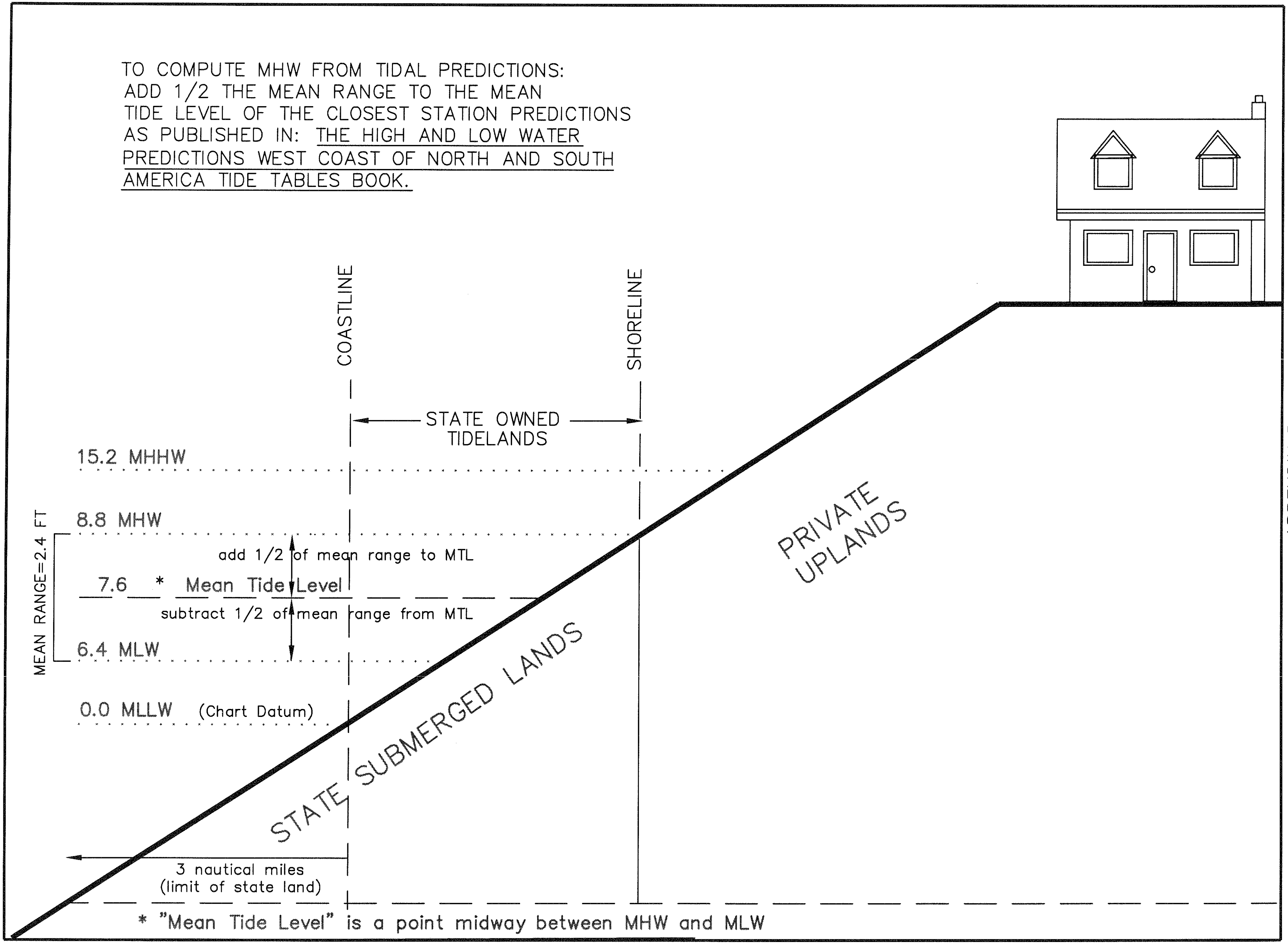
For additional information contact:

Department of Natural Resources
Division of Mining, Land & Water

Southcentral Regional Office
550 West 7th Avenue, Suite 900-C
Anchorage, AK 99501
Phone: 907-269-8503

Southeast Regional Office
400 Willoughby Avenue, 4th Floor
Juneau, AK 99801
Phone: 907-465-3400

Northern Regional Office
3700 Airport Way
Fairbanks, AK 99709
Phone: 907-451-2700



APPENDIX B

96–4

DETERMINING MEAN HIGH TIDE WHERE AN NGS BENCH MARK EXISTS

1. NOAA Primary Control Stations and related benchmark data can be obtained at http://co-ops.nos.noaa.gov/bench.html or the State of Alaska/ DNR at (907) 269-8521. *Example: Juneau.*

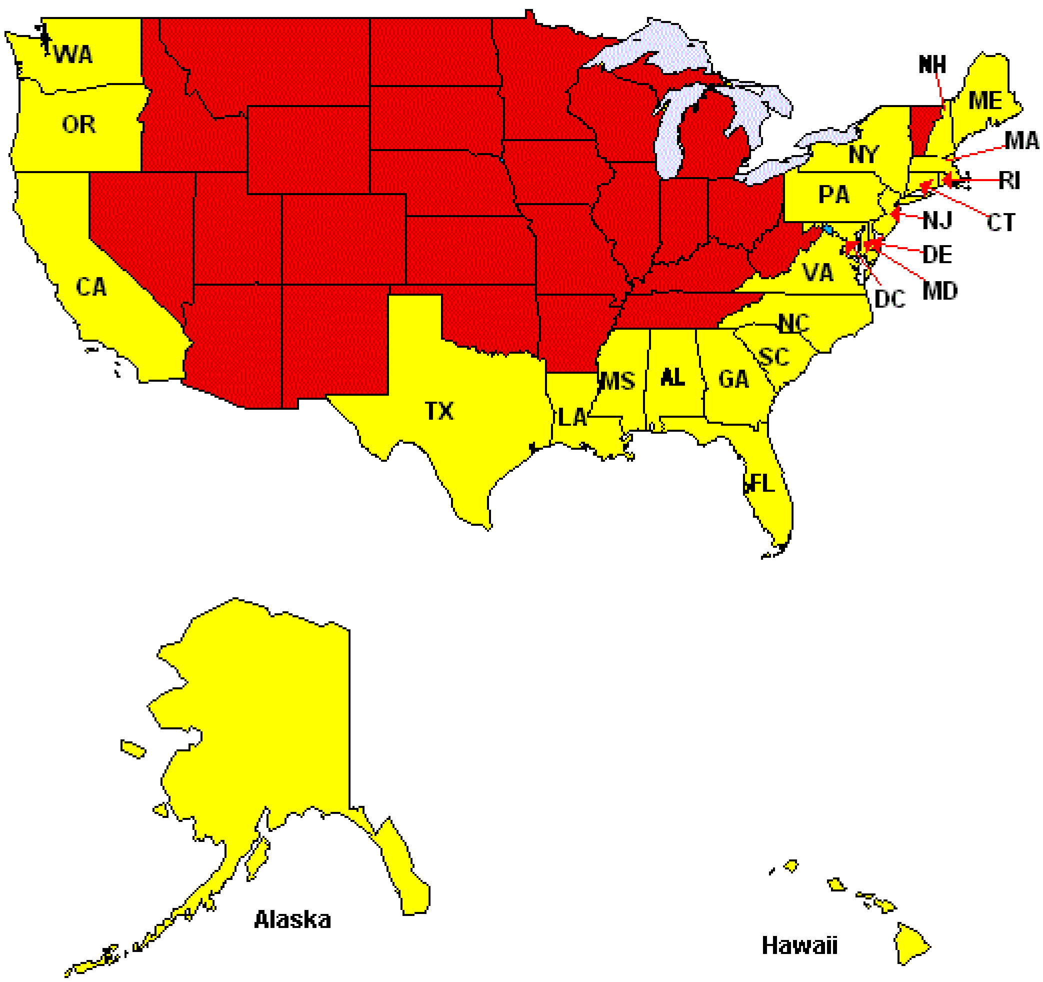
2. Using a level and rod, run differential levels from one of the Control Station bench marks to the project location.

3. Establish a point on each sideline of the ATS survey at the mean high water elevation. Measure the witness distance from these points to the witness monuments.

4. When the tide level reaches this elevation, field survey the meanders within the project.

PUBLISHED BENCHMARK SHEETS

Below is a map of states and geographical areas where CO-OPS maintains Published Benchmark Sheets. Specific stations are listed within each area.



Non U.S. Bench Marks

Appendix C

NOAA/NOS CO-OPS

Alaska Bench Marks

9450305 BOCA DE QUADRA , AK
9450460 KETCHIKAN, TONGASS NARROWS , AK
9450695 HUT POINT , AK
9450807 CONVENIENT COVE, HASSLER ISLAND , AK
9450811 FIN , AK
9450970 ENTRANCE TO ZIMOVIA STRAIT , AK
9451005 POINT HARRINGTON, SUMNER STRAIT , AK
9451037 VILLAGE ROCK, AK , AK
9451074 BUSHY ISLAND, SNOW PASSAGE , AK
9451124 STIKINE STRAIT , AK
9451204 WRANGELL, WRANGELL ISLAND , AK
9451218 VANK ISLAND, SUMNER STRAIT , AK

Click on station of interest.

The NOS bench mark sheets now contain links to corresponding NGS data sheets. Under the NOS vertical mark number (VM#) you may see a PID# link. Clicking on this link will bring up the corresponding NGS data sheet for that vertical mark.

For stations which do not list PID# links, the Latitude and Longitude of the station can be used to find data sheets for nearby PIDs by Clicking HERE.

Appendix C

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service

Station ID: 9452210 **PUBLICATION DATE: 11/02/1999**
Name: JUNEAU, GASTINEAU CHANNEL, STEPHENS PASS ALASKA
NOAA Chart: 17315 **Latitude: 58ø 17.9' N**
USGS Quad: JUNEAU B-2 **Longitude: 134ø 24.9' W**

To reach the tidal bench marks from the main Juneau Post Office main entrance at 9th and D Streets, proceed SW one block to Glacier Avenue, turn left onto Glacier Avenue and proceed 0.2 km (0.1 mi), bear left at the Y intersection onto Willoughby Avenue and follow it 0.3 km (0.2 mi) to Whittier Street, turn right onto Whittier Street and proceed 0.4 km (0.3 mi) (across Egan Drive) to the U.S. Coast Guard Pier. The bench marks are in the general vicinity. Turn right (SW) from the main Coast Guard pier and proceed 73.15 m (240.0 ft) to the tide house.

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

PRIMARY BENCH MARK STAMPING:
DESIGNATION: 945 2210 TIDAL 8
ALIAS: 8 1922

MONUMENTATION:	Tidal Station disk	VM#:	1188
AGENCY:	U.S. Coast & Geodetic Survey (USC&GS)	PID:	
SETTING CLASSIFICATION:	Building wall		

The primary bench mark is an unstamped disk set vertically in the SE corner of the Goldstein Emporium Building on the west side of Seward Street between Front and Second Streets, 5.18 m (17.0 ft) south of the entrance to Miss Scarlett's

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
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ALASKA
NOAA Chart: 17315 **Latitude: 58ø 17.9' N**
USGS Quad: JUNEAU B-2 **Longitude: 134ø 24.9' W**

T I D A L   D A T U M S

Tidal datums at JUNEAU, GASTINEAU CHANNEL, STEPHENS PASS based on:

LENGTH OF SERIES: 5 YEARS
TIME PERIOD: January 1994 - December 1998
TIDAL EPOCH: 1960-1978
CONTROL TIDE STATION:

Appendix C

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

HIGHEST OBSERVED WATER LEVEL (11/02/1948)	=	7.395
MEAN HIGHER HIGH WATER (MHHW)	=	4.962
MEAN HIGH WATER (MHW)	=	4.675
MEAN SEA LEVEL (MSL)	=	2.615
MEAN TIDE LEVEL (MTL)	=	2.580
MEAN LOW WATER (MLW)	=	0.485
MEAN LOWER LOW WATER (MLLW)	=	0.000
LOWEST OBSERVED WATER LEVEL (01/01/1991)	=	-1.663

Bench Mark Elevation Information In METERS above:

Stamping or Designation	MLLW	MHW
945 2210 TIDAL 8	11.836	7.161
12 1945	18.203	13.528
2210 C 1982	8.960	4.285
2210 D 1984	10.844	6.169
2210 E 1984	10.343	5.668
2210 G 1984	10.340	5.665
945 2210 TIDAL 9	9.714	5.039
BM WG-91 1994 ELEVATION 29.26	9.156	4.481
2210 J 1997	9.737	5.062
2210 H 1997	9.990	5.315

Appendix C

DETERMINING MEAN HIGH TIDE IN AREAS WHERE NO NGS BENCH MARKS EXIST

1. In NOAA Tide Tables 2002, NOS High and Low Water Predictions or on the internet at: http://co- ops.nos.noaa.gov/tpred2.html#AK look up high tides and times for nearest Tide Station in Table 1. *Example: Juneau - June 12, 2002.*
   A. Tide predictions in the NOAA Tide Predictions book are in Alaska Standard Time.

2. Look up nearest Place in Table 2. Example: Cannery Cove, Phybus Bay.

3. Add or subtract (or multiply by ratio factor) local correction factor to time of high tide in Table 1 to find predicted time of Local High Tide.
   Example: 17:57-00:08 = 17:49.

4. Using a level and rod observe the rising tide from ½ hour before to ½ hour after predicted time of high tide taking a minimum of six observations on the rod. Mean the observations and using the level and rod locate the mean elevation on the beach and mark with a temporary bench. This is the approximate High Tide for this location on this day at this time (AM or PM).

5. Apply local Height difference from Table 2 to High Tide at the nearest Tide Station in Table 1.This will be the approximate elevation of the point marked in step 4. *Example: 13.0' x 0.90' = 11.7'.*

6. Find the Mean High Tide for this location by looking up the Local Mean Range in Table 2. Divide this number by 2. Add the result to the local mean Tide Level also found in Table 2. *Example: 12.24' / 2 = 6.12' 6.12' + 7.60' = 13.72.'*

7. Locate the Mean High Tide Line on the beach by subtracting or adding to the elevation of the marked point. In this case you would move the rod upland from the water line to the point of elevation 13.72 feet.

Appendix D

Tide Tables 2002

All Tables Unaltered and Unabridged

High and Low Water Predictions

West Coast of North and South America

Including the Hawaiian Islands and the Alaskan Supplement

International Marine

Formerly published by the **National Ocean Service, NOS,**
a division of the **National Oceanic and Atmospheric Administration, NOAA.**

Accepted by the U.S. Coast Guard

TABLE 1.—DAILY TIDE PREDICTIONS
Juneau, Alaska, 2001
Times and Heights of High and Low Waters

April

Day	Time (h m)	Height (ft)	Height (cm)
1 Su	0544	14.4	439
	1247	1.5	46
	1924	11.8	360
2 M	0101	6.0	183
	0710	13.9	424
	1413	1.3	40
	2054	12.5	381
3 Tu	0238	5.4	165
	0842	14.3	436
	1527	0.4	12
	2203	14.0	427
4 W	0354	3.7	113
	0959	15.4	469
	1626	−0.7	−21
	2255	15.6	475
5 Th	0452	1.7	52
	1100	16.6	506
	1716	−1.7	−52
	2339	17.1	521
6 F	0541	−0.2	−6
	1152	17.6	536
	1800	−2.2	−67
7 Sa	0020	18.4	561
	0625	−1.7	−52
	1239	18.2	555
	1841	−2.2	−67
8 Su	0057	19.1	582
	0707	−2.7	−82
	1324	18.2	555
	1921	−1.7	−52
9 M	0134	19.3	588
	0748	−3.1	−94
	1407	17.7	539
	1959	−0.8	−24
10 Tu	0210	18.9	576
	0828	−2.8	−85
	1449	16.8	512
	2037	0.5	15
11 W	0246	18.0	549
	0908	−2.0	−61
	1532	15.5	472
	2115	1.9	58
12 Th	0322	16.9	515
	0950	−0.8	−24
	1618	14.1	430
	2155	3.5	107
13 F	0401	15.5	472
	1036	0.6	18
	1710	12.8	390
	2242	5.0	152
14 Sa	0446	14.1	430
	1131	2.0	61
	1816	11.7	357
	2342	6.2	189
15 Su	0544	12.8	390
	1242	2.9	88
	1938	11.3	344
16 M	0107	6.7	204
	0704	12.1	369
	1404	3.2	98
	2059	11.7	357
17 Tu	0237	6.3	192
	0832	12.1	369
	1513	2.9	88
	2157	12.6	384
18 W	0343	5.2	158
	0942	12.8	390
	1606	2.2	67
	2240	13.7	418
19 Th	0431	3.7	113
	1035	13.7	418
	1647	1.5	46
	2314	14.7	448
20 F	0510	2.2	67
	1118	14.6	445
	1723	1.0	30
	2344	15.7	479
21 Sa	0546	0.8	24
	1156	15.4	469
	1757	0.6	18
22 Su	0012	16.6	506
	0621	−0.5	−15
	1232	15.9	485
	1829	0.4	12
23 M	0040	17.2	524
	0655	−1.5	−46
	1308	16.2	494
	1901	0.6	18
24 Tu	0109	17.7	539
	0729	−2.2	−67
	1344	16.2	494
	1935	0.9	27
25 W	0140	17.9	546
	0806	−2.5	−76
	1422	15.9	485
	2010	1.6	49
26 Th	0213	17.7	539
	0845	−2.3	−70
	1503	15.3	466
	2047	2.4	73
27 F	0251	17.3	527
	0928	−1.8	−55
	1550	14.5	442
	2130	3.4	104
28 Sa	0334	16.5	503
	1018	−1.0	−30
	1646	13.7	418
	2223	4.5	137
29 Su	0427	15.4	469
	1118	0.0	0
	1754	13.1	399
	2331	5.3	162
30 M	0536	14.4	439
	1229	0.8	24
	1912	13.0	396

May

Day	Time (h m)	Height (ft)	Height (cm)
1 Tu	0100	5.4	165
	0702	13.7	418
	1348	1.0	30
	2029	13.8	421
2 W	0229	4.5	137
	0830	13.9	424
	1459	0.7	21
	2132	15.0	457
3 Th	0340	2.7	82
	0945	14.6	445
	1558	0.3	9
	2224	16.3	497
4 F	0436	0.8	24
	1047	15.6	475
	1649	−0.1	−3
	2309	17.5	533
5 Sa	0524	−0.9	−27
	1140	16.4	500
	1734	−0.2	−6
	2350	18.4	561
6 Su	0608	−2.2	−67
	1227	16.8	512
	1816	−0.1	−3
7 M	0028	18.8	573
	0649	−3.0	−91
	1311	16.9	515
	1855	0.4	12
8 Tu	0105	18.8	573
	0728	−3.2	−98
	1353	16.6	506
	1934	1.1	34
9 W	0140	18.3	558
	0806	−2.9	−88
	1434	15.9	485
	2012	2.0	61
10 Th	0216	17.5	533
	0845	−2.1	−64
	1516	15.1	460
	2050	3.1	94
11 F	0252	16.5	503
	0925	−1.1	−34
	1559	14.1	430
	2131	4.2	128
12 Sa	0330	15.3	466
	1007	0.1	3
	1648	13.2	402
	2217	5.2	158
13 Su	0413	14.1	430
	1056	1.3	40
	1743	12.4	378
	2313	6.0	183
14 M	0507	13.0	396
	1154	2.4	73
	1848	12.1	369
15 Tu	0026	6.4	195
	0615	12.1	369
	1301	3.0	91
	1955	12.3	375
16 W	0147	6.0	183
	0734	11.8	360
	1409	3.2	98
	2053	12.9	393
17 Th	0256	4.9	149
	0849	12.0	366
	1507	3.0	91
	2140	13.8	421
18 F	0350	3.5	107
	0951	12.7	387
	1555	2.7	82
	2219	14.8	451
19 Sa	0434	1.9	58
	1042	13.5	411
	1637	2.3	70
	2254	15.8	482
20 Su	0514	0.4	12
	1126	14.4	439
	1716	2.0	61
	2328	16.7	509
21 M	0552	−1.1	−34
	1208	15.1	460
	1754	1.8	55
22 Tu	0001	17.5	533
	0629	−2.2	−67
	1248	15.6	475
	1832	1.8	55
23 W	0036	18.1	552
	0708	−3.1	−94
	1329	15.9	485
	1911	1.9	58
24 Th	0113	18.3	558
	0748	−3.5	−107
	1412	15.8	482
	1951	2.2	67
25 F	0153	18.2	555
	0831	−3.4	−104
	1457	15.6	475
	2035	2.8	85
26 Sa	0237	17.7	539
	0917	−2.9	−88
	1547	15.2	463
	2124	3.4	104
27 Su	0327	16.9	515
	1008	−2.0	−61
	1642	14.7	448
	2222	4.0	122
28 M	0424	15.8	482
	1105	−0.9	−27
	1744	14.4	439
	2331	4.5	137
29 Tu	0532	14.6	445
	1209	0.1	3
	1850	14.5	442
30 W	0051	4.3	131
	0651	13.7	418
	1318	0.9	27
	1956	15.0	457
31 Th	0211	3.3	101
	0813	13.5	411
	1425	1.4	43
	2056	15.8	482

June

Day	Time (h m)	Height (ft)	Height (cm)
1 F	0320	1.9	58
	0928	13.8	421
	1526	1.6	49
	2150	16.6	506
2 Sa	0418	0.3	9
	1033	14.3	436
	1620	1.7	52
	2238	17.3	527
3 Su	0507	−1.0	−30
	1128	14.9	454
	1708	1.8	55
	2321	17.8	543
4 M	0551	−2.0	−61
	1216	15.4	469
	1752	1.9	58
5 Tu	0001	18.0	549
	0631	−2.6	−79
	1300	15.6	475
	1833	2.2	67
6 W	0040	17.9	546
	0710	−2.8	−85
	1341	15.5	472
	1913	2.6	79
7 Th	0116	17.6	536
	0748	−2.5	−76
	1421	15.2	463
	1952	3.0	91
8 F	0153	17.0	518
	0825	−2.0	−61
	1500	14.8	451
	2030	3.6	110
9 Sa	0229	16.3	497
	0903	−1.3	−40
	1541	14.3	436
	2111	4.2	128
10 Su	0307	15.4	469
	0942	−0.4	−12
	1623	13.7	418
	2154	4.8	146
11 M	0348	14.4	439
	1024	0.6	18
	1708	13.3	405
	2244	5.3	162
12 Tu	0434	13.4	408
	1110	1.6	49
	1757	13.0	396
	2343	5.5	168
13 W	0530	12.5	381
	1202	2.5	76
	1849	13.1	399
14 Th	0051	5.3	162
	0636	11.8	360
	1259	3.2	98
	1941	13.4	408
15 F	0200	4.6	140
	0749	11.6	354
	1359	3.6	110
	2032	14.0	427
16 Sa	0301	3.3	101
	0900	11.8	360
	1456	3.8	116
	2119	14.7	448
17 Su	0353	1.8	55
	1002	12.5	381
	1549	3.6	110
	2203	15.7	479
18 M	0440	0.2	6
	1056	13.3	405
	1637	3.3	101
	2246	16.6	506
19 Tu	0524	−1.3	−40
	1145	14.2	433
	1723	3.0	91
	2328	17.5	533
20 W	0607	−2.6	−79
	1231	15.0	457
	1808	2.6	79
21 Th	0011	18.2	555
	0650	−3.6	−110
	1316	15.7	479
	1853	2.3	70
22 F	0056	18.7	570
	0734	−4.2	−128
	1402	16.1	491
	1938	2.2	67
23 Sa	0142	18.7	570
	0819	−4.2	−128
	1448	16.2	494
	2026	2.2	67
24 Su	0230	18.3	558
	0905	−3.7	−113
	1536	16.2	494
	2118	2.4	73
25 M	0322	17.4	530
	0954	−2.8	−85
	1627	16.0	488
	2215	2.7	82
26 Tu	0418	16.2	494
	1046	−1.5	−46
	1721	15.9	485
	2319	2.9	88
27 W	0521	14.9	454
	1142	−0.1	−3
	1818	15.8	482
28 Th	0030	2.9	88
	0633	13.6	415
	1244	1.3	40
	1918	15.8	482
29 F	0145	2.4	73
	0751	12.9	393
	1349	2.4	73
	2018	15.9	485
30 Sa	0256	1.5	46
	0909	12.8	390
	1454	3.1	94
	2116	16.2	494

Time meridian 135° W. 0000 is midnight. 1200 is noon.
Heights are referred to mean lower low water which is the chart datum of soundings.

Appendix D

TABLE 2 – TIDAL DIFFERENCES AND OTHER CONSTANTS

No.	PLACE	POSITION Latitude	Longitude	DIFFERENCES Time High Water	Time Low Water	Height High Water	Height Low Water	RANGES Mean	Diurnal	Mean Tide Level
		North	West	h m	h m	ft	ft	ft	ft	ft
	ALASKA Meares Passage to Davidson Inlet–cont. Time meridian, 135° W				on Sitka, p.128					
	Davidson Inlet–cont.									
1613	El Capitan Island	55° 56'	133° 20'	−0 11	−0 10	+0.9	−0.1	8.7	10.8	5.6
1615	Cyrus Cove, Sea Otter Sound	55° 55'	133° 24'	−0 16	−0 12	+1.1	0.0	8.8	10.9	5.8
1617	Marble Passage	55° 57'	133° 26'	−0 14	−0 09	+1.0	0.0	8.7	10.9	5.8
1619	Marble Island	56° 00'	133° 28'	−0 19	−0 15	+0.8	0.0	8.6	10.7	5.6
1621	Holbrook, Kosciusko Island	56° 02'	133° 30'	−0 10	−0 06	+0.9	−0.1	8.7	10.8	5.6
1623	Edna Bay	55° 57'	133° 40'	−0 20	−0 08	+0.9	0.0	8.6	10.8	5.7
	Sumner Strait									
1625	Coronation Island	55° 54'	134° 07'	−0 16	−0 17	+0.8	0.0	8.5	10.7	5.6
1627	Pole Anchorage, Kosciusko Island	55° 57'	133° 49'	−0 22	−0 22	+1.4	−0.1	9.2	11.4	5.9
1629	Port McArthur, Kuiu Island	56° 04'	134° 07'	−0 11	−0 07	+0.6	−0.1	8.4	10.6	5.5
1631	Kell Bay, Affleck Canal, Kuiu Island	56° 09'	134° 08'	+0 01	+0 01	+1.3	0.0	9.0	11.2	5.9
1633	Point St. Albans	56° 05'	133° 58'	−0 17	−0 13	+1.4	0.0	9.1	11.3	5.9
1635	Shakan Bay Entrance	56° 08'	133° 37'	−0 13	−0 12	+1.8	0.0	9.5	11.7	6.2
1637	Shakan Strait, Kosciusko Island	56° 08'	133° 28'	−0 09	−0 10	+1.9	−0.1	9.7	11.7	6.2
1639	El Capitan Passage	56° 04'	133° 19'	−0 05	+0 02	+0.9	−0.1	8.7	10.8	5.6
1641	Port Beauclerc, Kuiu Island	56° 17'	133° 57'	−0 14	−0 12	+1.9	−0.1	9.7	11.9	6.2
1643	Port Protection, Prince of Wales Island	56° 19'	133° 36'	−0 13	−0 11	+2.4	0.0	10.1	12.4	6.4
1645	Reid Bay	56° 23'	133° 53'	−0 11	−0 19	+2.5	0.0	10.2	12.4	6.5
1647	Sumner Island	56° 25'	133° 48'	−0 19	−0 12	+2.6	0.0	10.3	12.6	6.6
					on Ketchikan, p.120					
1649	Red Bay, Prince of Wales Island	56° 18'	133° 19'	+0 03	+0 07	−0.8	0.0	12.2	14.6	7.6
1651	Level Islands	56° 28'	133° 06'	+0 03	+0 04	−0.4	0.0	12.6	15.0	7.8
1653	Butterworth Island, Duncan Canal	56° 32'	133° 04'	−0 04	+0 03	0.0	0.0	13.0	15.3	8.0
1655	Duncan Canal, Kupreanof Island	56° 34'	133° 04'	+0 15	+0 16	−0.2	−0.1	12.9	15.2	7.8
1657	Grief Island, Duncan Canal	56° 37'	133° 03'	+0 15	+0 12	+0.1	−0.1	13.2	15.4	8.0
1659	Castle Islands, Duncan Canal	56° 39'	133° 09'	+0 27	+0 12	+0.1	−0.1	13.2	15.5	8.0
1661	St.John Harbor, Zarembo Island	56° 26'	132° 57'	+0 09	+0 05	−0.7	−0.2	12.5	14.6	7.6
1663	Greys Island	56° 31'	132° 33'	+0 06	+0 04	+0.2	0.0	13.2	15.6	8.1
	Wrangell Narrows									
1665	Point Lockwood, Woewodski Island	56° 33'	132° 58'	+0 20	+0 15	+0.2	+0.1	13.1	15.7	8.1
1667	Finger Point, Lindenburg Peninsula	56° 41'	132° 57'	+0 29	+0 41	+1.2	0.0	14.2	16.7	8.6
1669	Anchor Point	56° 38'	132° 56'	+0 20	+0 35	+0.6	0.0	13.6	16.0	8.3
1671	Petersburg	56° 49'	132° 57'	+0 09	+0 26	+0.3	−0.1	13.4	15.7	8.1
	Keku Strait									
1673	Monte Carlo Island	56° 32'	133° 46'	+0 02	+0 03	−2.8	−0.1	10.3	12.5	6.6
1675	Seclusion Harbor, Kuiu Island	56° 33'	133° 52'	+0 05	+0 02	−3.0	−0.2	10.2	12.3	6.4
1677	Beck Island	56° 39'	133° 43'	+0 08	+0 31	−1.6	−0.1	11.5	13.8	7.1
1679	The Summit	56° 41'	133° 44'	+0 31	+0 37	+0.3	+0.1	13.2	15.7	8.2
1681	Entrance Island	56° 49'	133° 47'	+0 22	+0 31	−0.7	0.0	12.3	14.7	7.6
1683	Port Camden, Kuiu Island	56° 44'	133° 55'	+0 03	+0 04	−1.5	0.0	11.5	13.9	7.2
1685	Hamilton Bay, Kupreanof Island	56° 55'	133° 50'	+0 03	+0 04	−1.6	0.0	11.4	13.8	7.2
1687	Kake	56° 58'	133° 56'	+0 05	+0 12	−1.4	−0.1	11.7	14.0	7.3
	Frederick Sound				on Juneau, p.124					
1689	Dry Strait	56° 37'	132° 34'	−0 18	−0 03	−0.2	0.0	13.5	16.1	8.3
1691	Cosmos Point	56° 39.8'	132° 37.0'	−0 05	−0 05	*0.98	*0.99	13.47	16.00	8.43
1693	Ideal Cove, Mitkof Island	56° 40'	132° 38'	−0 09	−0 05	−0.2	0.0	13.5	16.1	8.3
1695	Leconte Bay	56° 47.3'	132° 30.1'	0 00	+0 03	*0.98	*0.99	13.42	15.94	8.28
1697	Brown Cove	56° 53'	132° 48'	−0 14	−0 10	−0.3	−0.1	13.5	15.8	8.2
1699	Thomas Bay	57° 00'	132° 47'	+0 07	+0 07	−0.8	−0.1	13.0	15.4	8.0
1701	Portage Bay, Kupreanof Island	57° 00'	133° 19'	−0 19	−0 15	−0.7	0.0	13.0	15.5	8.1
1703	Cleveland Passage, Whitney Island	57° 13'	133° 30'	−0 01	+0 03	−1.2	−0.1	12.6	15.0	7.8
1705	The Brothers	57° 17.7'	133° 47.8'	−0 06	−0 03	*0.91	*0.94	12.40	14.74	7.68
1707	Pybus Bay, Admiralty Island	57° 18'	134° 08'	+0 03	−0 02	−1.9	−0.1	11.9	14.3	7.4
1709	Cannery Cove, Pybus Bay	57° 18.4'	134° 08.0'	−0 08	−0 06	*0.90	*0.94	12.24	14.63	7.60
1711	Eliza Harbor, Liesnoi Island	57° 10'	134° 17'	−0 19	−0 19	−1.9	−0.1	11.9	14.3	7.4
1713	Eliza Harbor, Admiralty Island	57° 11.3'	134° 17.2'	−0 06	−0 04	*0.87	*0.92	11.79	14.10	7.35
1715	Herring Bay	57° 06.8'	134° 22.8'	−0 08	−0 07	*0.84	*0.91	11.44	13.70	7.16
1717	Saginaw Bay, Kuiu Island	56° 54.2'	134° 18.2'	−0 12	−0 15	*0.84	*0.96	11.34	13.67	7.18
	Stephens Passage									
1719	Port Houghton, Robert Islands	57° 18'	133° 28'	−0 21	−0 17	−0.8	−0.1	13.0	15.4	8.0
1721	Hobart Bay	57° 24'	133° 25'	−0 06	+0 03	−1.1	−0.1	12.7	15.1	7.8
1723	Good Island, Gambier Bay	57° 29'	133° 54'	−0 03	+0 04	−1.4	−0.1	12.4	14.8	7.7
1725	Windham Bay	57° 33'	133° 30'	0 00	0 00	−1.1	−0.1	12.7	15.1	7.8
1727	Rasp Ledge, Seymour Canal	57° 41'	134° 02'	+0 06	+0 05	−0.7	+0.1	12.9	15.6	8.2
1729	Windfall Harbor, Seymour Canal	57° 52'	134° 16'	+0 14	+0 18	−0.2	0.0	13.5	16.0	8.3
1731	Holkham Bay, Wood Spit	57° 43'	133° 35'	+0 03	+0 06	−0.8	−0.1	13.0	15.4	8.0
1733	Sawyer Island, Tracy Arm	57° 52.7'	133° 11.4'	+0 02	+0 06	*0.97	*1.01	13.32	15.83	8.25
1735	Port Snettisham, Point Styleman	57° 58'	133° 53'	−0 12	−0 06	−0.4	−0.1	13.4	15.8	8.2
1737	Port Snettisham, Crib Point	58° 05.7'	133° 44.3'	−0 03	−0 03	*0.98	*0.97	13.40	15.86	8.23

Endnotes can be found at the end of table 2.

Appendix D

  - Possession Sound, Port Susan, Skagit Bay area
- Rosario Strait

select a different state

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ALASKA

- Dixon Entrance and Portland Canal
- Revillagigedo Channel and Tongass Narrows
- Behm Canal
- Clarence Strait
- Cordova Bay and Dall Island
- Meares Passage to Davidson Inlet
- Sumner Strait and Wrangell Narrows
- Keku Strait, Fredrick Sound, Stephens Passage
- Lynn Canal and Chatham Strait
- Baranof Island, Salisbury Sound, Chichagof Island
- Cross Sound and Icy Strait
- Gulf of Alaska
- Prince William Sound
- Kenai Peninsula and Cook Inlet
- Kodiak and Afgonak Islands
- Alaska Peninsula
- **Aleutian Islands**
  - Unimak and Unalaska Islands
  - Umnak, Yunaska, Atka Islands
  - Adak, Kanaga, Tanaga, Rat and Attu Islands
- Bristol Bay
- Kusokwim Bay and Bering Sea
- Norton Sound, Bering Strait, and Arctic Ocean

select a different state

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Pacific Islands

- Marianas Islands
- Caroline, Marcus and Wake Islands
- Marshall Islands
- Gilbert Islands and North Pacific Detached Islands

Appendix D

Petersburg	+0 09	+0 26	+0.3	-0.1

Keku Strait

Station	Time Diff. High	Time Diff. Low	Hgt. Diff. High	Hgt. Diff. Low
Monte Carlo Island	+0 02	+0 03	-2.8	-0.1
Seclusion Harbor, Kuiu Island	+0 05	+0 02	-3.0	-0.2
Beck Island	+0 08	+0 31	-1.6	-0.1
The Summit	+0 31	+0 37	+0.3	+0.1
Entrance Island	+0 22	+0 31	-0.7	0.0
Port Camden, Kuiu Island	+0 03	+0 04	-1.5	0.0
Hamilton Bay, Kupreanof Island	+0 03	+0 04	-1.6	0.0
Kake	+0 05	+0 12	-1.4	-0.1

Frederick Sound

Station	Time Diff. High	Time Diff. Low	Hgt. Diff. High	Hgt. Diff. Low
Dry Strait	-0 18	-0 03	-0.2	0.0
Cosmos Point	-0 05	-0 05	*0.98	*0.99
Ideal Cove, Mitkof Island	-0 09	-0 05	-0.2	0.0
Leconte Bay	0 00	+0 03	*0.98	*0.99
Brown Cove	-0 14	-0 10	-0.3	-0.1
Thomas Bay	+0 07	+0 07	-0.8	-0.1
Portage Bay, Kupreanof Island	-0 19	-0 15	-0.7	0.0
Cleveland Passage, Whitney Island	-0 01	+0 03	-1.2	-0.1
The Brothers	-0 06	-0 03	*0.91	*0.94
Cannery Cove, Pybus Bay	-0 08	-0 06	*0.90	*0.94
Eliza Harbor, Liesnoi Island	-0 19	-0 19	-1.9	-0.1
Eliza Harbor, Admiralty Island	-0 06	-0 04	*0.87	*0.92
Herring Bay	-0 08	-0 07	*0.84	*0.91
Saginaw Bay, Kuiu Island	-0 12	-0 15	*0.84	*0.96

Stephens Passage

Station	Time Diff. High	Time Diff. Low	Hgt. Diff. High	Hgt. Diff. Low
Port Houghton, Robert Islands	-0 21	-0 17	-0.8	-0.1
Hobart Bay	-0 06	+0 03	-1.1	-0.1
Good Island, Gambier Bay	-0 03	+0 04	-1.4	-0.1
Windham Bay	0 00	0 00	-1.1	-0.1
Rasp Ledge, Seymour Canal	+0 06	+0 05	-0.7	+0.1
Windfall Harbor, Seymour Canal	+0 14	+0 18	-0.2	0.0
Holkham Bay, Wood Spit	+0 03	+0 06	-0.8	-0.1
Sawyer Island, Tracy Arm	+0 02	+0 06	*0.97	*1.01
Port Snettisham, Point Styleman	-0 12	-0 06	-0.4	-0.1
Port Snettisham, Crib Point	-0 03	-0 03	*0.98	*0.97
Taku Harbor	-0 03	-0 04	*0.97	*1.00
Greely Point, Taku Inlet	-0 01	-0 04	-0.6	-0.1
Taku Point, Taku Inlet	+0 14	+0 13	+0.4	0.0
JUNEAU	Daily predictions			

Appendix D

19 Su	1238am	L	5.6	635am	H	13.8	124pm	L	0.9	806pm	H	13
20 M	202am	L	5.2	758am	H	13.4	235pm	L	1.2	912pm	H	14
21 Tu	324am	L	3.9	922am	H	13.5	341pm	L	1.2	1010pm	H	15
22 W	430am	L	2.0	1036am	H	14.2	440pm	L	1.0	1101pm	H	16
23 Th	526am	L	-0.1	1139am	H	15.1	533pm	L	0.8	1148pm	H	18
24 F	616am	L	-1.9	1235pm	H	15.9	621pm	L	0.7			
25 Sa	1232am	H	18.9	702am	L	-3.3	125pm	H	16.4	707pm	L	0
26 Su	115am	H	19.3	746am	L	-4.0	213pm	H	16.6	751pm	L	1
27 M	157am	H	19.2	829am	L	-4.1	259pm	H	16.4	834pm	L	1
28 Tu	239am	H	18.7	912am	L	-3.6	345pm	H	15.8	918pm	L	2
29 W	321am	H	17.8	956am	L	-2.6	432pm	H	15.1	1003pm	L	3
30 Th	404am	H	16.6	1040am	L	-1.4	521pm	H	14.3	1051pm	L	4
31 F	450am	H	15.2	1128am	L	-0.1	613pm	H	13.6	1145pm	L	5

Juneau, Alaska
Tide Predictions (High and Low Waters) June, 2002
NOAA, National Ocean Service

Daylight Saving Time

Day	Time		Ht.	Time		Ht.	Time		Ht.	Time		H
1 Sa	541am	H	13.9	1219pm	L	1.2	710pm	H	13.1			
2 Su	1249am	L	5.7	641am	H	12.7	117pm	L	2.3	809pm	H	13
3 M	203am	L	5.6	752am	H	11.9	219pm	L	3.0	906pm	H	13
4 Tu	314am	L	4.9	907am	H	11.7	319pm	L	3.5	956pm	H	13
5 W	414am	L	3.8	1015am	H	11.9	413pm	L	3.6	1040pm	H	14
6 Th	503am	L	2.4	1114am	H	12.4	500pm	L	3.6	1119pm	H	15
7 F	546am	L	1.1	1203pm	H	13.1	543pm	L	3.5	1155pm	H	15
8 Sa	625am	L	-0.1	1246pm	H	13.7	623pm	L	3.4			
9 Su	1230am	H	16.4	702am	L	-1.2	126pm	H	14.3	701pm	L	3
10 M	105am	H	16.9	739am	L	-2.0	205pm	H	14.7	739pm	L	3
11 Tu	140am	H	17.3	817am	L	-2.5	244pm	H	14.9	817pm	L	3
12 W	217am	H	17.4	856am	L	-2.8	324pm	H	14.9	857pm	L	3
13 Th	256am	H	17.3	937am	L	-2.7	407pm	H	14.9	940pm	L	3
14 F	339am	H	16.9	1020am	L	-2.3	452pm	H	14.8	1028pm	L	3
15 Sa	427am	H	16.2	1107am	L	-1.6	542pm	H	14.7	1124pm	L	4
16 Su	522am	H	15.3	1159am	L	-0.6	636pm	H	14.8			
17 M	1229am	L	4.1	627am	H	14.2	1256pm	L	0.4	733pm	H	15
18 Tu	143am	L	3.6	741am	H	13.4	159pm	L	1.3	832pm	H	15
19 W	259am	L	2.6	901am	H	13.0	304pm	L	2.0	931pm	H	16
20 Th	407am	L	1.1	1019am	H	13.3	407pm	L	2.4	1027pm	H	16
21 F	507am	L	-0.4	1127am	H	13.9	506pm	L	2.6	1120pm	H	17
22 Sa	600am	L	-1.8	1226pm	H	14.6	600pm	L	2.6			
23 Su	1209am	H	18.1	648am	L	-2.8	118pm	H	15.2	649pm	L	2
24 M	1256am	H	18.3	733am	L	-3.3	206pm	H	15.5	736pm	L	2
25 Tu	141am	H	18.3	816am	L	-3.4	251pm	H	15.6	820pm	L	2
26 W	223am	H	17.9	858am	L	-3.1	333pm	H	15.5	903pm	L	3
27 Th	305am	H	17.3	938am	L	-2.4	415pm	H	15.2	946pm	L	3
28 F	346am	H	16.4	1018am	L	-1.5	456pm	H	14.8	1030pm	L	3
29 Sa	428am	H	15.4	1058am	L	-0.4	538pm	H	14.3	1116pm	L	4
30 Su	512am	H	14.3	1139am	L	0.7	621pm	H	13.9			

Juneau, Alaska
Tide Predictions (High and Low Waters) July, 2002
NOAA, National Ocean Service

Daylight Saving Time

Day	Time		Ht.	Time		Ht.	Time		Ht.	Time		H
1 M	1208am	L	4.6	601am	H	13.1	1223pm	L	1.9	706pm	H	13
2 Tu	107am	L	4.7	657am	H	12.1	112pm	L	3.1	754pm	H	13

Appendix D