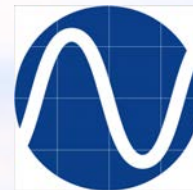


Alaska Water Level Watch – AWLW

An Overview



Laura Rear McLaughlin
former Steering Committee Member

With borrowed slides from
Alaska Coastal Mapping Summit
Carol D. Janzen (AOOS)
Jaci Overbeck, NOAA OCM, AK Regional Geospatial Coordinator
Autumn Poisson, Alaska Department of Natural Resources-DGGS
Rob Bochenek & Will Koeppen (Axiom Data Science)



Water Levels in the Southeast
June 13-15, 2023

What is the Alaska Water Level Watch – AWLW?

- Born out of a water level needs workshop held in May 2015 in Anchorage, AK
- The Alaska Water Level Watch (AWLW) is a collaborative group working to improve the quality, coverage, and accessibility to water level observations in Alaska's coastal zone.
- Steering Committee (6) representing NOAA, AKDNR, NWS, AOOS and Private Industry
- Annual water level workshops
- Solicits inputs for Alaska's water level build-out plans

COASTAL & NEARSHORE WATER LEVEL OBSERVATIONS IN ALASKA



Installing a tide gauge near Castle Cape, Alaska - June 25, 2014
Image Credit: Personnel of NOAA Ship RAINIER (NOAA's Historic Coast & Geodetic Survey (CHGS) Collection)

Version 1.0
June 2016

Challenges, Assets, Gaps, and Next Steps

A Status Overview

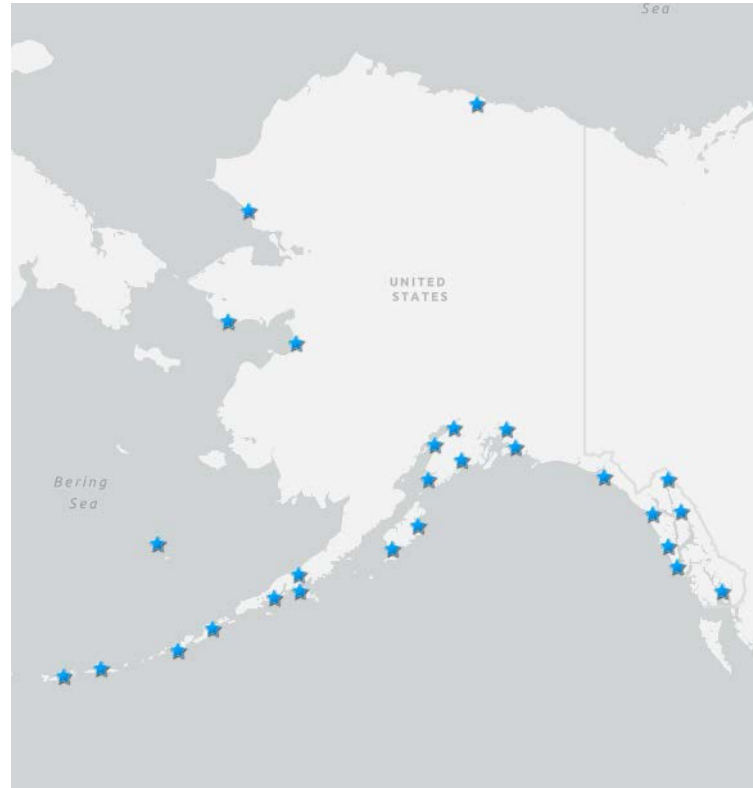
With Meeting Notes from:
Exploring Options for an Integrated Water Level Observation Network in Alaska
May 27 – 28, 2015
Anchorage, Alaska

AOOS
Alaska Ocean Observing System

Why Alaska Water Level Watch?

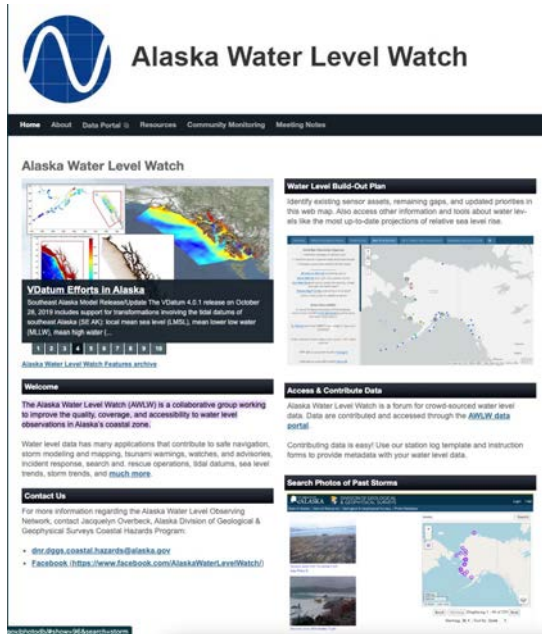
CHALLENGE

- Alaska's remote coastline among the nation's most vulnerable to geohazards
- NOAA's CO-OPS National Water Level Observation Network (NWLON ★) in Alaska consists of 27 active sensors for ~ 66,000 miles of coastline
- CO-OPS Tides & Currents online system hosts only the NOAA NWLON data
- Additional water level data exist, and easy comprehensive access is needed for storm-surge forecasting, informed emergency response, safe navigation, and charting



AWLW Vision: Fill Gaps in Water Level Observations & Increase Public Access to Water Level Information

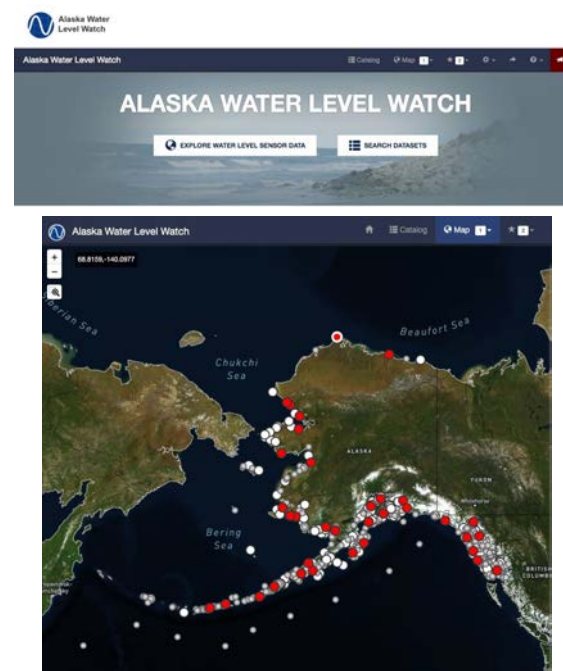
AWLW Website



The screenshot shows the Alaska Water Level Watch website. At the top is the logo, a blue circle with a white wave, and the text "Alaska Water Level Watch". Below the logo is a navigation menu with links: Home, About, Data Portal, Resources, Community, Monitoring, Meeting Notices. The main content area is titled "Alaska Water Level Watch" and features several sections: "Water Level Build-Out Plan" with a map of Alaska showing sensor locations; "VDatum Efforts in Alaska" with a text box about the VDatum 4.0.1 release; "Welcome" with a paragraph about the collaborative group; "Access & Contribute Data" with instructions on how to contribute data; and "Search Photos of Past Storms" with a search bar and a map showing storm tracks.

Through innovative technologies and collaborative partnerships, AWLW is expanding coastal water level observation capacity across Alaska's coastline. & Making data Accessible through an online AWLW Data Portal

AWLW Data Portal



The screenshot shows the AWLW Data Portal map interface. At the top is the logo and the text "Alaska Water Level Watch". Below the logo is a navigation menu with links: Catalog, Map, and a search icon. The main content area is titled "ALASKA WATER LEVEL WATCH" and features two buttons: "EXPLORE WATER LEVEL SENSOR DATA" and "SEARCH DATASETS". Below the buttons is a map of Alaska showing the coastline and water level stations. The map is titled "Alaska Water Level Watch" and has a search bar with the coordinates "66.8156, -142.0877". The map shows several red dots representing active water level stations and several white dots representing historical water level stations. The map also shows the Chukchi Sea, Beaufort Sea, and Bering Sea.

AWLW Data Portal map showing active (red) and historical water level stations (white).
<https://water-level-watch.portal.aos.org/#map>

Public access point for reference materials, portal links, contacts, meetings, other resources: <https://legacy.aos.org/alaska-water-level-watch/>

Alaska Water Level Watch Build-out

Alaska Water Level Watch Build-Out

Planning Site - 2019 Update



Overview

NWLON Backbone (Video)

Tidal Datums

Real-Time Sensors

Other Water Level Observations

Estimated Sea Level Trends



Story Map Objective

Increase public access, through innovative [technologies](#) and collaborative [partnerships](#), to an expanded coastal water level observation network in Alaska:

1. [Tidal Datums](#) define coastal water level heights, connecting the land to the sea and supporting relative [sea level trends](#)
2. [Real-time sensors](#) provide decision support to maritime activities, forecasting, and emergency response
3. [High water marks and other water level observations](#) advance Arctic coastal science and inform planning

Alaska Water Level Watch (AWLW)

A collaborative group working to improve the quality, coverage, and accessibility of water level observations on Alaska's coasts.

[Official Website](#)

[AWLW Guidance Plan](#)

[Highlights](#)



Tidal Datum Needs in AK

Alaska Water Level Watch Build-Out

Planning Site - 2019 Update



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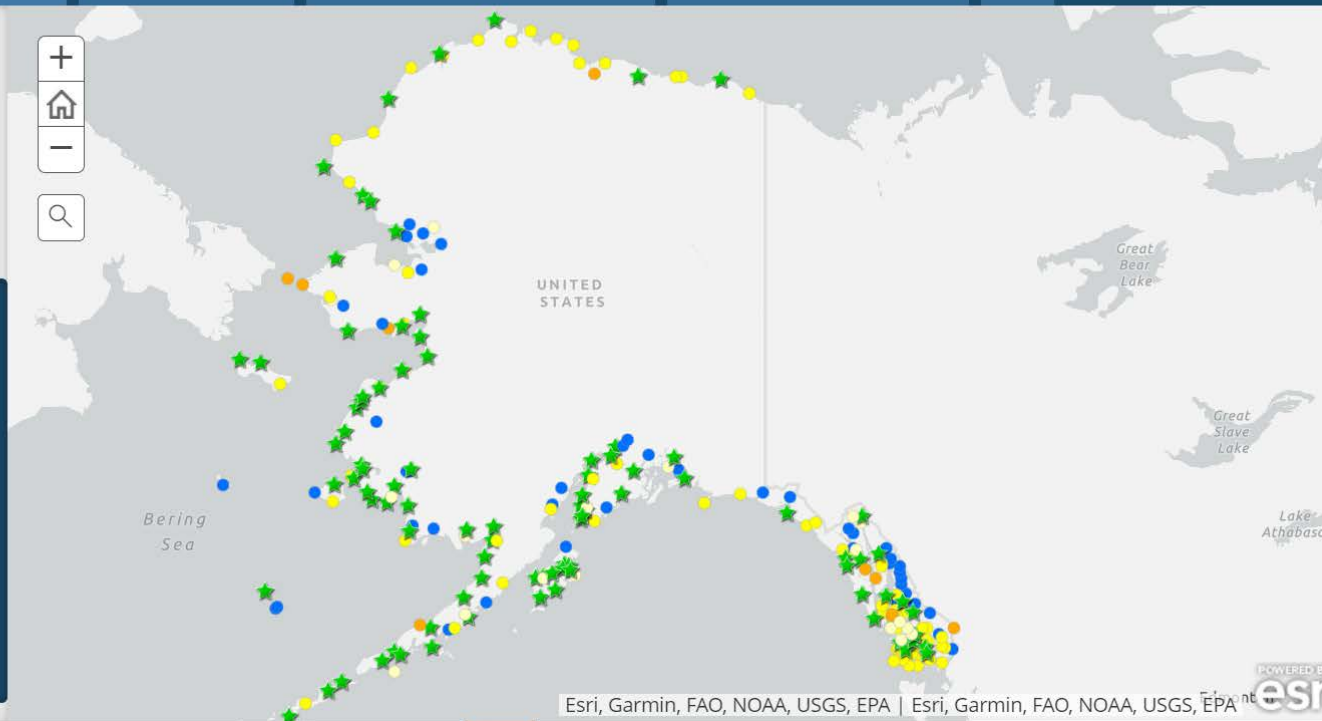


Datum Priorities

- Planned
- Highest
- High
- Medium
- Low
- ★ Complete

Non-Community Locations

- Planned
- Highest
- High
- Medium
- Low
- ★ Complete



Real-time Sensors in AK

Alaska Water Level Watch Build-Out

Planning Site - 2019 Update



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NOAA NWLON

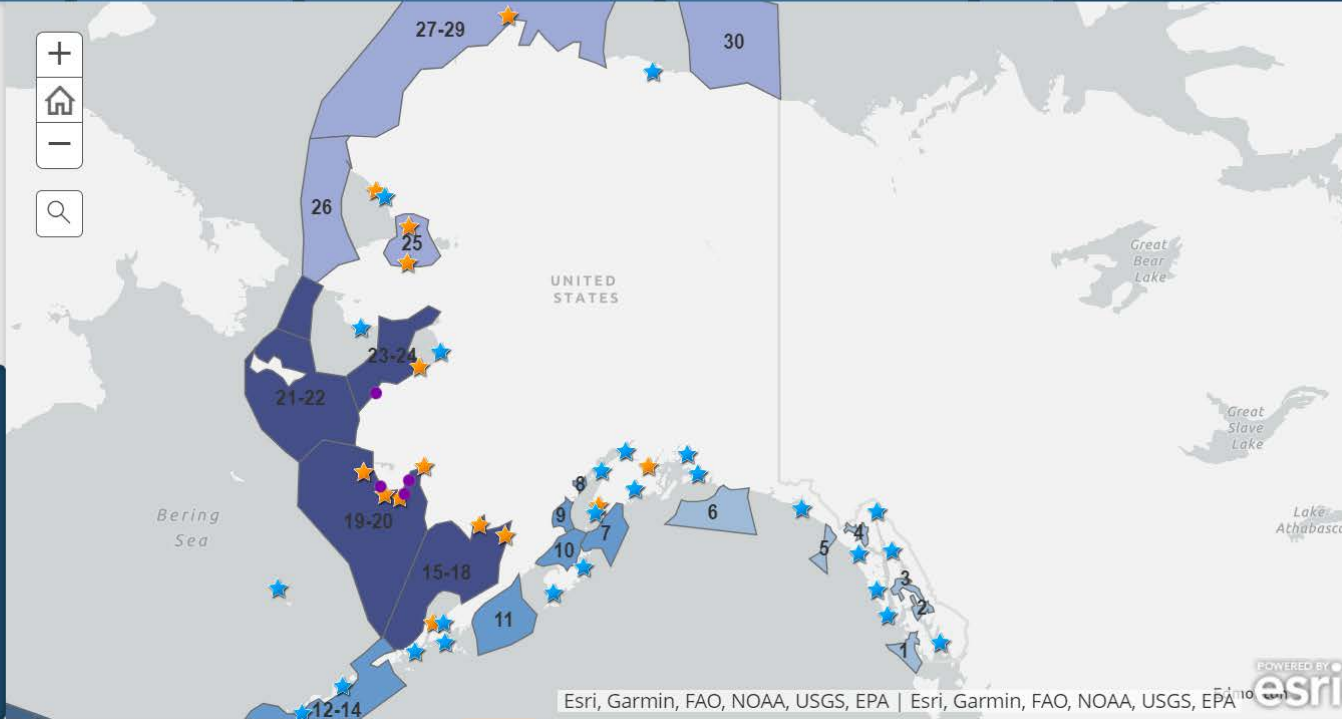


Other Real-Time Sensors

- Operational
- Needs Repair
- Funded
- Pending

NWLON Gaps

- 1-6
- 7-14
- 15-24
- 25-30
- 31-32



Other Water Level Observations

Alaska Water Level Watch Build-Out

Planning Site - 2019 Update



Overview

NWLON Backbone (Video)

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Estimated Sea Level Trends



AWLW Other Water Level Observations Objectives

1. Record water level conditions in real-time sensor gaps
2. Capture complex coastal flood and wave dynamics in the Arctic
3. Citizen science opportunities

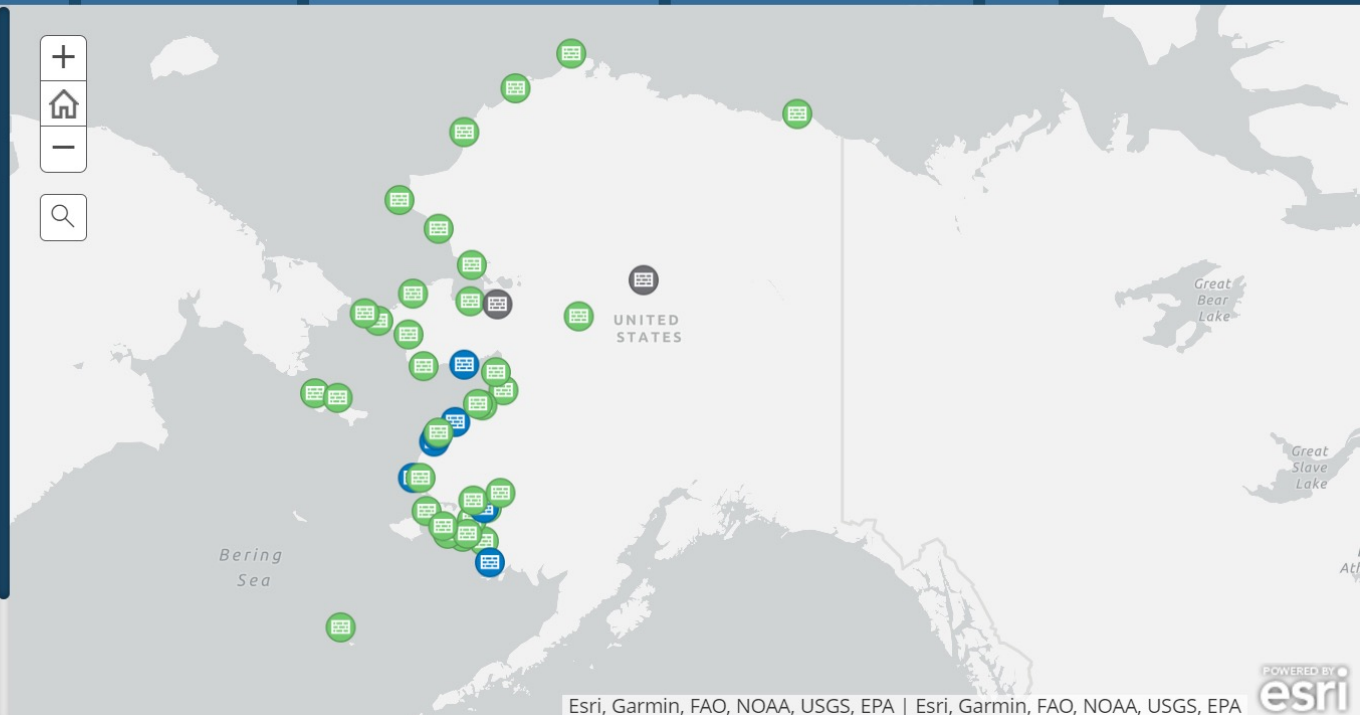
(click on map points for additional detail)

There are many types of other water level observation methods. Community-based observations of high water marks are collected from surveyed tide staffs ([example at Kwigillingok](#)). Water levels can also be monitored through camera systems ([example at Unalakleet](#)). Historical photographs and descriptions of flooding have also been used to create a storm record for some Alaska communities ([see photos](#)). Flood assessment reports are available [here](#).

Flood Assessment



Complete



The AWLW Data Portal Provides Public Access to Alaska Water Level and Information Products

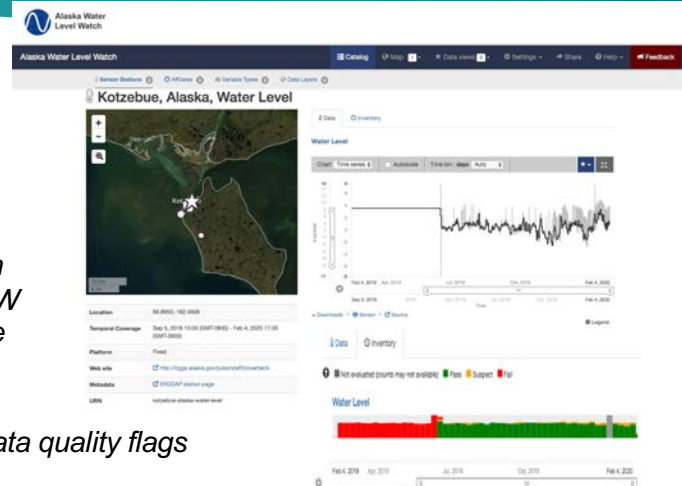
NWLON, non-NWLON and predicted water level information served through the AWLW Portal

Streamlined data ingestion and station page identification procedures allow simplified submission from various providers

Data are qualified as Tier A, B, and C on portal based on accuracy of data and associated NOAA sanctioned uses



Acoustic iGage® in Kotzebue and AWLW Portal Station Page

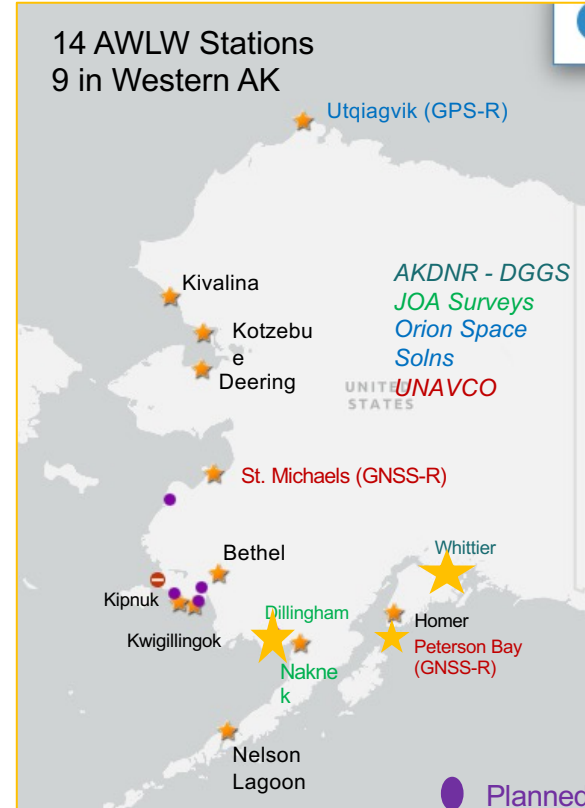


Visual of data quality flags

Tier	A	B	C
Minimum Accuracy	10 cm (on tidal datum)	30 cm (on tidal datum)	30 cm Or undetermined
Benchmarks	5	3	Not required
Leveling Order	Annual 2 nd Order Class 1 better	Biannual 3 rd Order or GPS derived ellipsoid based	Not applicable
Applications	<ul style="list-style-type: none"> Real-time navigation Marine boundaries Sea level anomalies Vdatum Hydrodynamic model forcing and skill assessment CO-OPS MAPTITE App 	<ul style="list-style-type: none"> Hydrographic surveys Shoreline mapping Marsh restoration Storm surge Exceedance Inundation dashboard 	<ul style="list-style-type: none"> Academic research Background oceanographic information Tsunami

AWLW Portal Reporting 50% More Water Level Stations

Many came online in 2021-22 and captured peak water levels during the 2022 Bering Sea Storm (Merbok)



AWLW Tidal Datum and Other Resources & Tools

Regular updated priorities reflect Vdatum grid development needs



Alaska Tidal Datum Calculator

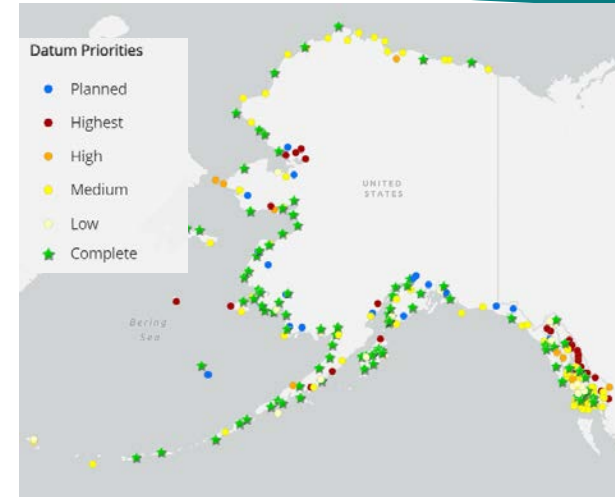
This conversion calculator is provided as a convenience to facilitate access to vertical measurements that have been independently verified and are freely available from either [NOAA CO-OPS](#) or [NOAA NGS](#). For rigorous emergency, planning or construction purposes, users are strongly advised to consult these original sources to ensure accurate and up-to-date transformations. All calculations are based on single tide station offsets, elevations obtained using this method are only valid in the immediate vicinity of the original tide station. Because the relationships between local tidal and geodetic elevations can change with time, the most up-to-date measurement sources must be consulted, independent of this site, to ensure accurate transformations for these high-stakes applications.

The values in this conversion calculator were last updated December 2021.

Location:

Geodetic Elevation:
 (meters)

Local Tidal Elevation:
 (meters)



- Pending VDatum development in Alaska, ADNR has tool for local datum transformations.
- Nov 2022 update of tool to include 10 new stations at Alaska Native Villages.
- Priority short-term water level station locations in support of VDatum are available on the AWLW build out plan.

AWLW Portal Hosts Other Useful Information

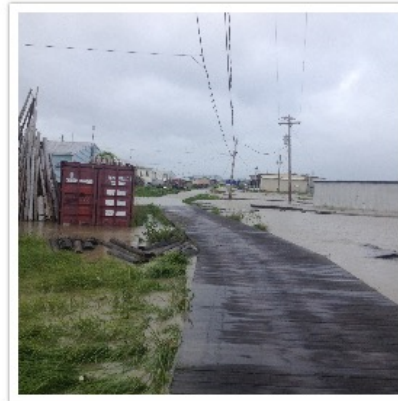
New Flood Event Layer from AKDNR

Select stage information & view photos from multiple locations in communities

Storm Surge: August 3, 2019

Event type	Storm Surge
Flood impact	moderate
Height (NAVD88)	3.35 (m)
Water level type	still water

[Click to enlarge image](#)



AWLW Observing Updates from Partners



Tununak iGage™ 2022 (photo courtesy Autumn Poisson, AKDNR-DGGS)



*Dillingham City
Dock Bubbler
Water Level
Station 2022
(photo courtesy
JOA Surveys)*



*Stebbins/St. Michaels GNSS-R Station,
AOOS/UNAVCO (photo courtesy UNAVCO)*

AWLW Obs Update with Partner AKDNR-DGGS

9 iGage™, iRdar™ Stations were operational during 2022

Kivalina
Kotzebue
Deering

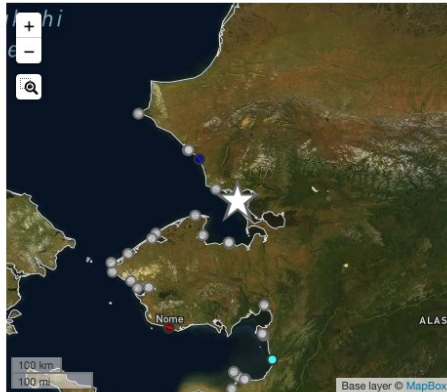
Kipnuk
Kwigillingok
Bethel

Homer
Whittier
Nelson Lagoon

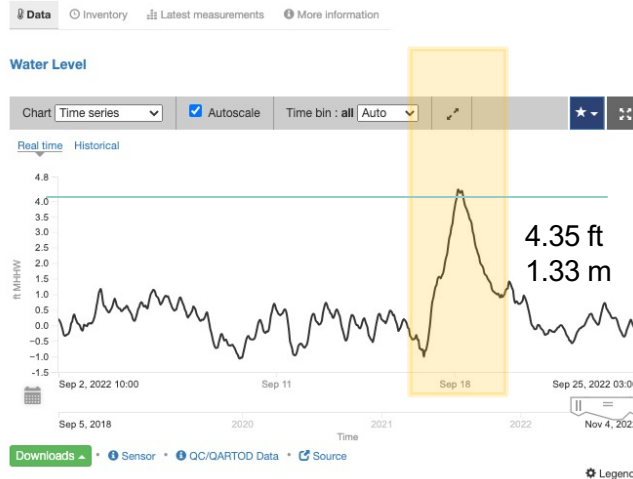


Alaska Division of Geological & Geophysical Surveys (AK-DGGS)

Kotzebue, Alaska, Water Level



Location	66.8950,-162.5668
Temporal Coverage	Sep 5, 2018 13:00 (AKDT) - Nov 4, 2022 08:00 (AKDT)
Tags	Tier C
Platform	Fixed



2022 Bering Storm Peak Water Level Kotzebue – September 18, 2022

AWLW Obs Update with Partner Orion Space Solutions

Utqiagvik GPS-R water level installation & GNSS-R Data Processing



MXAK provided in-kind assistance while servicing AIS at same location

- Oct 2021 Utqiagvik GPS-R installation completed before freeze-up
- Collaborators: North Slope Borough, AOOS, JOA Surveys & Marine Exchange of Alaska
- Onboard processed real time data reporting on the AWLW Data Portal for 1 year
- JOA Surveys providing MLLW based on 5 benchmarks in the area



AWLW Obs Update with Partner JOA Surveys

2 NWLON-Lites, iRadar™ Installation, and GNSS-R Data Processing

JOA Surveys supports NOAA CO-OPS, AKDNR and AOOS Coastal Hazards Portfolio

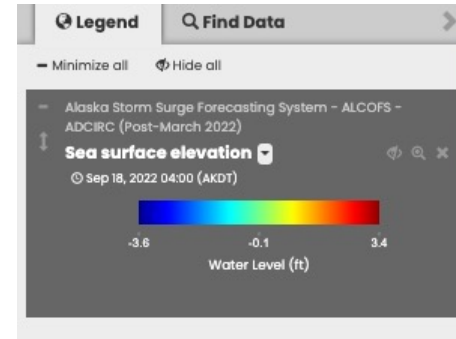
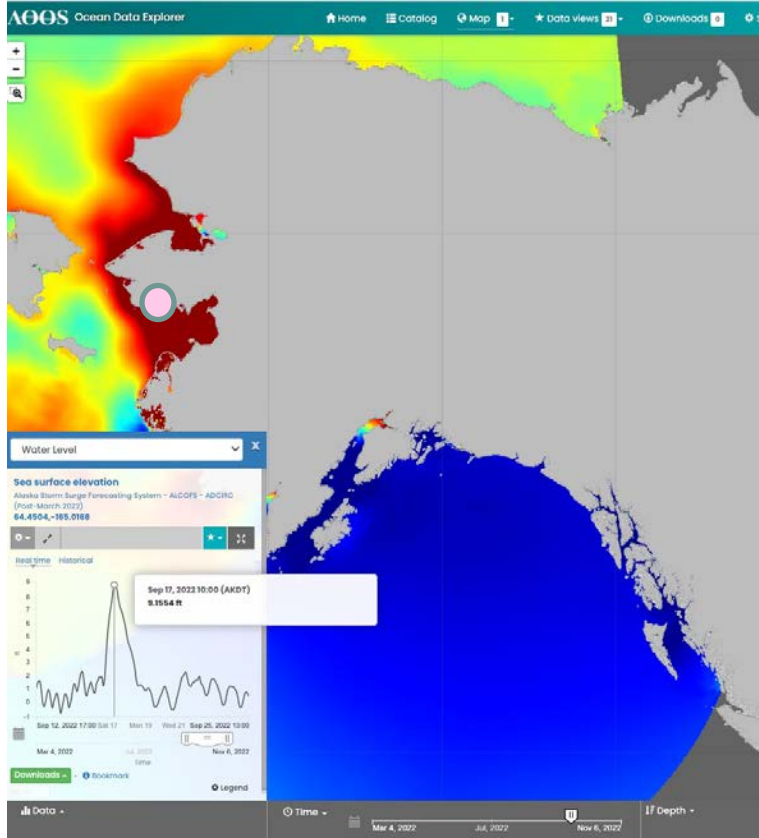
Recent projects:

- 2020 Naknek - Installed dual bubbler water level station
- 2021 Utqiagvik - assist with GPS-R Install
- 2021 Dillingham - Installed bubbler & downward looking Radar water level station
- 2022 Whittier – Installed iRadar™ water level station with equipment from AKDNR
- Processing GNSS-R data and datum assessments for 3 UNAVCO GNSS-R stations

Tide Gauge Installation at Whittier City Dock, March 2022, (Photo: Drew Lindow, JOA Surveys)



AWLW Data Inform Alaska Storm Surge Forecasting System ALCOFS (Research model integrated into Global ESTOFS)



[ALCOFS-ADCIRC Model](#) on AOOS Portal
(Alaska Coastal Ocean Forecast System)

During 2022 Bering Storm Event
Model output predicted peak water levels
exceeding 10 feet in Norton Sound
September 17, 2022

Nome observed NWLON peaked at 3.17 m
(10.5 ft) around noon, highest recorded
since 1974

*ALCOFS-ADCIRC modeled sea surface elevation
map and virtual sensor near Nome, visualized
through the AOOS Data Portal*



The Eye on Alaska's Coast's and Oceans

**Join the AWLW email list by contacting
Jacquelyn.Overbeck@noaa.gov**

