Water level datum conversions

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What are water level vertical datums?

- **Tidal datums:** "a standard elevation defined by a certain phase of the tide," used as references to measure local water levels.
  tidesandcurrents.noaa.gov/datum_options
- **Geodetic datums:** A reference point used to define the location of points on the Earth's surface
  Essential for creating accurate maps, property boundaries, and other applications requiring precise coordinates.
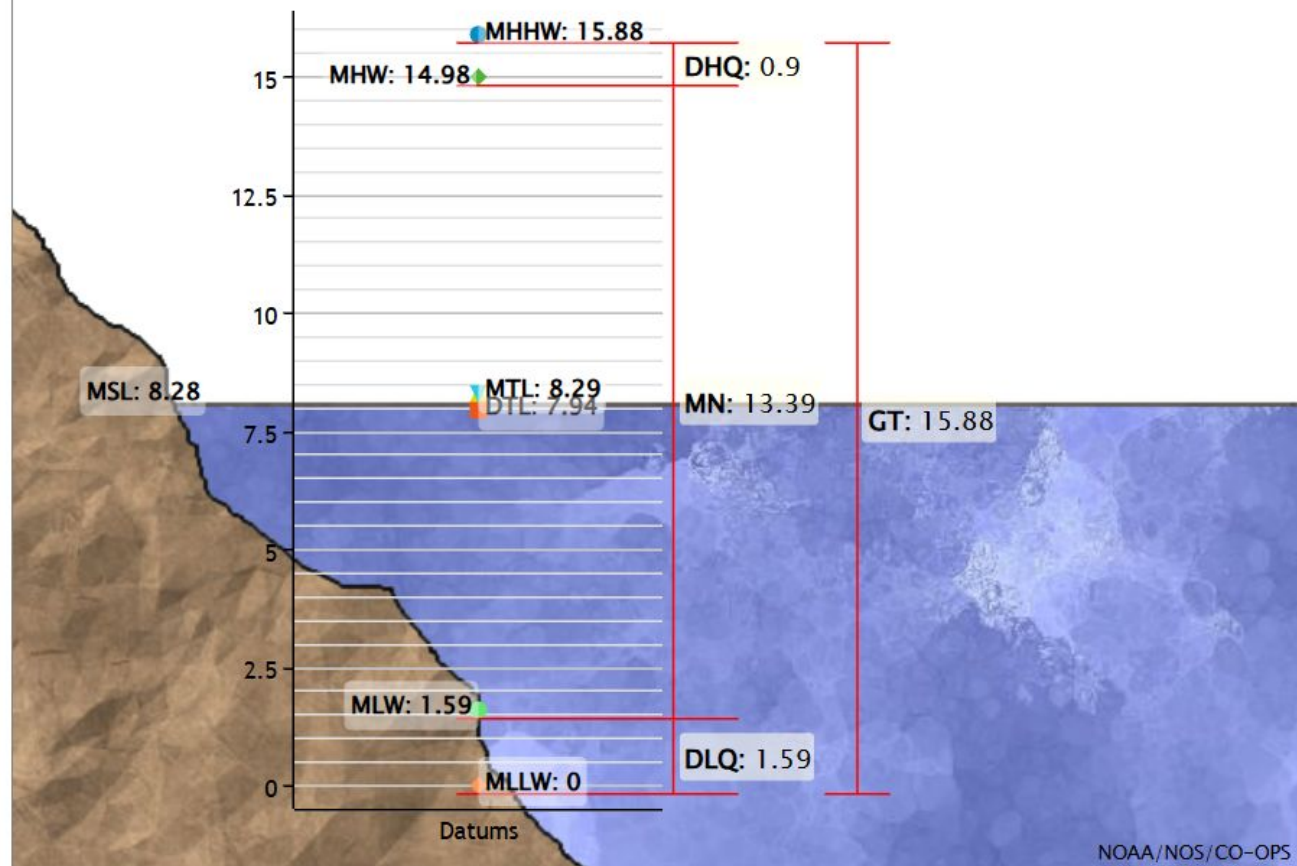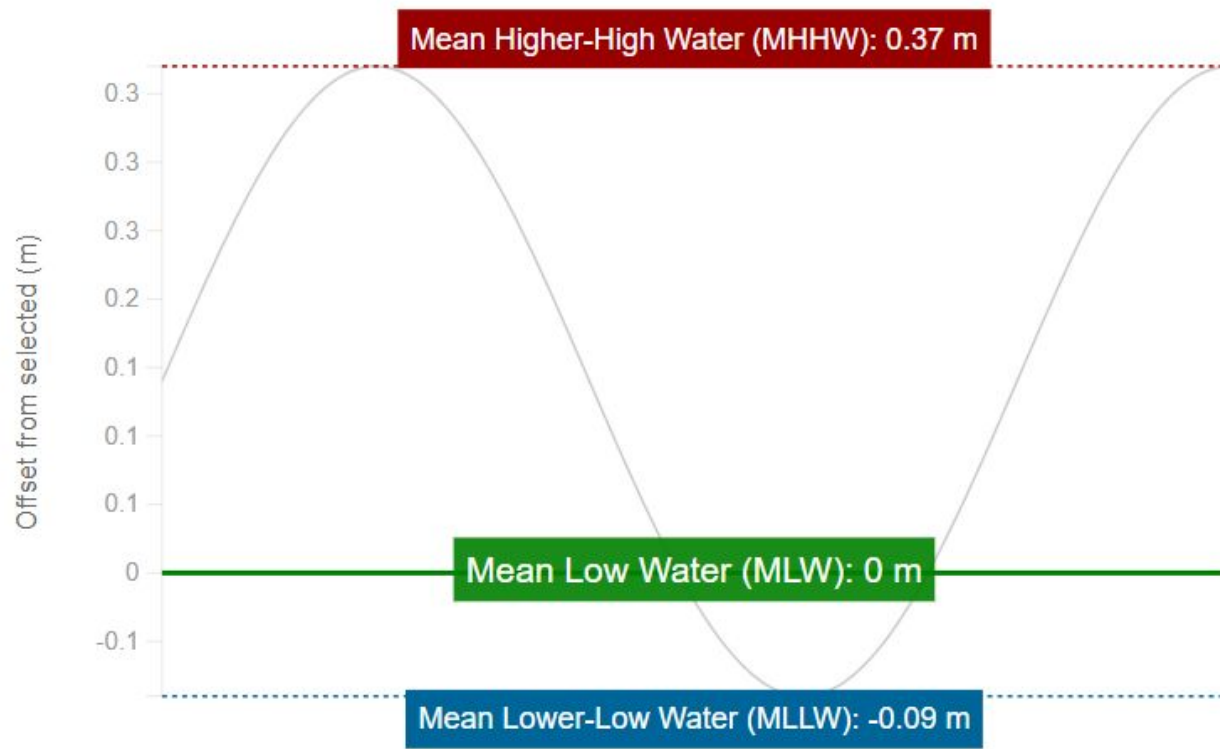
What are water level vertical datums?

- **Station datum:** An arbitrary, recoverable fixed point at a location.
  tidesandcurrents.noaa.gov/datum_options
  - ○ AOOS standardizes data submissions for water level data relative to Station Datum, so it refers to a local datum that is unique to each particular water level station.
  - ○ Station Datums need to be defined and should be recoverable (either to tidal bench mark or to the ellipsoid)
  - ○ AOOS uses site logs to document Station Datum and other relevant specs
- **Station offsets:** Set values that can be applied to a data stream of a known vertical datum (station datum or other) to convert it to other known vertical datums or tidal datums.
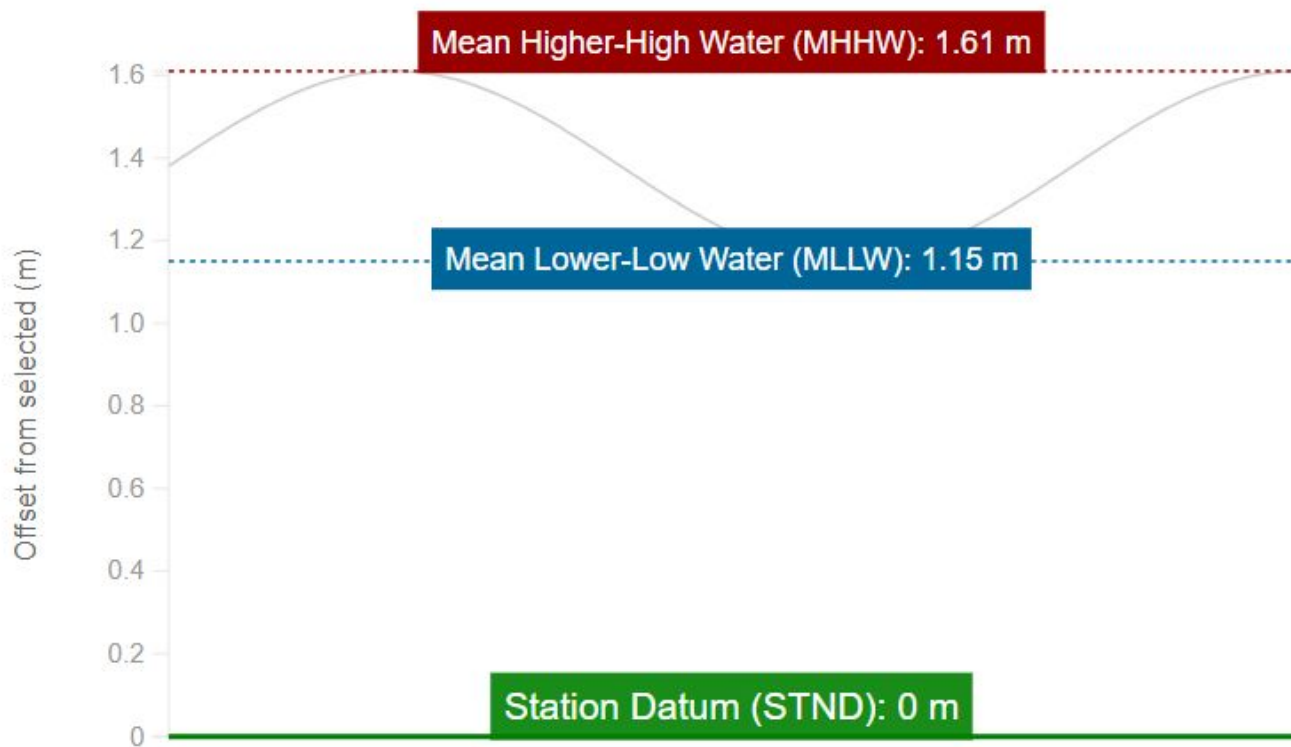
Datums for 9450544, Hollis Anchorage, Kasaan Bay, AK

All figures in feet relative to MLLW

- MHHW: 15.88
- MHW: 14.98
- DHQ: 0.9
- MSL: 8.28
- MTL: 8.29
- DTL: 7.94
- MN: 13.39
- GT: 15.88
- MLW: 1.59
- DLQ: 1.59
- MLLW: 0

Datums

NOAA/NOS/CO-OPS

Why?

- Align water level data for comparison
- Allow datum conversions for sites managed by NOAA CO-OPS and others
- Help inform decision making around events (e.g., weather, storm surge, flooding)
- Different groups need water level in specific datums
  - NOAA National Weather Service needs MHHW (storm events)
  - NOAA CO-OPS uses MLLW (navigation, surveying, coastal management)
  - US Army Corps of Engineers use real-time water level data and forecasts for numerous lakes and rivers relative to NAVD88
  - Scientists

Why?

- Make data on the portal consistent
  - Standardize data collection and submission information with defined station datum and associated information (benchmarks, vertical leveling, tidal datums)
  - Station site log provides metadata about instruments and collection methods too
  - Meets pan-regional national water level mission requirements to make water level data useful to a variety of stakeholders
- Make data useful to external data products
  - The more information we provide, the better odds that it will be used in products like the [Coastal Inundation Dashboard](#)

How?

1. Collect station datum and any available offsets from data providers so data can be related to known datums for conversion.
   *This process is more involved for stations where NOAA CO-OPS has not established benchmark network and published tidal datums.*
    - Ensure that data collected is in reference to a known datum rather than raw data, and that the offsets for aligning to a tidal datum are stored with respect to the reported datum.
2. UI for applying offsets to feeds. Ensure only like datums can be compared.
3. Add offsets to ERDDAP for data download as virtual columns.

Use cases

- Compare tide predictions to water level measurements across multiple sources
- Compare water levels between stations
- Merge multiple device measurements into the same time series
- Evaluate impact of historical and/or predicted events

2023 Sand Point Earthquake
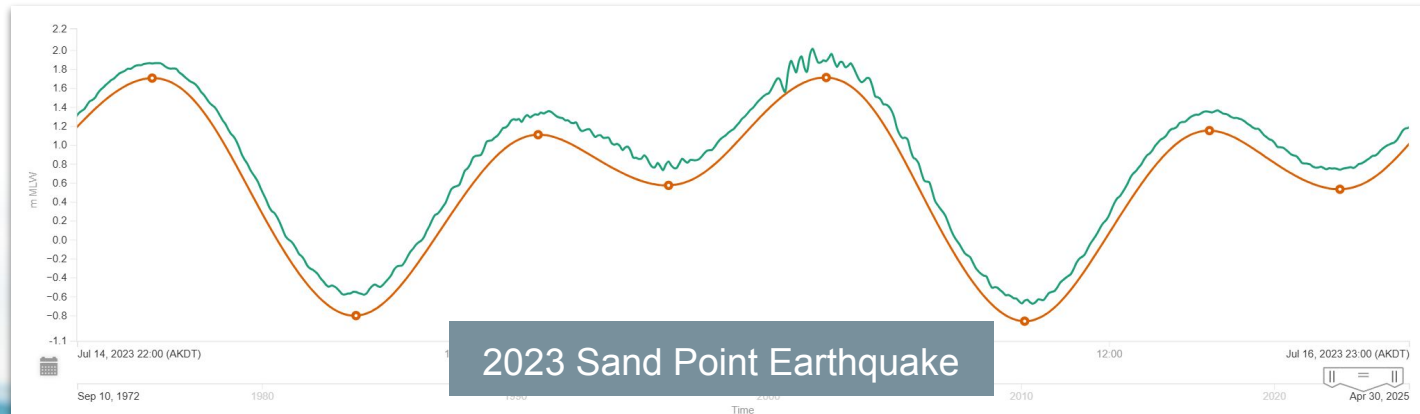
The tool

Visualize, compare and download data in the selected datum where station datums and offsets exist
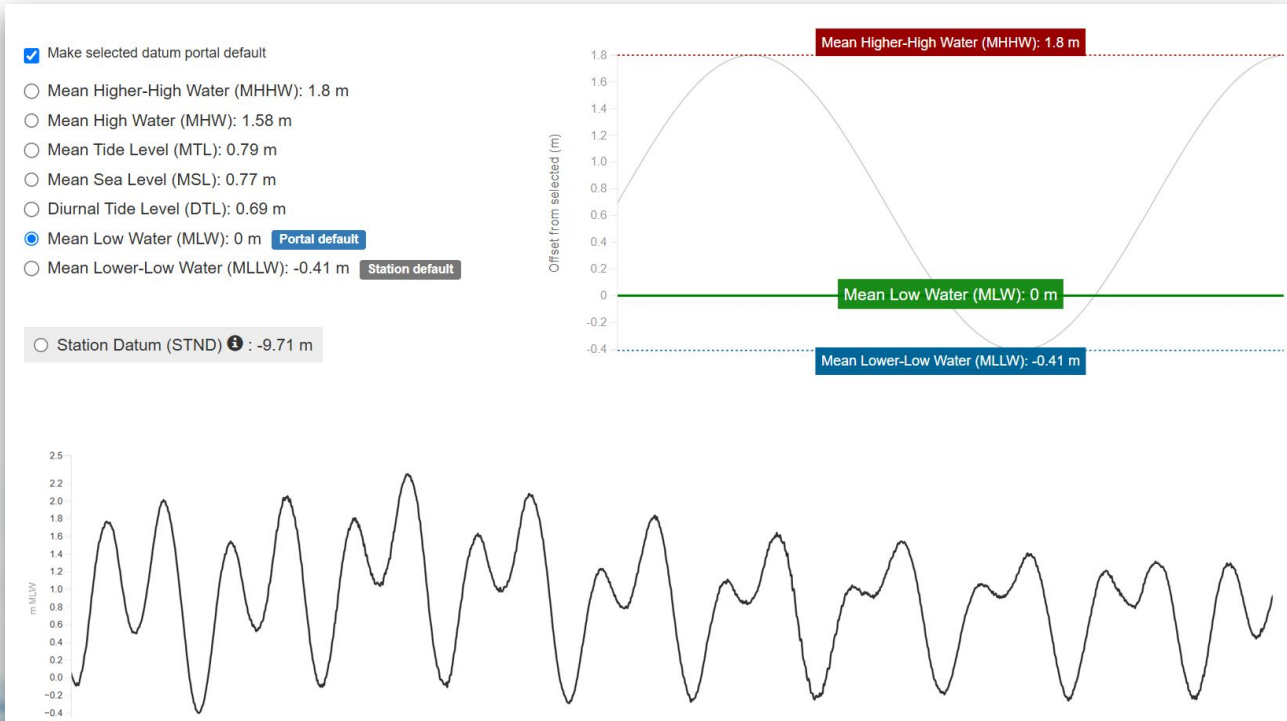
Future improvements

- Heatmaps and time series visualizations that leverage data uniformity to create multiple metrics
  - Difference between predicted (ideal) tide and observed
  - Absolute value in relation to flood stages
  - Percentage of tidal above/below selected datum

- System for submitting and managing station log information, including offsets, station datum, epoc and more!
- Encourage more tidal datum calculations