

Collecting Water Level and GNSS Observations to Upgrade the National Spatial Reference System in Alaska

Alaska GeoSummit

JOA Surveys, LLC
Oct 25, 2023

Project Drivers

Objective 2.2. Upgrade Alaska National Spatial Reference System (NSRS) Components to Support Mapping Data Acquisition

Milestone of Objective 2.2		Performance Indicator	Year/Goal
2.2.4	Establishing comprehensive Alaska VDatum coverage to enable regional transformations and support real-time mapping data acquisition and processing	Short term tidal observations acquired	Oct 2027
		GNSS observations taken on tidal benchmarks	Oct 2027
		Models of transformation grids developed and published for use	Oct 2028

ALASKA COASTAL MAPPING STRATEGY

Implementation Plan 2020-2030

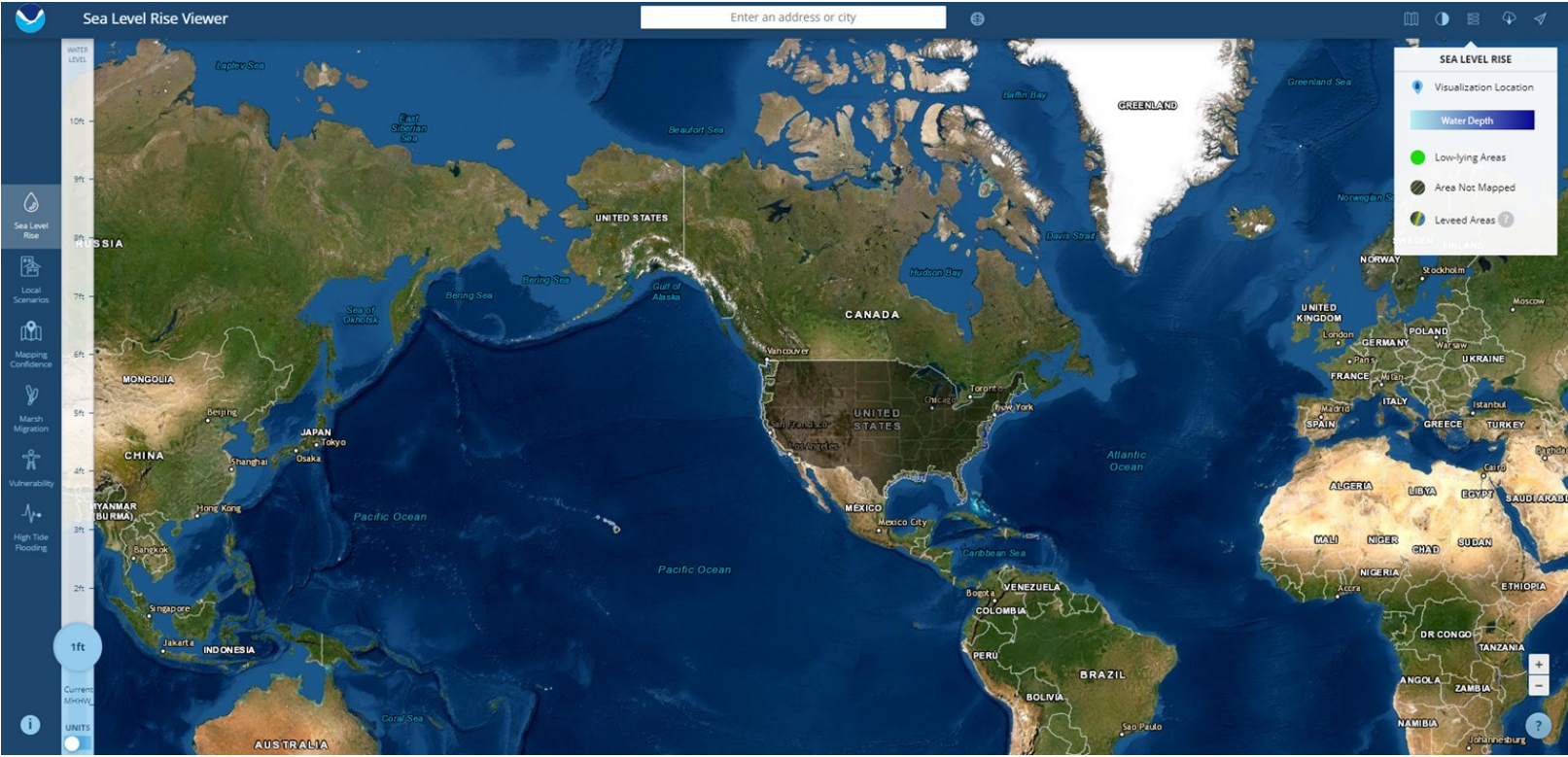
ALASKA
MAPPING
Executive Committee

DRAFT
PUBLICATION DATE TBD



JOA Surveys, LLC
At the boundary between land and sea

Project Benefits



Project Benefits

OPUS Shared Solution

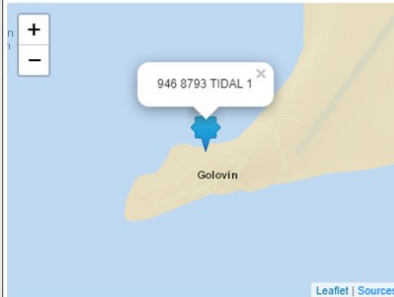
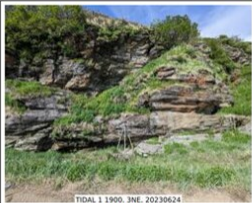
PID: BB392
Designation: 946 8793 TIDAL 1
Stamping: UNSTAMPED
Stability: Most reliable, expected to hold position well
Setting: In rock outcrop or ledge
Description: The bench mark is an encircled cross engraved in a bedrock outcrop, 158 m (518.4 ft) north-northeast of the easternmost corner of the base of a large satellite dish, 152.4 m (500.0 ft) northeast of the centerline of a gravel road named Nichols St, 8.1 m (26.6 ft) northeast of the eastern edge of a chain link fence surrounding a lagoon and 0.96 m (3.1 ft) south-southwest of the edge of a bedrock cliff.
Observed: 2023-06-24T03:00:00Z
Source: OPUS - page5 2008.25



REF FRAME: NAD_83(2011)	EPOCH: 2010.0000	SOURCE: NAVD83 (Computed using GEOID12B)	UNITS: m	SET PROFILE	DETAILS
LAT: 64° 32' 44.01110" = 0.029 m	UTM 3 SPC 5007(AK 7)				
LLN: -163° 1' 54.78521" = 0.009 m	NORTHING: 7159273.253m 1175042.796m				
ELL HT: 8.140 = 0.011 m	EASTING: 594371.777m 450501.483m				
X: -2629132.829 = 0.032 m	CONVERGENCE: 1.77719444" -0.93173611"				
Y: -802206.988 = 0.007 m	POINT SCALE: 0.99970905 0.99992999				
Z: 5736123.240 = 0.004 m	COMBINED FACTOR: 0.99970778 0.99992872				
ORTHO HT: 2.260 = 0.353 m					

CONTRIBUTED BY

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[JOA Surveys, LLC](#)



Tidal Benchmark from 1900 recovered in Golovin, AK



Project Team



Project Owner



Project Owner/Advisor

Project Contributors

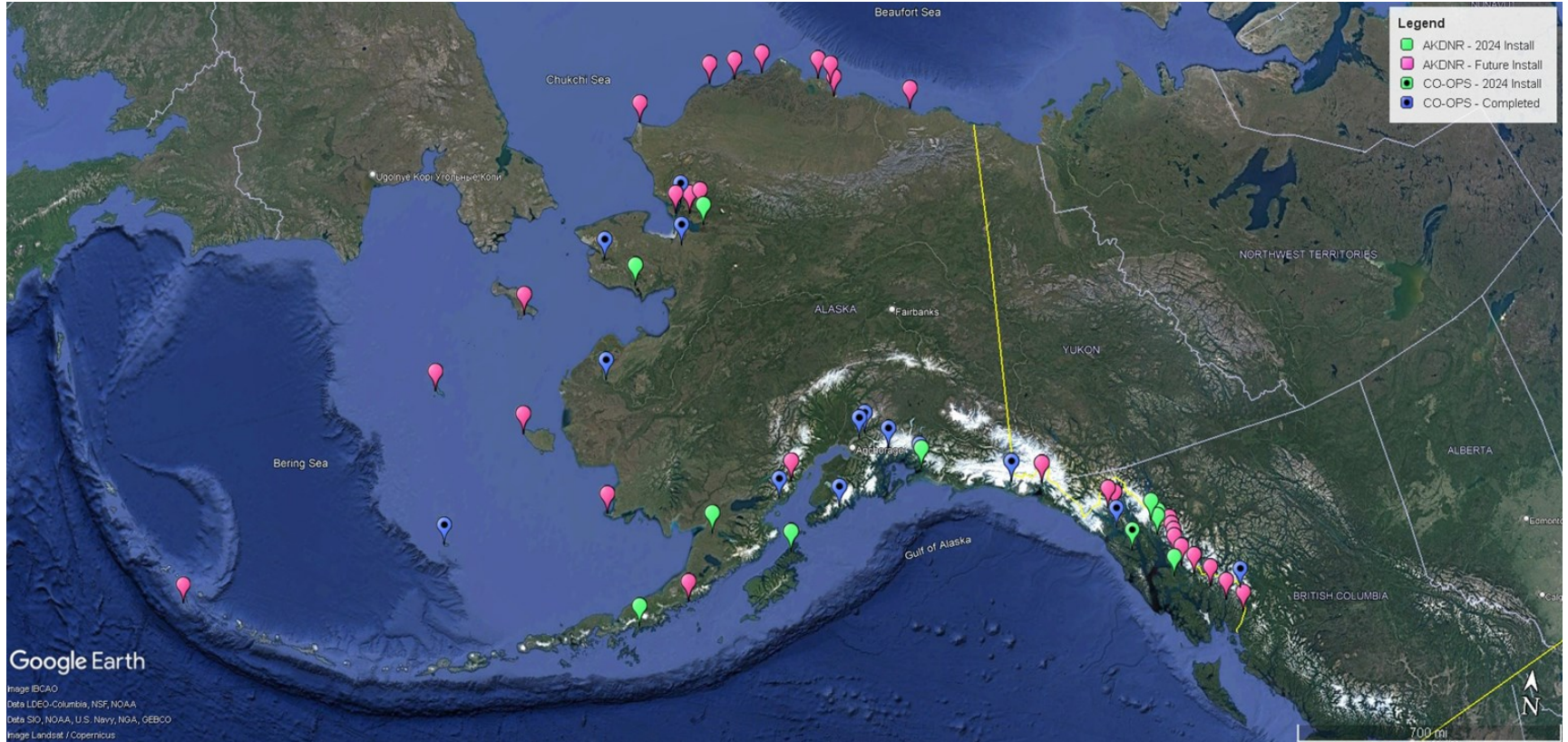


OFFICE FOR COASTAL MANAGEMENT

NATIONAL COASTAL ZONE MANAGEMENT PROGRAM

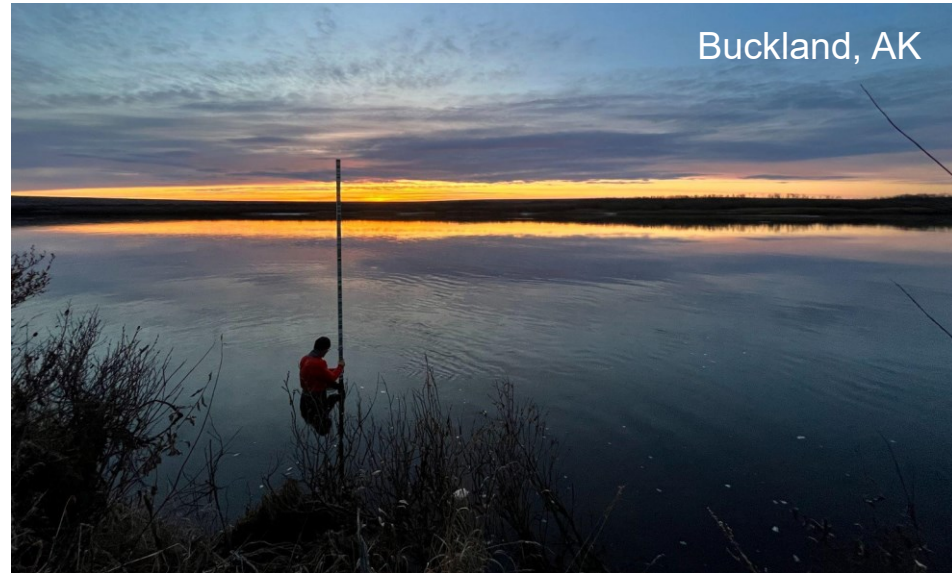
AOOS
Alaska Ocean Observing System

Project Map



General Tide Station Requirements

- **Recon**
 - Desktop recon
 - Field recon
 - Reporting
- **Install**
 - Planning
 - Install sensor and benchmarks
 - 2nd Order Class I or 3rd Order differential levels
 - GNSS Survey (6 hour static session on 2 marks)
 - Reporting
- **Removal**
 - GNSS Survey (6 hour static session on 2 marks)
 - 2nd Order Class I or 3rd Order differential levels
 - **Remove sensor***
 - Reporting

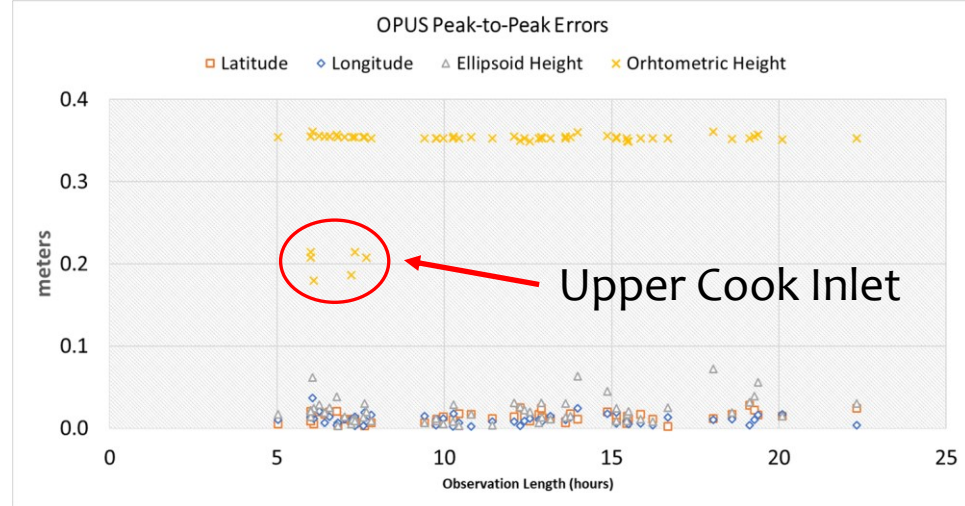


* If sensor moves more than **6mm** relative to the Primary Benchmark it must be reinstalled the next year.

Tie to the NSRS



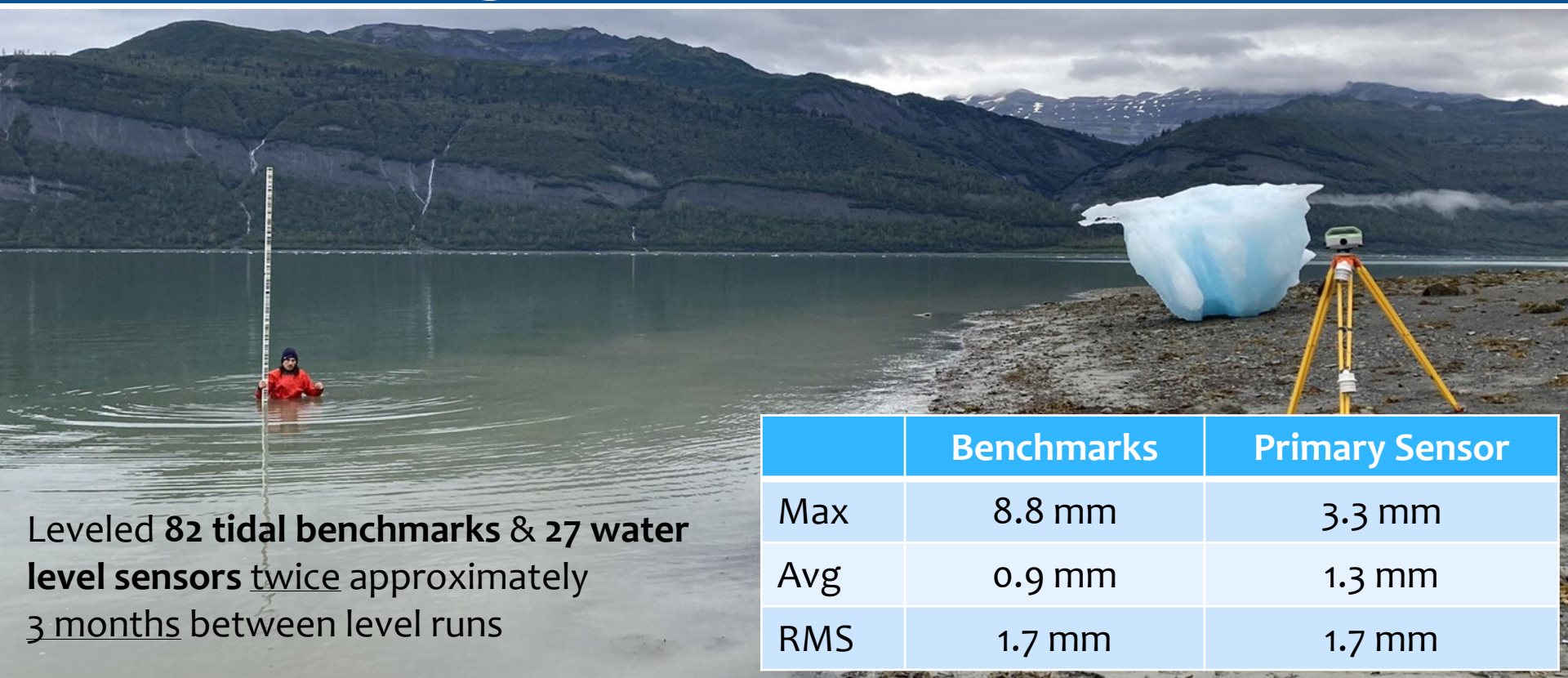
- OPUS Shared on **32 tidal benchmarks**
- Used **42 different CORS** stations
- Avg **baseline** length **205 km**
- **Avg diff btw repeat obs was 4 cm**



	Peak-to-Peak Errors (m)		
	Max	Avg	Min
Latitude	0.028	0.013	0.002
Longitude	0.037	0.011	0.002
Ellipsoid Ht.	0.072	0.021	0.003
Ortho Ht.	0.361	0.338	0.180



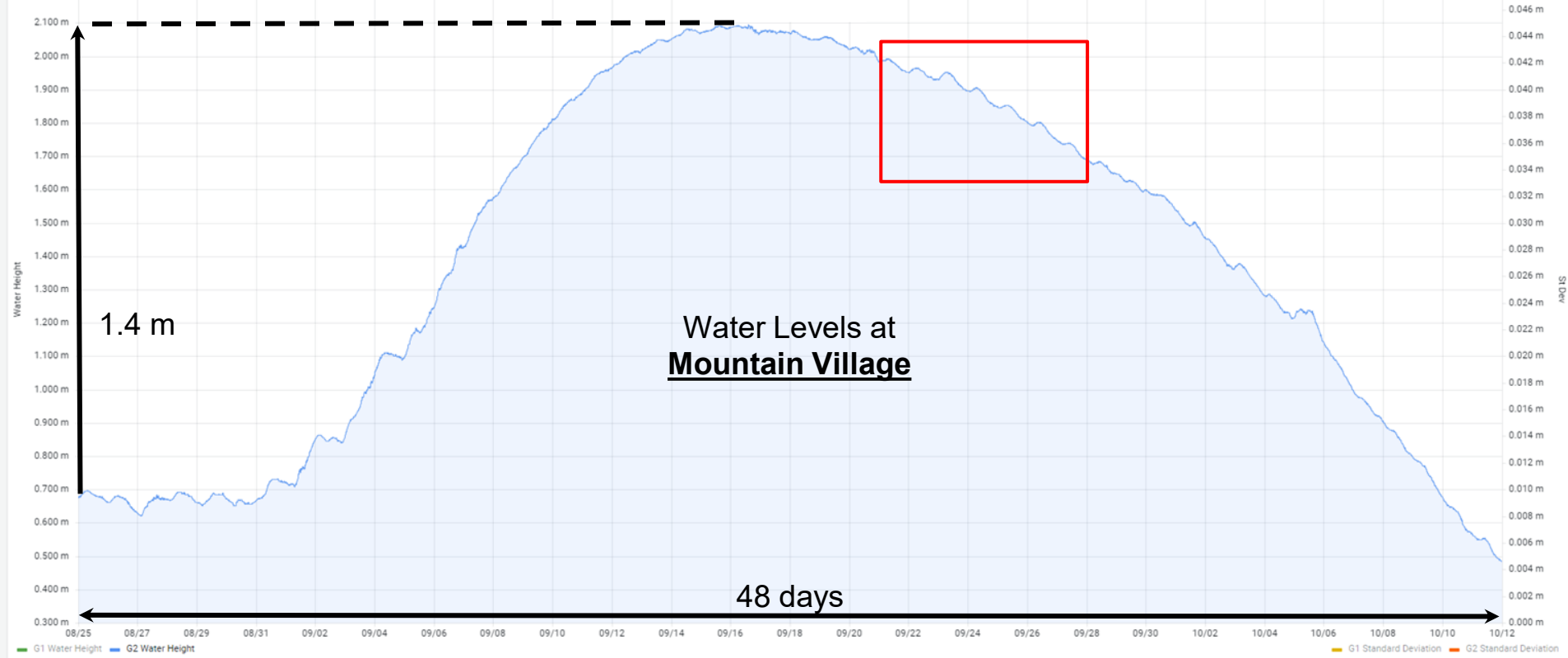
Connecting Tidal Datums to the NSRS



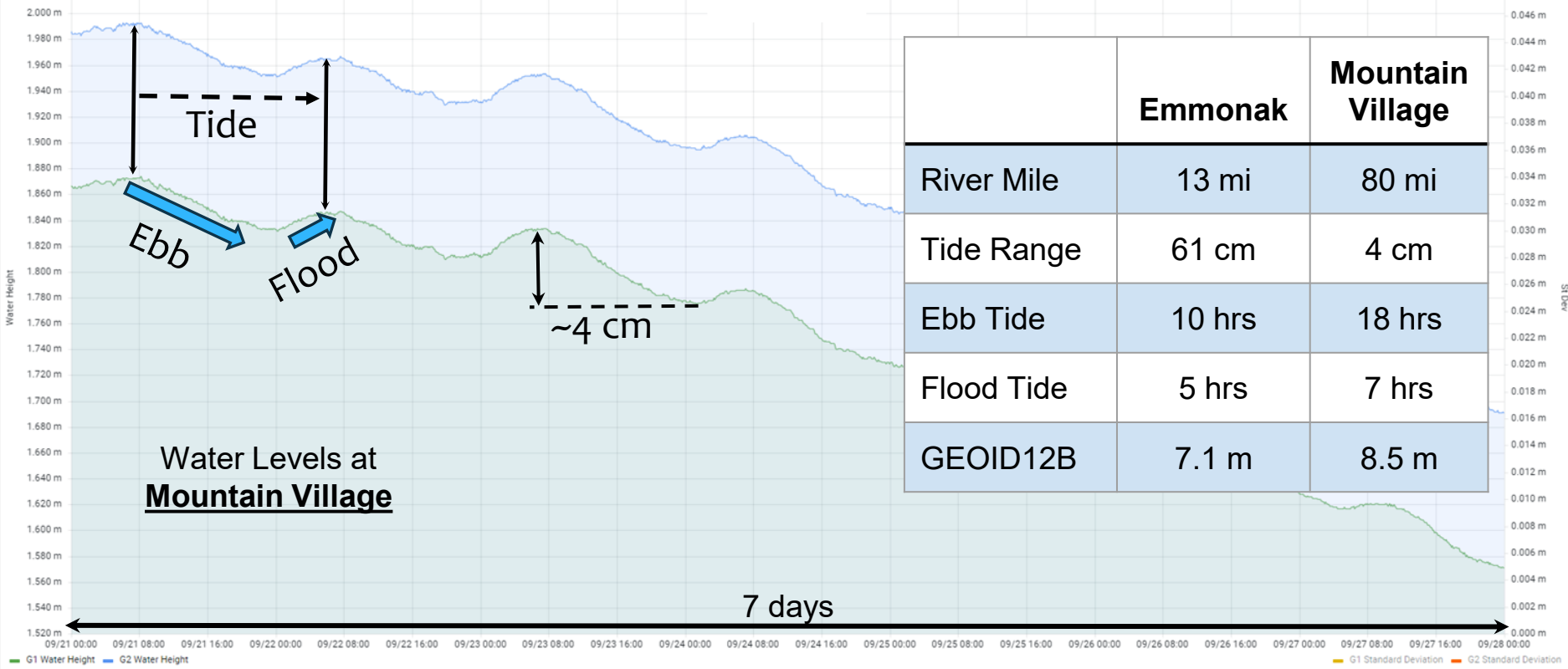
Leveled **82 tidal benchmarks** & **27 water level sensors** twice approximately 3 months between level runs

	Benchmarks	Primary Sensor
Max	8.8 mm	3.3 mm
Avg	0.9 mm	1.3 mm
RMS	1.7 mm	1.7 mm

Project Data: Yukon River

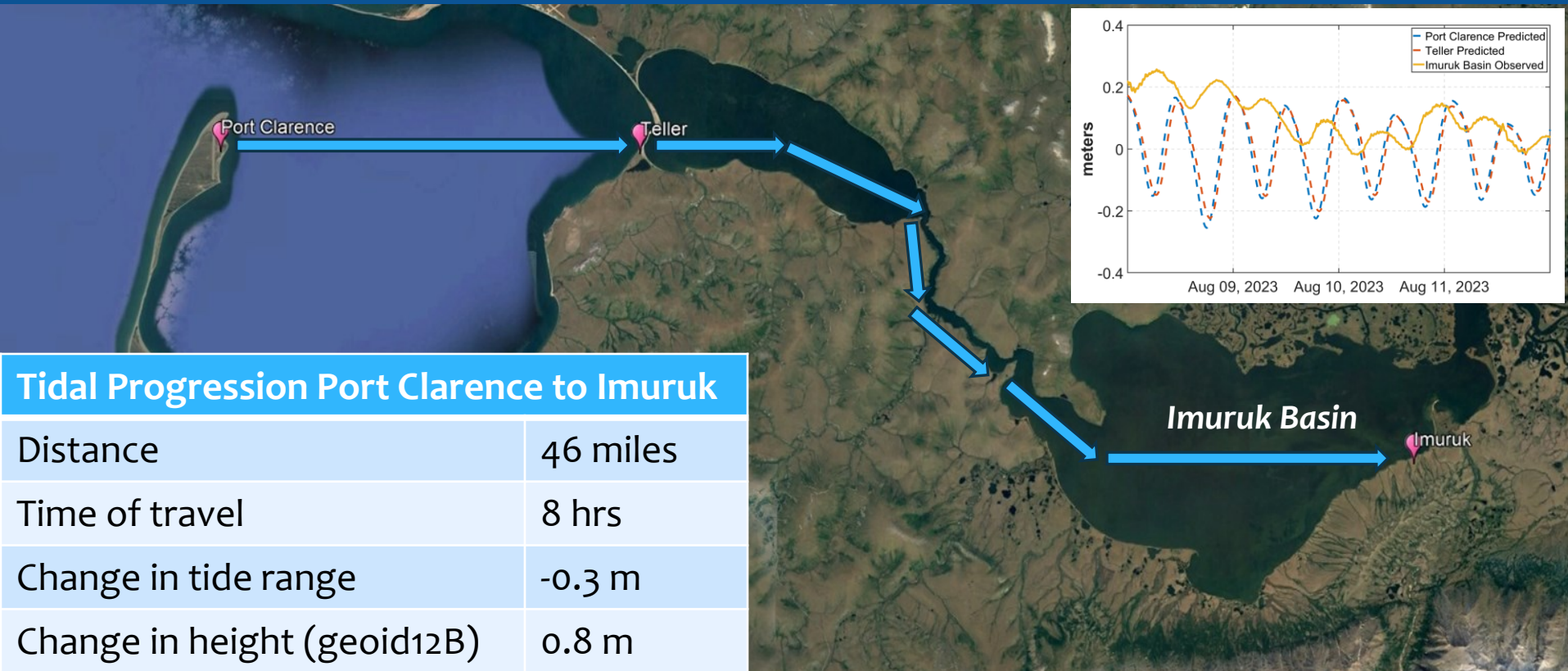


Project Data: Yukon River



	Emmonak	Mountain Village
River Mile	13 mi	80 mi
Tide Range	61 cm	4 cm
Ebb Tide	10 hrs	18 hrs
Flood Tide	5 hrs	7 hrs
GEOID12B	7.1 m	8.5 m

Project Data: Imuruk Basin



Project Data: Imuruk Basin



Tidal Progression Port C

Distance

Time of travel

Change in tide range


Change in height (geoid)

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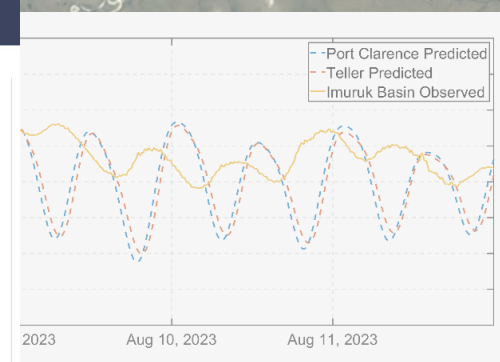
Business/Economy

Department of Defense awards \$37M to Graphite One mining project near Nome

By Riley Rogerson
Updated: July 18, 2023
Published: July 17, 2023



Core samples taken from Graphite One's summer 2012 exploration program. (AP Photo/Graphite One Resources, Dean Besserer)



Wrap Up

- **October 2007** - VDatum software was released. Included coverage of Chesapeake and Delaware Bays, Mobile Bay to Cape San Bias Florida, and New Jersey to Narragansett Bay.
- **2019** - VDatum grids for Southeast Alaska were released.
- **2028?** - Achieving statewide VDatum coverage will be 20 years in the making!

Thanks!



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