

## C. Vertical and Horizontal Control

Per Section 5.1.2.3 of the 2014 Field Procedures Manual, no Horizontal and Vertical Control Report has been generated for H13069.

### C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

Traditional Methods Used:

TCARI

The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

<b>Station Name</b>	<b>Station ID</b>
Yakutat, AK	9453220

*Table 12: NWLON Tide Stations*

<b>File Name</b>	<b>Status</b>
9453220.tid	Final Approved

*Table 13: Water Level Files (.tid)*

File Name	Status
O346FA2017.tc	Final

Table 14: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 11/11/2017. The final tide note was received on 11/21/2018.

Initial reduction of acquired data to MLLW was accomplished via traditional tidal means using the Tidal Constituent And Residual Interpolation grid provided by HSD-OPS. Once final tides were received, the final TCARI grids were applied to the data and used solely for reducing features to MLLW. Following the successful application of SBETs and computation of an Ellipsoidally Referenced Zone Tide (ERZT) separation model, ERS methods were used for reducing data to MLLW.

#### ERS Methods Used:

ERS via Poor Mans VDATUM

#### Ellipsoid to Chart Datum Separation File:

O346FA2017\_PMVD\_EPSG6332\_NAD83\_MLLW\_Debiated.csar

ERS methods were used as the final means of reducing H13069 to MLLW for submission. Data were initially reduced via traditional tidal means until an ERZT separation model could be calculated. This empirically derived model was then checked for consistency and compared to the Poor Man's VDatum (PMVD) separation model provided with the Project Instructions. The PMVD separation model was then vertically shifted such that the average difference between these two separation models is zero. This vertical shift de-biases the PMVD separation model, correcting for local offsets that cannot be effectively modeled by the PMVD.

## **C.2 Horizontal Control**

The horizontal datum for this project is North American Datum of 1983 (NAD83).

The projection used for this project is UTM Zone 07 North.

Vessel kinematic data were post-processed using Applanix POSpac processing software and RTX methods described in the DAPR. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS.

During real-time acquisition, launches 2806, 2807 and 2808 received correctors from the Wide Area Augmentation System (WAAS) for increased accuracies similar to USCG DGPS stations. WAAS and SBETs were the sole methods of positioning for H13069 as no DGPS stations were available for realtime horizontal control.

## D. Results and Recommendations

### D.1 Chart Comparison

A comparison was performed between survey H13069 and ENC US4AK3XM using CARIS HIPS and SIPS sounding and contour layers derived from the surface generated from H13069 data. The contours and soundings were overlaid on the chart to assess differences between the surveyed soundings and charted depths. An eight meter grid was generated from the ENC by extracting all soundings from the chart and creating an interpolated TIN surface which could be differenced with the surface generated from H13069 data. All H13069 data should supersede charted data. In general, surveyed soundings agree with the majority of charted depths. A full discussion of the comparison follows below.

#### D.1.1 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US4AK3XM	1:80000	4	02/13/2018	02/13/2018	NO

*Table 16: Largest Scale ENCs*