A.7. Tide Gauges

In support of this survey, three tide stations were installed in May 2012 by JOA Surveys, LLC (JOA) of Anchorage, AK. Stations were installed at historic U.S. Coast and Geodetic Survey tide station Snag Point in Dillingham, AK (946-5374), Protection Point, AK (946-5056) and a new tide station at Clark's Point, AK (946-5261).

JOA installed two WaterLOG series DAA H350XL bubbler gauges at each site. Data from the tide gauges was monitored remotely via GOES and downloaded periodically throughout the survey to be combined with staff observations and meteorological data that was collected during the project.

The WaterLOG gauges were calibrated prior to the start of survey operations. In the field, they were installed in pairs for redundancy and as a check on each other. Additionally, their installation stability was checked weekly throughout the survey with staff shot observations.

In addition, Sea-Bird SBE 26plus Wave and Tide Recorder submersible tide gauges were set in six strategic deployment locations for minimum 17-day periods during survey operations. The gauges were synced to UTC and set to log at a 6-minute interval using a 180 second averaging period and logged to internal memory. The gauges were downloaded upon retrieval prior to re-deployment at other sites. Barometric pressure was logged concurrently with a digital barometer and used to provide atmospheric pressure corrections. Data from the gauges with accompanying staff observations was used to assist with tide zoning and to provide additional ellipsoid to MLLW ties. The Sea-Bird gauges were calibrated prior to the start of the survey season.

Final processing of the tide data was completed by TerraSond and JOA. Refer to the Horizontal and Vertical Control Report (HVCR) for detailed information regarding the calibration, installation and data processing procedures used for these stations.

A.7.1. Tide Gauge Technical Specifications

WaterLOG H-350XL	
Pressure Sensor Accuracy	0.02% of full scale
Temperature Accuracy	1° C
Pressure Resolution	0.002%
Temperature Resolution	0.002%
Pressure Accuracy 0-15 PSI	0.007 ft
Pressure Accuracy 0-30 PSI	0.014 ft

Table 13 – WaterLOG H-350XL tide gauge specifications.

Environmental issues existed which caused some adverse impacts to data quality. These are itemized below.

The following positioning issue had an adverse effect on data quality:

- Some isolated tide busts between adjacent lines are not easily attributable to sediment transport because of their close proximity in time. It was not always possible to pinpoint the cause but was likely due to tide or tide zoning error, which is a common source of error in this riverine environment with 4-6 m daily tides and numerous constrictions due to sand bars and shoals that affect water levels differently over localized areas. These are also not always easily distinguishable from sediment transport-related bottom change, which can also occur over short periods of time as sand waves can shift relatively quickly with changes in tide and current. Despite the mismatches, these typically did not exceed 0.30 m, within specifications.

  On a case-by-case basis these were investigated by examining a copy of the data corrected using ellipsoid-referenced surveying (ERS) methods. This was possible since all lines are loaded with accurate post-processed kinematic GPS altitudes. Most lines with tide bust – when corrected using ERS to MLLW – show better matchup than tide-corrected lines.

  Note that per the work instructions, all lines were corrected to MLLW using discrete tide zones during the final merge process. However, the "GPSTide" record within all CARIS HIPS lines was computed using an ellipsoid-MLLW separation model developed for this project (supplied with the CARIS deliverables) and can be used for comparison and troubleshooting purposes.

Note that during field processing, a preliminary MLLW to ellipsoid separation model was applied in CARIS HIPS to assist with determining when the required MLLW depth (2 m) had been achieved. The model was provided by JOA Surveys, LLC (JOA). The model used the best data available at the time, but was limited by short tidal data series and lack of computed tide datums for the area. After the field season ended and all tide data became available, JOA provided final tide zones that were based on full data series and additional data points that were not available for the preliminary. The application of the final tides pushed some areas shoaler, but others deeper, sometimes substantially so. For example, in the eastern half of this sheet, soundings were up to 1.6 m deeper after the application of final tides. Therefore, a few final soundings may no longer meet the minimum depth requirements and stop just short of 2 m. Refer to the project HVCR for more information regarding tides.

Per the work instructions, all lines were corrected to MLLW using discrete tide zones during the final merge process. Tide zones were not provided by NOAA for this project. The tide zones were computed using data from three project tide stations and zoning seabird deployments.

Note that the "GPSTide" record within all CARIS HIPS lines was computed using an ellipsoid-MLLW separation model developed for this project (supplied with the CARIS deliverables) and can be used for comparison and troubleshooting purposes. The GPSTide record was not applied during the final merge and therefore does not affect the final soundings and BASE surfaces.

Refer to the project DAPR for more information regarding PPK processing methods. Refer to the project HVCR for details regarding derivation of tide zones. Abstract of Times of Hydrography and CO-OPS transmittal letters can be found in Appendix I. Navigation files (.TXT format), tide zones (.ZDF format) and gauge files (.TID) are available with the project deliverables.