

REPORT OF QUALITY ASSURANCE / QUALITY CONTROL

COASTAL CONDITION SURVEY ESCAMBIA COUNTY R-001 thru R-156, FLORIDA MAY 2021

Prepared for:
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1.0 RTK GPS EQUIPMENT AND CONTROL

1.01 EQUIPMENT

Topographic data was collected utilizing a combination of various components consisting of the following:

1.02 eGPS Virtual RTK Network

The eGPS system works by acquiring GPS observation data from a set of fixed reference stations that continuously transmit to a Geo ++ central server. For every station data set, quality checks are performed, and outliers are rejected, and cycle slips are corrected. Once the integrity of the data has been checked, the central server computes ionospheric, tropospheric, and ephemeris errors by analyzing double-difference solutions or through Kalman filtering. The effect of these errors on any rover working within the network coverage area is then modeled and the systematic errors for RTK are significantly reduced. To enable the modeling, the rover must provide its approximate position to the central

server. This is done via cellular or radio modem using the standard NMEA GGA string. The central server automatically receives this positioning information and performs a geometric displacement to the given location. The software interpolates and applies corrections for ephemeris, tropospheric and ionospheric errors and generates a "virtual reference station" for that individual rover. The software then produces a set of standard format correction messages as if they were coming from the virtual reference station and transmits them via cellular modem to the rover.

1.03 RECONNAISSANCE AND RECOVERY

The initial survey effort involved the reconnaissance and recovery of control points representative of the total survey area that could be utilized for the source of GPS corrections for Real-Time-Kinematic (RTK) topographic acquisition operations.

1.04 SITE CALIBRATION

A representative group of monuments were recovered and RTK site verification was computed. Refer to the monument report for details on existing monument comparisons.

1.05 DATA COLLECTION

Topographic data was collected with the use of two roving Trimble Model R8 Real Time Kinematic survey system with cellular modem telemetry. Data was collected from the profile origin seaward along the specified azimuth at intervals of twenty-five feet, except as necessary to accurately define breaks and vegetation limits. Prior to, and following any data collection, daily confidence checks were made by checking-in to control points recovered during the initial site- calibration stage.

2.0 HYDROGRAPHIC DATA

2.01 EQUIPMENT

Hydrographic data was collected with the use of the hydrographic survey vessel "Memphis Witch". This 24-foot survey platform is outfitted with the following specialized equipment:

a. ELECTRONIC CHART NAVIGATION SYSTEM

The Northstar electronic chart navigation system affords the survey operator real-time local navigation information in an interactive graphic format. This system also provides local area tide prediction data, which is used as reference and for planning purposes.

b. TRIMBLE Model R10 RTK RECEIVER

A Trimble R10 RTK receiver was utilized for vessel positioning and water surface height measurements (independent of the electronic chart system).

c. ODOM ECHO TRAC SURVEY FATHOMETER

The Echo Trac is a high precision, proven, survey quality fathometer designed specifically for underwater bottom mapping in demanding environments. The system records an analog chart and outputs digital depths to the data acquisition system.

d. TSS DYNAMIC MOTION SENSOR

The TSS DMS05 supplies survey vessel motion measurements (at 32 per second) to greatly reduce, if not eliminate, inconsistencies in depth measurements induced by sea conditions. Additionally, this M.R.U. is one of the few of its type to accept an “aiding” input from the shipboard DGPS. Older, and less expensive, M.R.U.’s suffers significant, time consuming, errors induced by the quick motions common to the smaller, highly maneuverable boats frequently used for these types of surveys. Further, this sensor interfaces readily with the survey software and provides quality indicators, in real time, so that the survey operator can ensure the sensor is fully operational and unbiased.

e. HYDROGRAPHIC SURVEYING SOFTWARE

Coastal Oceanographic’s “Hypack” hydrographic surveying software is a comprehensive navigational guidance and data acquisition system. This software allows the operator to define survey “lines” along which bathymetric data is to be collected. For the beach survey, lines were created beginning from the specified origins and extended seaward along the specified headings for 3000’. The survey system allows the operator to continuously monitor the quality of RTK GPS, fathometer and motion sensor data while providing real-time navigational guidance, and data acquisition, along the survey line.

f. eGPS Virtual RTK Network

The eGPS system works by acquiring GPS observation data from a set of fixed reference stations that continuously transmit to a Geo ++ central server. For every station data set, quality checks are performed, and outliers are rejected and cycle slips are corrected. Once the integrity of the data has been checked, the

central server computes ionospheric, tropospheric, and ephemeris errors by analyzing double-difference solutions or through Kalman filtering. The effect of these errors on any rover working within the network coverage area is then modeled and the systematic errors for RTK are significantly reduced. To enable the modeling, the rover must provide its approximate position to the central server. This is done via cellular or radio modem using the standard NMEA GAA string. The central server automatically receives this positioning information and performs a geometric displacement to the given location. The software interpolates and applies corrections for ephemeris, tropospheric and ionospheric errors and generates a "virtual reference station" for that individual rover. The software then produces a set of standard format correction messages as if they were coming from the virtual reference station and transmits them via cellular modem to the rover.

2.02 CALIBRATION

A standard "bar check" was performed at the beginning and end of each hydrographic survey day. The calibration procedure defines the electronic draft of the echosounder at a depth of 10' and then fine-tunes the speed of sound required, for the sounder, to provide accurate readings throughout the entire water column. At the end of the survey day the calibration procedure is repeated to ensure that the calibration remained constant. The echosounder calibration remained unchanged in all the days in which hydrographic surveys were conducted, which is a good overall quality indicator.

2.03 DATA COLLECTION

As a rule, 10% of the line spacing was the allowable "off- track" distance except in the beach sections where the maximum allowable distance offline was 20'. The quality indicators on the survey system onboard were monitored to determine that it was ok to proceed with the data collection. Any sign that the motion reference unit was biased resulted in the suspension of the approach and the vessel turned around and the line approach re-started. The typical survey speed was approximately 5 mph except as the boat approached the shoreline where the speed was gradually decreased.

2.04 TIDAL REDUCTION

Tidal reductions were derived from a VRS eGPS RTK measurements at the antenna location on board the survey vessel. Offsets were applied for the antenna from the phase center to the water surface at the vessel.

2.05 SIGNAL PROCESSING

Raw bathymetric data collected by the survey vessel was subject to post processing procedures. In this process, the entire body of data was scrutinized and erroneous points (fliers) both in the GPS positions and fathometer data are removed. In this stage all raw depths are tide corrected so that the data reflects depths at the specified datum. Once all records are edited and confirmed the data is then converted into x,y,z format in preparation for mapping.