U.S. DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL OCEAN SERVICE

Horizontal and Veritcal Control Report

Type of Survey	**Hydrographic**
Project	**OPR-X388-KR-19**
Contract No	**EA-133C-14-CQ-0031**
Task Order No	**T0010**
Time Frame	**May 2019 - September 2019**

State	**Michigan**
General Locality	**Lake Huron ; Lake Michigan**

2019

CHIEF OF PARTY

David R. Neff, C.H.

LIBRARY & ARCHIVES

Date

NOAA FORM 77-28
(11-72)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY No
H13252
H13253
H13254
H13255
H13256
H13257
H13258
H13259

HYDROGRAPHIC TITLE SHEET

INSTRUCTIONS - The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the office.

FIELD No

eTrac Inc.

State	Michgan		
General Locality	Lake Huron ; Lake Michigan		
Sub-Locality	Straits of Mackinac		
Scale	1:20,000 (H13255, H13257: 1:5,000)	**Date of Survey**	May - September 2019
Instructions Dated	May 15, 2019	**Project No.**	OPR-X388-KR-19
Vessel	R/V Benthos, R/V 505, R/V Endeavor, WAMV-1, WAMV-2		
Chief of Party	David R. Neff, C.H.		
Surveyed by	eTrac Inc.		
Soundings by echo sounder	Kongsberg 2040c, R2 Sonic 2024, R2 Sonic 2022		
Graphic record scaled by	N/A		
Graphic record checked by	N/A	**Automated Plot**	N/A
Verification by	Atlantic Hydrographic Branch		
Soundings in	Meters at Low Water Datum 577.5 ft IGD - 1985 Lake Michigan, Lake Huron		

REMARKS:

NAD 83 (2011), UTM Zone 16

Times are in UTC

The purpose of this contract is to provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area.

SUBCONSULTANTS:

Geodynamics, LLC, 310A Greenfield Drive, Newport, NC 28570

NOAA FORM 77-28 SUPERSEDES FORM C&GS-537

Contents

A. Vertical Control

Per the project instructions, survey data for OPR-X388-KR-19 were vertically referenced to the ellipsoid. Using VDatum, a vertical separation model was created to transform the ellipsoidally referenced data from ITRF-08 to LWD. This separation model was applied in QPS Qinsy on the vessels in real-time to achieve LWD in the field. Achieving LWD in the field was extremely efficient for field operations as the NALL was easily identified in realtime. The separation model was carried through the processing pipeline maintaining LWD throughout all processing efforts.

R/V Benthos and R/V Endeavor received GNSS satellite corrections on the Applanix POS MV 320 over the G2+ carrier signal from the Marinestar Global Correction System maintained by Fugro. R/V 505 received GNSS satellite corrections on the R2Sonic I2NS over the G2+ carrier signal from the Marinestar Global Correction System maintained by Fugro. The Marinestar system is a global real-time GNSS broadcast system that delivers corrections from a network of base stations around the world via geo-stationary satellites. The Marinestar corrections system was utilized for both vertical and horizontal positioning. It should be noted that the G2+ carrier is a recent upgrade from the G2 carrier used in previous years. Improved accuracy was observed in the real-time solution as a result of this upgrade. Accuracies in the 9-13cm range were observed throughout the project, an improvement over the 13-20cm accuracies observed with the previous G2 string.

WAM-V1 and WAM-V2 received DGNSS corrections on the R2Sonic I2NS and required post processing in Applanix PosPac MMS for positioning.

For OPR-X388-KR-19, Applanix PosPac MMS was utilized for all survey data to post-process real-time positioning data utilizing Trimble's PP-RTX implementation of Trimble CenterPoint RTX. The Trimble CenterPoint RTX correction service is delivered via internet connection and integrated into Applanix PosPac MMS 8, to aid in post processed trajectories. A Smoothed Best Estimate of Trajectory (SBET) is provided by PosPac MMS and applied to survey data in Qimera 1.7.6.

B. Horizontal Control

Survey data for OPR-X388-KR-19 were collected in NAD83 (2011) horizontal datum, UTM Zone 16N Projection.

Horizontal positioning was achieved using the same equipment and methods as described in the Vertical Control section of this document.

C. Approval Sheet

OPR-X388-KR-19

Registry Nos.
H13252
H13253
H13254
H13255
H13256
H13257
H13258
H13259

Horizontal and Vertical Control Report

This report and the accompanying data are respectfully submitted.

Field operations contributing to the accomplishment of OPR-X388-KR-19 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and associated data have been closely reviewed and are considered complete and adequate as per the Statement of Work.

David Neff
Digitally signed by David Neff
DN: C=US, E=david@etracinc.com, O=eTrac Inc., CN=David Neff
Date: 2019.10.25 11:25:23-07'00'

David R. Neff | eTrac Inc. | Lead Hydrographer | October 25, 2019

eTrac Inc.
October 2019