REQUEST FOR QUALIFICATIONS FOR

BEACH SURVEYING SERVICES

SUBMITTED TO:

TOWN OF NAGS HEAD | 5401 S CROATAN HIGHWAY | NAGS HEAD, NC
252.441.5508

SUBMITTED BY:

MCKIM & CREED | WILMINGTON, NC
910.343.1048 | MCKIMCREED.COM

McKIM&CREED
ENGINEERS SURVEYORS PLANNERS

McKIM&CREED
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November 21, 2019

Mr. Cliff Ogburn, Town Manager
Town of Nags Head
5401 S Croatan Highway
Nags Head, NC 27959

RE: REQUEST FOR QUALIFICATIONS FOR BEACH SURVEY SERVICES

Dear Mr. Ogburn:

McKim & Creed has the largest group of surveyors and geospatial professionals, technicians and specialists in the southeastern US. Our hydrographic survey group located in Wilmington, NC includes hydrographers, boat operators, technicians and surveyors. Beach profile surveys are a large part of the work that this group performs along the East coast. We have completed hundreds of miles of profiles annually in the last 22 years, including performed beach profile surveys throughout the Outer Banks including Nags Head. As a Task Order for the USACE, McKim & Creed established a control network from Oregon Inlet, north to Kitty Hawk that consists of roof top control base station points and calibration points throughout the area. We have three dedicated vessels, capable and ready to perform offshore and nearshore surveys. All data collected and delivered under this contract will be reviewed and checked by a surveyor licensed in the state of North Carolina and by an ACSM/THSOA Certified Hydrographer.

Since 1997, we have been performing beach profile surveys for public and private clients and have constantly and continuously improved our processes and procedures. Today, we can provide a very accurate product at a very competitive fee. Our knowledge of the North Carolina coast, as well as access to the beaches and tidal ranges, means we can be more efficient in getting the project up and running and completed on time. We have been performing annual monitor beach profile surveys, and successfully meeting deadlines for Bald Head Island, Ocean Isle Beach, Debordeau Island and Daufuskie Island for more than 10 years.

Finally, safety is the utmost importance to McKim & Creed, Inc. We have rigid safety procedures developed from thousands of hours of experience working offshore and in the surf zone. Our hydrographic survey team specializes in this type of work and their time is 100% dedicated to hydrographic projects. Our boat operators complete 12 months of observation and training before they are allowed to operate the vessel in the nearshore environment.

Sincerely,
MCKIM & CREED INC

David Jones, CFS, PLS
Regional Manager/Vice President

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McKIM&CREED
ENGINEERS SURVEYORS PLANNERS

FIRM GENERAL BACKGROUND

McKim & Creed, Inc. is a committed team of talented professionals who improve the quality of life for businesses and communities by providing world-class engineering and geomatics solutions. As one of the largest and most comprehensive geomatics firms in the U.S., McKim & Creed understands that complete and accurate data is the foundation—the building block—of every project.

McKim & Creed was founded in 1978 by Herbert P. McKim, Jr, PE, PLS, and Michael W. Creed, PE, Ph.D. The firm began as a two-person company providing structural engineering services to architects. Today, McKim & Creed is a 600-person, employee-owned firm with 23 offices in seven states and licensed surveyors in 21 states. The firm provides geomatics and engineering services to public and private clients throughout the country, and its geomatics business unit provides approximately 40 percent of McKim & Creed's annual revenue.

For four years, the company has been recognized as the No. 1 Surveying and Mapping Firm in the Southeast by Engineering News-Record Southeast. McKim & Creed has also been ranked among the Top 100 Land Surveying, Mapping and Geospatial Firms by Point of Beginning magazine, and one of the Top 25 Trenchless Design Firms by Trenchless Technology magazine.

McKim & Creed's depth of local resources offers the flexibility to provide experienced staff at your disposal to keep your project on track. Our solid background and experience have resulted in the method and controls being in place to balance staff requirements while maintaining quality, schedule and budget for our clients. McKim & Creed is committed to meeting budget and schedule requirements.

STRENGTH IN NUMBERS

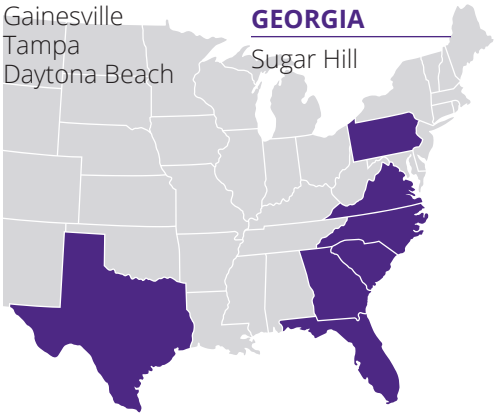
41 YEARS IN BUSINESS	**600+** EMPLOYEES
23 U.S. OFFICES	**250+** GEOMATIC EMPLOYEES

LOCATIONS

PENNSYLVANIA
Pittsburgh
Harrisburg

FLORIDA
Clearwater
Gainesville
Tampa
Daytona Beach
Orlando
Deland
Palm Coast
Fort Myers
Sarasota

GEORGIA
Sugar Hill



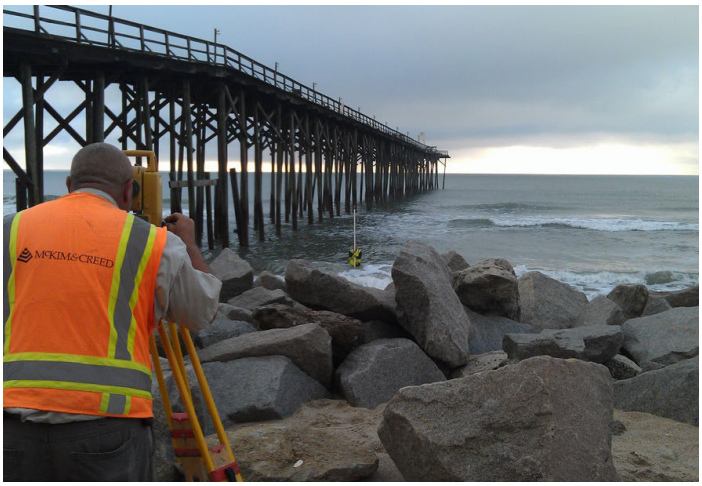
N. CAROLINA
Asheville
Charlotte
Raleigh
Wilmington

S. CAROLINA
Charleston

TEXAS
Austin
Dallas-Fort Worth
Houston
San Antonio

VIRGINIA
Hampton Roads

McKim & Creed offers a comprehensive Geomatics division to meet the topographic, hydrographic, and mapping needs of our customers using a combination of conventional surveying, hydrographic surveying and Global Positioning System (GPS) technology. Whether it is new design, construction, infrastructure monitoring, inspection, or understanding the existing physical conditions of an area, the ultimate success of any project relies on comprehensive and accurate data and analysis. We also understand that every project is unique and has its very own special requirements and conditions.



EXPERIENCE WITH GOVERNMENT ORGANIZATIONS

McKim & Creed has performed hundreds of miles of beach renourishment and beach monitoring surveys throughout the East Coast from Connecticut to the Caribbean for both public and private sector clients. For example, in 2001, while working with the USACE Wilmington District, we helped develop the methods and procedures for using RTKGPS in coastal inlets and near-shore environments that are being used today.

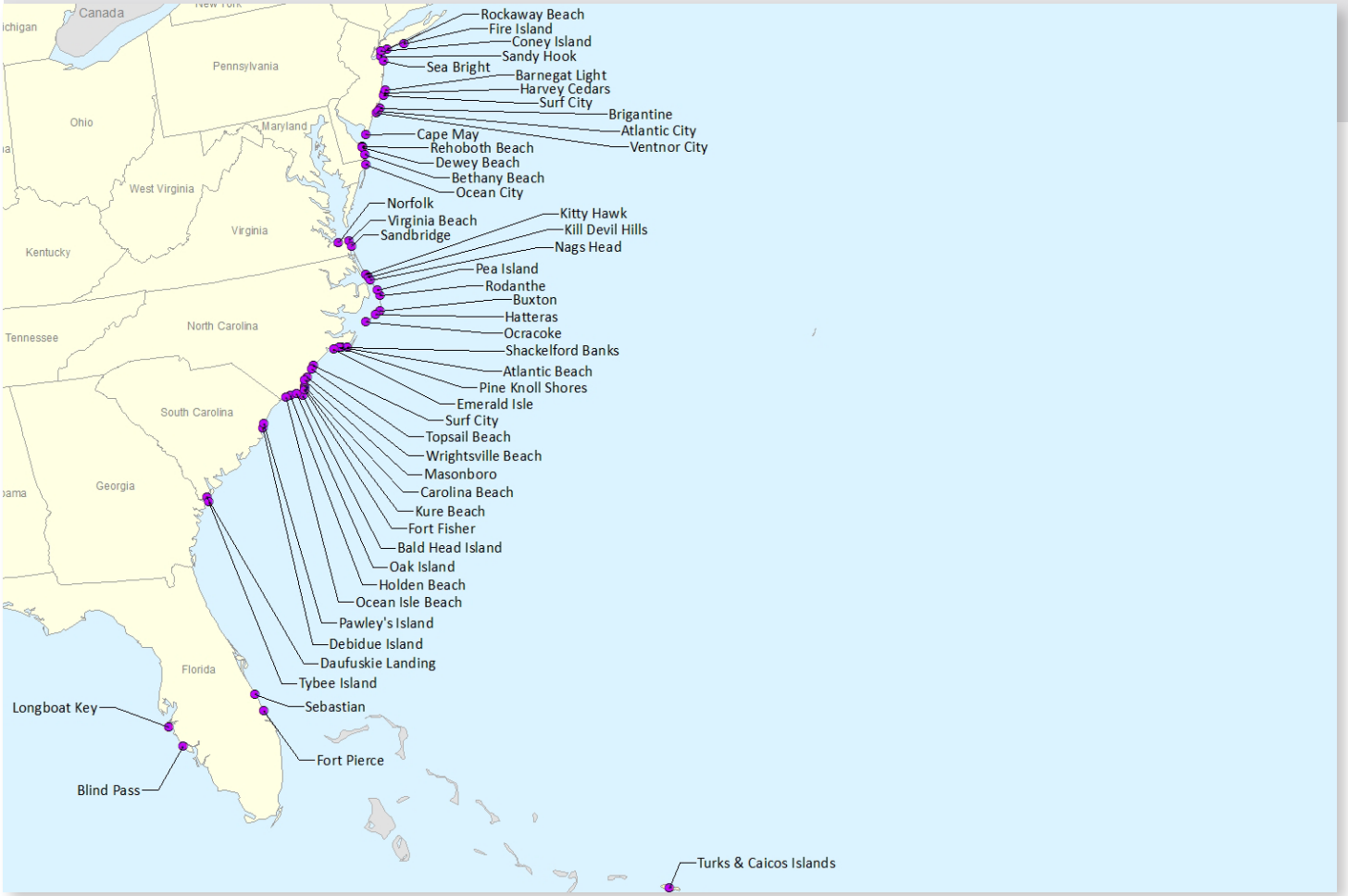
PAST PERFORMANCE

One way we measure past performance is by the amount of repeat work we receive. McKim & Creed has been successful in obtaining repeat contracts with both the public and private work sector. We have had repeat contracts with the Department of Defense for the Savannah COE, Wilmington COE and at military installations such as Camp Lejeune Marine Base, Fort Bragg and Seymour Johnson AFB. We have completed 12 indefinite delivery contracts in the past 10 years. Current beach monitoring projects include:

BALD HEAD ISLAND / McKim & Creed has been performing beach monitoring profile surveys at Bald Head island since 2002. Profiles are surveyed at 67 stations on the south, east, and west facing beaches. The surveys commence at the inland toe of the primary dune system and extend seaward to a depth of -20' NGVD29 or 2500' from the baseline, whichever is greater. Lines at stations 46+80, 50+00, 52+64, 56+56 extend as needed to cross the exiting Federal Cape Fear River Shipping Channel. Included are detailed topo surveys on 16 existing geo-tube groin structures. The profiles are surveyed along the centerline and each side (toe) of each structure. Surveys are performed approximately every 6 months. In addition, McKim & Creed has performed several Post-Storm surveys on the beaches after a hurricane or other major storm event.

OCEAN ISLE / McKim & Creed has been performing beach monitoring profile surveys at Ocean Isle Beach annually since 2012. Beach profile and hydrographic surveys are performed in 35 lines adjacent to the USACOE monitoring lines and include overlap between hydrographic and landside portions of beach profiles. Onshore beach profile elevations are obtained at maximum 20'

BEACH PROFILE SURVEYS PROJECT EXPERIENCE



intervals and at top and toe of all noticeable breaks in grade (greater than 1' vertically such as scarps, toe of dune, bulkheads, etc.). Surveys commence at the inland toe of the primary dune and extend seaward to -21' NAVD88 or 2500' from the baseline, whichever is less. The offset tolerance from azimuth is no more than 30ft. either side on offshore segments of the profile line and no more than 5' either side of the azimuth on the onshore segments of the profile line. Soundings for hydrographic portions of beach profiles are obtained at maximum 25' intervals. Survey results are provided in digital XYZ format. A digital AutoCAD drawing and two signed sealed hardcopies depicting bathymetric elevations and soundings are provided.

USACE / We are currently under contract with the New York, Philadelphia and Wilmington USACE Districts to perform hydrographic survey services and are currently negotiating rates with the USACE Jacksonville District for the same. Although these services are not exclusively for beach profile surveys we have received task orders from all 3 Districts to perform monitoring or pre-placement surveys. A task order for the Wilmington District included beach profile surveys for Wrightsville Beach, Carolina Beach, Kure Beach, Fort Fisher and Ocean Isle Beach. For the Philadelphia District we have successfully completed dozens of beach profile surveys directly and indirectly while working with dredging contractors. The Philadelphia District requires a 50' overlap between the hydrographic and topographic portions of the lines and that each portion is surveyed no more than 48 hours apart.

PROJECT EXPERIENCE

2005 -2015 BEACH MONITORING DEBORDIEU ISLAND, SC

McKim & Creed performed annual beach profile and hydrographic surveys at 30 control points along the shore at Debordieu Island, SC for 10 years. Hydrographic and landside portions of the beach profiles overlapped by approximately 50 feet. Onshore beach profile elevations were obtained at a maximum of 20 foot intervals and at top and toe of all noticeable breaks in the grade. Surveys were performed from the monument seaward along the specified azimuth to a distance not less than 1,500 feet. Soundings for hydrographic portions of the beach profiles were obtained at a maximum 25 foot intervals.

Debordieu Colony Community Association, Inc.
181 Luvan Boulevard
Georgetown, NC 29440
Blanche Brown
(832) 527-4436 / dcabrown@sccoast.net

BEACH MONITORING PROGRAM MAY 2002-2018, BALD HEAD ISLAND, NC

McKim & Creed has provided hydrographic surveying services for the annual beach monitoring program for Bald Head Island for over ten years. In addition to the regular monitoring and the extensions and additions of lines from previous survey events, McKim & Creed performed x-sections at each of the newly installed groin structures. Three sections were surveyed for the exposed areas of each groin, one section on the top and down the center of the groin, and one section on either side of the groin.

McKim & Creed performed beach profile surveys at 67 stations on the south, east and west facing beaches. The surveys commenced at the inland toe of the primary dune system and extend seaward to a depth of -20' NGVD29 or 2500' from the baseline, whichever was greater. Lines at stations 46+80, 50+00, 52+64, 56+56 were extended as needed to cross the exiting Federal Cape Fear River Shipping Channel. We performed profile surveys on 16 existing geo-tube groin structures. The profiles ran along the centerline and each side (toe) of each structure.

Village of Bald Head Island
106 Light House Wynd (PO Box 3009)
Bald Head Island, NC 28461
Chris McCall, Village Manager & Shoreline Protection Manager
(910) 457-9700 / cmccall@villagebhi.org

BEACH RENOURISHMENT HYDROGRAPHIC SURVEYS, FIRE ISLAND, NY

Surveying in 19-degree air temperatures and 35 to 42-degree water temperatures, McKim & Creed surveyors performed pre-construction beach profiles on 11 miles of beach on Fire Island. The team surveyed from the primary dune to negative 8-feet mean sea level. Hydrographic surveyors obtained survey measurements from several thousand feet offshore to approximately negative 4-feet mean sea level. McKim & Creed also gathered sand samples from two borrow sites, using equipment specially fabricated for this purpose. The surveyors retrieved one pound of sand from two different areas in each of the borrow sites.

Weeks Marine, Inc.
901 Protcentre Parkway, Suite 3
Portsmouth, VA 23704
Ronnie Rhodes, Survey Operations Manager
(985) 875-2500 / rrhoades@weeksmarine.com

BLOODY POINT BEACH ANNUAL MONITORING SURVEY 2004-2014

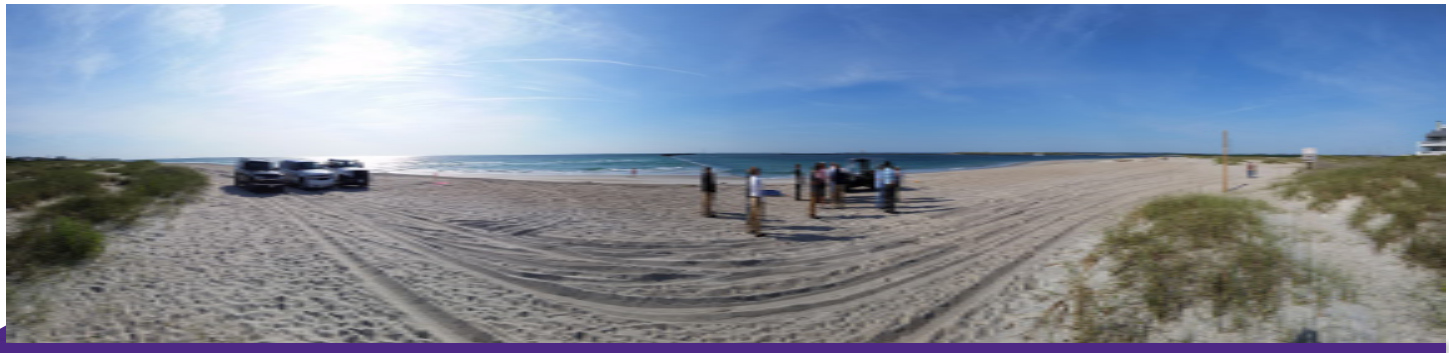
McKim & Creed has performed beach profiles on 25 historical lines on the south end of Daufuskie Island in the early Spring of each year from 2004 through 2014. Additional hydrographic and topographic surveys were performed in the vicinity of the T-Groin structure. Access to the Island is by boat only.

Bloody Point Property Owners Association
30 Fuskie lane
Daufuskie Island, SC 29915
Mike Loftus
(914) 760-1889 / mikeloftus@loftuscontracting.com

MANASQUAN INLET TO BARNEGAT INLET BEACH FILL PROJECT

The U.S. Army Corps of Engineers, Philadelphia District pumped approximately 11 million cubic yards of sand onto 13.7 miles of New Jersey coast to repair the dune and berm system, reduce risk and protect vulnerable beaches. As the hydrographic surveyor for the ~$100-million project, McKim & Creed provided pre- and post-placement condition surveys using single-beam technology. Additionally, monthly deliveries of beach profiles were provided in AutoCAD Civil 3D and USACE Beach Morphology Analysis Package (BMAP) softwares. McKim & Creed provided single beam, wade and land surveys of more than 700 beach profile lines. Between summer and mid-winter 2018, McKim & Creed had two boats, two hydrographic surveying crews, two 3-person land crews and one 2-person land crew on site at all times. Hydrographic data was collected using an Odom CV100 and CV200 echosounder with a 200KHz transducer, as well as an SBG Ekinox 2 Inertial Navigation system, TSS-DMS-05 motion sensor and Trimble SPS 865 heading system. Both survey vessels operated with the latest Hypack Navigation software versions. All land and wade data was collected using a variety of GPS-RTK and conventional survey methods.

Weeks Marine, Inc.
901 Beach Street
Camden, NJ 08102
Chris Champigny
(856) 963-0963 / cjchampigny@weeksmarine.com



PROOF OF CONCEPT TESTS UAS FEASIBILITY FOR COASTAL SURVEYS

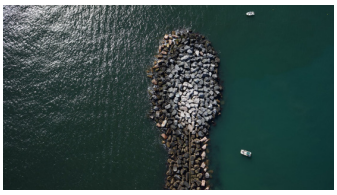
On May 16, 2016, during National Hurricane Preparedness Week, Esri, the world's largest geographical information systems (GIS) company, and McKim & Creed, a nationally recognized surveying and engineering company, hosted a proof of concept (POC) event to test the feasibility of using UAS to perform coastal surveys. The event was arranged by Esri to showcase its new Drone2Map software.

McKim & Creed performed the UAS data acquisition using 3DR's Solo platform and SiteScan software. Esri processed the data using its Drone2Map software, which processes imagery collected by UAS into an accurate, usable dataset that can be seamlessly imported into Esri's GIS mapping platform.

PROOF OF CONCEPT PREMISE

Hurricane season officially started June 1; however coastal communities prepare for a land-falling storm event year round. Most municipalities that have oceanfront assets have a beach management plan. These plans are a requirement for those communities that have or are seeking federal funds to help maintain their beaches. Included in the plans are beach monitoring surveys, which are performed twice per year, once in the spring prior to hurricane season and once in the winter. These surveys capture the current, existing conditions of the beach and are compared to previous surveys to help analyze the beach's performance in terms of erosion and accretion, and to plan and predict maintenance and renourishment events. In the case of a storm event where significant loss of beach occurs, these surveys can be used to help secure emergency funding for restoration. Esri, McKim & Creed, and 3DR conducted the POC to compare the potential cost savings, time savings and value of using UAS methods over conventional, traditional surveying methods.

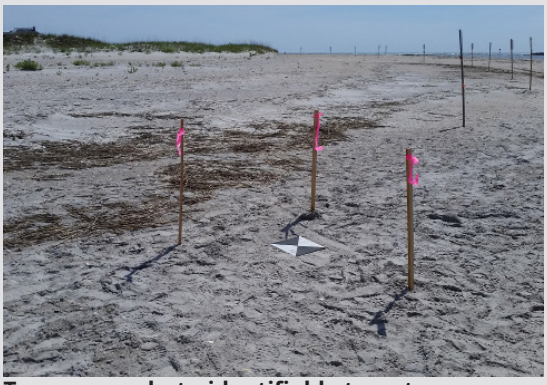
THE SITES



Two sites were chosen along the North Carolina coast: Wrightsville Beach and Eagle Island. In Wrightsville Beach, the test site extended south from Crystal Pier to Masonboro Inlet and included both the north and south rock jetties. This covered approximately 100 acres. There were a total of four flights that took a combined flying time of less than 30 minutes.

Eagle Island is a major disposal area for material that accumulates from maintenance and new work dredging for the Wilmington Harbor project, the Port of Wilmington, and a number of projects along the Cape Fear River. The site is divided into three cells for a total acreage of approximately 800 acres. The site is heavily used, and surveys are performed regularly to determine capacity. The size of the site and the wet conditions that occur in the interior of the site make conventional methods both timely and costly.

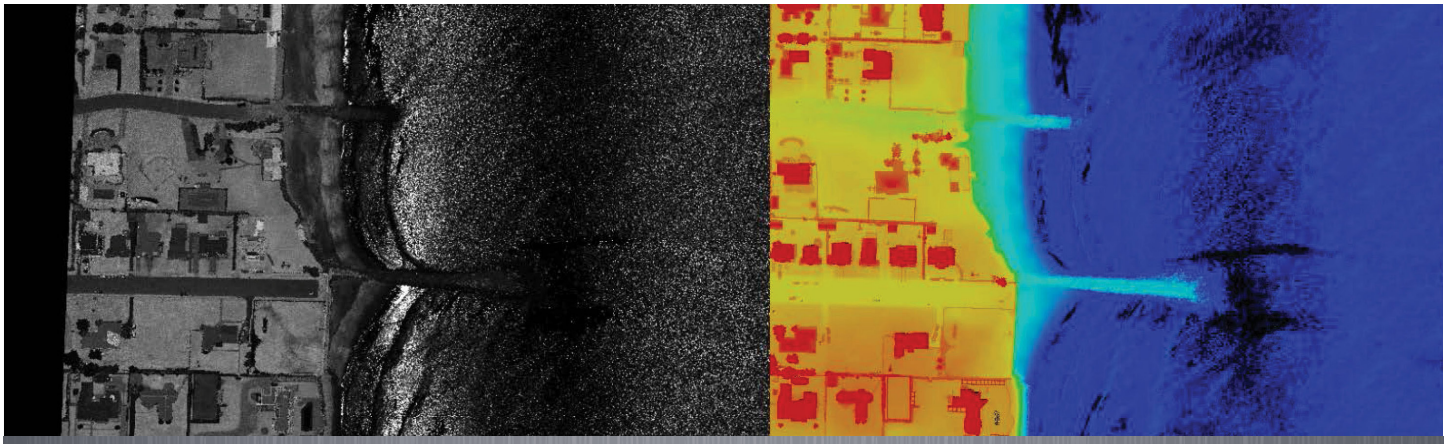
McKim & Creed ground crews set control points along the area to be surveyed.



Temporary photo-identifiable targets were placed on the beach and surveyed to georeference the UAS flight. Blind checkpoints were also collected at the site to independently verify the accuracy.

THE RESULTS

The processed data from both sites was compared to conventional land surveying technologies for accuracy, cost and delivery time, and was shared with the local, state and federal officials who were present at the data acquisition event. The data comparison from both sites showed that, in the correct environmental conditions such as open beaches or moderately vegetated berms and basins, UAS outperforms conventional services by producing a more detailed digital elevation model (DEM) more quickly and at a lower cost.



Sea Bright to Manasquan Profile Survey

In 2012, Hurricane Sandy made landfall near Atlantic City creating a coastal impact of devastating proportion. Since that time, the New York District, U.S. Army Corps of Engineers (District) has been working to repair and restore damaged beaches to their pre-storm conditions, as allowed by statutory authorities. As part of this effort, McKim & Creed was commissioned by the District to provide existing condition beach profile and groin surveys for a nine-mile segment of the Sea Bright to Manasquan area. The project involved a combination of conventional, hydrographic, and airborne LiDAR techniques to map 145 beach profiles and performed detailed topographic surveys above and below the water surface for 29 stone groins and revetments.

One of the main objectives of the project was to get accurate data and locations where rock material from the groins intersected with the natural sandy bottom beach. By using multiple data collection technologies McKim & Creed was able to survey the area quickly and accurately without putting workers in harm's way. Surveyors used conventional GPS on the beach and into waist-deep water. Bathymetric single-beam sonar aboard McKim & Creed's 28-ft. survey vessel was used to capture profile line data out to the depth of closure. Side scan and multi-beam sonar, also attached to the boat and angled sideways, enabled surveyors to collect data points along the sides of the groins, which allows the District to determine rock/sand interface. A fixed wing aircraft was used to capture aerial LiDAR of all abovewater topography. The very dense LiDAR data, approximately 30 points/square meter, provided such an accurate and detailed surface that the size and configuration of the boulder or rock materials from which the groins were constructed could be determined. Most of the groins were unsafe for land surveying. The project supports the repair and restoration of the largest beachfill project ever, by volume, and helps the New York District, U.S. Army Corps of Engineers return the beaches to their pre-storm condition and restore them to their full, original design level of protection.

PROJECT DETAILS

OWNER:

USACE New York District

LOCATION:

Sea Bright, NJ

COMPLETION:

2014

Wilmington Inner Harbor & Carolina Beach & Kure Beach Maintenance Dredging

McKim & Creed provided survey services for the maintenance dredging and beach nourishment for Wilmington Inner Harbor, Carolina and Kure Beaches. Hydrographic and land surveys were provided for the entire project from pre-placement, borrow areas, beachfill and post-placement phases at each of the three separate locations. Approximately 2 million cubic yards of material were dredged from the borrow sites and utilized for beach renourishment at the three locations. Both land and hydrographic surveys were conducted with overlapping data to ensure a seamless profile was delivered. When field surveys were completed, data were processed and delivered to our project surveyors for review, analysis and responsive delivery of data files to the client.

PROJECT DETAILS

CLIENT:

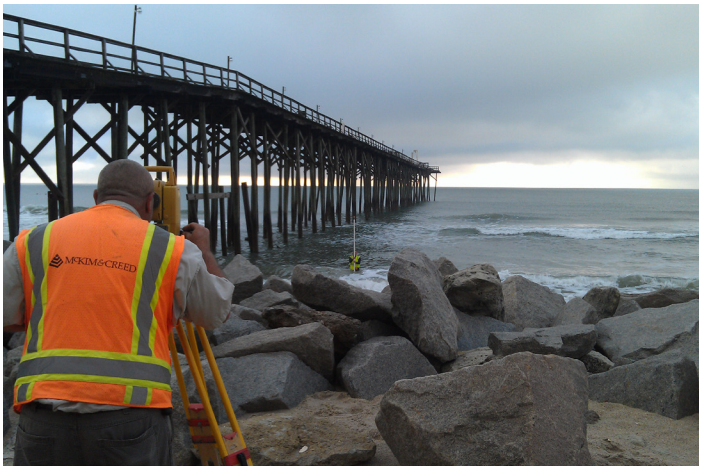
Weeks Marine, Inc.

LOCATION:

New Hanover County, NC

COMPLETION:

2013



A McKim & Creed surveyor uses conventional survey techniques to capture topographic data in the near-shore wading portion of the beach profile.

Survey operations are underway on the beach.

Bald Head Island Beach Monitoring Surveys

McKim & Creed is under contract with the Village of Bald Head Island to perform biannual beach monitoring surveys of Bald Head's west, south and east facing beaches. The project involves beach profiles and groin field monitoring surveys every spring and fall. There are 68 historical profile lines that extend off the beach from 3,000 ft. to over 5,500 ft. The profile lines on the west-facing beach extend westward to cross the newly aligned Cape Fear River Channel. The profile lines on the south-facing beach extend to 3,000 ft. offshore. Profile surveys begin at the inland toe of the primary dune and run seaward to the offshore extent of the line. The upland and surf zone portions of the profiles are surveyed using a combination of RTK GPS and conventional survey methods, while the offshore areas are surveyed using one of McKim & Creed's dedicated hydrographic survey boats. The groin field survey includes surveying profiles on 16 sand-filled groins. Three survey lines are run, one down the centerline of the groin and one down each side on the groin. These profiles are mapped and compared to previous surveys. Deliverables for this project include plan view with contours, beach profiles, groin profiles and xyz point files. All data are delivered both in digital and hardcopy formats.

PROJECT DETAILS

CLIENT:

Village of Bald Head Island

LOCATION:

Bald Head Island, NC

COMPLETION:

Ongoing

McKim & Creed monitors survey lines on the south and east facing beaches covering nearly five miles. Surveys are performed every six months.

PROJECT APPROACH

MCKIM & CREED HAS PERFORMED SURVEYS RELATED TO BEACH MONITORING, COASTAL EROSION AND RENOURISHMENT FOR BOTH THE PUBLIC SECTOR AND THE PRIVATE SECTOR FOR MORE THAN 20 YEARS.

McKim & Creed's beach profile survey experience includes projects with the USACE Wilmington, Philadelphia and New York Districts. Additionally, we have performed beach profile surveys on Ocean Isle, Holden Beach, Oak Island, Bald Head Island, Fort Fisher, Kure Beach, Carolina Beach, Masonboro Island, Wrightsville Beach, and Bogue Banks, from Emerald Isle to Fort Macon, Shackleford Banks, Hatteras Island, Nags Head, Kill Devil Hills, and Kitty Hawk. Currently, we perform ongoing beach monitoring survey services for Bald Head Island, the Town of Ocean Isle Beach, Debordeau Island, and Daufuskie Island for which we provide beach monitoring surveys annually or semi-annually.

DATA COLLECTION AND PROCESSING

For the onshore upland portions of the surveys, we use a combination of Virtual Reference Network (VRN) and Real Time Kinematic (RTK) GPS techniques with conventional survey methods, as needed, to produce a high-quality, cost-effective product. For the offshore and nearshore surveys, we use 22-foot to 28-foot survey vessels equipped with INS's (Inertial Navigation Systems), RTK-GPS, single beam and multibeam echosounders, and Hypack® as the hydrographic software. Our hydrographic data collection methodology follows the USACE Hydrographic Surveying Manual EM 1110–2–1003. In the surf/wade zone, bathymetric data is collected during high tide and wade data is collected during low tide to allow enough overlap data to compare both methods, remove artifacts, and merge the two datasets to produce a clean profile (critical QC component of the survey). Meanwhile, the land portion of the profiles can be collected at any tide cycle.

SURVEY METHODS | HYDROGRAPHIC - OFFSHORE AND NEARSHORE

Our survey vessels are equipped with INS (Inertial Navigation System) RTK-GPS, single beam and multibeam echosounders, speed of sound profilers, digital compass, and Hypack® hydrographic software. Our INS/RTK-GPS/Echosounder systems - the most advanced, state-of-the-art units available today - are permanently installed on our vessels. Our GPS antenna, IMU (Inertial Motion Unit, part of the INS) and sonar transducer are mounted as close to the Center of Gravity (CG) of the boat as possible to reduce the pitch, roll, and yaw effects in the units. Our hydrographic surveying software is the latest Hypack® version, currently 2019.

We use the vertical component of RTK-GPS to provide a real-time water-level correction and the horizontal component for x,y positioning of every sounding.

Our Inertial Navigation System (INS) is a navigational system capable of calculating the relative position of the IMU on the survey vessel. The INS is composed of three gyros and three accelerometers enabling the system to derive a navigation solution. This navigation solution contains the position (latitude, longitude), heading, heave, pitch, and roll of the vessel. The basic concept behind an INS system is the measurement of changes in relative motion (through the measurement of acceleration)

to project a changing position in some inertial reference frame over time.

Next, Hypack combines the corrections from the RTK and INS with the echosounder depth reading to produce and record an accurate measurement of the seafloor, even in the highly dynamic area within the surf zone. This entire system produces highly accurate and consistent results.

SURVEY METHODS | LAND – TOPO AND WADE

We perform all the upland topography and 95% of the wade nearshore surveys using RTK-GPS. For this project we will use the NC-VRS network with our Trimble R-8 and R-10 Rovers connected to TSC-3 data collectors via Bluetooth.

For the upland topo surveys a team of two, each with a GPS rover and a 4x4 John Deere Gator or similar all-terrain vehicle, will collect profile shots from the inland-most point, origin of the profile to approximately the HWL (high water line). This work can be done at any tide cycle. At low tide, the two-person team will be surveying the wading sections of each profile with one person carrying the R-8 antenna on the pole and the other person using the data collector.

We use this method for three reasons: safety, efficiency and protection of the equipment. All our GPS rover poles are custom-built to a fixed height with topo boots, eliminating the human error of the wrong rod height being entered into the data collector.

HYDROGRAPHIC SURVEY EQUIPMENT

McKim & Creed has three dedicated survey vessels, ranging from 22 feet to 28 feet, that are used for beach monitoring and nourishment projects, and multiple smaller vessels or platforms for use in unique or special situations. Our dedicated vessels have permanently installed equipment and often more than one system.

SURVEY VESSEL CLOCK DETAILS

EQUIPMENT	MAKE AND MODEL	MEASUREMENT
Boat	1999 28 ft. Thomas Marine (welded aluminum) 28 ft. x 10 ft. (11 ft. house)	platform
Engines	2x250HP Yamaha Four-Stroke Outboard Motors	propulsion
Singlebeam Sonar	Odom CV 200 and Odom Transducer (Dual frequency 33/200kHz)	depth
RTK-GPS	Trimble SPS 855, Trimble SPS 555H for both RTK-GPS and DGPS	position (X, Y, heave and tide)
DGPS	Trimble SPS 351	position (X, Y), speed and course
IMU	Teledyne DMS-05 Motion Sensor	heave, roll and pitch
Computer	Small PC Custom Ruggedized and water-resistant w/SSD	data collection and storage
Software	Hypack 2019	SB acquisition, processing
Sound Velocity	AML CTD Base X Profiler	speed of sound through water
GPS Gyro	Trimble SPS 555	heading (0.1-degree rms), position
Bar Check	Custom made	Calibrate Echosounder
Digital Compass	Honeywell HMR 3000	heading

SURVEY VESSEL SOUNDS DEEP DETAILS

EQUIPMENT	MAKE AND MODEL	MEASUREMENT
Boat	2004 24' Gray Marine (welded aluminum) 24'x 8' (8' house)	platform
Engines	2-115hp Yamaha Four-Stroke Outboard Motor	propulsion
Singlebeam Sonar	Odom CVM and Odom Transducer (Dual frequency 33/200kHz)	depth
RTK-GPS	SBG Ekinox 2 Inertial Navigation System with GNSS receiver	position (X, Y, heave and tide)
DGPS	Trimble DSM 212 (10Hz update)	position (X, Y), speed and course
IMU	SBG Ekinox 2 Inertial Navigation System with GNSS receiver	heave, roll and pitch
Computer	SmallPC Custom Ruggidized w/SSD	data collection and storage
Software	Hypack 2019	SB acquisition, processing
Sound Velocity	AML CTD Base X2 Profiler	speed of sound through water
GPS Gyro	INS2	heading (0.1 degree rms), position
Bar Check	Custom made	Calibrate Echosounder

SURVEY VESSEL BOTTOM LINE DETAILS

EQUIPMENT	MAKE AND MODEL	MEASUREMENT
Boat	24' Scully Boat with Trailer	platform
Engines	2-115hp Yamaha Two-Stroke Outboard Motor	propulsion
Singlebeam Sonar	Odom CV 100 and Odom transducer (Dual frequency 33/200kHz)	depth
Multibeam Sonar	R2Sonic 2022	Depth (100% coverage)
RTK-GPS	Pos-MV Inertia Navigation System I2NS	position (X, Y, heave and tide)
DGPS	Trimble SPS 351	position (X, Y), speed and course
IMU	Pos-MV Inertia Navigation System I2NS	heave, roll and pitch
Computer	SmallPC Custom Ruggidized w/SSD	data collection and storage
Software	Hypack 2019	SB acquisition, processing
Software	Hysweep 2019	MB acquisition, processing
Sound Velocity	AML CTD Base X2 Profiler	speed of sound through water
GPS Gyro	INS2	heading (0.1 degree rms), position
Bar Check	Custom made	Calibrate Echosounder

LAND SURVEY EQUIPMENT

McKim & Creed has continued to make significant improvements in our equipment and technology. Our survey crews run TDS software on CE Ranger Data Collectors and Trimble software on TSC-3 Survey Controllers. These collectors allow us to better utilize feature codes, line codes, and the Geopak SMD files. We added Trimble Access software with sync options which automatically uploads survey data to the cloud every 15 minutes if the survey crew has cell phone coverage. This allows for office staff to perform near real-time QA/QC, which helps reducing overall project schedule by allowing for the office mapping work to start immediately. Point files and other supporting files can also be transferred directly to the field through the data collector. These enhancements have significantly increased our productivity and helped to eliminate errors and return trips. We are also running robotic total stations and digital levels to increase productivity and reduce human error.

McKim & Creed has 60 survey grade Trimble (R8's and R10's with GNSS) available to provide sub-centimeter accuracies and uses the NCGS Virtual Reference System (VRS) throughout North Carolina, when available, for RTK-GPS observations. These units, combined with the VRS, have allowed us to be more efficient in collecting real-time coordinates.

CALIBRATION

All land and hydro RTK-GPS units are calibrated by checking local known and verified control monuments prior to and after each survey day.

For echosounder calibration, we use both bar-checks, latency and squat tests, and speed of sound velocity probes. Echosounders calibrations are performed at least twice daily, at the beginning and end of each survey event.

Using an RTK-GPS system different from the one installed on the survey vessel we check local control monuments using land survey techniques. With the separate RTK-GPS unit we check the water surface elevation against the elevation provided by the system installed on the vessel.

Once on the project site, a sound velocity probe is deployed in the deepest location. The sound velocity cast is then downloaded and incorporated to the echosounder software to correct for the speed of sound through the water column. A large aluminum bar is then lowered from the boat under the echosounder's transducer to a specific measured depth to calibrate and verify that the echosounder's depth reading is true. These procedures are repeated at the end of the survey day and whenever conditions, such as tide cycles, and job location, change.

DATA PROCESSING

All hydrographic data collection and processing are accomplished using Hypack software. Detailed logs are kept onboard during survey operations. Logs include all relevant information about the survey, including vessel and crew details, sensor offsets, speed of sound measurements, weather conditions, etc. Each survey line is logged with line number, direction of line and any comments useful for the technician who processes the data back at the office. At the end of each day and prior to leaving the site, the field crew does a preliminary review in Hypack to check for complete coverage, missing lines or gaps.

Overlap elevation differences between hydrographic work and wade crew work are accepted if within a couple of 10ths of a foot. If the difference is larger, the line is re-run by both, hydro and land surveyors to ensure accuracy of profile data. In addition, Hydro surveys are typically performed two hours either side of high tide to achieve maximum coverage and ensure overlap with land survey data.

For RTK-GPS we use the newest NGS Geoid model 12b unless specified otherwise by the scope of work to correct ellipsoidal heights to project datum. A custom Geoid or KTD file or NOAA's V-Datum program files can be used for tidal datum's with zoning and can be used with RTK-GPS to get real-time project datum results. McKim & Creed implements a variety of different software as analysis tools to work with the data, including: TerraModel, Hysweep, Hypack, Excel, AutoCAD, MicroStation, BMAP and Arcview.

DATA ACCURACY

All surveys performed under this contract will be referenced to the North Carolina State Plane Coordinates System horizontal datum, NAD 83 (2011), vertical datum NAVD88 as specified in the statement of work (SOW). Hydrographic surveys will be performed to meet or exceed the Class 1 criteria as defined in EM1110-2-1003 (Hydrographic Surveying) latest version.

All data will be corrected for heave, roll, pitch and tidal influences. Topographic data will be accurate to within 5cm (0.16-ft.) vertically and be within 5-feet of the profile line. Hydrographic data will be accurate to within 15cm (0.49-ft.) vertically and be within 20-feet of the profile line.

Hydrographic and wade data for the same profile will be collected normally within 48 hours. If data between the hydrographic and wade data cannot be collected within what has been specified in the SOW, the surveys will be rerun. Data between the hydrographic and land data will be checked for accuracy compliance.

QUALITY ASSURANCE/ QUALITY CONTROL

The appropriate skilled professional and technical staff will be assigned to this project. There will be advance planning of the project phases and scheduling resources with anticipation of potential problem areas and advanced discussion of solutions.

It takes sound logistical planning to make sure you have good weather conditions, appropriate tide stages and access to remote areas.

A project "kick-off" meeting and periodic progress meetings will be held to ascertain that the project is running smoothly and to head off any issues before they become problems. The goal of each McKim & Creed project team is to accelerate the schedule for the survey and mapping work effort and deliver the data correct in the first time, to expressly follow any client-specific requirements, and to present the work in a manner that will allow quick and effortless client reviews.

QUALITY CONTROL IN THE OFFICE

Each project area that is delivered will be subject to a quality control review prior to its submittal by one or more survey professionals and a certified hydrographer. Each individual review is routed through the project manager, who is responsible for assigning the project quality reviewers. The project manager will oversee the quality review process to ensure that the proper McKim & Creed review and checking procedures were followed. Reviewers have access to tools such as Hypack, AutoCAD, TerraModel, and BMAP that allow them to look at the Digital Terrain Model and profiles.

Upon completion of each quality control review, the individual reviewers will return the reviewed drawings or maps, along with their mark-ups and/or comments, to the project manager. The appropriate revisions are then made to the drawings or maps.

QUALITY CONTROL IN THE FIELD

McKim & Creed has developed the following QA/QC elements that are specific to beach profile monitoring surveys:

- Daily RTK-GPS calibration
- Daily echosounder bar-checks and SOS (speed of sound) profiles
- Detailed field notes and log book
- Digital pictures
- Tides from multiple sources
- Redundant positioning systems (RTK-GPS and INS)
- Redundant heave corrections (RTK-GPS and IMU)
- Software graphical tools (3D viewing and contouring of data)
- Final data review by PLS (Professional Land Surveyor) and Hydrographer
- 30-feet data overlap between inshore and offshore data on at least 75% of all transect lines
- Detailed comparison with historical data (when available)
- Fixed height prism poles

In the case that we lose RTK-GPS (offshore) we can post-process the data using the INS data files recorded during the survey through POSPac software, which also provides an additional QA/QC tool.

ENVIRONMENTAL CONDITIONS AND TIMING

The beach and the nearshore surf zone are extremely dynamic. Waves, longshore currents and even wind can displace a lot of sand in a short amount of time. We understand the importance of performing the upland and nearshore surveys as close in time to one another as possible. We do a lot of beachfill work in the Northeast and monitor stations immediately before and after pumping sand. The US Army Corps, Philadelphia District requires that upland and nearshore surveys be completed with 24 hours of each other, so we are aware of the processes to accomplish this.

Safety is important to us and working in the surf zone has the potential of serious injury or worse. Over the years we have developed safety protocol for a number of circumstances.

For example, if the sea conditions are greater than 2-feet, we will survey all our lines from inshore to offshore. The vessel gradually approaches the shoreline at roughly a 30-degree angle from being parallel to the beach. At the right time, the captain turns the vessel onto the survey line and begins recording data. The purpose of this method is that it allows the helmsman to get the bow of the vessel into an oncoming, unusually large or rough wave. All our surveyors that are wading lines wear inflatable life vests.

We are also mindful of the sea turtles, piping plovers, and other wildlife species that cohabitate along our shorelines and beaches, with special attention to their mating seasons.

DELIVERABLES

All deliverables as required in the RFQ will be delivered on a DVD, external hard drive (or other acceptable storage device) within 30 days of the completion of the field survey for each beach. These will include:

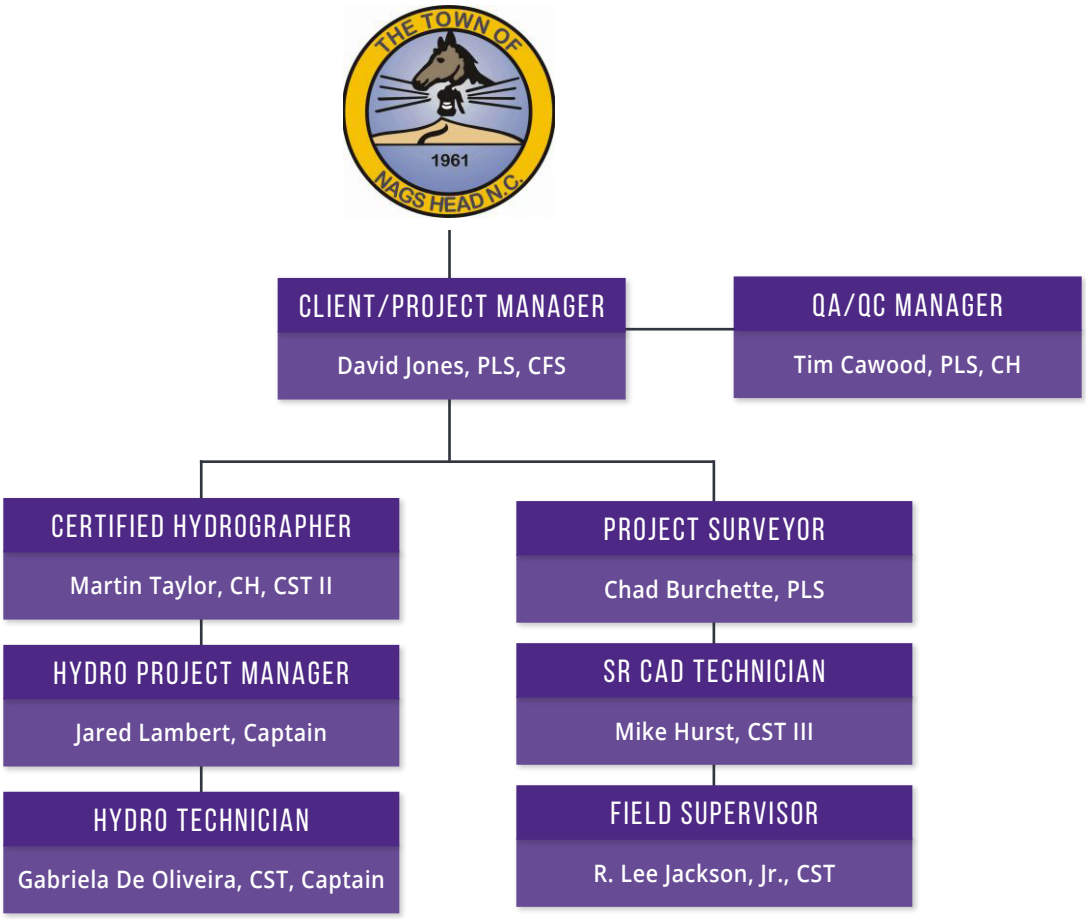
- Electronic ASCII files in the format requested by the Town
- General summary of the work performed
- Photos and Field notes
- Other files requested by the Town

PROJECT TEAM

Our project team is composed of veteran staff, each with extensive coastal mapping experience. Our staff has knowledge of coastal shoreline and inlet dynamics, responses, testing, procedures, protocols and methods. Our dedicated project team has the ability and resources to facilitate this project directly from our Wilmington office. Each team member is identified in the organizational chart on the following page.

Two NC and SC licensed surveyors, two NSPS Certified Hydrographers, five hydroggraphic technicians, five land surveyors and 10 survey crew members, along with support staff are stationed in our Wilmington office and have the resources to meet all project demands directly from our local offices. That, coupled with our experience in the area, will provide unparalleled surveying services for this pursuit.

Additional resources are also available firm-wide, as surveying staff at McKim & Creed includes 34 Professional Land Surveyors (PLS), Certified Floodplain Managers, GIS Professionals, 2 Certified Hydrographers and a supporting staff of more than 153 other technicians and specialists to pull from companywide.



SPECIFIC RELATED EXPERIENCE OF PROJECT TEAM MEMBERS

One true measurement of past performance is repeat business. We consider our client as our partner and treat him as such. Some examples of repeat contracts include:

- NCDOT annual on-call contracts for 20 consecutive years
- NC State Ports on-call contracts for 15 consecutive years
- USACE Wilmington District — 3 IDIQ contracts (12 years)
- USACE NY District — 3 IDIQ contracts (10 years)

McKim & Creed has acquired and accomplished over 300 individual task orders under many individual and annual IDIQ contracts with many districts of the US Army Corps of Engineers (USACE) since 1992, including Galveston, New York, Savannah, Wilmington, Charleston, Fort Bragg, and Norfolk. Most of these projects include hydrographic surveying services. All of the task orders and contracts have been accomplished and delivered in the formats and time frames required. McKim & Creed's current ACASS evaluations are either "very good" or "exceptional". We have been providing hydrographic survey services to the USACE NY District for 10 consecutive years. The projects include coastal monitoring surveys and navigation condition surveys for inland waterways.

Tim Cawood, PLS, CH

QA/QC MANAGER, CERTIFIED HYDROGRAPHER

KEY QUALIFICATIONS

- ✓ Hydrographic Surveys
- ✓ Mobile Scanning
- ✓ 3-D Laser Scanning
- ✓ Geodetic Control Surveys
- ✓ Photogrammetric Surveys
- ✓ Topographic and Boundary Surveys

EDUCATION

A.A.S., Marine Technology, Cape Fear Community College

Attended, Shallow Water Multibeam Course, University of New Brunswick at St. Andrews

PROFESSIONAL LICENSURE

ACSM Certified Inshore Hydrographer

Professional Land Surveyor / NC / L3358

Professional Land Surveyor / SC / 14806

Mr. Cawood has 38 years of experience in the survey profession and serves as president of McKim & Creed's Geomatics division. Having started as a rodman in 1981, Mr. Cawood has extensive field experience and has been an innovator of technology, processes and procedures throughout his career. Mr. Cawood has managed federal government projects for the United States Army Corps of Engineers for Districts throughout the North and South Atlantic Divisions, NOAA, FAA, CDC and FEMA. He has worked with many state Departments of Transportation throughout the Southeast, as well as for many of ENR's top 50 engineering and design firms in North America. He has worked throughout the U.S., including Alaska, as well as Canada and the Caribbean.

As part of his duties as the Geomatics division manager, Mr. Cawood is responsible for quality assurance and quality control and making sure that McKim & Creed is responsive and meets our commitments to our clients. Mr. Cawood is the acting Chairman of the Business Practices Committee of the Council of Professional Surveyors (COPS), a coalition of surveyors within ACEC focused on helping its members with better business practices within the survey profession.

SELECTED PROJECT EXPERIENCE

Bloody Point Beach Profile Surveys, Bloody Point Property Owners Association, Rockville, SC

Mr. Cawood served as project manager for this project. McKim & Creed has performed hydrographic beach profile surveys for the Bloody Point Homeowners Association, South Carolina since 2006. In addition to performing annual profile surveys on approximately 20 historical ranges, McKim & Creed has established four new geodectic survey control monuments set in concrete that can be used for future surveys and construction projects on the Island. The annual surveys also include detailed soundings and a topographic survey in the area of a new terminal groin on the south side of the island.

Bald Head Island Beach Monitoring Program, Bald Head Island Utilities, Bald Head Island, NC

Mr. Cawood served as project manager for this project. McKim & Creed monitors survey lines on the south and east facing beaches covering nearly five miles. The project involves beach profiles and groin field monitoring surveys every spring and fall. There are 60 historical profile lines that extend off the beach from 3,000 ft. to over 5,500 ft. The profile lines on the west-facing beach extend westward to cross the newly aligned Cape Fear River Channel. The profile lines on the south-facing beach extend to 3,000 ft. offshore. Profile surveys begin at the inland toe of the primary dune and run seaward to the offshore extent of the line. The upland and surf zone portions of the profiles are surveyed using a combination of conventional survey methods, RTKGPS while the offshore areas are surveyed with a dedicated hydrographic survey boat.

Ocracoke Beach Profiles, Moffatt & Nichol Engineers, Ocracoke, NC

Mr. Cawood served as project manager for this project. McKim & Creed performed beach profiles surveys on 10 lines on Ocracoke Island. The position of the origin of each line and the azimuth of each line was provided by Moffatt Nichol Engineers. The land based shots commenced 200 feet north of NC12 of the marsh line and ran seaward to elevation -5' NGVD29 or deeper. Shots were taken along each profile at a distance that did not exceed 25 feet and included all top, toes and other breaks in grade. The land-based work was completed during low tide to ensure that the survey staff could get to the maximum safe depth. A hydrographic survey vessel completed the offshore portion of each profile.

David Jones, PLS, CFS
CLIENT/PROJECT MANAGER

KEY QUALIFICATIONS

- ✓ Boundary Surveys Topographic Surveys
- ✓ Hydrographic Surveys
- ✓ Control Surveys
- ✓ Wetland Surveys
- ✓ GPS Surveys
- ✓ Construction Staking Aviation Surveys
- ✓ GIS Data Acquisition

PROFESSIONAL LICENSURE

Professional Land Surveyor / NC / L-3672

Professional Land Surveyor / ND / LS-8170

Certified Floodplain Surveyor / NC / NC-105

U.S. Coast Guard Captain's License / #3927734

Having grown up in New Bern, North Carolina and now living in Wilmington, Mr. Jones has spent his entire life, to date, living and working on and around the water. He started working in his early teens, before school and weekends where he operated one of his father's commercial fishing boats in the Neuse River and vast Pamlico Sound by himself. Those deeply rooted experiences have helped him in his professional career as a professional surveyor and regional manager and for Geomatics in Southeastern North Carolina and for hydrographic surveying services company wide. Having those experiences at a young age has given him intimate knowledge of coastal environment and dynamics including sea conditions, erosion and accretion processes, and boat performance and safety, knowledge that many seasoned hydrographers do not even possess.

As regional manager of hydrographic surveying services, Mr. Jones oversees our fleet of survey vessels and technical and professional staff that perform these services for both public and private clients throughout the US. Our hydrographic services include bathymetry (multibeam and singlebeam), sidescan sonar, magnetometer surveys and sub-bottom profiles. These services are performed for a variety of reasons, including navigation, search and rescue, obstruction investigation, beach monitoring, volume calculations and marine construction. He is proficient in Terramodel (CAD Software), Auto CAD, HYPACK and HYSWEEP (Hydrographic survey processing and acquisition software).

SELECTED PROJECT EXPERIENCE

Bald Head Island-Beach Monitoring Survey-Spring 2015 / Village of Bald Head Island, NC
Mr. Jones served as project manager for this project, which included beach profile surveys at 67 stations on the south, east and west facing beaches at Bald Head Island. McKim & Creed also executed a single beam survey of the proposed Jay Bird Borrow Area near Bald Head Island. Hydrographic/topographic existing conditions survey of the Bald Head Island Creek Borrow Area was also completed.

Bloody Point Beach Annual Monitoring Survey 2015, Bloody Point Property Owners Association / Daufuskie Island, SC
Mr. Jones was project manager overseeing beach profile surveys for the client, totaling 25 beach profile lines. A sufficient number of points were taken along each line to ensure adequate descriptions of the profiles. All topographic features and major breaks in slope, including dunes, beach berms, foreshore, and bar and trough systems, were identified. On smoothly sloping sections a maximum elevation difference of approximately 1-foot between adjacent points was used to define this section of the profile.

Fire Island Inlet to Moriches Inlet, U.S. Army Corps of Engineers - New York District / Fire Island, NY
Mr. Jones served as project manager for this project, which included beach profile surveys between Fire Island Inlet and Moriches Inlet. These profiles were used to prepare plans and specifications of several coastal fill projects. The study area is located in Suffolk County, New York along an approximately 32-mile stretch of the Atlantic Coast, from Fire Island Inlet to Moriches Inlet.

Ocean Isle Beach Monitoring -Annual 2015, Town of Ocean Isle Beach, NC
Mr. Jones supervised hydrographic surveying services for annual beach monitoring for the Town of Ocean Isle Beach. This project met the US Army Corps of Engineers Wilmington District requirements for navigation and dredging.

Chad Burchette, PLS
PROJECT SURVEYOR

With nearly 17 years' surveying experience, Mr. Burchette specializes in performing boundary and topographic surveys.

KEY QUALIFICATIONS

- ✓ Boundary Surveys
- ✓ Topographic Surveys

EDUCATION

A.A., Land Surveying Technology, Guilford Technical Community College

PROFESSIONAL LICENSURE

Certified Survey Technician Level I

Professional Land Surveyor / NC / L-5181

OSHA 10-hour Safety Training

Certified Survey Technician Level III Construction

SELECTED PROJECT EXPERIENCE

Beach Profiles Ocean Isle, Holden Beach, and Shallotte Inlet (Task Order), U.S. Army Corps of Engineers - Wilmington District, NC, Ocean Isle, Holden Beach, NC
Mr. Burchette served as survey crew chief for this project. The work included elevation data collection along specified azimuths at specified intervals along existing baselines, breakline feature mapping, sinusoidal pattern data collection, hydrographic survey data collection, and the identification and location of existing storm sewer systems within the limits of the area.

Carolina and Kure Beaches Renourishment Surveys, Norfolk Dredging Company, Wilmington, NC
Mr. Burchette served as survey crew chief for this project. McKim & Creed performed beach renourishment (topographic and hydrographic) surveys on an as-needed basis in connection with a USACE - Wilmington District project. A total of 350 historic profile lines at 100-foot intervals were completed. The historic profile lines began at the established baseline (which in most cases is located landward of the primary dune system) and extended offshore approximately 2,500 feet. McKim & Creed utilized a combination of conventional survey methods along with GPS to maximize time and cost effectiveness. All data was based on NC Grid/NAD83 and NGVD 29.

Coastal Storm Damage Reduction – Wrightsville Beach and Ocean Isle Beach, Weeks Marine, Inc., Wrightsville Beach, NC
Mr. Burchette served as project coordinator for hydrographic and conventional land surveying provided to Weeks Marine, Inc. on an as needed basis.

Dare-Rodanthe SCurves - NC 12 Rodanthe Breach - Dare County, NCDOT, Dare County, NC
Mr. Burchette served as survey crew chief for this project. McKim & Creed performed hydrographic and topographic surveys, as well as centerline staking in and around the NC 12 breaches in Rodanthe, NC following Hurricane Irene. McKim & Creed was asked to conduct surveys of a new inlet in Rodanthe where waves carved a breach up to 50 feet wide and eight feet deep in some places, in order to tie the underwater and embankments of the new waterway to the overall mapping. McKim & Creed responded with five surveyors and an 11-foot inflatable survey vessel. Because the opportunity arose for the NCDOT to begin construction almost immediately, McKim & Creed was asked to set and control additional aerial targets, as well as stake the centerline and right-of-way, with the western right-of- way being a priority. Centerline and right-of-way geometry were provided by the NCDOT.

Jared Lambert, Captain
HYDROGRAPHIC PROJECT MANAGER

KEY QUALIFICATIONS

✓ Hydrographic Surveying

EDUCATION

A.S., Marine Technology, Cape Fear Community College

Attended, 74th Multibeam Sonar Training Course, University of Southern Mississippi

PROFESSIONAL LICENSURE

U.S. Coast Guard Captain's License / #2770765

Mr. Lambert has 15 years of experience conducting hydrographic and topographic surveys in the United States and Brazil. He has served as a party chief for dozens of beach profile surveys for design, construction and monitoring of beach nourishment projects, as well as for reconnaissance and control establishment surveys and hydrographic surveys of navigational channels and borrow area sites using both singlebeam and multibeam survey systems. Mr. Lambert has also assisted with numerous geophysical and geotechnical surveys as well as environmental monitoring projects. In the past, he has served as a boat captain/navigator for the geophysical surveys and scuba dive investigations. Mr. Lambert is also a certified open water diver and certified Hypack Hydrographer.

SELECTED PROJECT EXPERIENCE

Sea Bright to Manasquan PS Survey; U.S. Army Corps of Engineers - New York District Sea Bright, NJ
As hydrographic survey technician, Mr. Lambert used a combination of data collection methods and diverse remote sensing technologies were to conduct existing condition beach and groin surveys along a four-mile stretch of beach devastated by Hurricane Sandy. By blending conventional, hydrographic and airborne LiDAR techniques, McKim & Creed mapped 145 beach profiles and performed detailed topographic surveys above and below the water surface for 29 stone groins and revetments.

East Rockaway Beach Renourishment, Weeks Marine, Inc., Rockaway Beach, NY
Mr. Lambert provided hydrographic and land surveys for this project. Single beam soundings were collected using 200 kHz sonar and were provided in feet and tenths. Additionally, survey lines were performed at a minimum of 75 feet from known obstructions.

Bronx River Hydrographic Survey, U.S. Army Corps of Engineers - New York District, Bronx, NY
Mr. Lambert served as hydrographic survey technician for this project. Work included a hydrographic condition survey of the Bronx River in New York City, NY. Crews performed a single beam high frequency (200kHz) condition survey from the beginning of the federal channel north of the Bascule Bridge, which is approximately 3 miles in length.

Absecon Inlet, NJ Beach Fill Project - Philadelphia District Corps, Weeks Marine, Inc., Absecon Island, NJ
Mr. Lambert provided hydrographic surveys along 1.5 million cubic yards of beachfill along the Atlantic Ocean coastline of Absecon Island in Atlantic County, New Jersey. The project area encompassed the municipalities of Atlantic City and Ventnor City. The contract work also consisted of the construction and repair of pedestrian, vehicle, and handicap dune crossovers; planting dune grass; providing sand fencing; repairing or extending existing storm water outfalls; and relocating or removing various existing structures to accommodate the new beachfill and dunes.

Maintenance Dredging-Wilmington Inner Harbor & Carolina Beach & Kure Beach Storm Damage Reduction, Weeks Marine, Inc., New Hanover/Brunswick County, NC
Mr. Lambert was hydrographic survey technician, and the scope included professional staking, pre-placement and hydrographic surveying services. Additionally, single beam soundings were collected using 200 kHz high frequency sonar. All surveys were performed in accordance with the standards of practice for land surveying in North Carolina.

Gabriela De Oliveira, CST, Captain
HYDROGRAPHIC TECHNICIAN

A recent hire with McKim & Creed, Ms. De Oliveira is a trained Marine Technician and critical problem solver. Her extensive background includes vessel and sea equipment positioning, maintaining detailed logs, troubleshooting navigation equipment, processing navigation data and ensuring data was accurate and complete, and managing equipment inventory and installation. Her unique experience includes monitoring for sea turtles and marine mammals to properly log all sightings and implement mitigation measures to protect marine life during seismic activities.

KEY QUALIFICATIONS

- ✓ Hydrographic Surveys

EDUCATION

A.A.S., Marine Technology

B.S., Biological Science

M.Sc., Biological Science

Attended, Multibeam Training Course, Hypack

PROFESSIONAL LICENSURE

U.S. Coast Guard Captain's License / #8419498

Certified Survey Technician Level I

SELECTED PROJECT EXPERIENCE

Bald Head Island Beach Monitoring Surveys and Jay Bird Shoals Conditions Survey, Bald Head Island, NC
Hydrographic Survey Technician, Fathometer Operator. McKim & Creed surveyed all 80 monitoring profile lines including the MHWL and the 5 transect lines and Jay Bird Shoal Borrow Area. The team also performed a single beam survey of the proposed Jay Bird Borrow Area near Bald Head Island. The area to be surveyed is approximately 405 acres which includes 500' of survey coverage outside the proposed permit limits of the borrow area.

Multibeam and Side Scan Sonar Surveys of Existing Bonner Bridge and Scour Protection - Dare County, NC
Hydrographic Survey Technician, CAD Technician. McKim & Creed provided a pre-demolition multibeam and side scan sonar survey of existing Bonner Bridge and scour protection, comprising an area of 1.25 miles by 150 feet.

Manasquan Inlet to Barnegat Inlet Beach Fill Project, U.S. Army Corps of Engineers - Philadelphia District, Point Pleasant, NJ
Hydrographic Survey Technician, CAD Technician. Since 2017, McKim & Creed has been providing hydrographic and topographic surveys for both pre- and post-dredging operations spanning from Manasquan to Barnegat Inlet, NJ as well as monthly deliveries of beach profiles in AutoCad Civil 3D and USACE Beach Morphology Analysis Package (BMAP). These surveys consist of single beam, wade and land surveys of over 700 beach profiles lines.

Dominion Energy Chesterfield Power Station Hydrographic Surveying, Chester, VA
CAD Technician. McKim & Creed performed hydrographic surveying for the power station, The scope of work consisted in performing 100% coverage plus 10% overlap multibeam and side scan sonar survey on Intake area of the power plant, and a single beam survey in the outfall area. The side scan images were used to perform approximate measurements of the water intake gates.

Hudson River Federal Navigation Channel between Kingston and Waterford, Albany, NY
Hydrographic Survey Technician. McKim & Creed provided hydrographic survey and volume calculations of the Hudson River Federal Navigation Channel between Kingston (Reach 63) and Waterford (Reach N01), New York. The area included two anchorage areas, the Albany Turning Basin. The survey consisted of 100% coverage plus 10% overlap over approximately 63 nautical miles of river channel using a Multibeam Echosounder System.

Martin Taylor, CH, CST Level II
CERTIFIED HYDROGRAPHER

KEY QUALIFICATIONS

- ✓ Hydrographic Surveying
- ✓ 3-D Laser Scanning
- ✓ Tide Stations
- ✓ Mapping
- ✓ GPS

EDUCATION

B.S., Physics, University of Waikato, New Zealand

PROFESSIONAL LICENSURE

Certified Survey Technician Level I

U.S. Coast Guard Captain's License / 107523

OSHA 10-hour Safety Training

Certified Survey Technician Level II Field

Certified Hydrographer / 318

Mr. Taylor has ten years of experience in the survey industry. He specializes in hydrographic surveying and has been supervising survey operations for six years. During this time he has used hydrographic, conventional and remote sensing survey equipment, as well as GPS. Mr. Taylor has performed a variety of land and hydrographic surveys, including multibeam, single beam, side scan, magnetometer, sub-bottom, topographic, boundary, beach profile, route, subdivision layout, as-built and remote sensing surveys. He is proficient in Terramodel (CAD Software), Auto CAD, HYPACK and HYSWEEP (Hydrographic survey processing and acquisition software).

SELECTED PROJECT EXPERIENCE

2010 Debordieu Beach Profile Survey, Debordieu Colony Community Association, Inc., Georgetown, SC
Mr. Taylor served as hydrographic specialist for this project. McKim & Creed performed beach profile and hydrographic surveys at 30 control reference locations.

Bald Head Island Beach Monitoring Surveys, Olsen Associates, Inc., Bald Head Island, NC
Mr. Taylor served as hydrographic survey technician for this project. McKim & Creed provided hydrographic surveying services that included performing beach profile surveys at 67 stations on the south, east and west facing beaches on Bald Head Island, NC. Surveys commenced at the inland toe of the primary dune system and extended seaward to a depth of -20 LF or 2,500 LF from the baseline, whichever was greater. Lines at several stations 46 were extended as needed to cross the exiting Federal Cape Fear River Shipping Channel. Profile surveys were performed on 16 existing geo-tube groin structures. Profiles ran along the centerline and each side (toe) of each structure.

Ocracoke Beach Profiles, Moffatt & Nichol Engineers, Ocracoke, NC
Mr. Taylor performed beach profiles surveys on 10 lines on Ocracoke Island. The land-based shots commenced 200 feet north of NC12 of the marsh line and ran seaward to elevation -5 feet NGVD29 or deeper. Shots were taken along each profile at a distance that did not exceed 25 feet and included all top, toes and other breaks in grade. The land based work was completed during low tide to ensure that the survey staff could get to the maximum safe depth. A hydrographic survey vessel completed the offshore portion of each profile. The offshore portions of the profiles near the beach were performed at high tide to ensure maximum coverage with minimal risk.

Bloody Point Beach Profile Surveys, Bloody Point Property Owners Association, Rockville, SC
Mr. Taylor served as hydrographic specialist for this project. McKim & Creed has performed hydrographic beach profile surveys for the Bloody Point Homeowners Association, South Carolina since 2006. In addition to performing annual profile surveys on approximately 20 historical ranges, McKim & Creed has established four new geodectic survey control monuments set in concrete that can be used for future surveys and construction projects on the Island. The annual surveys also include detailed soundings and a topographic survey in the area of a new terminal groin on the south side of the island.

Manteo Bay & Oregon Inlet Bridge Vicinity Spit Beach Nourishment Surveys, Great Lakes Dredge & Dock Company, Manteo, NC
Mr. Taylor provided hydrographic surveying services that included beach nourishment pre- and post-placement surveys at Manteo Bay near the Oregon Inlet Bridge in Outer Banks, NC. Data was processed on site and available immediately in Hypack form. In processing, data was converted to Microstation and In-Roads format, as well.

Michael Hurst, CST Level III
SENIOR CAD TECHNICIAN

Mr. Hurst has been with McKim & Creed for 23 years, the first five years as a survey crew party chief and the past 18 years as a CAD technician. He has extensive field experience with all types of surveys including topographic, boundary, wetlands, highway and bridge design surveys, subdivision layout, golf course layout, easement surveys, utility route surveys, beach profiles, and volumetric surveys. Since becoming a CAD technician Mr. Hurst has become proficient in Terramodel, AutoCAD 2009, MicroStation V8, C&G, TDS, and SMI. He is capable of using Microstation with Geopak and In-Roads COGO packages. In the past few years, Mr. Hurst has provided Microstation CAD deliverables for over 50 projects for the USACE.

KEY QUALIFICATIONS

- ✓ AutoCAD
- ✓ Microstation
- ✓ Terramodel

EDUCATION

A.A.S., Surveying Technology, Coastal Carolina Community College

A.A.S., Marine Construction Engineering Technology, Cape Fear Community College

A.A.S., Marine Laboratory Technology, Cape Fear Community College

PROFESSIONAL LICENSURE

Certified Survey Technician Level III Office

Certified Survey Technician Level III Boundary

SELECTED PROJECT EXPERIENCE

Bloody Point Beach Upland and Hydrographic Beach Profile Surveys, Erickson Consulting Engineers, Inc./Coastal Design & Engineering, Dafauskie Island, SC
Mr. Hurst served as CAD technician for this project. McKim & Creed performed beach profile monitoring surveys and ebb shoal surveys on 6,500 feet of beach frontage and Bloody Point Inlet. Set control monuments at each historic monitoring lines. There are 22 monitoring stations

2010 Debordieu Beach Profile Survey, Debordieu Colony Community Association, Inc., Georgetown, SC
Mr. Hurst served as CAD technician for this project. McKim & Creed performed beach profile and hydrographic surveys at 30 control reference locations.

Bald Head Island and Oak Island Beach Profile Survey, U.S. Army Corps of Engineers - Wilmington, Bald Head and Oak Island, NC
Mr. Hurst served as CAD technician for this project, which provided surveying and mapping services for designated areas onshore and offshore of Bald Head Island and onshore only on Oak Island. All horizontal or vertical control used for the survey was from a North Carolina or a United States Agency network and of third-order accuracy or better.

Bald Head Island Beach Monitoring Surveys, Olsen Associates, Inc., Bald Head Island, NC
Mr. Hurst served as CAD technician for this project. McKim & Creed provided hydrographic surveying services that included performing beach profile surveys at 67 stations on the south-, east- and west-facing beaches on Bald Head Island, NC. Surveys commenced at the inland toe of the primary dune system and extended seaward to a depth of -20 LF or 2,500 LF from the baseline, whichever was greater. Lines at several stations 46 were extended as needed to cross the existing Federal Cape Fear River Shipping Channel. Profile surveys were performed on 16 existing geo-tube groin structures. Profiles ran along the centerline and each side (toe) of each structure.

Absecon Inlet, NJ Beach Fill Project - Philadelphia District Corps, Weeks Marine, Inc., Absecon Island, NJ
Mr. Hurst served as CAD technician for this project, which provided contract work that consisted of a base bid to place approximately 1.5 million cubic yards of beachfill along the Atlantic Ocean coastline of Absecon Island in Atlantic County, New Jersey. The project area encompassed the municipalities of Atlantic City and Ventnor City. The contract work also consisted of the construction and repair of pedestrian, vehicle, and handicap dune crossovers; planting dune grass; providing sand fencing; repairing or extending existing storm water outfalls; and relocating or removing various existing structures to accommodate the new beachfill and dunes.

R. Lee Jackson, Jr., CST
FIELD SUPERVISOR

KEY QUALIFICATIONS

- ✓ Static GPS Surveys
- ✓ RTKGPS Surveys
- ✓ Wetland Surveys
- ✓ Subdivision layout
- ✓ Topographic Surveys

EDUCATION

Attended, Lenoir Community College

PROFESSIONAL LICENSURE

Certified Survey Technician Level I

OSHA 10-hour Safety Training

As a geomatics crew chief with McKim & Creed, Mr. Jackson has extensive experience performing all types of surveys, including topographic surveys, boundary surveys, beach profile surveys, route surveys, subdivision layout and as-built surveys. He is experienced with conventional survey equipment, robotic total stations and GPS. He has also been involved with high-order GPS control surveys.

SELECTED PROJECT EXPERIENCE

Debordieu Island Beach Renourishment Project Survey, Debordieu Colony Community Association, Inc., Georgetown, SC. Mr. Jackson served as party chief for this project. McKim & Creed performed beach fill profile and hydrographic surveys of borrow area. Post-construction survey was completed within three weeks of completion of beach fill placement. Monitoring survey was completed annually for two years.

Beach Profiles Ocean Isle, Holden Beach, and Shallotte Inlet (Task Order), U.S. Army Corps of Engineers - Wilmington District, NC, Ocean Isle, Holden Beach, NC
Mr. Jackson served as party chief for this project. The work includes elevation data collection along specified azimuths at specified intervals along existing baselines, breakline feature mapping, sinusoidal pattern data collection, hydrographic survey data collection, and the identification and location of existing storm sewer systems within the limits of the survey area.

Big Beach, Beach Monitoring Services Winter 2006/2007, City of Virginia Beach, Virginia Beach, VA
Mr. Jackson served as party chief for this project. McKim & Creed conducted a beach monitoring survey of approximately 32,000 LF in connection with a beach nourishment project along waterfront referred to as "Big Beach." Topographic and hydrographic cross-sections were performed every 500 feet along previously established baselines, and the new profiles were overlaid and compared to previously drawn USACE's BMAP. Additionally, the collected data was incorporated into a GIS for further analysis of shoreline and volumetric change. An evaluation of the remaining duration of the beach nourishment project was made based on these analyses, and a report summarizing findings was issued to the city.

Carolina and Kure Beaches Surveying Services, Greenhorne & Omara, Carolina and Kure Beach, NC
Mr. Jackson served as party chief for this project. McKim & Creed surveyed and mapped designated areas onshore and offshore of Carolina and Kure Beaches in North Carolina. The work included elevation data collection along specified azimuths at specified intervals along an existing baseline, breakline feature mapping, and hydrographic survey data collection within the survey limits.

Ocean View Norfolk VA Beach Profile Surveys Fall 2007 and Summer 2008, Moffatt & Nichol Engineers, Ocean View, VA
Mr. Jackson served as party chief for this project. McKim & Creed provided hydrographic surveying services that included beach profile surveys and land based profile surveys at a beach in Ocean View, VA. Land-based profile surveys commenced at inland toes of dunes; shots were taken along each profile that included all elevation tops, toes and breaks in grade.

CURRENT PROJECT WORKLOAD

"*To provide the most responsive and dependable service all the time*" is part of our firm-wide Mission Statement. These are more than just words on our wall. Being responsive and meeting our commitments is part of our culture and play a major part of our success in becoming the largest surveying & mapping operation in the Southeast United States.

At McKim & Creed, we use our best professional judgment, practices, and years of experience in determining the most practical, safe, and cost-efficient approach to each task. McKim & Creed has the experience and professionalism to get the assignment done on time, within the budget and with the utmost attention to the quality of the survey. We have achieved a seamless blend of the latest methodology with long-established basic surveying principles to maximize results. Our current workload allows for our proposed team to fully respond to the requests and needs of the Town of Nags Head.

We have carefully assessed our current and projected workload and are confident that our uniquely qualified team is available to provide the services required to complete this project on schedule.

KEY PERSONNEL AVAILABILITY

Each member of our proposed project team has been carefully selected to assemble a team that brings extensive experience. The table below demonstrates that our key personnel are available to perform on this project.

KEY TEAM AVAILABILITY

Tim Cawood, PLS	50%
David Jones, PLS, CFS	52%
Chad Burchette, PLS	70%
Jared Lambert, Captain	70%
Gabriela De Oliveira, CST, Captain	80%
Martin Taylor, CH, CST II	75%
Mike Hurst, CST III	80%
R. Lee Jackson, CST	80%

The availability shown represents the availability based on their current utilization rate, however they will be 100% available to your projects

McKim & Creed performed annual monitoring surveys for the Fort Fisher Revetment for the USACE

Attachment 1

RESPONDENT'S CERTIFICATION FORM

THIS PAGE MUST BE COMPLETED AND INCLUDED WITH THE SUBMITTAL CERTIFICATION

The undersigned hereby certifies, on behalf of the Respondent named in this Certification (the "Respondent"), that the information provided in this proposal submittal to Town is accurate and complete, and I am duly authorized to submit same. I hereby certify that the Respondent has reviewed this RFQ in its entirety and accepts its terms and conditions. I certify that all information contained in this proposal is truthful to the best of my knowledge and belief.

I further certify that I did not either directly or indirectly enter into any combination or arrangement with any person, firm or corporation, or enter into any agreement, participate in any collusion, or otherwise take any action in the restraint of free competition in violation of the Sherman Anti-Trust Act, 15 USCS Sections 1 et seq.; the North Carolina General Statutes Sections 133-24 through 133-31.

I further certify, under oath, that this proposal is made without prior understanding, agreement, connection, discussion, or collusion with any other person, firm or corporation submitting a proposal for the same product or service; no officer employee or agent of the Town of Nags Head or any other respondent is interested in said proposal; and that the undersigned executed this Respondent's Certification with full knowledge and understanding of the matters therein contained and was duly authorized to do so. This is an acknowledgement that FEMA financial assistance will be used to fund the contract only. The Respondent will comply with all applicable federal laws regulations, executive orders, FEMA policies, procedures, and directives. It is distinctly understood that the Town of Nags Head reserves the right to reject any or all proposals

McKim & Creed Inc

(Name of Respondent)

(Signature of Authorized Representative

David Jones, PLS

(Typed Name of Authorized Representative)

Regional Manager

(Title)

November 22, 2019

(Date)

HUB PARTICIPATION

McKim & Creed is committed to partnering with small businesses, small disadvantaged businesses, woman-owned businesses, and minority businesses when the need arises. A significant portion of McKim & Creed's services are performed for clients who routinely require HUB/DBE/MBE participation. We routinely work with and pursue HUB/DBE/MBE subconsultants and use our ever-expanding database of qualified HUB/DBE/MBE subconsultants to procure additional work depending on the needs of our clients. In fact, we have never failed to meet a client's contractual requirement in regard to the use of HUB firms.

McKim & Creed commits to exploring opportunities to achieve the 10% HUB Project Goal set forth by the Town.

SUBMITTED BY:
MCKIM & CREED | WILMINGTON, NC
910.343.1048 | MCKIMCREED.COM

McKIM&CREED
ENGINEERS SURVEYORS PLANNERS

FIRM GENERAL BACKGROUND

PROJECT TEAM

CURRENT PROJECT WORKLOAD

CERTIFICATION FORM

HISTORICALLY UNDERUTILIZED BUSINESS PARTICIPATION