

**DESCRIPTION/SPECIFICATIONS/STATEMENT OF WORK**  
**Department Of Commerce (DOC)**  
**National Oceanic and Atmospheric Administration (NOAA)**  
**National Marine Fisheries Service (NMFS)**  
**Alaska Fisheries Science Center (AFSC)**  
**Electronic Monitoring in Alaska Fixed Gear Groundfish and Halibut Fisheries**  
**Statement of Work**

## **1.0 GENERAL**

The Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Alaska Fisheries Science Center (AFSC) is responsible for research on living marine resources in the coastal oceans off Alaska. The mission of the AFSC is to plan, develop, and manage scientific research programs which generate the best scientific data available for understanding, managing, and conserving the region's living marine resources.

The AFSC's Fisheries Monitoring and Analysis Division (FMA) is responsible for administering the North Pacific Observer Program (Observer Program) which provides the regulatory framework for National Marine Fisheries Service (NMFS) to obtain information necessary to conserve and manage the groundfish and halibut fisheries in the Gulf of Alaska (GOA) and the Bering Sea and Aleutian Islands (BSAI) management areas. Data collected by the Observer Program, whether through observers or electronic monitoring, are a cornerstone of management of the Federal fisheries off Alaska. These data are needed by the North Pacific Fishery Management Council (Council) and NMFS to comply with the Magnuson-Stevens Fishery Conservation and Management Act, the Marine Mammal Protection Act, the Endangered Species Act, and other applicable Federal laws and treaties.

## **2.0 BACKGROUND**

### **2.1 Overview**

In 2013 NMFS restructured the North Pacific Observer Program (Observer Program) thereby expanding the vessels subject to observer coverage to include groundfish vessels less than 60 ft in length overall (LOA) and halibut vessels that had not been previously required to carry an observer. Expanding observer coverage to the approximately 950 previously unobserved vessels improved NMFS' ability to estimate total catch in all Federal fisheries in the North Pacific.

Many vessel owners and operators are opposed to carrying an observer. Vessel owners and operators have voiced their concerns to the North Pacific Fishery Management Council and NMFS stating that with the expanded observer program, there is limited space on board for an additional person or limited space in the vessel's life raft. Some vessel owners, operators, and industry representatives, particularly those active in fixed gear fisheries (i.e., hook-and-line and pot fisheries) have advocated for the use of electronic monitoring (EM) of fishing activity instead of having an observer on board their vessels.

To address these concerns, the Council and NMFS have been actively engaged in developing EM as a tool to collect imagery and sensor information that would be processed to extract data necessary to estimate total catch in the fixed gear fisheries. Over the past several years, NMFS and industry participants have undertaken cooperative research to test the applicability and reliability of readily available “off-the-shelf” EM systems. An EM system uses cameras, video storage devices, and associated sensors to record and monitor fishing activities. Through a final rule published in September 2017 (final rule citation when available), NMFS intends to integrate EM into the Observer Program beginning January 1, 2018 and to begin collecting data for catch accounting using EM.

The final rule established the process and structure for use of an EM system to monitor catch and bycatch on those vessels using fixed gear in the partial coverage category of the Observer Program that choose to be in the EM selection pool. EM data will supplement observer data from other fixed gear vessels. Since some data necessary for catch estimation, fishery management, and stock assessment cannot be collected from EM systems, NMFS will continue to obtain these data from observers.

The Council and NMFS will make EM system and observer deployment decisions following the sampling design in the Annual Deployment Plan (ADP). In the ADP, NMFS and the Council will define the criteria for vessels to be eligible to participate in the EM selection pool. The criteria for being in the EM selection pool may include, but are not limited to: gear type, vessel length, area fished, number of fishing trips or total catch, sector, target fishery, and home or landing port. The ADP will specify the EM selection rate—the portion of trips that are sampled—for each calendar year. NMFS and the Council may change the EM selection rate from one calendar year to the next to achieve efficiency, cost savings, and data collection goals. NMFS may adjust the EM selection rate set in the ADP to respond to new information inseason. NMFS posts the ADP on the NMFS Alaska Region website (<http://alaskafisheries.noaa.gov>).

The number of vessels participating in the EM selection pool will be dependent on the number of vessels that opt-in to the EM selection pool by November 1 of each year, and the criteria established by NMFS through the ADP that is dependent on funding. In 2017, a total of 90 longline vessels and 30 pot vessels were authorized to participate in the voluntary EM cooperative research Pre-Implementation Plan. For 2018, the Council has recommended that up to 120 longline vessels and 45 pot vessels may participate in the regulated EM program. In 2018 a vessel can use an EM system it already has pre-installed onboard if the system meets the specifications in the vessel monitoring plan (VMP). To ensure that management needs are met, the EM system must meet the specifications for data quality and data output described in the VMP. If the system does not meet the specifications in the VMP, it must be modified to meet those specifications.

### **3.0 MANAGEMENT REQUIREMENTS**

NMFS is seeking a Contractor to provide and install EM systems (cameras and sensors) to collect fishery data on vessels participating in fixed gear (hook and line and pot) fisheries in the partial coverage category in Alaska. The data must be of sufficient quality for video reviewers to estimate discards by documenting species composition and disposition of catch. For longline vessels, validating the presence/absence of seabird mitigation devices (streamer lines) when

setting gear is also a management requirement. The Contractor shall be responsible for installing, uninstalling and maintenance of equipment, field support, and providing regular updates on deployment status to NMFS personnel via a web-based application. Vessels that have not previously participated in EM will not have wiring systems to support EM systems and the Contractor will be responsible for supplying the required materials and installation. The Contractor personnel shall work under the guidance of NMFS staff. The Contractor shall also have adequate spare or back-up equipment available locally in case of a system failure or equipment malfunction. There are approximately 90 systems available at this time that will be used for this purpose. These systems have a limited lifespan and will need to be replaced over time by EM systems supplied by the Contractor. These systems shall meet or exceed the technical requirements defined in the equipment specifications described below. All data collected will be the property of the Government.

Installation of EM equipment shall occur as early as 30 days but no fewer than 3 days prior to the vessel commencing commercial fishing. The Contractor shall ensure that each system is operating according to requirements in the VMP. Image acquisition controls that can be set to trigger image capture during all gear retrieval events are required in addition to customizable, additional time post-fishing to allow data capture of fish handling and/or full monitoring of all at-sea activities.

### **3.1 Vessel Monitoring Plans**

The Contractor shall work with the vessel owner or operator to develop a vessel monitoring plan (VMP). The VMP will describe how fishing operations on the vessel are conducted, including how gear is set, how catch is brought on board, and where catch is retained and discarded. The VMP will also describe the EM system and how the system and associated equipment will be configured to meet the data collection objectives and purpose of the EM program, including camera locations to cover all fishing activities, any sensors to detect fishing activities, and any special catch handling requirements to ensure the data collection objectives can be met. The VMP will also include methods to troubleshoot the EM system and instructions for ensuring the EM system is functioning properly. These required components of the VMP will be detailed in the VMP template.

NMFS will provide a VMP template for guidance to the Contractor on the elements that NMFS will require to approve a VMP. NMFS will make this VMP template available on the NMFS Alaska Region website at <https://alaskafisheries.noaa.gov/> when the draft ADP is released in early October to allow vessel owners and operators an opportunity to review the requirements for the upcoming year. Once the VMP is complete and the vessel owner or operator agrees to comply with the components of the VMP, the vessel owner or operator must sign and submit the VMP to NMFS for approval. Vessels may not fish without a NMFS approved VMP.

### **3.2 Trip Selection**

Once in the EM selection pool and after the vessel has an approved VMP, the vessel operator will log fishing trips in the Observer Declare and Deploy System (ODDS). ODDS is the communication platform among industry participants in the partial coverage category,

Government, and the Contractor. ODDS will notify the vessel operator and the Contractor when a vessel is selected to use the EM system. Individual fishing trips are selected for monitoring in the EM selection pool, with selection rates varying annually depending on availability of funding, data collection requirements, and optimizing the number of trips between observers and EM as described in the ADP.

To log a trip in ODDS, the vessel must have an operating EM system installed and a NMFS-approved VMP. All installed EM components must be functioning prior to disembarking on a fishing trip. The vessel operator is required to complete a system function test prior to departing on a fishing trip to ensure the system is functioning properly. If a high priority malfunction is detected (defined in the VMP), the vessel operator will be required to contact their EM service provider and remain in port for up to 72 hours to allow an EM service provider to conduct repairs.

The Contractor shall have trained EM service technicians available within 24 hours of notification by vessels to address technical problems and provide fleet support at specific ports in Alaska as described in Section 4.5. Initial technical support contact and resolution may be provided via telephone. Follow-up technical support shall be provided in person if equipment performance issues cannot be resolved within 24 to 48 hours or cell phone service coverage of participating vessels is limited.

### **3.3 Equipment Specifications for current EM system inventory**

Most of the current fleet of vessels have EM systems previously installed including hydraulic and/or drum sensors, GPS and wiring. The Contractor shall maintain this system of hardware in the field, including swapping non-working components with current inventory; and if parts are not available replacement with like parts for the duration of the contract period as necessary. Contractor supplied EM systems will begin to replace existing systems beginning in 2021 as described in Section 3.4. The following section describes the current EM hardware, software, and support elements required.

#### **3.3.1 EM Hardware**

- Overall - All components in the EM system must be:
  - Able to withstand a marine environment.
  - Capable of accommodating vessel input power voltages from 10V – 32V DC and 110V AC.
  - Capable of accommodating reasonable variations in power quality common to small fishing vessels.
  - Utilize an uninterruptable power supply (UPS) or other system to allow data to continually be logged during short power fluctuations or temporary brownouts in order to minimize data loss.
  - Designed so the vessel's power state (engines or generators on/off) govern the EM system's power state to prevent draining vessel batteries. EM systems may power down to minimize battery drain when the main engine is off, but should automatically re-start when engine activity resumes.

- Designed for a bridge environment to standards that minimize radio frequency interference with other electronics and instrumentation. (e.g. BS EN 60945);  
And consist of the following elements:
- Control Center - The control center should be an independent, fully enclosed, device containing the operating software and data storage components of the EM System. It must be:
  - Capable of receiving and processing digital video inputs from a sufficient number of cameras to fully support species identification and fate determination of catch (longline and pot gear vessels); and determine presence/absence of seabird deterrent devices the wake area when setting gear (longline vessels only). Typically this requires three to four cameras on vessels fishing longline gear and two cameras on vessels fishing pot gear.
  - Capable of receiving and recording the following sensor data elements based on a configurable interval (typically 30 seconds):
    - Vessel position and speed from GPS
    - Hydraulic pressure
    - Deck equipment rotation (longline only)
  - Contain a hard drive for data storage capable of being easily removed/replaced by the vessel operator and mailed in for EM review. Hard drives should have sufficient capacity to store approximately 1 month of fishing activity (typically 1 TB);
  - Have “quick disconnect” connections to allow easy removal and installation on multiple vessels/yr.
- Video Monitor - A compact video monitor, powered by the control center, capable of displaying video images to allow vessel operators to evaluate system operation, (recording vs. not recording), system health, and video image quality in order to conduct maintenance as needed.
- Rail Camera(s) - Digital camera(s) housed in a waterproof (minimum IP66 rating,) low profile fixture, capable of providing color images of the hauling and discard areas at sufficient resolution and frame rate to support species identification and fate determination (typically 5 -10 FPS). Rail camera(s) are activated only during hauling events to avoid constant recording. The rail camera field of view (FOV) must monitor the entire area from where catch breaks the surface of the water to where it is brought onboard the vessel. Previous experience has identified a 20 degree outboard view angle of the hauling station as an optimal camera view.
- Deck Camera - Digital camera(s) housed in a waterproof (minimum IP66 rating) low profile fixture, capable of providing color images of the deck area at a sufficient resolution and frame rate (typically 5 to 10 FPS) to validate the fate of fish that pass from view of the rail cameras (longline vessels) or species identification and fate determination (pot gear vessels). Deck camera(s) are activated only during hauling events to avoid constant recording, and have adjustable run-on times to accommodate final deck sorting after the haul.

- Sea Bird Camera (longline vessels only) - Digital camera, housed in a waterproof (minimum IP66 rating) low profile fixture, capable of providing color images of the vessels wake area at a sufficient resolution and frame rate to validate presence/absence of seabird streamer lines (typically 1-5 FPS). Seabird cameras need to be activated by deck equipment rotation, hydraulic pressure, or vessel speed to avoid constant recording.
- Hydraulic pressure sensors - Pressure transducers appropriate for the deck equipment on the vessel (typically 0-3000 PSI) which can transmit gradations of hydraulic pressure as changes in base line voltage to activate camera recording during hauling events.
- Rotation sensors - Sensors capable of monitoring the rotation of deck equipment, such as a longline drum, and transmitting a signal to the control center to activate camera recording during hauling or setting events.
- GPS - Must provide a digital data stream of time, vessel location (lat/lon), speed, heading, and position accuracy to the control center for recording – time and location must be available on a per frame basis.

### **3.3.2 EM System Operating Software**

- User interface - Operating software must provide a “fisherman friendly” user interface to support vessel operator responsibilities and display video images and system operation status at all times when powered. Operating software should provide a separate user interface for EM service technicians to aid in on-site diagnostic and repair work.
- Function test - Operating software must provide a system health check capable of being executed by vessel operator to document EM system functionality prior to departing in a trip.
- Independent camera activation - Operating software must enable event based activation of camera recording based on a variety of sensor inputs such as vessel speed, rotation of deck equipment, and/or hydraulic pressure. Each camera should be independently activated with configurable “run-on” times after sensor trigger ceases to record final deck activity.
- Sensor configuration - Operating software must enable setting of vessel-specific, sensor threshold values which trigger activation of camera recording.
- System security - Operating software must provide system diagnostic files (i.e. system operation status, error detection, input voltage, operator commands etc.) of sufficient detail to support forensic determination of system malfunctions. These files should be password protected to prohibit access or tampering by vessel crew.
- Data Encryption - All sensor and video data must be encrypted using industry-standard encryption.

**3.3.3 EM Review Software** - Contractor will not be responsible for providing review software, but all data streams (sensors, images etc.) for contractor supplied systems will be time synchronized to support current and future image review applications.

**3.3.4 Technical Support** - Contractor shall provide the following technical support:

- Provide technical assistance to vessels, upon request, in EM system operation, the diagnosis of the cause of malfunctions, and assistance in resolving any malfunctions. Technical support must be available by phone 24-hours per day, seven days per week, and year-round. Technical support must also be available by email.
- Submit critical failure notices and requests for technical assistance from vessels to NMFS within 2 hours via the NMFS provided web-based application, including when the call or visit was made, the nature of the issue, and how it was resolved.
- Provide technical support to NMFS Office of Law Enforcement (OLE) including:
  - Assistance in EM system operation, diagnosing and resolving technical issues, and recovering corrupted or lost data.
  - Support for inquiries related to data summaries, analyses, reports, and operational issues with vessel representatives.
  - Enforcement support to NMFS if the EM system/data is being admitted as evidence in a court of law. All technical aspects of a NMFS-approved EM system are subject to being admitted as evidence in a court of law, if needed. The reliability of all technologies utilized in the EM system may be analyzed in court for, inter alia, testing procedures, error rates, peer review, technical processes and general industry acceptance. The Contractor shall provide technical and expert support for litigation to substantiate the EM system capabilities or other relevant information to investigate or establish potential violations of this chapter or other applicable law, as needed, including: (i) If the technologies have previously been subject to such scrutiny in a court of law, the EM service provider must provide NMFS with a brief summary of the litigation and any court findings on the reliability of the technology. (ii) Sign a non-disclosure agreement limiting the release of certain information that might compromise the effectiveness of the EM system operations.
  - Supply all software necessary for accessing, viewing, and interpreting the data generated by the EM system, including maintenance releases to correct errors in the software or enhance the functionality of the software.
  - Notify NMFS within 24 hours after the EM service provider becomes aware of the following: (i) Any information regarding possible harassment of EM provider staff; (ii) Any information regarding possible EM system tampering; (iii) Any information regarding a prohibited action; and, (iv) Any information, allegations or reports regarding EM service provider staff conflicts of interest..
  - Notify NMFS of any change of management or contact information or a change to insurance coverage.

### **3.3.5 Installation and Field Services**

The Contractor shall provide installation, maintenance and support services, including maintaining an EM equipment inventory to ensure that all deployed EM systems perform according to the performance standards. Primary service ports for longline vessels will be Sitka, Homer, and Kodiak, and primary service ports for pot vessels will be Homer, Kodiak, and Sand Point. Some support services may be performed at secondary ports. Secondary ports such as Juneau, Petersburg, King Cove, and Dutch Harbor may have periodic EM installation services

available. Vessels not available during scheduled dates of EM installation in a secondary port will be required to travel to a primary port for EM installation services prior to the date of their first logged trip in ODDS. The Contractor shall perform the following:

- Provide field technician training and support in three primary ports for longline vessels - Homer, Kodiak, and Sitka.
- Provide field technician training and support in three primary ports for pot vessels - Homer, Kodiak, and Sand Point.
- Installation services within two weeks of notice in primary ports.
- Provide limited installation services based on scheduled travel to remote ports following NMFS approval.
- Provide on-site maintenance and repair services within 48 hours of receiving a call in primary ports.
- Provide wiring and sensor installation to support current and future contractor provided systems as necessary.
- Ensure that field service events are scheduled and carried out with minimal delays or disruptions to fishing activities.
- Develop a VMP for each vessel and submit it to NMFS for approval within 24 hours of installation.
- Comply with data integrity and security requirements, including requirements pertaining to hard drives containing EM data.
- Provide standardized programmatic communication including vessel operator feedback forms, vessel service reports, and critical failure notices.
- Submit critical failure notices and requests for technical assistance from vessels to NMFS, including when the call or visit was made, the nature of the issue, and how it was resolved.

### **3.4 Equipment Replacement and Innovation**

The Observer Program at the Alaska Fisheries Science Center has been conducting research and development of new, innovative EM technologies to help address challenges for collecting scientific data to support bycatch estimation and stock assessment. NMFS focuses on development of new camera-based systems, methods, and tools while leveraging the latest development in computer vision to improve system functionality and offering potential solutions.

Further development of automated event-based image capture systems is critical to improve real time reporting by computer storage capacity, reducing lag times associated with current monitoring and post processing methods. The goal is to develop EM systems that offer significant cost savings associated with the collection, transfer, storage and analysis of image and sensor data, which will allow for greater coverage rates to a wider range of vessels types and vessel sizes where it is impractical to place an observer. NMFS development of Machine Vision image analysis and automation includes accurate species composition and length measurement of catch currently for NMFS camera chute system which are necessary components for catch estimation. NMFS is in the process of developing applications to allow extending this functionality to the rail camera system used in the longline fishery. Contractor supplied hardware



systems must support this functionality, but is not a Contractor requirement to develop these applications.

It is our expectation the Contractor will gain valuable experience from deploying and maintaining NMFS provided EM systems beginning with Option Period 2 (2020-2021), which will aid in development of their own systems. NMFS will provide up to 15 systems as needed in Option Period 2 until Contractor provided systems are ready for deployment beginning with Option Period 3 in June 2021 and continue throughout the contract period. Contractor systems will be like or an improvement on NMFS current EM system specifications that are known to support automation for catch event detection, length measurement and species identification. NMFS systems are based on off-the shelf components and use open source software developed by NMFS. The Contractor can use this software or not, but any operating software provided for Contractor provided system is required to be open source. The Contractor shall provide installation and maintenance services for NMFS and Contractor provided systems.

There are approximately 90 systems that are currently available for deployment and have a reported average life expectancy of 5 years. Based upon the age of currently deployed EM systems, a replacement schedule is provided below. Since life expectancy can vary widely each replacement will require prior NMFS approval, be based on the size of the EM fleet, funding and need. However, a minimum of 10 Contractor provided systems will be deployed in each year beginning in 2021-2022 option year to replace aging systems. This will also advance cost saving automated image analysis and real-time system health reports to improve data quality and reduce personnel costs for routine system maintenance.

**Potential Number of System Replacements by Option Year**

2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
0	15	40	25	10

The EM system provided by the Contractor shall consist of a single or multiple computer systems to manage the data collection, connected to an array of peripheral components including digital cameras (generally 2 or 3, depending on the deck configuration), satellite receiver, and sensor or sensors to accurately determine start of gear retrieval and end of fish processing. An additional camera or sensor will also be installed to determine compliance if a seabird streamer line was used during setting.

Digital imagery shall include: vessel name and a GPS time/date stamp in each frame which shall be incorporated into the frame naming convention. GPS time date stamp shall be associated with all sensor data and shall be collected throughout an entire trip in order to obtain information on fishing events and fishing effort. Time/date information for all EM equipment must be synchronized (using GPS time) and maintained as separate, parallel data streams. Note that satellite systems provide GPS information and a separate unit for GPS is not necessary.

Image compression will be limited to MJPEG or JPEG for each of two cameras capturing catch events during haul back. Cameras must be GeniCam compliant (<https://en.wikipedia.org/wiki/GenICam>) and paired frames must be collected simultaneously (within 2-5 milliseconds) to ensure accuracy of length measurement. The goal of the GeniCam standard is to provide a flexible camera interface (such as [GigE Vision](#) or [Camera Link](#)) from the user application programming interface (API). This standard is compatible with all NMFS image processing applications and allows for real time reporting of image quality and system health. Throughput for each of the two cameras monitoring catch retrieval must be a minimum of GigE interface standard or better.

Camera or cameras will also be required to monitor the fishing operation to ensure fishers are following regulations and guidelines and ensure catch is not being discarded following retention and streamer lines are being deployed. These compliance camera(s) are not required to be GeniCam compliant and can use compression utilities (Mpeg, H.264, etc) to maximize storage space. They also must not require third party plug-ins or software for review.

Contractor provided systems will allow pre-trip operational status checks by the vessel operator or automated feedback to vessel operator on status. NMFS applications will monitor system health and image quality and send reports through a satellite transceiver, which is required as part of the contractor provided EM system. Contractor will provide satellite service plan for each of the units as necessary. Currently, NMFS systems required very low transmission data rates and monthly subscription is \$30.00 per month. The video and sensor data shall be accessible by NMFS or designee staff to review, annotate, and archive. NMFS staff or designee will retrieve the imagery and sensor data from the vessels (if download is not automated), without the assistance of the Contractor, but may request facilitation of retrieval if necessary. There is a wide range of sensors that can be used to identify when a vessel begins hauling catch that could be explored; and NMFS encourage exploration of alternative sensor or sensor systems that minimize installation costs and impact on vessels.

The Contractor is responsible for training vessel operators in various aspects of the EM system operation to ensure that the system is in good working order during their trip. Vessel operators and owners develop the requisite knowledge for the program to succeed in collection of high quality imagery (recognizing that the vessel operator is a critically important component of the system). The topics shall include, but would not be limited to: equipment installation, use, maintenance, and troubleshooting; development of vessel monitoring plans and data protocols.

The Contractor is responsible for soliciting feedback and collecting data from the vessel operators after the initial deployment of the system. Specifically, the Contractor shall either interview vessel owners, either in person or through other means, to compile information on the operational status of the systems, and then summarize this information for NMFS and discuss potential ways to address any challenges.

The Contractor shall provide ongoing technical support to the vessel operators to maintain and optimize operational and current and Contractor provided equipment, obtain data that meets the

objectives of the program, and where possible, reduce the costs and burden to the operation of the vessel. The Contractor shall communicate with NMFS on a continuous basis, and coordinate and communicate with a third party if necessary.

New vessels requesting to participate in the EM pool may or may not have wiring, cabling and/or sensors in place. The contractor shall be responsible for replacement and installation of any new or faulty sensors or cabling. If vessel configuration does not support installation requirements a "EM light" type system may be installed upon NMFS approval and as needed. NMFS has been conducting research of these minimalist systems and can provide example system and software to aid Contractor development. The functionality of these systems will include remote sensing of effort (haul) and location (GPS) information. The Council has expressed much interest in remote monitoring for the "Zero Coverage" fleet that includes jig and vessels <40 feet in length as there is little information on these vessels to support catch accounting. NMFS expects that many of these vessels may not meet camera based EM system requirements, but will meet requirements for the "EM Light" monitoring. It is likely that "EM Light" monitoring could expand into this sector in the near future and will require Contractor supplied systems, installation and maintenance beginning in Option Period 2 (2020-2021).

### **3.4.1 Minimum specifications for rail camera systems to support current image analysis and automation applications developed or in development by NMFS.**

Contractor supplied systems must meet minimum requirements of the example system specified below. Systems components can be of any make or model.

- **Cameras**
  - GeniCam Compliant
  - 15 frames per second minimum
  - 2/3 image sensor size
  - 5 MegaPixel
- **Control and Vision Box**
  - Powered from a single source and capable of accommodating a range of power quality and input voltages from 12V – 32V DC or 110V AC;
  - Incorporates an uninterruptable power supply (UPS) capable of providing sufficient run time to for sensor, video recording and operating software to shut down with minimal data loss.
  - All components designed for installation in a vessel wheelhouse or open marine environment (IP66 min) to standards that minimize possible impact with other electronics and instrumentation.
- **Vision Box**
  - Computer Hardware: Chassis: Intel Core i7 2.6GHz Single board computer, HD4000 Graphics, VGA port, 120GB Solid State Drive with OS, 2 SATA-Ready Hot-Swappable 2.5" Shuttles with

cover(ready for NOAA provided Samsung 850 Series 1TB Solid State Drives),  
8GB DDR3 Memory IP67 rated

- Capable of being triggered off and on by the Control Box
- Capable of receiving and processing image inputs from sufficient number of cameras to provide rail, streamer line compliance and deck camera coverage.
- Image processing capabilities to ensure consistent capture of 5 MP images during both day and night at a minimum of 15 frames per second for rail stereo image (jpg) pairs.
- Contain a hard drive for data storage capable of being removed/replaced by a technician. Hard drives should have sufficient capacity to store approximately three trips of fishing activity (e.g. 1-2 TB);
- Have “plug and play” connections to allow easy removal and installation on multiple vessels/yr.

#### **Control Box**

- Computer hardware: Computer Hardware: Intel Celeron Quad Core 1.83GHz(2.16GHz burst) CPU, HD4400 Graphics, VGA Port, 64GB Solid State Drive, 4GB DDR3 Memory. IP67 rated
- Capable of receiving and processing inputs from multiple sensors (e.g. Satellite/GPS, hydraulic pressure, engine pressure, battery voltage, deck equipment rotation, and proximity or image sensors) to ensure identification of effort (hauls) to trigger image acquisition area of catch and disposition of catch;
- Contain a hard drive for data storage capable of being removed/replaced by vessel operator to mail in for EM review. Hard drives should have sufficient capacity to store approximately 1 month of fishing activity;
- Control box that collects sensor data throughout a trip including time vessel has left port.
- Automatically powers down when engine operation ceases and on when engine starts.
- Have “plug and play” connections to allow easy removal and installation on multiple vessels/yr.

### **3.4.2 Deployment/Installation Specifications**

**Rail camera field of view (FOV)-** will monitor the entire area that covers where catch breaks the surface of the water. This will be vessel dependent.

**Rail Camera(s)**—Camera(s), powered by the control box, housed in a waterproof (minimum IP66 rating), capable of providing color images of the hauling and discard areas at a minimum of 15 frames/second (FPS); stereo pairs must be captured within < 4 milliseconds

**Sensors to identify haul events to activate camera recording. Possible solutions include:** hydraulic pressure sensors, rotational sensors, proximity sensors and image based sensors.

**Engine operation sensors**—capable of transmitting an electrical signal to the control box when the vessels main propulsion engine is operating to automatically power down control and vision box when engine operation ceases to avoid battery drain.

**Satellite/GPS**— must provide a digital data stream of time, vessel location (lat/lon), speed, heading, and position accuracy to the control center – time and location must be overlaid onto each image frame and also integrated into the sensor data collected at a minimum every 30 seconds.

**Real Time System Health and Image Quality Reporting**— once the EM system is powered on and within port, satellite communications through the computer system (control box) must be used to send an evaluation report on system operation, (recording vs. not recording), system health, and video image quality in order to notify EM providers/NMFS that maintenance is needed or system is ready for departing on a trip. A system health report will also be sent to a NMFS server and vessel operators display at the start of every haul thereafter and will be made available for Contractor monitoring in real time. System must be fully autonomous.

**EM Light**— The functionality of these Contractor provide systems will include remote sensing, and metadata to identify vessel, recording of effort (haul), location (GPS) and time/date. These systems will be provided as a potential option for a vessel that does not meet requirements for installation of image based EM system. These system will be installed and removed for TBD fishing period and data will be uploaded to NMFS within one week following removal.

### **3.4.3. EM System Operating Software control—**

**Video Monitor**—a compact video monitor, powered by the control center/box, to allow vessel operators to evaluate system operation, (recording vs. not recording), system health, and video image quality in order to conduct maintenance as needed.

**User interface**-- Operating software must provide a “fisherman friendly” user interface to support vessel operator responsibilities and system operation status at all times when powered. Operating software should provide a separate user interface for EM service technicians to aid in on-site diagnostic and repair work.

**Function test**—Operating software must autonomously provide a system health check to vessel operator interface (monitor) to document EM system functionality prior to departing on a trip. If a malfunction is discovered system software will provide instruction to vessel operator for potential resolution and notify (via system satellite or cell phone communications) NMFS server/ Contractor that onsite repair is or is not required.

**Independent camera activation**— Operating software must allow event based activation of camera recording based on vessel speed, rotation of deck equipment, image or proximity sensor or hydraulic pressure. Rail, deck and seabird cameras should be independently activated with independently configurable run-on times after deck activity ends.

**Sensor configuration**—Operating software must allow custom configuration of threshold sensor values (if needed) which support automated camera activation for each vessel's unique operating profile.

**Engine off sleep mode (sleep sensor)**— Operating software will allow EM system to power down when engine is off to minimize drain on the vessel battery.

**System security-** Data encryption of all image and sensor data.

**EM Light**— The operating software will allow EM system to power down when engine is off to minimize drain on the vessel battery. This system will be independent and not require vessel crew involvement other than monitoring installation.

## **4.0 SERVICE REQUIREMENTS**

### **4.1 Test Data**

The Contractor shall provide an example to NMFS of a full trip in-season imagery and sensor data derived from a commercial fishing vessel, software to expedite video review and any associated data produced from these vessels using their EM system. NMFS or their designee will review the test deliverable to ensure fishing locations can be identified, fishing effort can be quantified, and retained and discarded fish can be accurately identified to the lowest taxonomic level possible. In order to facilitate the sharing of imagery with NMFS or their designee, the video format should be accessible with Windows Media Player or VLC without requiring non-standard or third party CODECs. Collected data shall be delivered via a removable hard drive intended for use in the field or automated download to a server in ports of call.

### **4.2 Project Outreach**

4.2.1 The Contractor shall provide public outreach at the dock with vessel owner/operators during equipment installations, data retrievals, equipment service events, or as required. Frequent and consistent communication with EM participants will help build a good working relationship, reinforce commitment, and will serve to address any outstanding questions or concerns the vessels may have. The Contractor and NMFS will also use these opportunities to describe data collection goals, provide feedback on crew performance, and convey data collection results. Outreach shall be conducted to limit interference with vessel fishing operations and to promote data quality. The Contractor shall track all vessel visits and document the purpose of each event in a vessel service tracking sheet, which will be accessible to NMFS.

4.2.2 The Contractor shall engage in regular communication and shall respond within 12 hours of NMFS inquiries.

4.2.3 Any communication the Contractor engages in with the industry must be within the scope of this contract and must be approved by the Contracting Officer Representative (COR).

### **4.3 Installation, servicing of EM units aboard vessels, and field support**

4.4.1 Prior to commencement of the active data collection component of the project, the Contractor shall set up local capacity to install equipment and provide field support to participants. The field support shall include: equipment installation, equipment or system troubleshooting, and equipment removal. The Contractor shall provide local service technicians who are capable of providing all servicing events and needs for participating vessels. In addition, the Contractor shall set up a twenty-four (24) hour service hotline to address any vessel servicing needs seven (7) days a week. The Contractor shall present a formal plan on servicing, local capacity, and response time to address any equipment issues in their quote.

4.4.2 The Contractor shall maintain a NMFS provided field service tracking log to include all installations, service events, data retrievals, equipment or system troubleshooting and equipment removals, malfunctions and resolution. If equipment servicing or troubleshooting occurs the contractor shall note the issue, when they were notified by the vessel, the length of time to fix the issue, and how the issue was rectified in the service tracking log. The tracking sheet shall be updated daily and the Contractor shall provide full access to NMFS. The Contractor shall also track all system failures (any instance where the equipment is not functional), when they were notified by the vessel, and report all critical system failures to NMFS within two (2) hours of occurrence.

4.4.3 The Contractor shall work with the vessel to develop a VMP for each participating vessel within 24 hours of EM system installation to NMFS for approval. The VMP shall outline vessel specific catch handling protocols and EM system configurations being used throughout the fishing year. The VMP is a communication tool used to ensure that captains, EM field technicians, EM data reviewers, and project coordination staff know what their roles are for a successful implementation. The VMP shall include at a minimum: general EM components, operating procedures, EM system configuration, operator responsibilities, protocols for data retrieval, catch handling, general vessel information, monitoring objectives, the vessel layout, reporting requirements, vessel hail in or out procedures, basic system troubleshooting, program contacts, and any other pertinent information. The Contractor shall assist the vessel operator in understanding each component of the VMP and assist the vessel operator in submitting the completed and signed VMP to NMFS.

All alterations, with the exception of the vessel's power supply, required for a vessel to accommodate the EM system shall be installed by the Contractor. This includes, but is not limited to: swing arm mounts for cameras, additional lighting for night fishing, and wire shielding to prevent Radio Frequency Interference (RFI). The Contractor shall devise a plan with NMFS and vessel operators for those vessels who want to participate but have insufficient power resources or space. In these cases a low power EM light unit (described in section 3.4) may be deployed instead with NMFS approval.

4.4.4 The Contractor shall coordinate and determine a schedule for EM installation on each vessel and shall take into account vessels’ fishing schedules and concerns. The installation and maintenance of the EM technology shall not unduly delay any vessel from participating in the fishery.

### 5.0 Performance Standards

The Contractor shall ensure the following performance measures are met:

#### Acceptable Quality Level Matrix

	Performance Target	Surveillance, Variance and Performance Analysis
1	Ensure that 100% of designated vessels will have EM installed and functional prior to departure of their fishing trips.	Compare the number of selected trips with the number of entries in the EM Provider maintenance logs.
2	Ensure that data on the EM system install / removal and status are updated daily in the provided EM maintenance log 100% of the time.	Compare date of entry to date of service.
3	Ensure that VMPs are submitted to NMFS prior to vessel deployment.	Compare date of receipt to anticipated fishing dates in ODDS.
4	Ensure that 100% of designated vessel owners and/or operators are trained in the operability and maintenance of EM systems.	Compare reports generated by the hosting provider to the performance target.
5	Ensure that feedback from all designated vessel owners and/or operators on the installation and training of EM systems is obtained, compiled, and conveyed to NMFS.	Compare reports generated by the hosting provider to the performance target.
6	Install and remove EM Innovation systems on selected vessels.	Compare EM Maintenance logs to ADP and ODDS.



7	Ensure that any EM problems will be fixed within 72 hours.	Examine EM maintenance logs
8	Ensure EM system performance remains high across all vessels.	<p>95% of Trips with complete sensor data from departure to return to port.</p> <p>95% of all hauls have complete imagery from start of haul to end of fish processing.</p> <p>95% of Trips with video for compliance with seabird mitigation devices (Hook and line gear only)</p>

## 5.0 PERFORMANCE STANDARDS

### 5.1 Non-Conforming Services

Non-conforming services will be rejected. If any of the systems or services are non-functional or incomplete, the contractor must notify the Technical Point of Contact and the Contracting Officer's Representative (COR) within 2 hours of any high priority malfunctions; what the contractor is doing to address the failure; and, within 48 hours provide an estimate of when the component will be repaired. If any of the components of system remain non-functional after 72 hours, the Government will document the issues associated with the down time of services, and the following penalties may result in withholding of up to ten (10) percent of payments on pending invoices for the service that was not performed. Other performance deficiencies at the level specified in the SOW shall be corrected by the contractor within 5 workdays of a deficiency notice. If performance cannot be corrected within 10 workdays of the notice, the contractor shall immediately notify the COR or the Technical Point of Contact of the reason for the delay and provide a proposed corrective action plan within 3 workdays after notifying the COR or the Technical Point of Contract.

### 5.2 Quality Control Plan

The Contractor shall provide and maintain a Quality Control Plan (QCP) that contains, as a minimum, the items listed below. The QCP will be evaluated as part of the proposal submission, and shall include the following minimum requirements:

- A description of the tracking and monitoring system to be used to cover all services and deliverables. The description shall include specifics as to the areas to be tracked and monitored and the frequency these quality assessments will be performed.

- A description of the methods to be used for identifying and preventing deficiencies in the quality of services being performed.
- A description of the records to be kept to document quality assessments and corrective or preventative actions taken.
- All such records shall be retained and made available to the Government upon request throughout the contract's performance period, and until the final contract comes to term.

### **5.3 Quality Control Tracking System**

NMFS will provide a tracking and monitoring system which the Contractor will use to report all services and deliverable and track quality control. Monitoring system will include specifics as to the areas to be tracked and monitored and the frequency these quality assessments.

NMFS tracking system will include methods for identifying and preventing poor data quality and a description of records required to document quality assessments, corrective or preventative actions taken.

### **5.4 Quality Assurance**

The Contractor is responsible for continuous quality assurance in accordance with the contract's QCP to ensure performance targets are met and that the overall requirements of the SOW are satisfactorily provided. The Government will evaluate the contractor's performance of this contract based on the Performance Standards stated above.

#### **5.4.1 Coordination, Notification, and Communication**

The Contractor shall coordinate and communicate with NMFS or a third party/other contracting vendor as necessary to facilitate the full functioning of the EM system, the security of property, and data confidentiality. The contractor shall notify the Government COR or the Technical Point of Contact as soon as it becomes apparent to the contractor that a performance will not be met. The contractor shall include the rationale for noncompliance, the expected date of remedy, and the impact for the noncompliance. The COR or the Technical Point of Contact will review the remedy and provide feedback to the contractor. Such notification in no way limits the Government's right to any and all rights and remedies up to and including termination.

### **5.5 Monthly Status Report (MSR)**

The contractor shall enter MSR data through NMFS supplied application no later than ten (10) business days following the end of the month. This report shall summarize activities performed and provide a separate invoice.

The MSR shall include the following elements:

- A summary of work performed for the reporting period.
- A summary of operating and maintenance performance measure compliance.

- Milestones and updates against task activities.
- Deliverables submitted or progress on deliverable products.
- Brief summary of activity planned for the next reporting period.
- Total billed hours by month and to date.
- Travel costs and charges - including the traveler's name, dates of travel, destination, purpose of travel and cost for each trip (original receipts, travel vouchers, etc. completed in accordance with Federal Travel Regulations shall be maintained by the contractor to support charges other than labor hours and made available to Government auditors upon request).
- Any other direct costs that have been approved for this contract.
- The contractor shall also ensure the MSR coincides with the monthly invoice.
- Upon contract completion, the Contractor shall assemble in an orderly and logical manner, and deliver to the Government, all working papers prepared during the contract term. These working papers shall include background studies, research documents, drawings, charts, diagrams, and any other documents developed at Government cost. Any final report(s) due shall be submitted within ten (10) calendar days after the last month of performance.

## **5.6 Security**

The Contractor shall coordinate with the vessel operator/owner to maintain the security and integrity of the EM system and data. To ensure the security of confidential data, NMFS and the Contractor shall develop a data protocol for the retrieval of data after a trip(s) and the preparation/ replacement of data storage devices in preparation for a trip.

### **5.6.1 Information Technology (IT) Security**

- Contractor shall comply with all Federal, Department of Commerce, NOAA, and NMFS Security Policies.
- Contractor shall ensure that all system and testing documentation is accurate and current.
- Contractor shall fully cooperate with NOAA and NMFS IT Security in response to IT Security Incidents. Such cooperation may require providing log data and implementing mitigation strategies with little or no advance notice.
- Contractor's IT Security compliance is subject to reviews and audit by, the Department of Commerce Office of Inspector General, NOAA, and NMFS. Contractor shall fully cooperate with all audits.
- Contractor shall comply with all data calls in support of such reviews and audits.

### **5.7 Other Unique Requirements**

A confidentiality agreement must be signed by the Contractor to ensure complete confidentiality of the data collected during the entire period of performance. No copies of digital video recordings, sensor information, location data or other confidential data collected during the execution of these tasks will be retained by the Contractor without the written consent of NMFS. NMFS or their designee will own all of the EM data collected by the Contractor system and will be responsible for interpretation of the raw EM data and reporting.

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