UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA Marine and Aviation Operations
Marine Operations Center
439 W. York Street
Norfolk, VA 23510-1114

MEMORANDUM FOR: Commander Ricardo Ramos, NOAA
Commanding Officer, NOAA Ship *Okeanos Explorer*

FROM: Captain Anita L. Lopez, NOAA for 24 CDR/NOAA
Commanding Officer, NOAA Marine Operations Center-Atlantic

SUBJECT: Project Instruction for EX-13-02
Ship Shakedown, Patch Test and Exploration NE Canyons

Attached is the final Project Instruction for EX-13-02, Ship Shakedown, Patch Test and Exploration NE Canyons, which is scheduled aboard NOAA Ship *Okeanos Explorer* during the period of 13 May – 6 June, 2013. Acknowledge receipt of these instructions via e-mail to **OpsMgr.MOA@noaa.gov** at Marine Operations Center-Atlantic.

Attachment

cc:
MOA1

FINAL Project Instructions

Date Submitted: May 2, 2013

Platform: NOAA Ship *Okeanos Explorer*

Project Number: EX 13-02

Project Title: Ship Shakedown & Patch Test & Exploration, NE Canyons

Project Dates: May 13 - June 6, 2013

Prepared by: LTJG Brian RC Kennedy, NOAA
Expedition Coordinator
Office of Ocean Exploration & Research

Approved by: _____ Dated: 5/2/2013
Craig W. Russell
Program Manager
Office of Ocean Exploration & Research

Approved by: _____ Dated: 5/7/2013
Captain Anita Lopez, NOAA
Commanding Officer
Marine Operations Center - Atlantic

I. Overview

A. Brief Summary and Project Period

This cruise plan encompasses sonar shakedown and patch test as well as the field trials and shakedown of the new Office of Ocean Exploration and Research (OER) 6000m ROV. The cruise will depart from Charleston, South Carolina on May 13, 2013 then conduct an alongside personnel transfer on or near May 17 in Norfolk, VA. The cruise will end June 6, 2013 in North Kingstown, RI.

B. Service Level Agreements

Of the 25 DAS scheduled for this project, 19 DAS are funded by the program and 6 DAS are funded by OMAO. This project is estimated to exhibit a high operational tempo.

C. Operating Area

The primary operating area will be off the East coast of the United States in water deeper than 1000m. The sonar shakedown portion of the cruise will be conducted between Charleston, SC and Norfolk, VA. The ROV shakedown portion weather permitting will focus area for the cruise will be the Atlantic Canyons from North Carolina to the Canadian maritime border; however, dives may be conducted as far south as the northern edge of the Blake Spur if weather conditions are unfavorable for ROV operations further north. This cruise is engineering focused so the geographical location of the dives is not as important as finding specific seafloor types and good weather. As possible, dives will be planned in areas of high scientific interest and/or limited previous submersible work. The map below shows the general operating area as well as the priority areas.

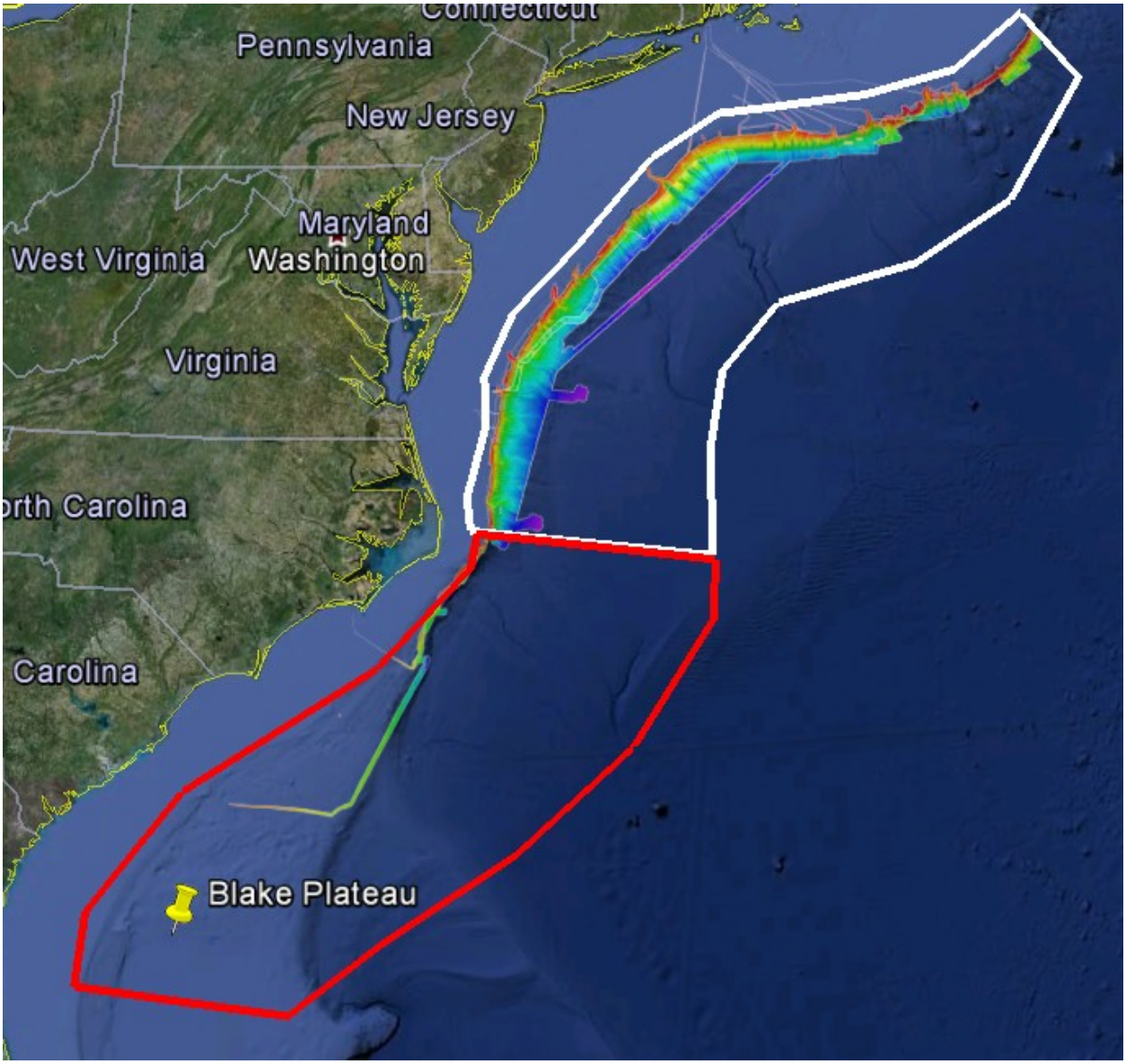

Figure 1. The primary operations area is shown in white. The southern contingency area is shown in red. Both polygons lay completely within the US EEZ. Multibeam bathymetry shown was collected as part of the ACUMEN project. *Image created in Google Earth.*

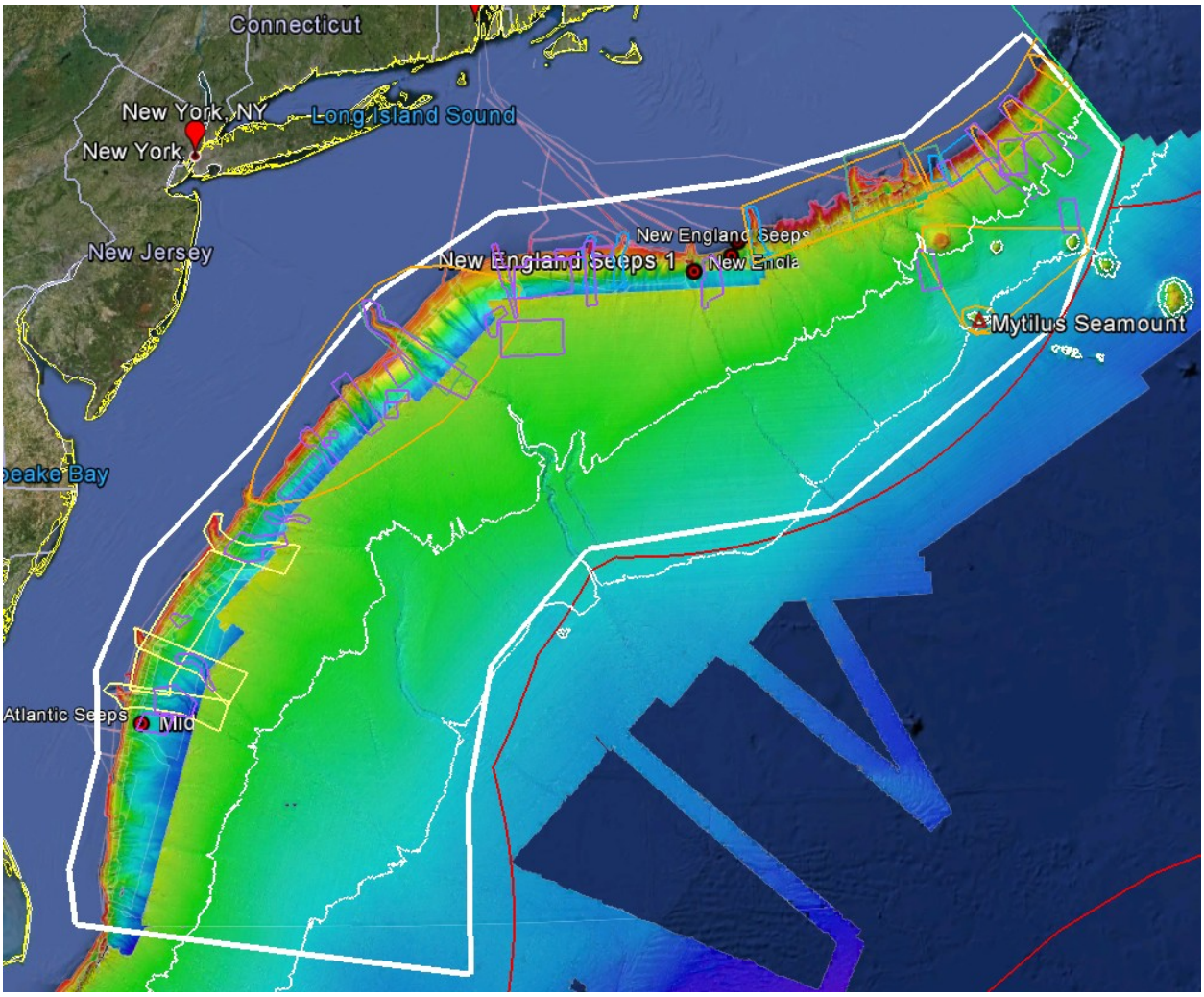

Figure 2. The primary operations area is shown along with the canyons priority areas. Blue polygons are from the NOAA Deep Water Cora Group. Yellow boxes are from BOEM, Orange are from the NortheastFisheries Management Council, green from NOAA Sanctuaries, and purple are from USGS . The locations of the seeps discovered on EX1206 are also displayed. Image created in Google Earth.

D. Summary of Objectives

1. *Sonar Shakedown and Patch test*

a. Ensure all scientific sonars are in good working order after dry dock

b. Assess noise reduction modifications for the Knudsen Chirp 3260 Sub-bottom profiler (SBP)

c. Kongsberg technical representative update software and install the new multibeam acquisition computer

d. Conduct EM 302 multibeam patch test including a CTD

e. Calibrate the EK60 single beam sonar with assistance from the Kongsberg technical representative.

f. Conduct annual maintenance on EM 302 and EK 60 units in the sonar closet (Kongsberg technician)

g. Test newly-installed Reson SVP70 spare probe

2. *ROV shakedown*

a. Test stern thrusters after dry dock

b. Put 6000m ROV and Seirios camera platform through rigorous engineering tests.

c. Calibrate 6000m ROV navigational systems

d. Train pilots to take high quality images and navigate the new ROV

e. Continue to apply, develop and/or refine system checklists, SOPs, spares lists, etc.

f. Continue training in ROV launch and recovery operations

g. Continue to train bridge crew on ROV operations and use of dynamic posistioning system (DP)

h. Ongoing system familiarization and training

i. Refine communications protocols

j. Test 24 hour ROV operations

3. *Telepresence (VSAT 10 mb/sec ship to shore; 512 kb/sec shore to ship)*

    a. Observe and test VSAT

    b. Refine data management protocols relating to the automated system

    c. Test terrestrial links between ship and shore

    d. Continue to apply, develop and/or refine system checklists, SOPs, spares lists, etc.

    e. Ongoing system familiarization and training

    f. Refine and test information sharing protocols between ship and shore

    g. Test supporting 24 hour ROV operations

    h. Test new website really simple syndication (RSS) update system

    i. Troubleshot EX video feed with NOAA net

    j. Test full dive video recording on the ship

4. *Data management*

    a. See the Data Management Plan in Appendix B.

5. *Education/outreach*

    a. Complete live telepresence media events with the Aquarium of the Pacific Long Beach, California on May 23

7. *Science*

    a. Gather reconnaissance information about possible dive locations for future ROV cruises

    b. Collect value-added scientific data as engineering objectives allow

E. Participating Institutions

National Oceanic and Atmospheric Administration – Office of Ocean Exploration and Research (OER)
1315 East-West Hwy, Silver Spring, Maryland 20910

University of New Hampshire (UNH), Center for Coastal and Ocean Mapping (CCOM)
Jere A. Chase Ocean Engineering Lab, 24 Colovos Road, Durham, NH 03824 USA

University Corporation for Atmospheric Research (UCAR), Joint Office for Science Support (JOSS) PO Box 3000 Boulder, CO 80307

University of Rhode Island, Graduate School of Oceanography, 215 South Ferry Rd. Narragansett, RI 02882

Aquarium of the Pacific, 100 Aquarium Way, Long Beach, CA 90802

F. Personnel/Science Party:

Sonar Shakedown and Patch Test (May 12 ~ May 17, 2013)

Name (Last, First)	**Title**	**Date Aboard**	**Date Disembark**	**Gender**	**Affiliation**	**Nationality**
LTJG Brian Kennedy	Expedition Coordinator	5/10/13	6/7/13	M	OER(NOAA Corps)	US
Webb Pinner	Telepresence Team Lead	5/11/13	6/7/13	M	OER (2020)	US
Elizabeth “Meme” Lobecker	Mapping Co-Lead	5/11/13	6/7/13	F	OER (ERT)	US
Ash Harris	Mapping Team	5/11/13	~ 5/17/13	M	OER (UCAR)	US
Vanessa Self-Miller	Mapping Team	5/11/13	~ 5/17/13	F	NOAA (NOS)	US
Jennifer Kist	Mapping Team	5/11/13	~ 5/17/13	F	NOAA (NOS)	US
Tony Dalheim	Kongsberg Representative	5/11/13	~ 5/17/13	M	Kongsberg	US
Jared Drewniak	Telepresence Engineer	5/11/13	6/7/13	M	OER (ERT)	US

ROV Shakedown (~May 17- June 6, 2013)

Name (Last, First)	**Title**	**Date Aboard**	**Date Disembark**	**Gender**	**Affiliation**	**Nationality**
LTJG Brian Kennedy	Expedition Coordinator	5/10/13	6/7/13	M	OER(NOAA Corps)	US
Dave Lovalvo	ROV Team Lead	5/11/13	6/7/13	M	OER (20/20)	US
Webb Pinner	Telepresence Team Lead	5/11/13	6/7/13	M	OER (20/20)	US
Elizabeth “Meme” Lobecker	Mapping Lead	5/11/13	6/7/13	F	OER (ERT)	US
Dave Wright	ROV Engineer	~ 5/17/13	6/7/13	M	OER (UCAR)	US

Chris Ritter	ROV Engineer	~ 5/17/13	6/7/13	M	NavSea	US
Todd Gregory	ROV Engineer	~ 5/17/13	6/7/13	M	OER (UCAR)	US
Brian Bingham	ROV Engineer	~ 5/17/13	6/7/13	M	OER (UCAR)	US
Karl McLetchie	ROV Engineer	~ 5/17/13	6/7/13	M	OER (UCAR)	US
Bobby Mohr	ROV Engineer	~ 5/17/13	6/7/13	M	OER (UCAR)	US
Josh Carlson	ROV Engineer	~ 5/17/13	6/7/13	M	OER (UCAR)	US
Tom Kok	ROV Engineer	~ 5/17/13	6/7/13	M	OER (UCAR)	US
Colin Riggs	ROV Engineer	~ 5/17/13	6/7/13	M	GreenSea Systems	US
Andy O'Niel	ROV Engineer	~ 5/17/13	6/7/13	M	GreenSea Systems	US
Jim Newman	ROV Engineer	~ 5/17/13	6/7/13	M	OER (UCAR)	US
Roland Brian	Telepresence Engineer	~ 5/17/13	6/7/13	M	OER (UCAR)	US
Joe Biscotti	Telepresence Engineer	~ 5/17/13	6/7/13	M	OER (UCAR)	US
Brian Brinkman	Telepresence Engineer	~ 5/17/13	6/7/13	M	OER (UCAR)	US
Jared Drewniak	Telepresence Engineer	~ 5/11/13	6/7/13	M	OER (UCAR)	US
Tara Smithee	Documentary filmmaker	~ 5/17/13	6/7/13	F	OER (UCAR)	US

G. Administrative

1. Points of Contacts

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ROV Program Manager for NOAA
Eastern Oceanics
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Expedition Coordinator
NOAA Ocean Exploration & Research
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LT Laura Gallant, NOAA
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2. Other Mission Contacts

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Catalina Martinez
RI Regional Program Manager
NOAA Ocean Exploration & Research
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Email: Catalina.martinez@noaa.gov

3. Diplomatic Clearances

NOT APPLICABLE TO THIS CRUISE

4. Licenses and Permits

NOT APPLICABLE TO THIS CRUISE

II. Operations

B. Project Itinerary

Sonar Shakedown and Patch Test (May 13 ~18, 2013**):**

Dates	Location	ROV ops	Telepresence	Mapping	Ship
5/10	Charleston, SC	NA	High Bandwidth Connection established. Testing with the Inner Space Center	NA	Dry Dock
5/11, 5/12	Charleston, Sc	NA	Personnel arrives to ship	Personnel arrives to ship	Alongside
5/13	Depart Charleston, SC	Preparation for ROV portion of the cruise	Test equipment and software; test VSAT and RTS connection	Test sonars and install new acquisition computer	Transit to patch test site
5/14-5/15	patch test and EK60 calibration location	Preparation for ROV portion of the cruise	Preparations for ROV portions of the Cruise Support mapping operations	Conduct patch test and sonar shakedown. EK60 calibration	Mapping operations
5/16	Transit to port for personnel transfer	Preparation for ROV portion of the cruise	Preparations for ROV portions of the Cruise	Transit mapping and sonar testing	Transit to port
5/17 AM	Arrive Norfolk, VA	ROV team arrival set up equipment	Preparations for ROV portions of the Cruise	Mapping personnel disembark	Assist ROV preparations

Table3: Draft table of activities for Sonar Shakedown and Patch Test

ROV Shakedown (~ May 18- June 6, 2013):

Dates	Location	ROV ops	Telepresence	Mapping	Ship
5/17 PM or 5/18 AM	Depart Norfolk, VA	ROV prep; familiarization and training	Preparations for ROV operations	Transit mapping	Transit
5/18	TBD	USBL calibration	Preparations for ROV operations	Support ROV operations	USBL Calibration

5/19-5/24	Dive sites TBD	Continue ROV system tests; ROV dives; ongoing familiarization and training	Support ROV OPS and training; control room familiarization and training; test clearinghouse protocols	Support ROV operations	Support ROV OPS and testing
5/23	Dive Site TBD	ROV shakedown	Live media events with the Aquarium of the Pacific and possibly national media	Support ROV operations	Support operations
Approx 5/25-6/3	Dive Sites TBD	Start 24hr ROV operations. Continue ROV system tests; ROV dives; ongoing familiarization and training	Start 24hr ROV operations. Support ROV OPS and training	Support ROV operations	Support 24hr ROV OPS and testing
6/4	Depart Dive Site	Prepare vehicles and support systems for future cruise	Prepare all systems for future cruises	Transit mapping	Transit
6/6	Arrive port North Kingstown, RI	Prepare vehicles and support systems for future cruise	Prepare all systems for future cruise	Cruise wrap-up	Cruise wrap-up

C. Staging and De-staging

The majority of the staging will be conducted during ROV integration period prior to the dry dock while the ship is alongside in North Kingstown, RI. Only small items are expected to be loaded on the ship after the dry dock is complete. Mission personnel will arrive at the conclusion of the dry dock. The ROV engineers will utilize the personnel transfer alongside time in Norfolk, to position the ROV on deck and conduct any operations requiring the ship's cranes and load any last minute items

De-staging will be minimal. The majority of equipment will remain onboard for the remainder of the OER field season. The ROVs will be secured onboard in preparation for the following mapping cruise. The 20ft container will remain on board for the remainder of the field season.

D. Operations to be conducted

Sonar Shakedown and Patch Test (May 13 ~ 17, 2013**):**

All scientific sonar systems will be tested to ensure that they are in proper working order following the emergency dry dock and sub bottom profiler noise mitigation work. This will include testing the newly installed SVP probe and a multibeam patch test. Ken Nadeau from EEB will be sailing to assess the sub bottom profiler noise mitigation work completed in dry dock. Calibration of the EK60 will be completed during this period.

The patch test will require 12-24 hours to complete and the deepest water possible given the time constraints of the cruise. The ship will be required to run several survey lines repeatedly at different speeds and directions. One or two CTD casts may be required during the multibeam patch test. They will be conducted according the *Okeanos Explorer* standard operating procedure for CTDs.

An EK60 calibration requires the ship to be as quiet as possible in the water. Ideally, the ship will drift or anchor in calm water deeper than 10 m with no propulsion online during the calibrations. Calibration operations can take up to 12 hours. During that time calibration efforts can be suspended to allow the ship to reposition if necessary. The calibration process requires hanging metal or glass spheres overboard and under the ship at varying depths to serve as a reference for the calibration. Detailed instruction regarding calibration can be found in appendix D.

ROV Shakedown (~ May 18- June 6, 2013):

Upon completion of the work required during the alongside personnel transfer, the ship will transit to an area with water 500-1000 meters deep with a relatively flat bottom to conduct a USBL calibration. The ROV team will deploy a USBL transponder attached to an acoustic release. The ship will be required to conduct several passes by the USBL transducers passing it on different sides. Once the calibration is complete the acoustic release signal will be transmitted and the USBL and the transponder will be recovered when it floats to the surface. Detailed instruction on the USBL calibration can be found in appendix F.

Following a successful USBL calibration the ship will commence operational system tests of the vehicles. The initial ROV dives will be conducted in 1000m to 2000m water depth for comprehensive operational system checks of all systems and support equipment. Deck and Bridge personnel will practice underway launch and recovery procedures, and training will be ongoing for ROV positions in the control room. Training will begin for ROV pilots, co-pilots and video engineers on capturing the highest possible image quality during dives.

Once the new ROV system has been demonstrated to be operational, the ship and mission personnel will commence 24hrs ROV operations. There are two goals associated with 24 hour ROV operations. The first is to get the ROV as much bottom time as possible. The second is the determine the outer limits of the ship and ROV team capabilities with regards to around-the-clock ROV operations to better inform future cruise planning. Vehicle launch and recovery will not be purposely be scheduled between 2200 and 0800, however it is likely the vehicle will require recovery during this time occasionally.

Some ROV dives will be conducted in the deepest water feasible given the cruise time frame and location. Due to the nature of a vehicle shakedown, dive locations may need to be selected with minimal lead time (12-24 hour notice of location) in order to use the ship time as efficiently as possible.

There is no plan for systemic mapping while the ROV is on deck, however, some opportunistic mapping data may be collected during transits and overnight as time and staffing allows. The only planned mapping activity during the ROV shakedown will be small area mapping to cover a proposed dive site. Currently there are no plans for CTD operations during the ROV shakedown portion of the cruise, however, CTD operations may be requested if the ROV requires extended down time.

During this cruise the Expedition Coordinator and OER web team will be testing a new method of near real-time updates from the ship. The Expedition Coordinator will be able to generate a RSS feed from the ship that will automatically generate a post with the live video page on the Ocean Explorer website; thus allowing for better situational awareness for internet 1 (I1) viewers who do not have access to the eventlog.

There will be one day of telepresence events coordinated by the Aquarium of the Pacific which will include several separate events throughout the day on May 23. The events may include interviews from the ship with national media outlets and a live press conference. More detail will follow as they become available.

D. Dive Plan

No dives are planned however SCUBA dive operations may be required if there are problems with the SVP probe or the USBL sonar after the emergency drydock or a problem during EK60 calibration.

E. Applicable Restrictions

Conditions which preclude normal operations:

Weather will be the biggest potential hindrance to operations during this cruise. ROV launch and recovery can be limited by even moderate weather and current. Given that this cruise is engineering focused the location of the dives are less important, therefore if an area is forecast to experience conditions outside of the ROV's weather envelope, dive sites in another area will be chosen.

III. Equipment

A. Equipment and Capabilities provided by the ship and OER

Kongsberg EM302 Multibeam Echosounder (MBES)
Kongsberg EK60 Deepwater Echosounder (SBES)
Knudsen Chirp 3260 Sub-bottom profiler (SBP)
TrackLink 10000
Reson SVP 70

LHM Sippican XBT (various probes)
Seabird SBE 911Plus CTD
Seabird SBE 32 Carousel and 24 2.5 L Niskin Bottles
Light Scattering Sensor (LSS)
Oxidation – Reduction Potential (ORP)
Dissolved Oxygen (DO) sensor
Altimeter Sensor and battery pack
CNAV GPS
POS/MV
Seabird SBE-45 (Micro TSG)
Kongsberg Dynamic Positioning 1 System
NetApp mapping storage system
CARIS HIPS Software
IVS Fledermaus Software
SIS Software
Hypack Software
Scientific Computing System (SCS)
ECDIS
Met/Wx Sensor Package
Telepresence System
VSAT High-Speed link (Comtech 10 Mbps ship to shore; 1.54 Mbps shore to ship)
Cruise Information Management System (CIMS)
6000m ROV and various cameras and sensors
Seirios Camera Platform and various cameras and sensors
Acoustic release system

B. Equipment and Capabilities provided by scientist and external programs

Sun photometer instrument provided by the NASA MAN program

IV. Hazardous Materials

A. Policy and Compliance

The Expedition Coordinator is responsible for complying with FEC 07 Hazardous Materials and Hazardous Waste Management Requirements for Visiting Scientific Parties (or the OMAO procedure that supersedes it). By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and the anticipated quantity brought aboard, MSDS and appropriate neutralizing agents, buffers, or absorbents in amounts adequate to address spills of a size equal to the amount of chemical brought aboard, and a chemical hygiene plan. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

Per FEC 07, the scientific party will include with their project instructions and provide to the CO of the respective ship 60 to 90 days before departure:

- A list of hazardous materials by name and anticipated quantity

- Include a chemical spill plan the addresses all of the chemicals the program is bringing aboard. This shall include:
    - Procedures on how the spilled chemicals will be contained and cleaned up.
    - A complete inventory (including volumes/amounts) of the chemical spill supplies and equipment brought aboard by the program. This must be sufficient to clean and neutralize all of the chemicals brought aboard by the program.
    - A list of the trained personnel that will be accompanying the project and the training they've completed.

Upon embarkation and prior to loading hazardous materials aboard the vessel, the scientific party will provide to the CO or their designee:

- An inventory list showing actual amount of hazardous material brought aboard
- An MSDS for each material
- Confirmation that neutralizing agents and spill equipment were brought aboard sufficient to contain and cleanup all of the hazardous material brought aboard by the program.

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory of hazardous material indicating all materials have been used or removed from the vessel. The CO's designee will maintain a log to track scientific party hazardous materials. MSDS will be made available to the ship's complement, in compliance with Hazard Communication Laws.

Scientific parties are expected to manage and respond to spills of scientific hazardous materials. Overboard discharge of scientific chemicals is not permitted during projects aboard NOAA ships.

B. Radioactive Isotopes

NOT APPLICABLE TO THIS CRUISE

V. Additional Projects

A. Supplementary ("Piggyback") Projects

During the cruise the marine aerosol layer observations will be collected for the NASA Maritime Aerosol Network (MAN). Observations will be made by ENS Keith with a sun photometer instrument provided by the NASA MAN program. Delivery of resulting data to the NASA MAN primary investigator Alexander Smirnov will be organized by ENS Keith. All collected data will be archived and publically available at: http://aeronet.gsfc.nasa.gov/new_web/maritime_aerosol_network.html. The equipment is already onboard.See Appendix E for full Survey of Opportunity Form.

B. NOAA Fleet Ancillary Projects

NOT APPLICABLE TO THIS CRUISE

VI. Disposition of Data and Reports

C. Data Responsibilities

All data acquired on *Okeanos Explorer* will be provided to the public archives without proprietary rights. All data management activities shall be executed in accordance with NAO 212-15, Management of Environmental and Geospatial Data and Information [http://www.corporateservices.noaa.gov/ames/NAOs/Chap_212/naos_212_15.html].

Ship Responsibilities

The Commanding Officer is responsible for all data collected for missions until those data have been transferred to mission party designees. Data transfers will be documented on NOAA Form 61-29. Reporting and sending copies of project data to NESDIS (ROSCOP form) is the responsibility of OER.

NOAA OER Responsibilities

The Expedition Coordinator will work with the *Okeanos Explorer* Operations Officer to ensure data pipeline protocols are followed for final archive of all data acquired on the EX without proprietary rights.

Deliverables

a. At sea

- Daily Plans of the Day (POD)
- Daily situation reports (SITREPS)
- Summary bathymetry data files

b. Post cruise

- Refined SOPs for all pertinent operational activities
- Assessments of all activities

c. Science

- Multibeam and XBT raw and processed data
- Mapping report
- ROV dive summary forms
- Dive tracks
- Still Images
- HD footage

Archive

- The Program and ship will work together to ensure documentation and stewardship of acquired data sets in accordance with NAO 212-15. The Cruise Information Management System is the primary tool used to accomplish this activity.

C. Pre and Post Project Meeting

Prior to departure, the Expedition Coordinator will conduct a meeting of the scientific party to inform them of project objectives. Some vessel protocols, e.g., meals, watches, etiquette, etc. will be presented by the ship's Operations Officer.

Post-Project Meeting: Upon completion of the project, a meeting will normally be held at 0830 (unless prior alternate arrangements are made) and attended by the ship's officers, the Expedition Coordinator and members of the scientific party to review the project. Concerns regarding safety, efficiency, and

suggestions for improvements for future projects should be discussed. Minutes of the post-project meeting will be distributed to all participants by email, and to the Commanding Officer and Chief of Operations, Marine Operations Center.

C. Ship Operation Evaluation Report

Within seven days of the completion of the project, a Ship Operation Evaluation form is to be completed by the Expedition Coordinator. The preferred method of transmittal of this form is via email to omao.customer.satisfaction@noaa.gov. If email is not an option, a hard copy may be forwarded to:

Director, NOAA Marine and Aviation Operations
NOAA Office of Marine and Aviation Operations
8403 Colesville Road, Suite 500
Silver Spring, MD 20910

VII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least seven days prior to the survey.

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Expedition Coordinator. The Expedition Coordinator and Commanding Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current make-up of the ship's complement. The Expedition Coordinator is responsible for ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen return; and for the return of any room keys which were issued. The Expedition Coordinator is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the project and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Expedition Coordinator will ensure that all non NOAA or non Federal scientists aboard also have proper orders. It is the responsibility of the Expedition Coordinator to ensure that the entire scientific party has a mechanism in place to provide lodging and food and to be reimbursed for these costs in the event that the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled project.

All persons boarding NOAA vessels give implied consent to comply with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 7, 1999 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, Revised: 02 JAN 2012) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Expedition Coordinator or the NOAA website http://www.corporateservices.noaa.gov/~noaaforms/eforms/nf57-10-01.pdf. The completed form should be sent to the Regional Director of Health Services at Marine Operations Center. The participant can mail, fax, or scan the form into an email using the contact information below. The NHSQ should reach the Health Services Office no later than 4 weeks prior to the project to allow time for the participant to obtain and submit additional information that health services might require before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of the NHSQ. Be sure to include proof of tuberculosis (TB) testing, sign and date the form, and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to sail if a legible email address is provided on the NHSQ.

Contact information:
Regional Director of Health Services
Marine Operations Center – Atlantic
439 W. York Street
Norfolk, VA 23510
Telephone 757-441-6320
Fax 757-441-3760
E-mail MOA.Health.Services@noaa.gov

Prior to departure, the Expedition Coordinator must provide an electronic listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: contact name, address, relationship to member, and telephone number.

C. Shipboard Safety

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) outside of private berthing areas is not permitted. Steel-toed shoes are required to participate in any work dealing with suspended loads, including CTD deployments and recovery. The ship does not provide steel-toed boots. Hard hats are also required when working with suspended loads. Work vests are required when working near open railings and during small boat launch and recovery operations. Hard hats and work vests will be provided by the ship when required.

D. Communications

A daily situation report (SITREP) on operations prepared by the Expedition Coordinator will be relayed to the program office. Sometimes it is necessary for the Expedition Coordinator to communicate with another vessel, aircraft, or shore facility. Through various modes of communication, the ship is able to maintain contact with the Marine Operations Center on an as needed basis. These methods will be made available to the Expedition Coordinator upon request, in order to conduct official business. The ship's

primary means of communication with the Marine Operations Center is via e-mail and the Very Small Aperture Terminal (VSAT) link.

Specific information on how to contact the NOAA Ship *Okeanos Explorer* and all other fleet vessels can be found at: http://www.moc.noaa.gov/phone.htm

NOAA Ship Okeanos Explorer –

OOD Cell Phone:	401-378-7414
Iridium:	808-659-9179
Cell Phone:	401-932-4114
VoIP:	301-713-7772
INMARSAT:	011 870 764 852 328
Quonset Point Land Lines:	401-294-4760 VOICE
	401-294-4591 VOICE
	401-294-4686 FAX
	401-294-4902 VOICE

E-Mail: Ops.Explorer@noaa.gov(mention the person's name in SUBJECT field)
expeditioncoordinator.explorer@noaa.gov - For dissemination of all hands emails by Expedition Coordinator while on board. See ET for password.

D. IT Security

Any computer that will be hooked into the ship's network must comply with the *NMAO Fleet IT Security Policy* 1.1 (November 4, 2005) prior to establishing a direct connection to the NOAA WAN.
Requirements include, but are not limited to:
(1) Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system.
(2) Installation of the latest critical operating system security patches.
(3) No external public Internet Service Provider (ISP) connections.
Completion of these requirements prior to boarding the ship is required.
Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within 3 days of embarking.

E. Foreign National Guests Access to OMAO Facilities and Platforms

NOT APPLICABLE TO THIS CRUISE

Appendix A: Emergency Contact Sheet

EMERGENCY DATA SHEET
NOAA OKEANOS EXPLORER

PRINT CLEARLY

NAME: _____
(Last, First, Middle)

Mailing Address _____

_____

_____
(Other than the ship address)

Phone (Home) _____

(Cell) _____

Date of Birth _____

Emergency Contact: _____
(Name and Relationship)

Address: _____

_____

Phone (Home) _____

(Work) _____

(Cell) _____

Email: _____

Signature _____ Date _____

Appendix B: **Data Management Plan (Will be included in final plan)**

Appendix C: Categorical Exclusion letter

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OCEANIC AND ATMOSPHERIC RESEARCH
Office of Ocean Exploration and Research
Silver Spring, MD 20910

April 1, 2013

MEMORANDUM FOR: The Record

FROM: John McDonough, Deputy Director NOAA Office of Ocean Exploration and Research (OER)

SUBJECT: **Categorical Exclusion for NOAA Ship *Okeanos Explorer* cruise EX1302**

NAO 216-6, Environmental Review Procedures, requires all proposed projects to be reviewed with respect to environmental consequences on the human environment. This memorandum addresses the NOAA Ship *Okeanos Explorer's* scientific sensors possible effect on the human environment.

Description of Project:
This project is part of the Office of Ocean Exploration and Research's "Science Program". It will conduct remotely operated vehicle (ROV) operations and ocean mapping activities designed to increase knowledge of the marine environment. This project is entitled "Ship Shakedown & Patch Test, ROV Shakedown & Field Trials: New England Canyons" and will be led by LTJG Brian Kennedy, an Expedition Coordinator for NOAA OER. The work will be conducted in May and June at various locations along the Eastern Seaboard inside the US EEZ. A tandem 6,000 meter ROV system will be deployed and CTD rosette casts may be conducted during the expedition. The Kongsberg EM 302 multi-beam (30 kHz) and the Kongsberg EK 60 single-beam (18 kHz) will be operated during the project. A Knudsen 3260 Sub-Bottom Profiler will also be operated. Additionally, expendable bathythermographs (XBTs) will be deployed in conjunction with multi-beam data collection. Multi-beam mapping operations will be conducted at all times during the expedition.

Effect of Project:
As expected with ocean research with limited time or presence in the marine environment, this project will not have the potential for significant impacts. Knowledgeable experts who are aware of the sensitivities of the marine environment will conduct the at-sea portions of this project.

Categorical Exclusion:
This project would not result in any changes to the human environment. As defined in Sections 5.05 and 6.03.c.3 (a) of NAO 216-6, this is a research project of limited size or magnitude or with only short-term effects on the environment and for which any cumulative effects are negligible. As such, this project is categorically excluded from the need to prepare an environmental assessment.

Signed: _____ Date: 4/1/13
John McDonough, Deputy Director

Appendix C: Recommended EK 60 calibration plan

Recommended EK 60 calibration procedures are outlined in "Simrad EK 60 Scientific Echo Sounder Reference Manual Release 2.2.0, January 2008."

Location:

It is recommended to conduct calibration at a deep pier facility (with depth > 10 m). If no deep pier facility is available the calibration can be conducted at anchor / while drifting in a location where there is minimal impact by fish (to avoid acoustic interference) and current/sea conditions (to avoid excessive movement which makes the mechanics of the calibration difficult). A final location will be chosen based on the impeding weather conditions and discussions with the ship.

Procedure:

The general procedure to conduct EK 60 calibration is:
1. Secure the vessel in a suitable location (bow/stern anchored in still water that is free of biological scatterers) or drifting in water with minimal currents.

2. Suspend the target sphere and weight (depending on the rigging, it may make sense to do this prior to anchoring).

a) Take a long line with a weight attached to the middle, and drop it down from either the bow or stern.

b) Walk back (or forward) holding the two ends of the line on either side of the vessel, keeping the line/weight clear of the hull (and thrusters, etc.)

c) Attach one end of the line to a pole/reel on the port (or stbd) side of the vessel.

d) Pay out the monofilament on the port (or stbd) side reel, and pull on the opposite side until the monofilament is reached. Detach the line, and attach the two remaining reels (e.g., one reel on port, two on stbd).

e) Attach a piece of monofilament, the calibration sphere, and a weight (weight needs to be at least one pulse length below the calibration sphere) to the point where the monofilament from all three reels are attached.

f) Soap the calibration sphere using ordinary liquid hand soap to avoid bubble development on the surface of the sphere.

g) Lower the calibration sphere over the side until all three lines are equal (ideally, this will place the sphere underneath the EK60 transducer). Ship's drawing will be consulted to precisely position the reels.

h) Adjust the lines in order to do the calibration. Will require someone on each reel, with radios, to make this work well.

i) After the calibration is finished, pay out the line on port side until the stbd lines are vertical. Then reel in on one of the stbd poles while continuing to pay out on port (to avoid tangles with ship).

j) Recover sphere/weight, untie lines and reel in all monofilament. The above methodology is the recommended approach for giving us the best control.

Time estimates:

It could take a few hours to precisely place the sphere under the EK 60. Up to 12 hours on-site may be required to conduct calibration. If additional time is available, it is recommended to collect data from both the EM 302 and the Knudsen while conducting EK 60 calibration in which case it might take up to 24 hours to complete the calibration.

Gear requirement

Kongbserg, Inc will provide with the calibration gear including outriggers, calibration sphere etc. The ship will be required to provide lines and personnel for lowering the gear into water.

Risks:

1. Gear entanglement: The ship's motion during the calibration procedure should be minimal to avoid any gear entanglement. If gear entanglement is suspected, the calibration procedure will be halted and ship's divers will inspect the ship hull for any entanglement.

Appendix E. NASA Maritime Aerosols Network Survey of Opportunity

Survey or Project Name

Maritime Aerosol Network

Points of Contact (POC)

Lead POC or Principle Investigator (PI & Affiliation) Supporting Team Members ashore

POC: Dr. Alexander Smirnov *Supporting Team Members aboard (if required)*

Activities Description(s) *(Include goals, objectives and tasks)*

The Maritime Aerosol Network (MAN) component of AERONET provides ship-borne aerosol optical depth measurements from the Microtops II sun photometers. These data provide an alternative to observations from islands as well as establish validation points for satellite and aerosol transport models. Since 2004, these instruments have been deployed periodically on ships of opportunity and research vessels to monitor aerosol properties over the World Oceans

Appendix F: USBL Calibration Instructions

4 Operation

The user should perform simple calibration as recommended in the TrackLink System User's guide. If any of the heading, pitch or roll offset value is too high, some adjustments are necessary to lower the offset values before running the automatic calibration software. The small installation offset values may improve the quality of the automatic calibration results and decrease the calibration time.

The user should operate the TrackLink system within the beamwidth of the transceiver and the transponder. As an example, the beamwidth coverage of a TrackLink 10000 system with a TN10015C transponder at 800 meters of water depth is a circle at surface with diameter of about 900 meters.

The user shall deploy a transponder fixed at the seabed. The recommended depth of the transponder is 500 to 1000 meters.

The user is advised to maneuver the ship to follow the trails suggested in Figure 1. The user is also advised to start from the edge of the beamwidth coverage and drive the ship towards the transponder. After passing the transponder, the user should keep driving the ship towards the edge of the beamwidth coverage and make a turn slowly towards the position of the transponder. The turn should be made within the beamwidth coverage of the system.

The ship should pass the transponder four times; making two left turns and two right turns. Among these four times, the ship passes the transponder, which should be at the port twice and at the starboard twice. If the ship made a wrong turn and passed the transponder at the wrong side, the user can simply maneuver the ship to make the right move to continue the calibration process. Following the calibration trails suggested exactly is not required, as long as the ship passes the transponder twice at the starboard and twice at the port, and makes two left and two right turns slowly within the bandwidth coverage.

If the user is only interested in calibrating the smaller beamwidth below the transceiver instead of entire beamwidth, the ship can make the turns closer to the transponder and there is no need to drive the ship towards the edge of the beamwidth. In this case, ship time spent on calibration can be saved.

IMPORTANT: Different from many other USBL calibration software, the TrackLink Calibrator does not require the ship to circle around the seabed mounted transponder from far away. It is best to maneuver the surface ship on top of the transponder according to the suggested calibration trails.. This approach significantly reduces the calibration time.

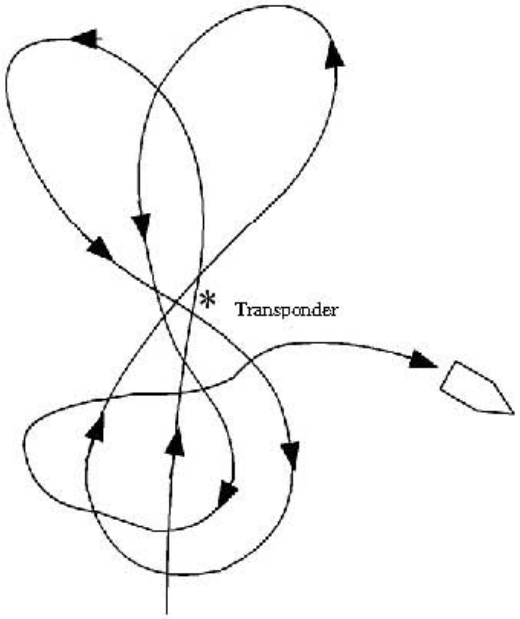

Figure1

IMPORTANT: The accuracy of the compass, GPS, and motion sensor will have direct impact on the quality of the calibration results. Therefore, the user is advised to configure, operate, and calibrate the sensors correctly to maximize the benefits of the automatic calibration process.

The user can observe the positions of the ship and the target from the Ship Track window. The positions of the transponder generated from the TrackLink system will become more accurate as time goes on. The error percentage of the X, Y and Z coordinates will also decrease (refer to Section 5.3 for detail). Generally, with accurate GPS, compass, and motion sensor, the error can be reduced to 0.5 to 1% or better.

After the user stops the calibration, the calibration results will be saved in the c:\tracklink cal\cal res directory. The user can then start the TrackLink Navigator software and load this calibration result into the TrackLink Navigator software for tracking the transponders with improved accuracy.

Okeanos Explorer

EX1302: Ship Shakedown, Patch Test and Exploration, NE Canyons
Data Management Plan

Document Purpose

This document is an addendum to the overarching Okeanos Explorer FY13 Data Management Plan (EX_FY13_DMP.pdf) and is specific to the EX-13-02 mission entitled "Ship Shakedown, Patch Test and Exploration, NE Canyons" For more detailed information on the data management effort for the Okeanos Explorer in FY13, please refer to that document.

General Description of the Data to be Managed

EX1302 operations are expected to begin on May 13 from the dry dock location in Charleston, SC and return June 6, 2013 to North Kingstown, RI. Patch tests will be conducted during the first week of the cruise to verify the equipment is fully functional following the drydock. During the patch tests, data will be collected using the subbottom profiler, the multibeam sonar system, the single beam sonar system, the ship's CTD, and hull mounted atmospheric and sea surface sensors. Upon completion of the patch tests, the new 6000m ROV will be tested. ROV sensor data, broadcast quality video, and screenshots will be captured. In addition to the ProRes broadcast quality video, the streamed H.264 video streams encompassing the full dive will be captured. Data management procedures are fully documented in the data management plan for the *Okeanos Explorer* for the FY13 field season (EX_FY13_DMP.pdf)

- Name of Dataset
  - : "EX1302: Ship Shakedown, Patch Test, and Exploration, NE Canyons"
- Mission Specific Keywords:
  - Place Specific:
    - Blake Plateau
    - Western North Atlantic Ocean
    - US-Canadian territorial boundary
    - Northeast Seamounts
    - New England Seeps
    - Mid-Atlantic Seeps
    - Davisville
    - New England Canyons
    - Mid-Atlantic Canyons
    - Canadian Maritime Border
  - Theme Specific:
    - Multibeam
    - Multibeam sonar
    - Multi-beam sonar
    - Sub-bottom profile
    - Mapping survey
    - Multibeam backscatter
    - Water column backscatter

- Singlebeam sonar
- Singe beam sonar
- Single-beam sonar
- New England Seamounts
- Continental shelf mapping
- EX1201
- EX1204
- EX1106
- EX1205L2
- EX1206
- ACUMEN
- Atlantic Canyons Undersea Mapping Expedition

Summary description: Between May 13 and May 18, shakedown operations will: ensure all scientific sonars are in good working order after dry dock operations; assess noise reduction modifications to the sub-bottom profiler; update software and install new multibeam acquisition computer; conduct multibeam patch test; and calibrate the EK60. After May 18, the new 6000 meter ROV will be put through rigorous engineering tests, calibrated, and exercised. Video acquisition procedures and pathways will be tested on the new system, both in terms of broadcast quality video clips as well as testing the new system to record the outgoing video streams. Ship personnel will be trained on video acquisition and image generation protocols.

- Temporal Bounds:
  - May 13 – June 6, 2013
- Spatial Bounds:
  - Northern: 41.2
  - Southern: 38.4
  - Western: -71.4
  - Eastern: -63.5
- Data Type Collections for Preservation/Stewardship:
  - Multibeam Bathymetry – continuous collection during the duration of the expedition.
  - Bottom Backscatter – continuous collection during the entire duration of the expedition
  - Water Column Backscatter – continuous collection during the entire duration of the expedition
  - Scientific Computing System (SCS) output – continuous collection of navigational, meteorological, integrated oceanographic sensor data
  - XBT – casts will be conducted at an interval defined by prevailing oceanographic conditions, but not to exceed 6 hours. Casts will collect water temperature at depth for sound velocity calculations to maintain multibeam data quality
  - Knudsen CHIRP 3260 –sub-bottom profiler data collected between 1000 and 1800 each day
  - EK60 – single beam sonar for water column features during the entire duration of the expedition
- Data Product/Product Collections for Preservation/Stewardship:
  - Gridded bathymetry (.txt)
  - Gridded bathymetric image (.tif)
  - Fledermaus gridded bathymetry imagery (.sd)
  - Fledermaus gridded backscatter imagery (.sd)

  - Google Earth gridded bathymetry (.kml)
  - ArcView gridded bathymetry (.asc)
  - SCS data output in NetCDF
  - Final Mapping Summary document
  - Final Cruise Summary document
- Volume of Data Expected
  - The volume of data expected from this cruise is approximately 120 GB.
- Personally Identifiable Information (PII) concerns
  - No PII will be included in these data.

Points of Contact

- Overall Point of Contact (POC) for the data:
  - Data Acquisition: EX Mapping Team: oar.oer.exmappingteam@noaa.gov
  - Data Management: OER Data Management Team (oer.info.mgmt@noaa.gov)
- Responsible for Data Quality:
  - Seafloor mapping and water column data:
    EX Mapping Team: oar.oer.exmappingteam@noaa.gov
  - SCS data: Office of Marine and Aviation Operations (OMAO): Lt. Laura Gallant, Okeanos Explorer Operations Officer (Ops.Explorer@noaa.gov)
- Responsible for data documentation and metadata activities:
  - National Coastal Data Development Center (NCDDC); OER Data Management Team (oer.info.mgmt@noaa.gov)
- Responsible for the data storage and data disaster recovery activities:
  - NOAA National Data Centers; National Oceanographic Data Center (NODC), National Geophysical Data Center (NGDC), NOAA Central Library (NCL)
- Responsible for ensuring adherence to this data management plan, including resources are made available to implement the DMP:
  - Data Acquisition: Lt. JG Brian Kennedy, Expedition Coordinator
  - Data Acquisition: Elizabeth “Meme” Lobecker, Mapping Team Lead
  - Data Acquisition: Lt. Laura Gallant, OMAO, Okeanos Explorer Operations Officer
  - Data Management: OER Data Management Team

Data Stewardship

- What quality control procedures will be employed?
    - Quality control procedures for the data from the Kongsberg EM302 is handled at UNH CCOM/JHC. Raw (level-0) bathymetry files are cleaned/edited into new data files (level-1) and converted to a variety of products (level-2).
    - Data from sensors monitored through the SCS are archived in their native format and are not quality controlled.
    - Data from XBT firings are archived in their native format and are not quality controlled.
- What is the overall lifecycle of the data from collection or acquisition to making it available to customer?
    - All ship data from this mission is expected to be archived and accessible within 60-90 days post-mission.
    - METOC data from the SCS are converted in a post-mission model into archive-ready compressed NetCDF3 format and stored within the NCDDC THREDDS open-access server.
    - CTD data from casts are processed in a post-mission model and converted into archive-ready compressed NetCDF3 format and stored within the NCDDC THREDDS open-access server.

Data Documentation

- An ISO format metadata record to document the mission will be generated during pre-cruise planning and published in an OER catalog for public discovery and access. Documentation templates will be provided for post-mission products with references back to the overall mission metadata documents. Data collections and products will be documented with ISO or FGDC CSDGM metadata and published at the appropriate NOAA Data Center.
- ISO 19115-2 Geographic Information with Extensions for Imagery and Gridded Data will be the metadata standard employed.

Data Sharing

- All data recorded, observed, generated or otherwise produced on the *Okeanos Explorer* are considered non-proprietary and will be made available to the public as soon as possible after a period of due diligence in performing quality assurance and data documentation procedures.

Initial Data Storage and Protection

- Data are recorded and stored on NOAA shipboard systems compliant with NOAA IT procedures. Data are moved from ship to shore using a variety of standard, documented data custody transfer procedures. Data are transferred to NOAA data centers using digital and physical data transfer models depending upon data volume.

Long-Term Archiving and Preservation

- Data from this mission will be preserved and stewarded through the NOAA National Data Centers. Refer to the *Okeanos Explorer* FY13 Data Management Plan (EX_FY13_DMP.pdf) for detailed descriptions of the processes, procedures, and partners involved in this collaborative process. Appendix A has an excerpt from EX_FY13_DMP.pdf) that illustrates the data and product pipelines that will be employed for this mission.

Data Management Objectives

The DMT's specific objectives for this mission are:

- Test dual video stream capture and consolidation protocols.
- Integrate captured streams into hourly ship to shore rsync
- Usage test of Rsync rule interface
- Ensure that the new ROV is integrated into the existing data workflow
- Explore possibility of dual mode rsync protocol to maximize the available bandwidth

The DMT's common objectives for this mission are:

- Ensure the near real-time update of the *Okeanos Atlas* with
    - Ship track and hourly observations received via email.
    - Daily logs pulled from URI through RSS feeds and links to related images on oceanexplorer.noaa.gov website.
    - Daily cumulative bathymetric image overlays received via URI SRS.
- Execute multibeam and oceanographic data pipelines according to the FY13 DMP (EX_FY13_DMP.pdf).
- Develop ISO metadata for collection-level and dataset-level records collected from the ship (multibeam, singlebeam sonar, sub-bottom profiler, XBT, CTD, EX METOC,)

Expedition Principals for Data Management

Webb Pinner, OER Telepresence, EX Data and Information Lead, Webb.Pinner@noaa.gov
Sharon Mesick, NCDDC, Federal Program Manager, Data Management IPT Chair, Sharon.Mesick@noaa.gov
Susan Gottfried, NCDDC, OER Data Management Coordinator, Susan.Gottfried@noaa.gov
Andy Navard, NCDDC, Okeanos Atlas Developer, Andrew.Navard@noaa.gov
Dan Price, NGDC, Geophysical Data Officer, Daniel.Price@noaa.gov
Tom Ryan, NODC, Oceanographic Data Officer, Thomas.Ryan@noaa.gov
Anna Fiolek, NCL, Multimedia Librarian, Anna.Fiolek@noaa.gov

Appendix A: Data and Product Pipelines (excerpt from EX_FY13_DMP.pdf)

A. Oceanographic/Meteorological/Navigational Data Archive Pipeline

Data from hull-mounted and off-board oceanographic and meteorological (METOC) sensors; integrated oceanographic sensors from the submersibles; and navigational instrumentation on both the vessel and its submersibles are monitored through the ship's Scientific Computer System (SCS). Some of these data will be used in a near real-time mode to update the *Okeanos Atlas*. All of these data will be archived at the National Oceanographic Data Center (NODC) Marine Data Stewardship Division (MDSD) in Silver Spring, MD. A cruise-level and several collection level metadata records describing the data inventory to be archived at the NODC/MDSD will be included with the data submission.

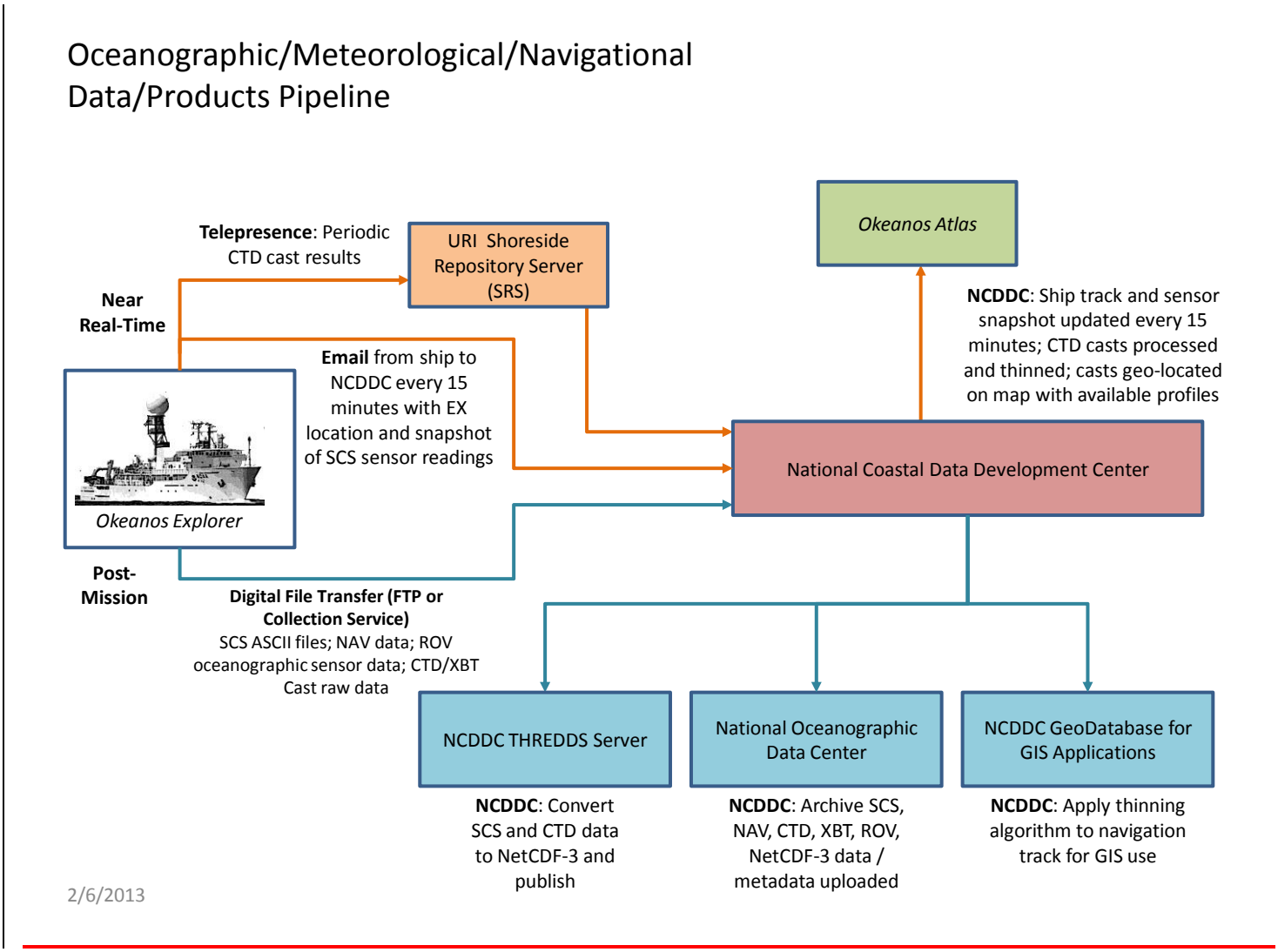

Fig 4: Okeanos Explorer Oceanographic Data Pipeline

Near Real-Time:

At periodic (currently fifteen minutes) intervals, an email from the ship to NCDDC is delivered with the ship's position and a snapshot of the SCS sensor suite.

As CTD casts are deployed, the results of the cast are included in the periodic synchronizations to the SRS.

The GIS team at NCDDC processes:

- CTD cast data into thinned profiles for comparison to World Ocean Atlas historical profiles in the same region and month. The thinned profiles are geo-located on the *Okeanos Atlas*. The corresponding temperature profile plot from the World Ocean Atlas is added for comparison.
- Ship track and sensor snapshot readings are geo-located on the *Okeanos Atlas*.

Post-Mission

All SCS data, including navigation and CTD/XBT cast data are delivered to NCDDC either via ftp or through a Collection Service.

SCS navigation data are used to apply a thinning algorithm and return an optimized thinned navigation track, which is added to the GeoDatabase for GIS applications.

Using the SCS configuration file, a header line is appended to each SCS ASCII data file.

All of the SCS data files are used to generate an archive-ready compressed NetCDF-3 formatted file.

The CTD Cast raw data are used to generate a second NetCDF-3 formatted file.

ncISO metadata records are generated for the NetCDF-3 files, and FGDC CSDGM metadata records are generated for the SCS ASCII files, the NAV data set, and the CTD and XBT data sets.

All data sets and the corresponding metadata are uploaded to the National Oceanographic Data Center (NODC), where they will be accessioned and archived.

The NetCDF3 file will be ingested into an NCDDC hosted Thematic Real-time Environmental Distributed Data Services (THREDDS) server for user discoverability and access.

Data Class	Instrument	Data Type	Format	Metadata Granularity	Archive Center
OCN/ MET	All SCS monitored sensors	Meteorological and Oceanographic data sensors	ASCII	1 meta rec	NODC/MDSD
NAV	DGPS, CNAV	EX, ROV, and sled navigation	ASCII	1 meta rec	NODC/MDSD
ALL	All	Archive Ready	NetCDF-3	1 meta rec	NODC/MDSD

Table 3: Oceanographic/Meteorological/Navigational Metadata Granularity and Target Archive

B. Multibeam Survey Data Archive Pipeline

The multibeam survey data collected by bottom-looking and complementary sensors, data from the calibration instruments, and the products generated after the data is returned to and post-processed at UNH will be archived at the NGDC. These data will be accompanied with a collection level metadata record for the NGDC as well as individual metadata records for each raw (level-0) file, each edited (level-1) file and each data product (level-2) and report (level-3) generated as a result. In addition, the submission to NGDC will include the following:

- raw (level-0) mapping survey and water column data files,
- CTD and/or XBT profile data used for calibration in multibeam survey,
- post-processed, quality assured, and edited (level-1) data files,
- specific data products (level-2) from the Fledermaus software, including cumulative GeoTIF images, gridded bathymetric files, KML files, KMZ images, .sd output files, and an ArcGrid format, and
- comprehensive mapping survey data summary (level-3) report.

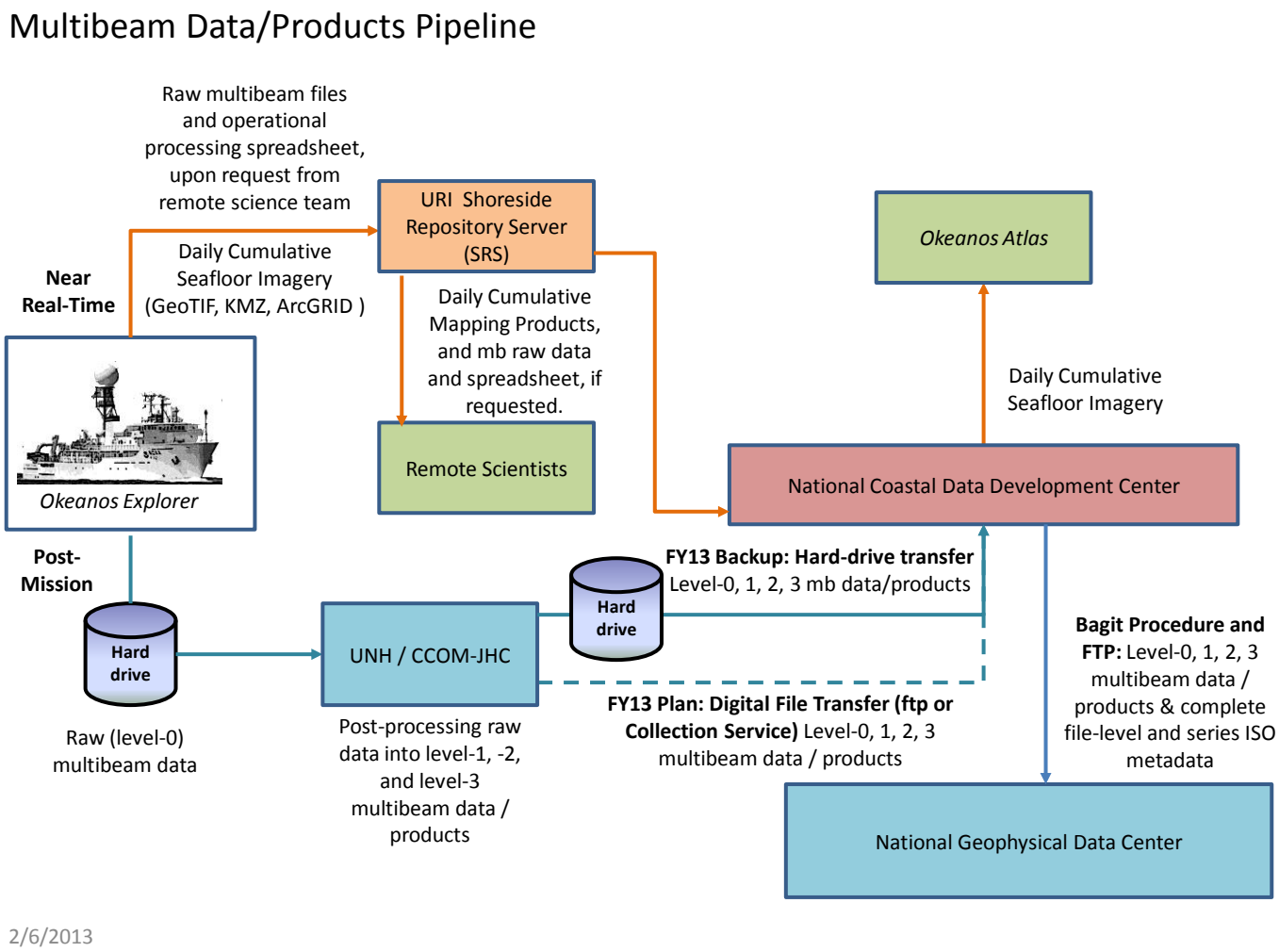

Fig. 5: Okeanos Explorer Multibeam Data Pipeline

Near Real-Time

If the remote science team has requested that some raw multibeam data be transferred in near real-time to the SRS, the raw data and a current copy of the processing spreadsheet will be transmitted during the Rsync process.

As operational GeoTIFF images are created, these will also be transmitted to the SRS by the Rsync process.

The data management team at NCDDC will pull the GeoTIFF images and the operational bathymetry processing spreadsheet for near real-time metadata generation. Participating scientists wanting access to the raw multibeam in near real-time can pull the individual files with the metadata that provides operational and provisional processing steps and a disclaimer for non-QC status of the data.

Daily cumulative GeoTIFF images of the seafloor imagery will be geo-located on the Okeanos Atlas by the GIS team at NCDDC.

Post-Mission

All bottom-looking sensor data and complementary data (water column and sound velocity) are saved to a hard-drive. This hard-drive will be either brought back or shipped to the University of New Hampshire Center for Coastal and Ocean Mapping (UNH CCOM) for post-processing.

A full complement of multibeam data from a 30-day EX cruise on which the Kongsberg EM302 multibeam system runs continuously will produce 200-300 Gigabytes of raw multibeam (37.5% of total volume) and water column data (62.5% of total volume). At UNH, the mapping team will post-process the multibeam data through the following steps:

- The raw (level-0) data will be saved to the CCOM file servers, where they will be quality checked and post-processed.
- The edited level-0 data is saved as level-1 data files in a non-proprietary format – ASCII xyz files (cleaned not gridded).
- The post-processing steps used to produce the level-1 data will be documented.
- Level-2 products will be generated from the level-1 data files.
- The post-processing steps used to produce the level-2 data products will be documented.
- The level-1 data, level-2 products, post-processing steps, and working data processing spreadsheets will be copied to the hard drive in a new folder. A processing spreadsheet for FY13 will contain the temporal and spatial limits of each file and any supplemental information documenting problems or issues that affected the quality of the data in that file.

In FY13, an attempt to use an ftp protocol or collection service to transfer the multibeam data and products from UNH is planned. A normal hard-drive delivery will remain in effect as a backup until the digital file transfer process is sufficiently tested and becomes normal operations.

At NCDDC, all multibeam related files will be post-processed through metadata generation procedures. Metadata will be generated for each individual survey track file (level-0 and -1), for accompanying CTD/XBT profile data sets, for composite xyz files, KMZs, GeoTIFs, png images, and Fledermaus output (level-2), and a set of data products and reports (level-3). Finalized data/metadata will be compressed and bundled using the Bagit software and delivered to NGDC via ftp protocol.

Data Class	Instrument	Data Type	Format	Metadata Granularity	Archive Center
GEO	Kongsberg EM302 (30 kHz)	Multibeam Bathymetry, Bottom Backscatter, Water Column Backscatter (proprietary format read into MBSystem)	.all, .wcd (proprietary)	1 meta rec per .all file in Multibeam Data folder and subfolders	NGDC
GEO	Simrad EK60	Singlebeam (time,depth)	.txt, (ASCII), .raw (proprietary)	Included in the SCS feed	TBD
GEO	Knudsen CHIRP 3260 (3.5 kHz)	Sub-bottom profile	.sgy, .kea, .keb (proprietary)	1 meta rec = Subbottom Profile Data folder	NGDC
OCN	SeaBird SBE-911plus	CTD Cast	.hex, .con (Proprietary); .cnv, .hdr, .bl, .jpg (processed)	1 meta rec = CTD folder	NGDC
OCN	Sippican MK-21 eXpendable BathyThermograph (XBT)	XBT	.edf (ASCII), .rdf (proprietary)	1 meta rec = XBT folder	NGDC
OCN	RESON	Sound Velocity (m/s)	TBD	1 meta rec = RESON folder	NGDC
OCN	Calculated	Sound Velocity (m/s)	.asvp (ASCII)	1 meta rec = Profile_Data/SVP or Profile_Data/ASVP	NGDC

Table 4: Multibeam Survey Metadata Granularity and Target Archive

C. Video Data Archive Pipeline

Low-resolution video segments will be archived at the NOAA Central Library (NCL) in Silver Spring, MD, a division of NODC. All available resolutions of the underwater video and their metadata will be temporarily stored in private and dedicated storage space on the NODC server and periodically backed up in a scheduled tape rotation.

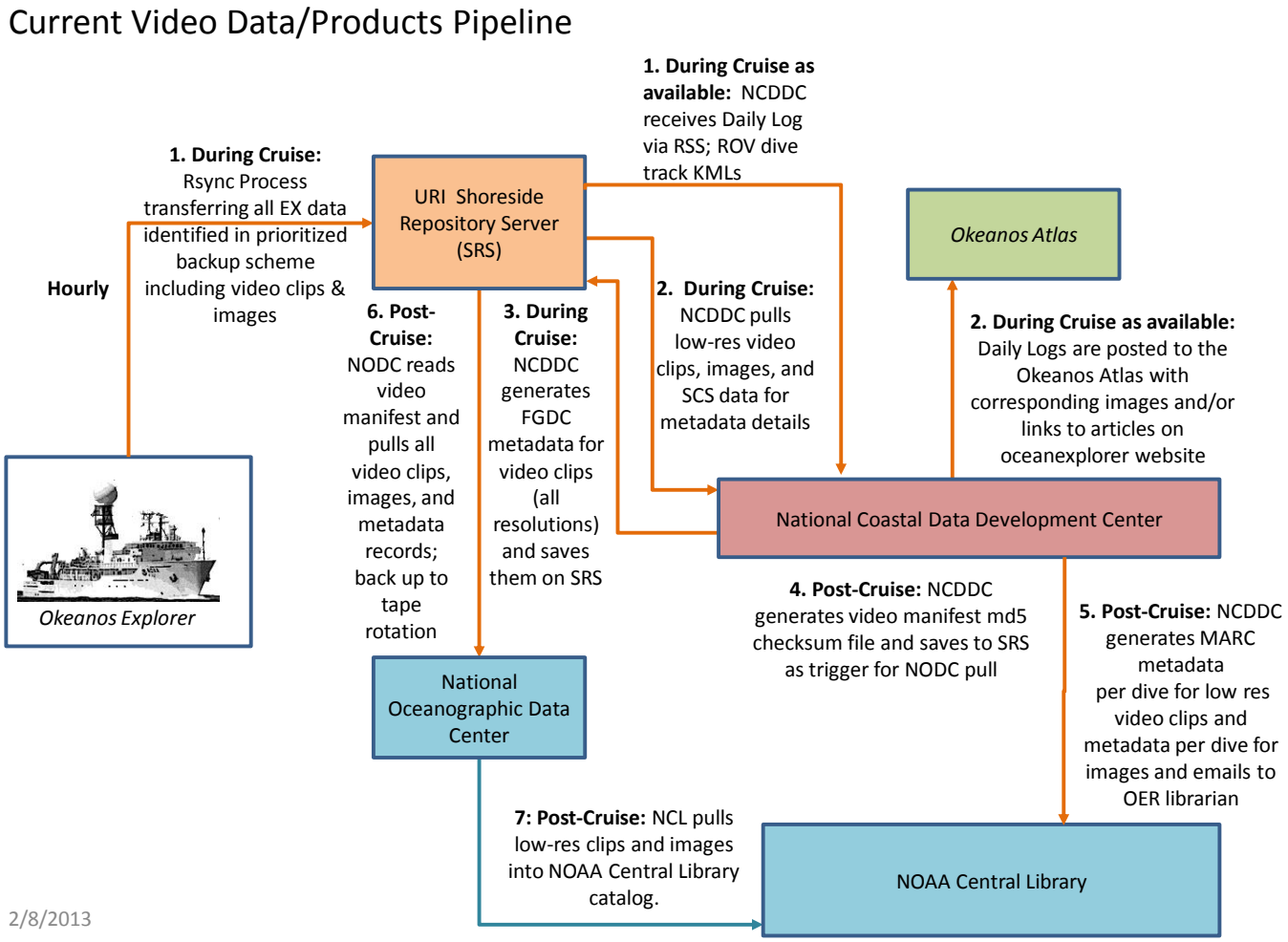

Fig 6: Okeanos Explorer Video Data Pipeline

Near Real-Time

Video segments to be preserved will be marked and saved onboard the EX by onboard videographers through collaboration with the onboard and remote science team. These clips will be saved with embedded metadata – cruise ID, camera ID, date/time, lat/lon, and file name and saved in the Ship Board Repository Server (SBRS). These enhanced multimedia files will be transmitted via an automated process (outlined in Section VI-B) to the Shoreside Repository Server (SRS) and saved in web-streaming low-resolution quality and, if possible, a medium-to-high resolution. The files will be named using a strict naming convention outlined in the "Okeanos Shore-Side FTP Server Standard Operating Procedures" document and in Section VI-C of this document.

Low-resolution video clips and images will be downloaded by NCDDC from the SRS for metadata generation routines. Image and video files will have embedded metadata and the file name will also include fields for the metadata.

Daily logs generated by the Expedition Coordinator will also be pulled from the SRS as they become available. Dive tracks in kml format are pulled from the SRS as they become available.

Daily Logs and representative images and dive tracks and links to representative video clips are displayed on the Okeanos Atlas,

The embedded information and the file names of the downloaded low-res video clips will be used in the routines to produce the FGDC metadata for each. An FGDC metadata record will also be generated for the medium-to-high resolution counterpart to the clip, although that clip will not be downloaded from the SRS. The generated metadata records will be named similarly to the video clips they represent and all metadata will be uploaded to the SRS in the same folder with the video clips. A manifest file with md5 checksum values will be generated daily for all of the video clips and metadata records available on the SRS. The manifest file will be uploaded to the SRS.

Post-Mission

At the end of the mission, MARC metadata for each dive will be generated for video clips and framegrab images. All MARC metadata records are emailed to the NOAA Central Library for the mission catalog.

A final manifest file and md5checksum file are generated and uploaded to the SRS.

NODC automated routines will be in place to recognize when the md5 checksum file is available for processing. Video clips and corresponding metadata will be saved to NODC dedicated storage space and backed up to tape until such time that a permanent solution to high-definition video archive is available.

The NOAA Central Library will pull all of the low-res video clips from the NODC server and do a bulk ingest into their system, cataloging these clips by corresponding dive in their online video data management system (VDMS).

Data Class	Instrument	Data Type	Format	Metadata Granularity	Archive Center
MUL	ROV/Sled Cameras	Low-res video clips	h.264 low	1 MARC meta rec per each dive	NCL
MUL	ROV/Sled Cameras	Medium-res video clips	h.264 med	1 FGDC meta rec per each	NODC/MDSD (temporary hold)
MUL	ROV/Sled Cameras	Highlight Images	.jpg	1 MARC meta rec for the folder	NCL
MUL	ROV/Sled Cameras	Still images	.jpg	1 MARC meta rec for the folder	NCL
MUL	Topside Cameras	Still images	.jpg	1 MARC meta rec for the folder	NCL

Table 5: Video Metadata and Target Archive