Inaugural meeting of the Ocean Observatories Initiative Facilities Board (OOIFB) May 18-19, 2017 at the National Science Foundation 7th Floor - Room 730

Meeting Minutes

Goal of meeting -

- Familiarize the Board with OOI, the role of OOIFB, and our Terms of Reference
- Discuss and agree on OOIFB activities thru May 2018
- Stay focused on the future

May 18 Thursday

Goal of Day One -

- Understand our Terms of Reference from NSF
- Develop common understanding of the OOI, its observing systems and the user interface to data and information.
- Review OOI science documents and determine path forward for updating them or creating new ones.
- Learn about past interaction with user community and determine future activities.
- Become aware of major issues such as how to keep OOI on cutting edge yet meet the long-term science requirements; the impact of new technology; and determine OOIFB role.

Appendices (Meeting Presentations:

01_OOIFBmi_Chair_NSF_Reports_May2017.pdf

- 02_OOIFB_PMO_Report_May2017.pdf
- 03_00IFB_Sensor_and_Instrument_Overview_May2017.pdf
- 04_OOIFB_EnduranceArray_May2017.pdf
- 05_OOIFB_PioneerArray_May2017.pdf
- 06 OOIFB GlobalArray May2017.pdf
- 07_OOIFB_CabledArray_May2017.pdf
- 08_OOIFB_CI_SystemsEngineering_May2017.pdf
- 09_OOIFB_CI_Data_Mgmt_Education_May2017.pdf
- 10_OOIFB_User_Engagement_May2017.pdf
- 11_OOIFB_User_Engagement_Cabled_May2017.pdf

Special Notes:

- The Day-1 agenda included presentations as well as discussions. The discussions are shown in blue text.
- Many of the "parking lot" items are highlighted in "yellow."
- Day-2 was spent mostly in discussion. Only action items are shown in blue text.

Summary of Major Action Items:

Action: OOIFB- 2017-1: Form an OOIFB Ad-hoc Working Group on Data Dissemination and Cyber Infrastructure (DDCI)

DRAFT Charge of the OOIFB Ad-hoc Working Group on Data Dissemination and Cyber Infrastructure (DDCI):

To facilitate the assessment of OOI data quality by the scientific community, and to accelerate the integration of OOI infrastructure usage into project proposals and scientific publications, the OOIFB will establish an ad-hoc Working Group to identify near-term obstacles to the delivery of data to the science community and to create recommendations for removing these obstacles.

The Data Dissemination and Cyber Infrastructure (DDCI) Working Group will include subject matter experts and cyber infrastructure (CI) experts to review the current status of the CI component of the OOI and the existing development plans. OOIFB members Tim Crone and Jim O'Donnell will serve as co-chairs, and Brian Glazer will serve as a member. Representatives of the Marine Implementing Organizations, and representatives of earlier CI Review Panels will be included as members. Representatives of the OOI CI team will be asked to participate. There are other operational systems that aggregate and disseminate marine, earth and atmospheric sciences data and the DDCI Working Group will consider input from those enterprises. The Working Group will report to the OOIFB in August 2017.

Action: OOIFB- 2017-2 – Refresh OOI Traceability Matrices and Create a Conceptual Diagram of relative O&M costs versus relevance of OOI Infrastructure assets Charge:

- Step 1: Refresh the traceability matrices that are included as Appendices in the document, *Ocean Observatories Initiative (OOI) Scientific Objectives and Network Design: A Closer Look,* 2009.
- Step 2: Create a figure (or figures) similar to Figure 3.9 of the Sea Change: 2015-2025 Decadal Survey of Ocean Sciences NAS report that focuses on OOI Infrastructure. Figure 3-9 is a conceptual diagram of relative operation and maintenance costs versus relevance of infrastructure assets.
- Timeline The refreshed matrices and figure are needed for the November NSB meeting. Preliminary data is needed by the summer.
- OOIFB should hold a web conference in 3 to 4 weeks.

Suggestions for future OOIFB action items:

Action: OOIFB- 2017-3 (pending FB discussion) – Establish policies for adding infrastructure to arrays:

It is important to have clear guidance regarding the processes by which instruments may become core infrastructure.

How will priorities be established for adding infrastructure onto arrays or into array space if there are space-instrument restrictions (e.g. three PI's would like to put an instrument at the same place, on the same port, one instrument interferes with the other instruments etc.)? As a follow-on, when infrastructure is full (e.g. all ports are used), how will additional infrastructure be added to expand the networks (e.g. additional moorings, additional junction boxes)?

Action: OOIFB- 2017-4 (pending FB discussion)- Form Sensor Working Groups: It would be good to establish sensor working groups that could focus on the data evaluation that would inform on both data quality and possible refresh. Early in the program (e.g. the subcommittees formed as part of the Science Technical Advisory Committee – 80 community members as volunteers) there were very successful working groups focused on engineering, science, modeling etc.

Meeting Notes

0815 Introductions

Welcome from Scott Borg, Assistant Director (acting) Geosciences. He expressed his appreciation to the OOIFB members and welcomes their feedback.

Welcome from OOIFB Chair – Larry Atkinson

- Larry's slides are included as Appendix I.
- Larry reviewed the agenda. The agenda will be revised as needed throughout the meeting.

Around the room introductions – Participants provided self-introductions. The participant list is included as an Addendum to these minutes. Many program officers from NSF were in attendance.

OOIFB Terms of Reference Overview, Transition, and other topics- Rick Murray

- There are three major NSF OCE Large Programs the Drill program, OOI, and the Academic Research Fleet
 - OOI was the only large program that did not have its own committee for input and guidance.
 - OOIFB is the highest board for OOI.
 - OOIFB brings OOI in line with the other major facilities of NSF in terms of external guidance and oversight.
- Rick's slides are included in *Appendix I*.
- The OOIFB Terms of Reference were reviewed:
 - General Purpose
 - Mandate

- Structure
- o Membership
 - 7 non-conflicted scientists
 - 2 members from OOI Operator Deb Kelley and Sherri White
 - NSF hopes that OOIFB decisions will be made by consensus. By having the operator reps on the committee, they can bring reality/checks to decisions.
 - Tim Crone will there be times with the operator reps would be asked to be excluded from discussions?

• Rick – it would be the rare exception at this point.

- Committee chairs will be considered non-voting members
 - These are the subcommittee chairs.
- Non-member liaisons to OOIFB perhaps UNOLS reps.
- Non-member observers will include reps from NSF
 - Lisa Since this is the first meeting, only NSF OCE Program Officers were invited. Other parts of NSF are interested, but for this first meeting, basic organization plans needed to be discussed.
- The first OOIFB Chair, Larry Atkinson, was, appointed by NSF
- Going forward, the OOIFB will seek its own chair and members.
- Meetings, decisions, and reporting
 - The OOIFB operating year is the calendar year.
 - NSF suggests the OOIFB annual report before the fall AGU meeting.
- Modification and discontinuation of the OOIFB
- OOIFB Administrative Support Office
 - Must be unconflicted with the OOI operator
 - OOIFB Admin office to be funded by NSF to support meetings, travel, workshops, and Chair support.
 - NSF will advertise the OOIFB admin office soon
 - Thanks to UNOLS for agreeing to serve in ASO role for first year
- OOI Graphical Relations chart showing OOI relationships
 - NSF provides the funding to OOI lead operator.
 - Information flows between OOIFB, NSF, and OOI Operator

Discussion:

- Larry Atkinson OOIFB will not review proposals.
- Jim O'Donnell where does the NSF Program Officers and the scientists fall in the relationships?
 - Rick NSF will be able to provide information on the number and types of proposals being funded. They will also be able to report on proposal pressure.

- Lisa NSF will provide Award information. Members of OOIFB as individuals might be on review panels, but specific proposal information will not be provided to the FB.
- Rick the OOIFB will serve as community ambassadors. We hope that the community will reach out to the OOIFB members.
- Jim O it is important for the FB also know the rate of decline of proposals- NSF - will report out on success rates relative to OCE averages.
- Deb Kelley about three times a year the OOI operators holds webinars. Community members learn about what is feasible in terms of instrument/sensor additions, etc. If sensors will be added to the array, the PI needs to know if it is feasible. If a sensor addition is feasible, the PI will receive a certificate of technology feasibility from the OOI operator that the PI will attach to his/her NSF proposal.
- Rick Murray– Larry is the main point of communication to the Operator.
- Bob Houtman the OOIFB does not "direct" the OOI operator, they provide input and guidance.
- Rick COL has indicated that they will not compete for the operation of OOI. In 2016, NSF put out a solicitation for a new operator and applications have been received. The current operator contractor ends in 12/17. The selection will have to be approved by NSB, which would happen in fall 2017. Until that time, the selection will not be public. There will be a 6-month transition period.

Trends and Awards (including LTER) - Lisa Clough provided the report

- The data is available to everyone.
- Digital Object Identifiers (DOI) are a priority
- The OOI operation and maintenance support comes from NSF IPS.
- The science funding comes out of NSF's core science programs. There is not a designated OOI program office that will support OOI proposals.
- Lisa did a proposal search today and there were 1600+ hits for observatory proposals; however, the search needs to be filtered to be more specific for OOI.
- Lisa described some of the OOI awards that have been made:
 - There were several awards by MG&G to use the cabled array.
 - William Wilcock, Cabled Array
 - Enhancements of the array at Axial Bill Chadwick
 - MG&G/OTIC Tim Crone received an award. Tim explained his proposal is to put a computing system on the video system on the Axial Seamount cabled array. They have a front-end computer that allows people to log-in and then do science using the video data. This could apply to many disciplines.
 - There was a 2014 award to a Physical Oceanographer for the Pioneer Array data.
 - Mete The Program Officers have told PIs to check with OOI to make sure that the OOI data will be available to support their proposed research program.

- Chemical Oceanography Clare Reimers received an award that is in the vicinity of the Endurance Array. It will enhance her non-OOI data set.
- Biological Oceanography WHOI has been awarded an LTER. The LTER is a long-term program. This will tie data from the Pioneer Array, Martha's Vineyard observatory, and LTER.
- She is seeing roughly a 20% success rate in OOI proposals, comparable to non-OOI proposal rates (MG&G OOI submissions seem to have a higher than average success rate).
- The Germans are interested in putting instruments on the cabled array.
- ONR is interested in putting a project on the cabled array
- NOAA Has interest in OOI data (Northeast Pacific 'Warm Blob' related)
- Discussion:
 - Annette how does the international community and other agencies interact with OOI? Are they required to have certificates of feasibility? Who is overseeing this?
 - Greg Ulses A lot of information for NSF proposals is on the OOI website.
 - Lisa This is a topic that should be added to the "Parking Lot" flip chart. There are a variety of issues that need to be addressed – feasibility, permits, etc. This is the sort of architecture that needs to be built. The data is the "easy" part.
 - Kendra Daly Would an international partner need to pay their share for modifications? Rick – the country would have to pay their incremental costs.
 - Sarah Gille Are there NSF metrics to measure success for OOI? Rick NSF doesn't really have a metric. OOI will likely be transformational.
 - Bob Houtman there will be value beyond the US science community the public, the international community. Metrics are difficult.
 - Lisa Clough there have also been some education awards made to Rutgers (REUs and Community colleges)
 - Lisa will send to OOIFB a packet of the award abstracts for OOI Science and Education before the next OOIFB meeting

Brief history of OOI focusing on initial vision, construction, O&M phase and now the transition – Larry Atkinson provided the history (see *Appendix I*)

Deadlines/Critical Points in coming 2 years – Atkinson

- In general, OOIFB should meet on a schedule to provide input to both the development and the revision stages of the OOI Annual Work Plans.
 - Bob Houtman explained that the OOI operator provides the draft work plan to NSF by Aug 1, with the finalized annual workplan submitted in November, and certainly prior to the upcoming calendar year (the OOI work plans operate on a calendar basis). A late spring meeting can

contribute to development of the AWP, and a fall meeting would allow input on the draft plan prior to finalization.

 2017 is a bit different because of the re-competition- NSF will be presenting an information item to the National Science Board (NSB) in August 2017, and will be formally presenting our recommendation for the new O&M award to the NSB in November. An October 2017 OOIFB will allow NSF to report on OOIFB activities at the Nov NSB meeting, and will allow OOIFB to comment on the draft Project Year 9 (the transition year) annual work plan.

Break

Rationale, Status and Modifications of OOI Assets:

Introduction by Greg Ulses (COL) – His slides are included as **Appendix II.** Greg's report covered:

- What is OOI
- OOI Infrastructure
- OOI Planning and history
- OOI Mandates these mandates determined the OOI design.
- Work plan All OOI work being done this year is in accordance with the work plan that was presented last year. The OOI Operator is tracking progress. When changes to the AWP are needed, changes are submitted as engineering change requests with associated cost estimates.
- Turns all of the OOI program operations/servicing are referred to as turns.
- Recent OOI Highlights:
 - OOI is operational. MREFC construction was completed in 2016, and 2016 is designated as the first year of full operations.
 - Data is flowing from 89 platforms, carrying 857 instruments, providing over 100,000 scientific and engineering data products.
 - In 2016 all 9 planned "turn cruises" were completed.
 - All planned 2017 cruises are on schedule (1 complete).
 - Cyber Infrastructure CI had significant changes over the course of MREFC. It is reason to think of CI as lagging infrastructure by 12 to 16 months. It is now working and there have been measurable success stories.
 - Now that they are operational, there are opportunities for partnerships and engagement
- Science Oversight Committee (SOC)
 - Internal to OOI
 - SOC serves as the primary scientific advisors to the COL OOI Program Director (Greg).
 - Membership:

- Four scientists, one each from Pioneer, Endurance, Global, and Cabled Arrays
- Two reps from Cyber Infrastructure (CI) Team
- The COL OOI Program Director
- Ad Hoc Members (UNOLS OOSC, NSF/OCE)
- Current Roles and Responsibilities
 - Develop and maintain the OOI Science Plan (consisting of science themes, focus areas, and objectives) (transitioning to OOIFB) – this will be off SOC's plate)
 - Ensure that the Science Plan serves as the basis for OOI operations (provide input to the OOI Annual Work Plan)
 - Evaluate OOI operations and engineering to ensure that OOI scientific goals and objectives are being optimally achieved
 - Provide feedback on the performance of OOI marine and cyber infrastructure
 - Lead outreach to the scientific community from within the OOI program (conduct and support workshops, user engagement, etc.)
- Some of the SOC roles will transition to OOIFB; others may be shared by both OOIFB and SOC. What is the way ahead for the SOC? Align with and complement OOIFB?
- OOI Priority Next Steps there will be a transition to the new operator. COL will continue to assist and operate to the work plan.
 - Cyber Infrastructure upgrades and enhancements are the operator's top priority
 - In 2018, the solicitation called for the O&M budget to be reduced by 20%
 What will the steady state operations look like? These are the things that the operator is looking at to determine how much it costs to run OOI.
 - They will evaluate lessons learned.

OOI Instrument Overview – Greg Ulses (COL) provided the report. His slides are included as *Appendix III*.

- OOI has approx. 900 instruments deployed worldwide, on moorings, cabled sites, and mobile assets.
- Not all of these instruments are working at any given time
- Many of the sensors, instruments, and mobile assets were designed specifically for OOI, and are being deployed, operated, and evaluated in ways that are unique to OOI. The operational availability hasn't been able to be fully evaluated over the last year or two. Some instruments still have teething pains.
- OOI is pushing (and redefining) the outer boundaries of extended operations in harsh environments, at great depths, etc.
- In many cases OOI is also ordering unprecedented quantities of some sensors and instruments, pushing vendors to "tool up" for large volume production and extensive long term refurbishment support, quality control and assurance, etc.

- Following extended evaluation OOI is beginning to develop an emerging sight picture of some sensors and instruments, which are "problematic." They are actively engaged with vendors to correct shortfalls as able, and will engage with NSF as needed (through Engineering Change Requests) to replace and refresh the technology. This is an extensive process.
- OOI Core Science Instrument Issues A slide with some examples of specific issues and their statuses was provided.
- Ocean Gliders:
 - OOI operates a fleet of 64 Slocum Gliders
 - 24 Coastal Gliders, 40 Open Ocean Gliders (new Glider variant, designed specifically for OOI)
 - Since 2014, 15 Gliders have been lost (2 Coastal, 13 Open Ocean)
 - With Gliders, in particular, OOI is pushing (and redefining) the outer boundaries of extended operations in harsh environments. They are deploying Gliders longer and doing more with them (acoustic data mules) than any other operational science program.
 - During initial design reviews and analysis of alternatives, as far back as 2011, risk of Glider loss was understood, and documented (projected loss rates of up to 20% per year).
 - OOI PMO and WHOI (Glider lead) have been conducting a comprehensive investigation of the Glider program since Aug 2016. The final report has been submitted to NSF for (ongoing) review.
 - In coming months they will be coordinating closely with NSF to determine whether any changes are required in our current Concept of Operations (CONOPS) for Glider operations.
 - Deployment of Gliders at Global sites has been suspended

Coastal Arrays:

Endurance Array - Jack Barth (OSU) provided the report via WebEx. His slides are included as **Appendix IV.**

- OOI Science Themes for the Array:
 - Global Biogeochemistry and Carbon Cycling
 - Ocean-Atmosphere Exchange
 - Ocean Circulation, Mixing and Ecosystems
 - Climate Variability and Ecosystems
 - Coastal Ocean Dynamics and Ecosystems Hypoxia on Continental Shelves
 - Coastal Ocean Dynamics and Ecosystems Shelf/Slope Exchange.
- Endurance Array Jack provided a map showing the deployment of the Array.
 - \circ $\$ Cross-shelf mooring lines are at Newport and Grays Harbor $\$
 - Oregon Line is connected to the Cabled Array
 - There are six deployed gliders year-round

- There are 20 platforms: EA ~240 sensors and Cabled EA ~39 sensors
- Locations were chosen based on existing long-term data
- Jack described the Oregon and Washington Lines (see slides)
- Cabled Benthic Experiment Package this has been operating since 2014 and is operated by UW.
- Jack showed a photo of the ship with the Endurance platforms and sensors loaded for deployment.
- Jack reviewed the Default Sampling Strategy.
- Endurance Array gliders and glider coverage. A fresh set of gliders was recently deployed. The lithium batteries are allowing long deployments (2-3 months). There is large barnacle growth and anti-biofouling methods have been employed.
- Endurance Array Platform Status 12 of 163 instruments are not working.
- Washington Offshore Wire Following Profiler: This is in 500m of water. It is able to be deployed for long periods of time and was able to observe the northeast Pacific 'warm blob'. The blob (unusually warm surface waters) impacted the ecosystems and, economically important Dungeness crabs. There has been two years of successful observations.
- 2015 CSPP Inshore Washington This profiles two to 4 times per day. It chooses not to surface in rough seas.
- Biofouling is a problem (see slide). Anti-biofouling coatings have been applied with some success.
- Endurance Array Summary the array is presenting opportunities to use data, add instruments, change sampling, join a cruise, and communicate with them.

Pioneer Array- Al Pluddemann (WHOI) provided the report via WebEx. His slides are provided as **Appendix V**.

- The Coastal Pioneer Array is centered near 40° N, 71° W. It spans the shelf-break front south of New England.
 - Science focus is on shelf/slope exchange processes
 - Multi-scale, multi-platform array captures relevant dynamical processes
- Coastal Pioneer Array description:
 - 3 Surface Mooring- Profiler Mooring pairs
 - 4 single Coastal Profiler Moorings
 - 6 Coastal Gliders
 - 2 Coastal Profiling Gliders
 - o 2 AUVs
- Coastal Profiler Moorings:
 - The capabilities are:
 - Surface telemetry, inductive modems
 - Wire Following Profilers, ADCPs
 - There are seven moorings at Pioneer (see slides)
- Coastal Surface Moorings

- Capabilities:
 - Surface telemetry, EM connectivity to seafloor
 - Power generation (solar and wind)
 - Instruments on Buoy, NSIF and MFN
- There are 3 moorings at Pioneer (see slides)
- They measure about 30 variables.
- They have a modular frame provides buoyancy
- There is a custom designed Anchor Recovery Module (ARM)
- Coastal Gliders
 - \circ $\,$ Teledyne Webb G2 Slocum Glider 200 and 1000 m engines $\,$
 - They carry 5 different instruments
 - Sample five different regions by 6 gliders.
 - They focus on repeat sampling of the cross shelf.
 - There is a plot of the cumulative tracks of 41 of 48 gliders deployed at the Pioneer Array
 - The sampling plan is working.
 - Storms are the biggest problem, sending the gliders off-track. It is time consuming to fly the glider back on-track. There are also bio-fouling issues.
- The Pioneer Profiling Gliders were described.
- Autonomous Underwater Vehicle (AUV) AUV Operations docking was descoped from the operation plan.
 - There are two AUVs and the plan is for deployment from a ship once per month (not quite there yet)
- Summary of Coastal Pioneer Array:
 - Operational since Nov 2013 with full installation in Dec 2014.
 - What's deployed now:
 - 3 of 3 Surface Moorings
 - 5 of 5 Profiler Moorings
 - 2 of 6 Coastal Gliders
 - 1 of 2 Coastal Profiling Glider
 - There is 1 AUVs in "campaign mode"
 - Changes from the baseline:
 - AUV docks descoped, transition to campaign mode (ships)
 - Coastal Surface Piercing Profilers (CSPPs) replaced with (Coastal Profiler Moorings) CPM + Coastal Profiler Gliders (CPG)
 - o Issues:
 - Incidental contact with fishing gear fouls the Wire Following Profilers (WFPs) (long-line fishing gear drifts into the profilers).
 - MFN power/telemetry shutdown if persistent low wind
 - Gliders blown off course in storms
 - There are seven known sensors not working. They seem to know the issues.

• Al described the mooring issues. They are aware of many of the issues and have solutions. There are some issues that they cannot fix (fishing gear fouling).

Global Arrays - Sheri White (WHOI) provided the report. Her slides are included as *Appendix VI*.

- Global Surface Mooring Similar to the coastal mooring.
 - Modifications to the baseline:
 - Additional instruments added as a part of Global Surface Piercing Profiler (GSPP) Plan B – added clusters of instruments at 40, 80 and 130 m on the mooring riser. These will be deployed for the first time this year.
 - No power transmitted below the Near Surface Instrument Frame (NSIF)
 - Only inductive communications below the NSIF
- The Global Profiler Mooring was described. Same as coastal moorings, but longer battery duration. They are completely battery powered.
 - Modifications to the baseline Removal of Global Surface Piercing Profiler (GSPP), but addition of an inductive CTDMO to the riser above the profiler(s)
 - o Additional Instruments can be mounted (see slide for locations)
 - Addition of instruments in any location requires reanalysis of mooring design due to added weight/drag
- The Global Flanking Mooring was described.
 - Modifications to the baseline included:
 - Instruments added to Irminger Flanking Moorings for coordination with OSNAP (Overturning in the Subpolar North Atlantic Program)
 - CTDMO and VELPT pairs added at 100, 400, 700, and 1000 m above the seafloor
 - Orientation of Irminger Array adjusted such that the Flanking Moorings are along the OSNAP line
 - Additional Instruments can be mounted (see slides for locations)
- Global Gliders there are Open Ocean Glider and Global Profiling Gliders these are the same as the coastal gliders.
- Global Station Papa Array 50° N, 145° W
 - No OOI Surface Mooring (NOAA PMEL Surface Mooring)
 - Strong wind and waves
 - Moderate to low eddy activity
 - Long history of observation here (since 1949)
 - Array occupied since July 2013
 - All platforms deployed
 - What's deployed now
 - 3 of 3 moorings deployed

- 1 of 3 Open Ocean Gliders deployed (365)
- Glider 365 is adrift and low on power
- Looking into possible recovery options (R/V Sikuliaq)
- 0 of 2 Global Profiling Gliders deployed
- No significant issues with subsurface moorings
- Global Irminger Sea Array 60° N, 40° W
 - Strong wind and waves associated with tip jet off southern Greenland
 - High eddy activity
 - North Atlantic Deep Water formed here
 - Array occupied since Sep 2014 All platforms deployed
 - What's deployed now
 - 4 of 4 moorings deployed
 - 1 of 3 Open Ocean Gliders deployed (559)
 - Glider 559 is adrift and has wing damage
 - o Looking into possible recovery options (none likely)
 - 0 of 2 Global Profiling Gliders deployed
 - Issues
 - No significant issues with Subsurface Moorings
 - Currents and weather can make glider operations difficult
 - Working on improving robustness of surface moorings
- Global Southern Ocean Array 55° S, 90° W
 - Strong wind and waves, strong atmospheric forcing
 - o Antarctic Intermediate Water formed here
 - Array occupied since Feb 2015 All platforms deployed
 - Deployed now:
 - 4 of 4 moorings deployed
 - No gliders deployed as directed by NSF based on recommendation from OL
 - o Issues:
 - No significant issues with Subsurface Moorings
 - Currents and weather can make glider operations difficult
 - Working on improving robustness of surface moorings
- Global Argentine Basin Array 42° S, 42° W
 - High eddy activity
 - Bathymetric "mud waves" found here
 - Array occupied since Mar 2015 All platforms deployed
 - Deployed now:
 - 4 of 4 moorings deployed
 - 2 of 3 Open Ocean Gliders deployed (364, 470)
 - 1 of 1 Global Profiling Glider deployed (578)
 - Steering degraded on 364, 578
 - Glider 470 dropped its weight and is adrift
 - o Issues:

- 2015 Hybrid Profiler Mooring knocked down (to be recovered)
- Currents and weather can make glider operations difficult
- Working on improving robustness of surface moorings
- Heavy bio-fouling by gooseneck barnacles affects both gliders and moorings

• CGSN Global Operations Summary:

- Four Global Cruises per year with 13 total Global Cruises to date
- \circ $\,$ 15 Global Moorings refurbished and deployed each year $\,$
- 48 Global Moorings deployed since 2014
- 48 gliders deployed at Global Array sites
- o 15 glider deployment cruises
- There have been 6052 science days
- Approximately 3 profiles per day
- 44% science days vs. planned science days
- 91,656 total science km flown

Lunch Break

Regional Cabled Array - Deb Kelley (UW) provided the report. Her slides are included as *Appendix VII*.

- In the beginning, there was an outside advisory committee made up of telecommunications experts. At that time John Delaney was leading the effort.
- The cabled array offers 900 km of high bandwidth (10 Gbs) and high power (8kW)
- 18 junction boxes
- Six tall moorings (up to 2,700 m)
- 140 instruments
- Includes two types of infrastructure:
 - Primary backbone cables, primary modes, shore station, terrestrial backhaul
 - Secondary Infrastructure extension cables, junction boxes, moorings, instruments
- Power was turned on in 2014.
- Instrument Operational Status:
 - Fairly low failure rate.
 - 2016 deployment
 - 144 instruments 97 % operational
- Incorporating Operational Efficiencies (see slides)
- Primary infrastructure: L-3 Mari Pro Inc. Important to UW Industry-Institution collaboration
 - 7 primary nodes
 - If a trawl fishing vessel believes their gear is entangled with a submarine cable, the vessel calls an established hotline; and if advised, cuts away their fishing gear if the location and investigation indicates a possible

cable contact. The trawl fishing vessel would be reimbursed for replacement of the lost gear from a fund established by the cable members of the OFCC.

- Extension Cables:
 - Extension cables installed by ROPOS 2013-14. Very successful. The vehicle has heavy lift capability. Now *Jason* has that same capability.
- The ship space is very full during launch and recovery
 - 35-36 day cruises utilizing an ROV
- ROV ops were very ambitious rapid turn arounds
- Cabled Array Margin Science (see slides). The margin sites include:
 - Slope base
 - Southern Hydrate Ridge
 - Oregon Offshore
 - Oregon Shelf
 - See map of sites
- The OOI cabled array represents the most advanced coastal observatory in the worlds' oceans (see sketch).
- Shallow profilers were designed-built by APL
 - The platforms are very large and they have been knocked down on two occasions. There might be some really amazing currents that cause this. It would be interesting to learn the cause.
- Since 2015 the three shallow profilers have completed >10,000 profiles.
- Cabled Array Deep Profiler the idea is that the vehicle goes down, docks, powers up and resumes operations. This hasn't worked. It turns out that the manufacturer changed the material of a connector. They have been evaluating the issue. If it continues to be a problem, they will ask OOIFB for feedback.
- Field verifications are carried out for the cabled array:
 - Vertical CTD casts taken before and after installations
 - CTD and Niskin samples on ROV immediately adjacent to profiler.
- Southern Hydrate Ridge most active venting site with bubble explosions and jets. From year to year it is unrecognizable.
 - Three junction boxes
 - Ten cabled instruments
 - All operational
 - This is a site where Germany has interest to add bubble plume sensors
 - This is one of the few sites in the world where there is a time series data on methane seep sites.
- Axial Seamount the most advanced submarine volcanic observatory in the worlds' ocean
 - $_{\odot}$ $\,$ Largest and most active volcano off the OR-WA coast $\,$
 - Axial Caldera 24 instruments.
 - This summer will add bottom pressure, tilt, current meter and power generator.

- Only issue there are sensors that go into the throat of the vents, so there are some material issues.
- NSF and ONR additions are funded for 2017 -2018 installations
- \circ International district discussion
- 2015 Eruption earthquakes and underwater explosions were observed. There
 was thick lava flow (ca. 400 feet or more thick) that was covered by microbial
 organisms

Discussion:

- Tim Crone when you are running a field program and you get 50% of the data, it is considered a success. So, the level of success from all of the OOI groups is very good.
- Greg Ulses the briefing slides will be available. Much of the information is also available in some form on the OOI website. There is a website for each array.

Cyberinfrastructure:

Manish Parashar (Rutgers U) provided the first presentation. His slides are included as *Appendix VIII*. He focused on the OOINet.

- OOI CI Overall Architecture see slide for organization chart.
 - Rutgers hosts the data storage, computer infrastructure, and primary backup
 - They make sure the data is maintained and safely stored.
 - CI Systems:
 - There is redundancy
 - There is an east coast (Rutgers) and west coast (Pittock) center.
 - They leverage Internet-2
 - Estimated Data (Acquisition) Rates see the matrix. There is a lot of variability. They want to insure that they can handle the variability.
 - Integrated Software Stack This slide summarizes how people access the OOI data. There are various ways the data can be accessed. In the future, they would like the ability to link to other databases. They have built this to be very flexible.
 - uFrame-based OOINet Data Ingestion this shows how the data flows into the OOI CI
 - uFrame-based OOINet this shows how people can get to the data for plotting and download.
 - Other CI Integrated Services there are other areas that are not accessible to the science community, but are important to the system:
 - Configuration management
 - Comprehensive monitoring
 - There is extensive monitoring of the system. It is automated. Helps CI team to understand problem areas.

- Cyber-security Overview This is very important to CI. CI uses best practices. They use a living program that reviews security.
 - There are redundant perimeter firewall appliances in all sites
 - VPN IPSec tunnels across all sites
 - Two-factor authentication
 - Federated Identity Management
 - There have been 778 attacks mitigated in Q1, 2017
- Manish reviewed the Data Download Statistics and the OOI CI Teams (see slides)

Mike Vardaro continued the report. His slides are included as **Appendix XI**. The topics that Mike covered included the following. Details are included in the slides.

- OOI stats are in his slides.
- An example of a "Day in the life of an OOI data evaluator" is described
- User Support and Outreach this is lead by Sage Lichtenwalner
- Data Flow Example Pioneer Profiler
 - Ingestion into the uFrame database is a manual process (by a person). It doesn't just come off the sensor and automatically flow into the database.
- Mike reviewed the current data processing flow chart
- There are sheets for calibration, ingestion, deployment, etc.
- Data Types include:
 - Telemetered Data Data received through a transmission medium over distance (e.g. surface buoy to satellite, glider to satellite, acoustic modem
 - Recovered Data Data downloaded directly from a recovered instrument or data logger after the instrument has been recovered.
 - Streamed Data Data received via transmission over electro-optical cable. Streaming data are provided at full temporal resolution and nearreal time.
 - Shipboard Data Shipboard data and water samples collected during OOI expeditions.
 - Metadata Info about the data record (e.g., time & location of collection, unique source & record description identifier, instrument serial #, etc.).
- OOI Data Product Levels:
 - Raw data: The datasets as they are received from the instrument
 - Level 0 (L0): Unprocessed, parsed data parameter that is in instrument/sensor units and resolution
 - Level 1 (L1): Data parameter that has been calibrated and is in scientific units. QC may be applied at this level, utilizing simple automated techniques or human inspection.
 - Level 2 (L2): Derived data parameter created via an algorithm that draws on multiple L1 data products
- First in Class Reviews: 2016 they reviewed over 1000 types of data.

- QC Database: Higher Resolution Statistics are tracked (see slide). Some of these stats need to be updated (some of the "0%" will be higher).
- Data Annotation annotations are the primary means for communicating between the data team and users
- Current Rest in Class Reviews:
 - Process, Challenge, expediting the solution.
 - Upload and ingestion of the data is taking longer than anticipated.
- Rest in Class Data Review Workflow see chart
- Automated Scripting Tools these are available for anyone to access. These tools are open access.
- OOI Automated QC Procedures:
 - There are six automated QC algorithms that can produce 7 flags (including logical "or" which combines flags) which are plottable and are included in downloaded files
 - Coded based on specifications written by OOI Project Scientists, derived from QARTOD manuals and other observatory experiences
 - Algorithms refer to "lookup tables" assembled by OOI Project Scientists with input from subject matter experts: <u>https://github.com/ooi-</u> integration/qc-lookup
- QARTOD/OOI QC Comparison see table
- QC Challenges & Solutions
 - Local range values need statistical analysis of environmental data for each platform
 - Trend test may not work as designed, because it requires the system to compare data prior to the user request date analysis ongoing
 - Gradient test is complicated to apply, requires 2D dataset analysis ongoing
 - Spike test is currently very simple needs tweaking to avoid false positives/negatives (especially in biological data) and to work with certain data types
 - Not all QC algorithms apply to all data products ongoing review with SOC
 - The QC algorithms do NOT trigger alerts in the system Alerts/alarms only trigger when new data is telemetered/streamed

Discussion:

Jim O'Donnell – Where is the red flag? Mike – it is there as a bitcode. They need to do a better job of showing the flag.

- Rest in Class Data Status Categories there is a matrix in the slides that shows the status category along with the description and the color code.
- Reviews and Reporting The reports are available on the GitHub site.
- QC Database Tool see <u>http://ooi.visualocean.net</u>

- There is a Post-Cruise/Post-Deployment Checklist
- Deliverables they are applying all of these types of tools so that they can provide NSF with the reports that are needed.
 - Data Availability Reports
 - (% completeness, streams/parameters reported, particles in the system)
 - Data Quality Reports
 - Redmine (a help desk ticketing software package) reporting Issues found, investigations, and Help Desk open/closed
 - Deep dive investigation reports
 - Annotations (to users)
 - Download statistics
 - Forum statistics (TBD)
- Options for Data Review Acceleration they have options for acceleration that they would like to propose.
 - The matrix includes the option along with pros and cons.
 - They are open to additional suggestions.
- Data Evaluation Daily Activities they would like to get into a daily routine.
- Next Mike spoke about communications. Redmine is a major form for collecting user feedback.
- Data Delivery Enhancements:
 - Refinement of ERDDAP production interface
 - Upload of additional data sets to ERDDAP
 - Data Portal bug fixing, closure of existing Redmine tickets
 - Additional cruise data online
 - Improved metadata access
 - Improved Data Availability statistics & timeline
 - Validate data quality using external, ship, other OOI data
 - EPE integration with ERDDAP
- Adding capability to OOInet based experience
 - Since the Portland meeting they made improvements based on the feedback received at the workshop.
- Conclusions
 - 1. A large amount of high quality data has been and is being collected, with high science value
 - 2. Data review is finally our primary focus, given maturation of the system
 - 3. Data team accelerating Rest In Class review via development of specialized tools
 - 4. Short-term, medium-term, and long-term goals for improving data quality and delivery
 - 5. OOI is providing a curated, consistent data system that is delivering data and metadata to the community

Question:

• Are there plans to put recovered data into the database? Mike – the OOI is collecting the recovered data, but it is not included in the database.

Education and Public Engagement (EPE) – Mike Crowley provided an introduction and Sage Lichtenwalner provided the report. The slides are included in *Appendix IX*.

- Between 2011 and 2015, the Ocean Education Portal was designed
- Education Tools include:
 - Concept Map Builder
 - Investigation Builder
 - Visualization Tools
 - Vocabulary Navigator
 - Resource Database
- EPE System Architecture the primary goal of this site is to provide undergraduate educators with tools.
- New Content for OOI EPE was developed through external workshops geared for professors who teach undergraduate entry-level oceanography.
- Enabled by EPE visualization tools that access OOI data in ERDDAP.
- Sage went to the website and showed how the site can be adapted for a particular educational curriculum.
- They have developed activities or "challenges" for students.
- The data is displayed on the interactive portals.
- There are a lot of resources that can be added to content sites.
- The site that allows people to explore the various components of OOI. It links the instruments to physical sites.
- Instructors can customize their concept maps

Discussion:

- Annette is this being used now? Mike C they are sharing it with anyone who wants to use it. Lisa Rom (NSF) has funded them to use it with Rutgers undergraduates
- Mike V Are there Google Analytics on who is using this? Mike C yes
- Mike Crowley they received funds to build the educational portal, but there are no funds to advertise it.
- Lisa Clough Lets put "education" on the parking lot. It will not be part of the new management contract.
- Greg as you can see, the CI team has accomplished a lot

Break

Examples of Research Community Engagement/OOI User Engagement:

Case Studies & Special Considerations - Leslie Smith provided the report. Her slides are included as *Appendix X*.

- There are broad communications with media engagement (see slides). They are hitting big media contacts.
 - Within the science community OOI has a Newsletter & Website Updates
 - There are 1,400 OOI List Serv Subscribers
 - Periodic Newsletter (monthly, quarterly)
 - List Serv blasts as needed to advertise events/opportunities
 - Inclusion within weekly COL newsletter
 - 7,400 Subscribers
 - Periodic distribution through UNOLS newsletter
 - They used conferences/Town Halls
 - Conferences attended:
 - American Geophysical Union Fall meeting
 - Ocean Sciences Meeting (Biannual)
 - MTS/IEEE Oceans Meeting
 - Town Halls Town Halls offer OOI scientists, engineers, management, and data team an opportunity to direct connect with the community through targeted discussions.
 - Previous town hall topics have included:
 - Accessing OOI Data
 - NE Pacific Joint Town Hall with ONC
 - OOI Construction updates
- Posters & Presentations
- Website, Help Desk, Forum the OOI website is a focal point
- Website Features Portal of entry for various stakeholders and users:
 - o Data
 - Science Themes
 - Community Tools/Forum
 - Researcher Proposal Information
 - Education
- Help Desk Sage is the primary manager. Since June 2015 there have been 664 total tickets. Currently 30 remain open.
- Forum <forum.oceanobservatories.org> users from around the world can connect to share experiences
- Community Tools
 - Repository for community generated tools external to the OOI Cyberinfrastructure team
 - These tools include:
 - Quality Control Testing Repository
 - Download & plotting tools
 - "Decoders" for reference designator codes
 - Tilt Meter Plots
 - Python modules for CAMHD & HYDBB
 - Time-Lapse Videos

- Publications Goal: list all publications that reference the OOI and its data. This is a work in progress with a lot more to go.
 - Question Sarah Gille At the moment how are the publications included on the list? Leslie – she finds them and posts them. Sarah – Argo has a process for this. Tim Crone suggested Google Alerts.
- Subject Matter Experts were engaged in Spring-Summer 2016
 - Emmanuel Boss contributed and sent in the plots that are included in the slides
 - Mike V we want to expand this.
 - Kendra lets add this to the parking lot.
 - Mike V it was a significant effort. We need better recruiting efforts and there needs to be better engagement
- Proposals & Staff Consultations all ocean science researchers are encouraged to use OOI data, and to propose.
- Data Use Proposal
 - Data are <u>free</u>, anyone can use OOI data, you do not need a proposal to use it
 - NSF is welcoming proposals to fund researchers as they seek to use OOI data to answer a specific scientific question
 - DOI Procedures more soon! In the meantime see the OOI Data Usage Policy
 - Mike V- staff consultations can be useful.

Discussion:

- Lisa Clough If you plan to change/add to the arrays sensors, there is a protocol to follow. However, should there also be a similar process for PIs who propose to use OOI data in their research? Should a letter be attached to proposals to confirm that the OOI data will be available for the proposed research project? This information will be useful to proposal reviewers and program officers. How do we formalize this? Action PIs need to reach out to the OOI to find out if the data stream will be available for their research. Then the PI can attach a letter to their proposal this would be a Best Practice. It does not have to be OOI specific.
- Kendra Daly What is the status of the DOIs? Mike V there is a DOI process that is being developed for levels of data. It might be at the instrument level. Rutgers Library is working on this. Lisa – this is still under discussion. DOIs are in the Parking Lot and Rabbit Hole.
- Connecting Instrumentation to the Arrays the process for PIs:
 - Webinars held prior to NSF deadlines to provide information
 - Identification of candidate instruments
 - o CGSN Connect self-powered, self-logging instruments
 - o Consultation with CGSN/EA/CA engineers on viability

- CGSN/Cabled Staff provide letter confirming technical feasibility, recommended schedule and costs
- Consultation to determine potential impacts to permits and/or environmental compliance.
- Shiptime request (as needed)
- Funding of proposal
- Researcher development of instrumentation
- Integration and test at CGSN/EA/CA
- Deployment
- Sampling Rate Modification process for PIs:
 - OOI instruments sample at "Baseline Sampling Rates"
 - Researchers can propose to modify sampling rates
 - Rates can be lower than "As-Deployed Sampling Rates" but can not go below "Baseline"
 - Changes must be timed with deployment cycles
 - Staff Consultation to ensure compatibility
- Staff Consultations
 - These are twice a year Prior to the February and August NSF Proposal Deadlines, Staff Consultations and overview webinars are offered.
 - ~25-60 people register for each webinar
 - Recordings & PDF of slides are posted online
 - Consultations are recommended for any proposal seeking to make a change to existing OOI infrastructure or operation procedures in order to ensure compatibility of the proposal within the constraints of the system.
 - Consultations began Jan. 2016
 - July 2017 will mark the 4th round of consultations
- Cruise Berths and Water Samples
 - Make these available to PIs conducting additional work on normally scheduled OOI Cruises
 - Occupying extra berths as available
 - Additional activities must fit into the existing cruise schedule
 - Subject to vessel size and safety restrictions
 - Leslie Providing ancillary science opportunities by offering unused berths during OOI cruises can be an area for the parking lot. There needs to be some thought on how to evaluate the ancillary science?
 - Greg We need to avoid the appearance of an inside track. This is an area where OOIFB feedback would be helpful.
- Workshops OOI has had workshops over the years:
- Science Workshops:
 - Science Community Workshop I, Baltimore, MD (2009)
 - Science Community Workshop II, ASU, Tempe, AZ (2010)
 - o OOI Shelf/Slope Processes Workshop, Providence, RI (2011)
 - Pioneer Array Sampling Focus Group Meeting, Washington, DC (2012)

- OOSC Mini-Workshop on OOI Cyber Infrastructure: Pioneer Array Data Quality Assessment, Rutgers Univ., Rutgers, NJ (2015)
- UNOLS OOI Coastal Arrays Workshop: Pioneer, Endurance and the Coastal Cabled Arrays, NSF, Arlington, VA, (2016)
- UNOLS Community Workshop: Cabled, Endurance, Station Papa (2016)
- 1-Slider Presentations at the UNOLS Community Workshop: Cabled, Endurance, Station Papa (Sept. 2016) were very effective.
- Education Workshops (see list in the slides):
- Data Explorations There have been Workshops for undergraduate professors teaching entry level oceanography courses
- Engagement with other Observatories include:
 - OOI Data in IOOS and Regional Associations
 - \circ OOI Data in IRIS
- Partnerships, engagement, dialogue, and collaborations are encouraged

Coastal Global User Engagement - Sheri White continued the report. Her slides are included in *Appendix X*.

- Examples & Issues have included:
 - Proposal to add 2 sensors to Global Southern Ocean Surface Mooring by NOCS UK researcher seeking NERC funding - What are the issues with funding coming from non-NSF sources?
 - NSF Northeast U.S. Shelf Long Term Ecological Research (LTER) Site Ties in with the OOI Pioneer Array offshore
 - Proposal to place a mooring in the vicinity of Pioneer How are OOI permits affected by non-OOI moorings?
 - Deploying non-OOI assets on OOI cruises
 - Not a lot of deck space for additional projects
 - CGSN has deployed floats and moorings for other programs
 - Proposals also exist to use the data

Discussion:

- Permitting:
 - Greg a PI cannot just drop a non-OOI mooring in an OOI area site radius. It will require permitting.
 - Sue B the Pioneer Array, in particular, is very sensitive to fishing communities. Sue explained the permitting requirements. As new instruments are considered for deployment, they must go through the permitting process.
- Pioneer Array:
 - Kendra will the Pioneer Array be repositioned at some time? Bob Houtman – this is still on the table but will wait until after a new OOI operator is in place. We also should look at the science questions that put the Pioneer Array in place have been answered before moving.
 - Lisa Clough The clock starts with commissioning and runs for 5 years.

o Repositioning the Pioneer Array will be in the long-term parking lot

Cabled Array – User Engagement – Deb Kelley gave the report. Her slides are included as *Appendix XI*. Examples of engagement have included:

- Interactiveoceans Site:
 - UW OOI Education Site
 - Live cruise updates and streaming video at sea
 - Student blogs
 - Video, image resources
- Student at Sea Program
 - Hands on at sea experience for students
 - Senior thesis projects and peer review
- C+STEM WA Olympic STEM Pathway Project
 - 3-year project involving 17 school districts
 - 35 teachers and their students are learning real world skills involving integrated engineering, science, math, and computer programming around sensor building
- The Gordon and Betty Moore Foundation funded program offshore geophysical monitoring of Cascadia for early warning and hazard research

Data & CI User Engagement - Mike Vardaro reported. His slides are included as *Appendix IX*.

- MIO & SOC Communications weekly SOC calls, etc.
- OOINet Testing they would like to do more Q/A testing. They would like to have outside users for testing.
- Sept. 2016 Workshop Feedback Mike showed the progress the made on some of the feedback received at the workshop. They need outside input on these topics.
- User Initiated Deep Dive User initiated deep dive. User, Clare Reimers, made a call to the help desk.
- Community Interactions
 - OOI Data Team facilitating data interaction, discovery and analysis for the OOI community
 - This includes SMEs, scientists, educators, postdocs, graduate and undergraduate students
- Student Engagement it can expand beyond Rutgers
- Community Tools
- Verifying events across infrastructure

Discussion: [Note – many suggestions for community engagement are provided below]

- Sherri White it would be good if the OOI Program teams can get out to workshops to hear directly from the community
- Deb Kelley as we get a couple years under the belt, a broader Lessons Learned workshop would be helpful.

- Greg they are gathering a lot of detail on lessons learned, but there is a lot more input that is needed.
- Deb Because they have been so focused on getting things in the water, there are still perceptions and myths within the broader community that need to be addressed. We need to communicate the system upgrades to the community so that they will re-engage.
- Mike V Getting the operational team more feedback from the community (like from the fall workshop) would be useful.
- Mike V it would be good to get live OOI feeds into the museums
- Sarah at her home institution there is a lot of OOI negatively
- Kendra Hold summer courses that examine the observing data. There was funding for a course in the past, but it had to be cancelled because the data was unavailable.
- Jim O Interpretive graphs of the data that is available would be useful. More eyes on the data would be useful to attract people. They would learn to use the data as well as the tools needed to access the data.
- Deb Public outreach is important and hasn't been adequately addressed. A lot of OOI has to be visual.
- Barbara Ransom it is worthwhile to look at the data and write an EOS article.
- Greg there will also be an OOI Special Issue of Oceanography Magazine. It will come out in February/March. Deadline for interest is tomorrow.
- Larry what can OOIFB do for community engagement?
 - Sarah Grille publish papers
 - Mete Uz If you want to engage more people, the interface should be very simple.
 - Greg When do we feel comfortable to advertise the user interface to the community?
 - Jim O He feels that it is ready. There is data and you can make plots. Granted, things are missing. He found his way through it. Mike V– constructive comments to the help desk would be helpful.
 - Deb Kelley One of the successes of the Portland workshop was because Mike V walked people through the user interface to get data. Hold workshops with early career scientists. This would help.
 - Deb Kelley the fisherman want data that is useful to them
 - Jim O During Gordon conferences there is often open time where OOI could show people how to use the data.
 - NSF Program Officer Maybe we are trying to please everyone at once. There should be a prioritized list of who to accommodate first in terms of data access. First could be the NSF user scientists, and so on.
 - Greg It would be good to get a list of conferences from OOIFB that OOIFB should send OOI team members to. OOI is leanly staffed. There are resourcing constraints both in funds and staff.

Larry reviewed the Friday Agenda

1700 Adjourn Day 1

Day 2: Friday, May 19, 2017

Most of Day-2 was devoted to open discussion. Only action items are shown in blue text.

0815 to 0915 - Executive Session

Goal of Day Two – Discuss sub-panels and determine path to for CI sub-panel. Finalize consensus statements, action items and timelines.

0915 Summary of Executive Session - Larry provided a summary of the executive session comments and suggestions:

- There should be a check box on the UNOLS Ship Time Request and Scheduling (STRS) system to indicate if you plan to work in an OOI area. There are times when OOI will learn that a ship plans to deploy equipment in the same area where they are operating. On a positive note, these other ship operations could also be opportunities for verification of OOI data.
- CI management issues need to be addressed.
- There hasn't been a meeting of all of the OOI teams, engineering, CI, data, etc. in over three years. A meeting would be worthwhile.
- Re-engage the community, but not until the data/user interfaces is ready.
- In terms of metrics we would like to have more information on who is proposing to use the data.

OOIFB Sub-Panel Discussion

Background on sub-panels –Lisa Clough (NSF) provided background information regarding the formation of sub-panels/

- OOIFB can recommend sub-panels
- A lot of feedback is needed as soon as possible
- There is plenty of work for the CI transition from 1.0 to 2.0.
- OOIFB /sub-panel feedback can be very valuable. Things to consider include:
 - What is on the CI work list?
 - Priorities for the next year?
- Sub-panels will be seated for more than a year
- Ad-hoc committees can be less than that. An ad hoc committee was suggested for Gliders.

- Think about where resources should be committed on data, or should it be on software?
- Sarah Gille– Perhaps the issue of data delivery should be an ad hoc panel.
- Tim Crone He recommends that there be one sub-panel for data/Cl. They can address:
 - Prioritization of user interfaces for groups
 - Data access
 - o Data quality
- Larry Does NSF have any recommendations regarding sub-panel composition?
- Annette Due to the short timeline should we waive a call for nominations? Lisa yes, in this instance.
- We might want to start as an ad hoc and transition into a sub panel
- Panel member suggestions: 2 from OOIFB, 2 from CI Review Panel, 2 MIOs.
- Jim O'Donnell and Tim Crone volunteered to serve as co-Chairs on the data/Cl ad-hoc panel.
- NSF will share the CI review panel recommendations and RU response with OOIFB
- Timeline NSF needs the OOIFB feedback as soon as possible. Bob it would be useful to know the CI priorities and the timeline, then see how this matches with the FB priorities and timelines.
- Potential panel members were suggested. OOIFB will send names to NSF for vetting and then appoint
- It was suggested that Mike Vardaro liaison with the panel
- Brian Glazer volunteered to serve on the CI/data ad-hoc panel.

Post Meeting Note: After the OOIFB Meeting, Tim Crone and Jim O'Donnell drafted the charge to the ad-hoc working group on data dissemination and CI:

Action: OOIFB- 2017-1: Form an OOIFB Ad-hoc Working Group on Data Dissemination and Cyber Infrastructure (DDCI)

- •
- Charge of the OOIFB Ad-hoc Working Group on Data Dissemination and Cyber Infrastructure (DDCI):
- •
- To facilitate the assessment of OOI data quality by the scientific community, and to accelerate the integration of OOI infrastructure usage into project proposals and scientific publications, the OOIFB will establish an ad-hoc Working Group to identify near-term obstacles to the delivery of data to the science community and to create recommendations for removing these obstacles.
- •
- The Data Dissemination and Cyber Infrastructure (DDCI) Working Group will include subject matter experts and cyber infrastructure (CI) experts to review the current status of the CI component of the OOI and the existing development

plans. OOIFB members Tim Crone and Jim O'Donnell will serve as co-chairs, and Brian Glazer will serve as a member. Representatives of the Marine Implementing Organizations, and members of earlier CI Review Panels will be included as members. Representatives of the OOI CI team will be asked to participate. There are other operational systems that aggregate and disseminate marine, earth and atmospheric sciences data and the DDCI Working Group will consider input from those enterprises. The Working Group will report to the OOIFB in August 2017.

Break

OOI Science Documents – There was an open discussion on past and future OOI science documents.

- NSF suggests that OOIFB conduct a refresh of the traceability matrices that are included as Appendices in the document, *Ocean Observatories Initiative (OOI) Scientific Objectives and Network Design: A Closer Look,* 2009.
- NSF also suggested that OOIFB create a figure similar to Figure 3.9 of the *Sea Change: 2015-2025 Decadal Survey of Ocean Sciences* NAS report. Figure 3-9 is a conceptual diagram of relative operation and maintenance costs versus relevance of infrastructure assets.
- Lisa Clough Can OOIFB examine the matrices and determine if there are major flaws?
- Bob Houtman There is the urgency because NSF will go to the National Science Board (NSB) this summer to recommend an award for a new operator. It is important to be able to demonstrate the science need for the OOI infrastructure and data.
- The original matrices will be located, so that they won't need to be redrafted.
- Lisa Clough When reviewing the matrices, some things to consider include:
 - Are these still relevant science questions?
 - How is OOI meeting them?
 - Are there any new recommendations
- Kendra Daly Figure 3.9 includes a cost benefit analysis. OOI cost information is needed. Lisa – The Annual OOI Work Plan can be provided when needed because it provides cost benefit.
- Jim O'Donnell The refresh effort can be helpful to the science community. The refreshed document can be used by PIs as justification for science proposals. This can present an opportunity.
- Sarah Gille The matrices don't look at the emerging science /technologies.
- Some additional questions to consider in the refresh of the matrices:
 - Why is an OOI infrastructure needed?
 - What is needed?
 - What are the research capabilities needed?
 - What would be nice to do?

- Specific examples would helpful.
- Highlight the things that have been funded.
- Brian Glazer Has something been funded for each of the 10 matrices? This would be good to include as a bibliography.
- Deb Kelley In addition to funded OOI work, ancillary work should also be included.

Summary of the Science Document OOIFB Action Item:

Action: OOIFB- 2017-2 – Refresh OOI Traceability Matrices and Create a Conceptual Diagram of relative O&M costs versus relevance of OOI Infrastructure assets Charge:

- Step 1: Refresh the traceability matrices that are included as Appendices in the document, *Ocean Observatories Initiative (OOI) Scientific Objectives and Network Design: A Closer Look,* 2009.
- Step 2: Create a figure similar to Figure 3.9 of the *Sea Change: 2015-2025 Decadal Survey of Ocean Sciences* NAS report that focuses on OOI Infrastructure. Figure 3-9 is a conceptual diagram of relative operation and maintenance costs versus relevance of infrastructure assets.
- Timeline The refreshed matrices and figure are needed for the November NSB meeting. Preliminary data is needed by the summer.
- OOIFB should hold a web conference in 3 to 4 weeks.

OOI Policies for Science Users – Lisa Clough reported that another task for the OOIFB will be to consider OOI policies for things such as international collaborations, physical samples, sensor additions, etc. Up to now, the OOI program has been operating primarily in a reactive mode. It would be useful to have policies in place as we go forward. NSF would like this to be on the agenda for the next meeting.

Post Meeting Note: Deb Kelly drafted a couple suggestion action items, one pertains to infrastructure policy and the other is a suggestion to form a sensor working group.

Action: OOIFB- 2017-3 (pending FB discussion)— Establish policies for adding infrastructure to arrays: It is important to have clear guidance regarding the processes by which instruments may become core infrastructure.

How will priorities be established for adding infrastructure onto arrays or into array space if there are space-instrument restrictions (e.g. three PI's would like to put an instrument at the same place, on the same port, one instrument interferes with the other instruments etc.)? As a follow-on, when infrastructure is full (e.g. all ports are used), how will additional infrastructure be added to expand the networks (e.g. additional moorings, additional junction boxes)?

Action: OOIFB- 2017-4 (pending FB discussion) - Form Sensor Working Groups:

It would be good to establish sensor working groups that could focus on the data evaluation that would inform on both data quality and possible refresh. Early in the program (e.g. the subcommittees formed as part of the Science Technical Advisory Committee – 80 community members as volunteers) there were very successful working groups focused on engineering, science, modeling etc.

Noon wrap up for NSF – review of actions:

Larry and OOIFB members provided the NSF Program officers a summary of the major action items that will be addressed by the OOIFB in the coming months. These included:

- Form an OOIFB Ad-hoc Working Group on Data Dissemination and Cyber Infrastructure (DDCI)
- Refresh OOI Traceability Matrices and Create a Conceptual Diagram of relative O&M costs versus relevance of OOI Infrastructure assets

Other actions that will be addressed at a later time include:

- Establish policies for adding infrastructure to arrays:
- Strategies for expanding user engagement:

Additional discussion on the refresh of the matrices:

- Kendra Daly provided additional plans for the OOIFB review of the matrices:
 - \circ $\;$ Will review questions and sub-questions $\;$
 - Then examine a few select questions.
 - They will look at sensors to determine if there are new sensors/platforms that are more effective.
 - Will need to look at the site requirements
 - Experimental descriptions.
 - At the end of today's meeting, OOIFB will look at the air-sea exchanges matrix.
 - By August, they hope to have a few of the matrices reviewed.
- Lisa Clough added:
 - NSF would like the refreshed matrices in July if possible (or a subset)
 - We will try to get original from Sue Banahan
 - Success stories and emerging technologies would be of interest.
 - She has an action item to get OOI award data as well as the abstracts. Leslie might have some success stories.
- Deb Kelley The OOI Final Design Review FDR lays out each of the arrays. Each array should be updated. It is a good foundation for a refresh.

Wrap-up comments from OOIFB members and NSF:

- There was general excitement and enthusiasm about the OOIFB activities
- It is clear that there is a lot of work to be done.

- It is so exciting that after so many years of planning, that the OOI system is in the water and ready for use.
- There is excitement about the level of feedback that OOIFB can provide.
- NSF program officers are happy that OOIFB is in place so that they have a group to bounce feedback against.
- Community expectation management of OOI is needed and will be very challenging.

Lisa Clough thanked the OOIFB for the work so far and the work to come. She thanked the FB for their optimism.

The OOIFB meeting was adjourned at 12:30 pm.

Many of the OOIFB members stayed and began review of the traceability matrix for Ocean-Atmospheric Exchange.

WebEx		
Atkinson, Larry	ODU	
Banahan, Sue	Consortium for Ocean Leadership	
Barth, Jack	OSU	х
Birkley, Kandy	NSF	х
Borg, Scott	NSF	
Clough, Lisa	NSF	
Crone, Tim	LDEO	
Crowley, Mike	Rutgers	х
Daley, Kendra	USF	
Davis, Xujing	NSF	
DeSilva, Annette	UNOLS	
Dufour, Rose	NSF	
Edmonds, Hedy	NSF	
Gille, Sarah	Scripps Institute Oceanography	
Glazer, Brian	U.Hawaii	
Houtman, Bob	NSF	
Kelley, Deb	UW	
Lichtenwalnee, Sage	Rutgers	х
Major, Candace	NSF	
Metz, Simone	NSF	
Miller, Bill	NSF	
Mison, Brian	NSF	
Murray, Rick	NSF	
O'Donnell, Jim	U.Connecticut	
Parashar, Manish	Rutgers	х
Peterson, Larry	NSF	
Plueddeman, AL	WHOI	х
Portier, Andrea	NSF	
Ransom, Barbara	NSF	
Rice, Don	NSF	
Rom, Lisa	NSF	
Shackelford, Rachel	NSF	
Smith, Deborah	NSF	
Smith, Leslie	Consortium for Ocean Leadership	
Tivey, Maurice	NSF	
Ulses, Greg	Consortium for Ocean Leadership	
Uz, Mete	NSF	
Vardaro, Mike	Rutgers	
Voulgaris, George	NSF	
Walter, John	NSF	
White, Sherri	NSF	

OOIFB Attendance List - May 18-19, 2017

"Parking Lot" Flip Chart

OOIFB NOT ODIFB Int. Policy AWP eit + Outreach not Kundol Longtern Parking Proneer SME'S Do proposalo need idata tram le DUIS (RH) EDS. user rompoli PT WORKON OOI (RUISes/Sample Use/duly 20