

MOOS MTM4/MSE Deployment Planning *Meeting Notes*

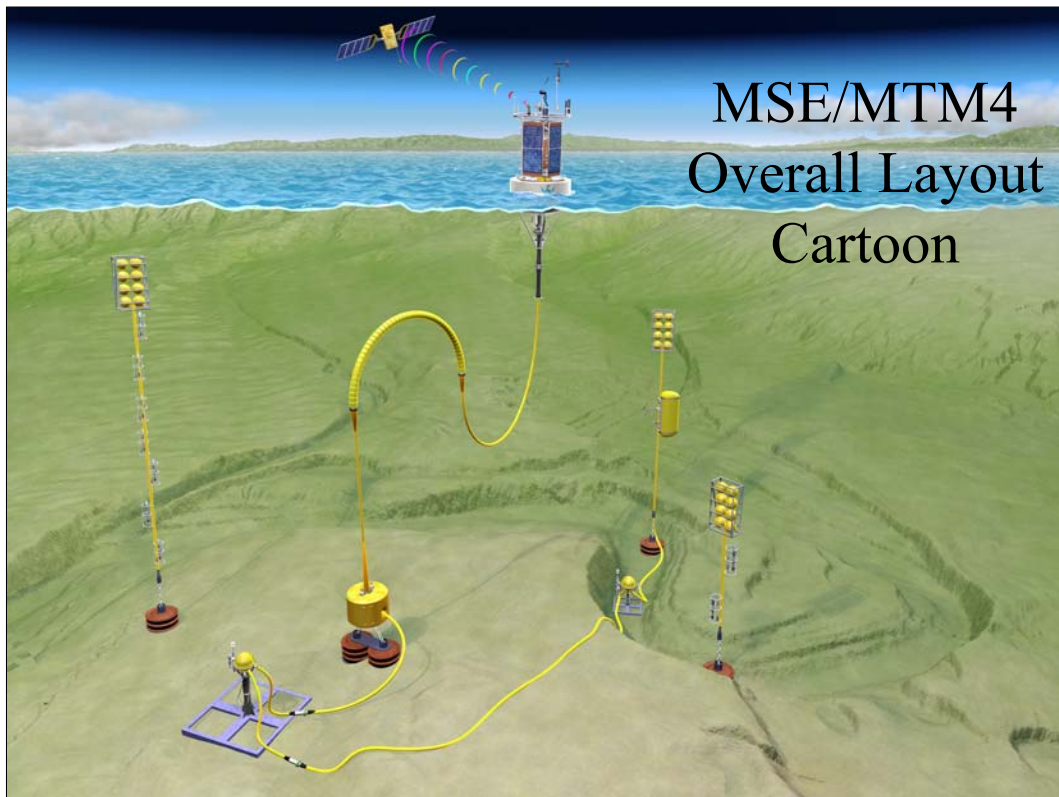
PDR – 10:00AM Nov. 22, 2005

Harbor View Conference Room

*Present: Steve E., Andy H., Bill U., Larry B., Keith R., Jon E., Jim B.,
Charley P., Gene M., Buck, Johnny F., Mark C.*

Action items:

- 1. Larry to check on method of releasing spool on dead vehicle recovery.*
- 2. Buck and Larry to follow up with Support engineering to make sure toolsled data items are being reported through Tiburon system.*
- 3. Mark C. to issue the draft operations plan and schedule the final operational review.*
- 4. Mark C. to confirm maximum 10BASET communications distance for the Benthic camera.*

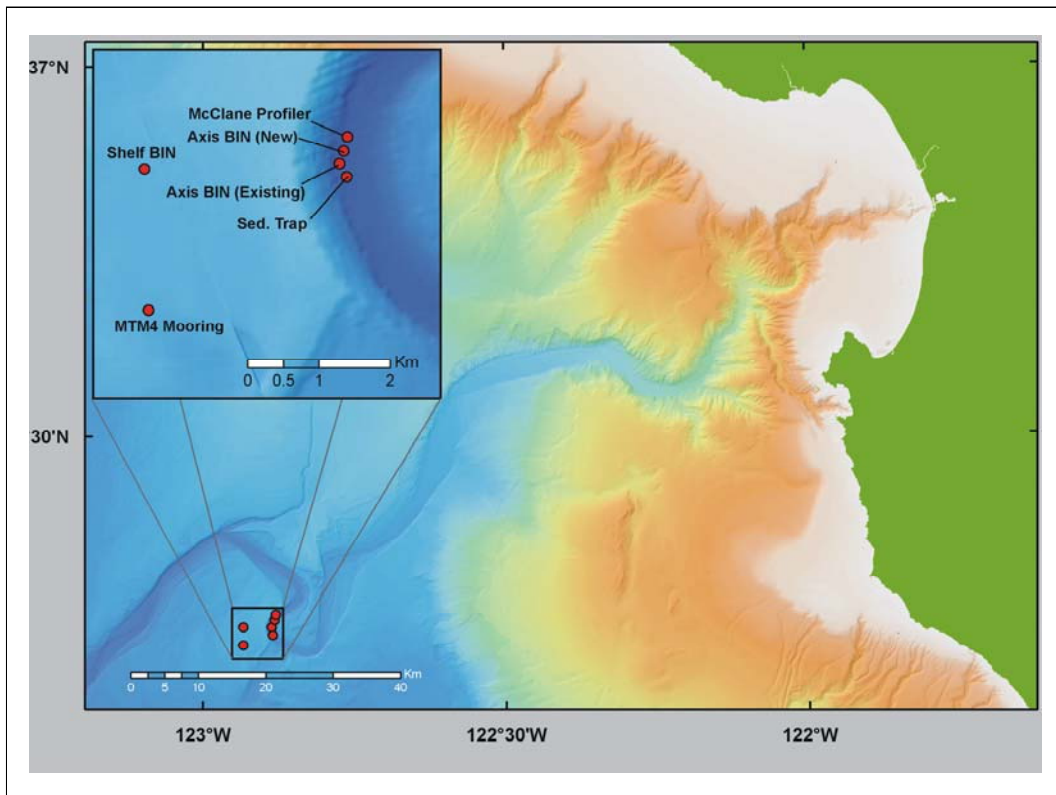


MSE/MTM4 Overall Layout Cartoon

Cartoon showing layout of MSE experiment. There is a surface float connected with the RISER CABLE to the CANYON SHELF BIN. An additional cable run connects the CANYON SHELF BIN to the CANYON AXIS BIN. A vertical profiler “McLane profiler” is deployed approximately 75 meters from the CANYON AXIS BIN and is connected by an ROV cable lay operation to this BIN. The two SEDIMENT TRAP mooring strings shown in this cartoon are standalone and have no connection to the MTM4 mooring system.

Comment:

We will have to carefully coordinate Benthos release codes for this experiment. Releases are used for BIN FRAME, sediment trap, MTM4 mooring and McLANE PROFILER deployments. It would be a very bad thing to release the wrong mooring string. - Charlie

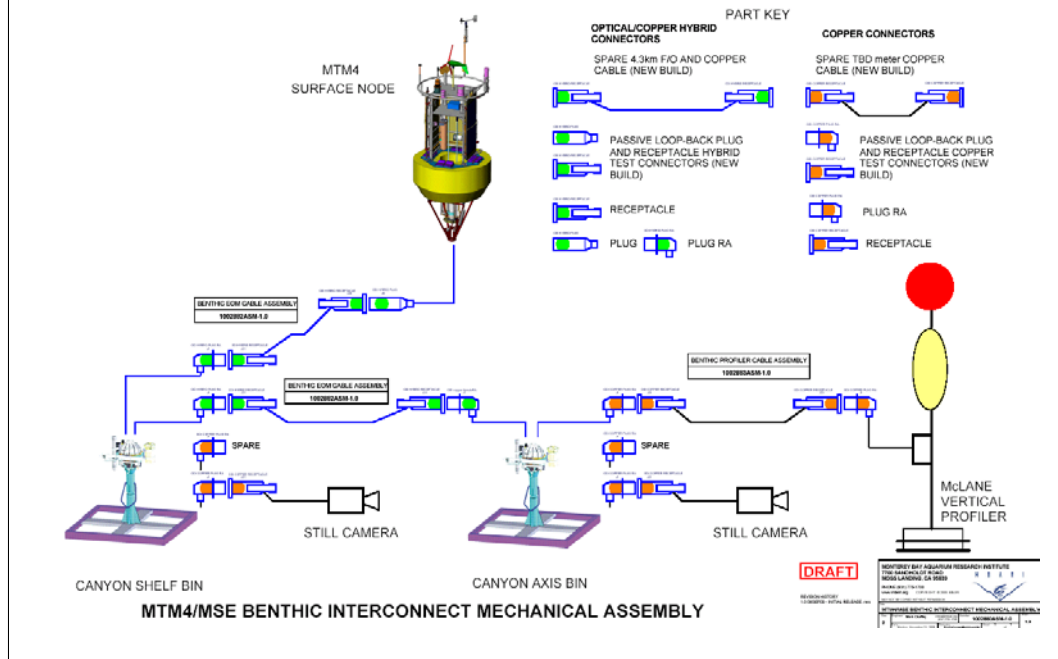


Here is a more detailed map showing the planned locations of the MTM4 mooring and BINS. Note that the SHELF BIN is just outside the mooring watch circle. It is positioned up-current of the mooring on the assumption that the mooring will tend to be on the southern side of the watch circle and therefore increase the chance that the one-time connection to the base of the mooring can be made without interference from the mooring riser cable.

Meeting comments:

- Accurate cable run survey is needed to confirm topography and distances. Plan on 20% cable slack. – Gene*
- Accurate calibration of payout distance wheel on cable sled very important. – Gene*
- Need to accurately work out ballast numbers for cable to complete operational planning for ballasting arrangement and order of operations. Having Tiburon out of trim can defeat many operations.*
- Which end for the armored section of cable? Generally agreed that the beginning part of the cable lay should be the armored section. This would put it at the mooring base (lay cable away from mooring) and at whichever BIN the cable lay was started for the second segment.*

Benthic Mechanical Assembly

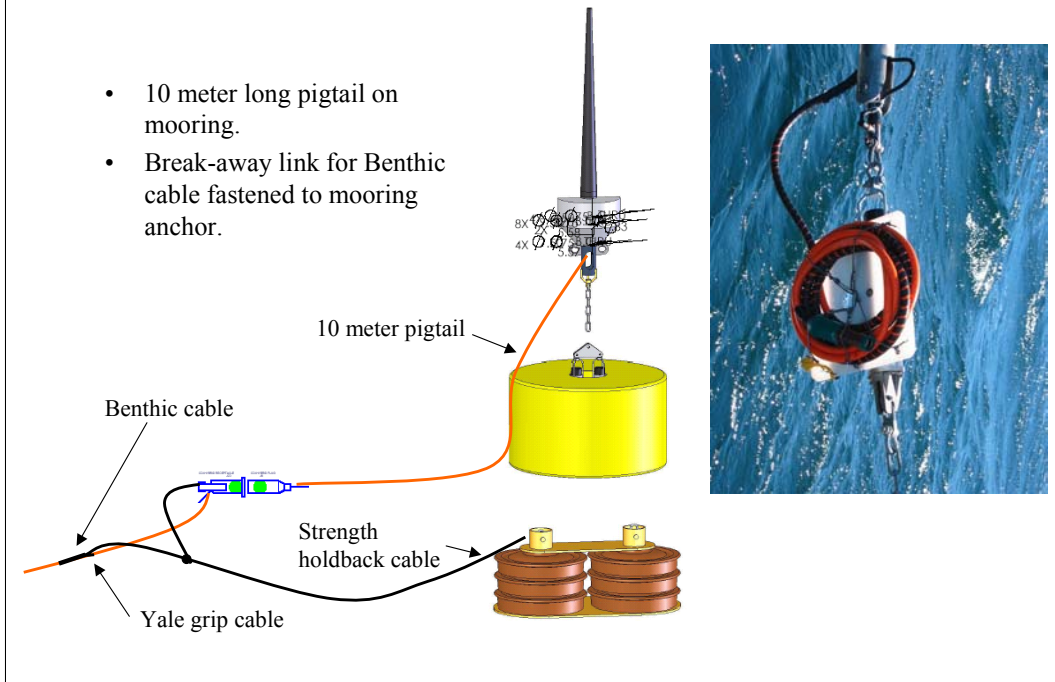


Complete MTM4 mechanical assembly is shown. Note that deployment also includes two remote cameras mounted some distance away from SHELF and AXIS BINS.

Comments:

- How are the cameras mounted? Ideally they would be on tripods looking straight down from several meters above the seafloor. –Jim B.
- The cameras should be
- The cable lay spool has a 30 meter section at the end, this seems ample for manipulating at the end of the cable lay to attach to the BIN.

MTM4 mooring termination



•Much discussion on advantages and disadvantages of having an auto-disconnect cable at the base of the mooring. General consensus was that you did not need this, that a normal service trip would use the ROV to disconnect because that was the only way you could be assured that the cable or connector was not damaged by laying in the mud or worse. Only scenario imagined that would require automatic disconnect would be if the vehicle became entangled in the riser cable and you wanted to release the mooring anchor for ROV recovery.

•Some concern that if riser cable pigtail was allowed to drape over float there might be chaf problems leading to hose damage.

•Strength hold back cable seemed a good idea, would be attached to Benthic cable with a yalegrip.

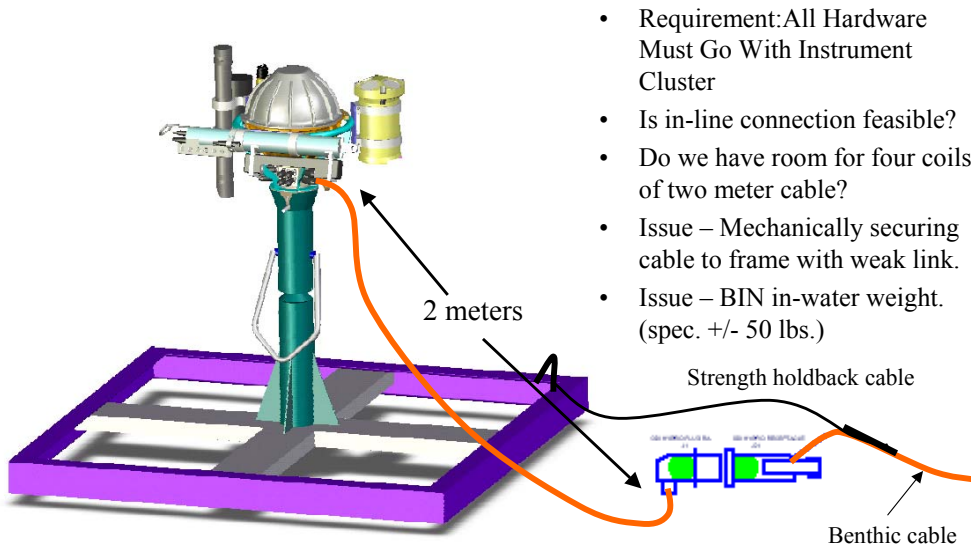
•Important issue came up: what happens if a dead vehicle situation occurs while you are laying cable? The vehicle would be anchored to the bottom by the Benthic cable. The cable lay spool would not freewheel without hydraulic power. Some possible solutions discussed:

•Larry suggested that he could provide a “deadman” disconnect that would drop the spool or allow it to freewheel in case of a dead vehicle.

•Alternatively the holdback cable and disconnect could be redesigned to allow the connector to part if there was a strong pull (dead vehicle being pulled up), bringing the Benthic cable up with the vehicle. This would still weight down dead vehicle with cable and might release before intended during cable lay if tension is put on cable.

•Floats are released as the cable lay proceeds to correct vehicle ballast.

MSE BIN design



- Requirement: All Hardware Must Go With Instrument Cluster
- Is in-line connection feasible?
- Do we have room for four coils of two meter cable?
- Issue – Mechanically securing cable to frame with weak link.
- Issue – BIN in-water weight. (spec. +/- 50 lbs.)

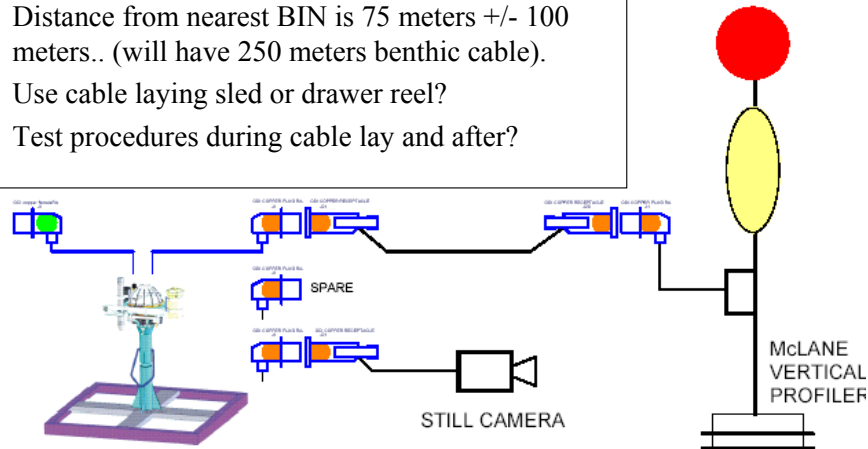
Operational plan is to approach BIN and release cable spool. ROV would pull of 30 meter whip and make in in-line connection with whip from BIN.

Comments:

- *Due to weight restrictions Tiburon has one arm only available no matter which toolsled is used. – Buck*
- *Discussion on having BIN connectors on connector plate vs in-line connections. Current design plans on in-line connections with an ROV mounted holder to allow one-armed connections to be made. This holder has been successfully tested on deck but not subsea.*
 - *Can BIN accommodate the 3-4 loops of pigtail cable that are planned? (open question).*
 - *Should the frame have connector holders/cradles mounted to it to aid connection?*
 - *What happens to the pigtails when the BIN is serviced (replaced). While in be OK for them to drape out of the elevator? Will they foul on stuff? Be damaged?*
 - *Holdback on BIN end of Benthic cable is not necessary. Cable spool will act as anchor. – Larry*
 - *Question: how strong is BIN pigtail? If ROV gets pulled away, how hard can it pull on pigtail? Strong but don't know exact figure – Mark C. (need to find out!).*

Vertical Profiler Connection

- Profiler deployed before Benthic BIN and cable installation.
- Distance from nearest BIN is 75 meters +/- 100 meters.. (will have 250 meters benthic cable).
- Use cable laying sled or drawer reel?
- Test procedures during cable lay and after?



Comments:

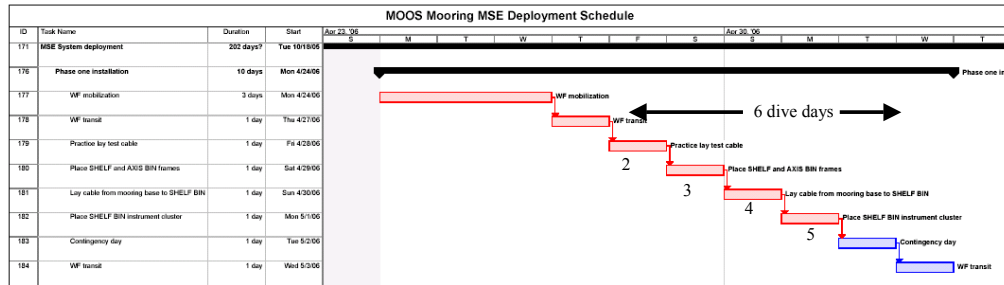
•Discussion on how to deploy the MCLANE PROFILER 250 meter Benthic cable.

- Use cable lay sled with standard spool. Have cable spool off at end of lay and connect. Takes advantage of cable lay infrastructure built into the cable lay sled. Allows lay under no tension.
- Use small reel in ROV drawer. Allows use of Benthic sled for hookup (more maneuverable). Would require cable lay under tension.
- Lots of discussion on how to reposition the Benthic cable when servicing the McLANE PROFILER every six months. Some thought ROV could lift end of cable clear from bottom for several 10's of meters and fly cable end to the new McLANE PROFILER anchor location. Complication is there may be abandoned railroad wheel anchors in place on seafloor. Second school of thought was that cable would have to be recovered and re-deployed or additional cable deployed to the new location.
- Benthic cable for McLANE PROFILER should have 450 lbs. minimum working load for benthic cable lay use.

11/18/2005

The chart displays the deployment schedule for various personnel across multiple locations (Lobos, FEB, MAR, JUN, JUL, SEP, OCT, NOV, DEC) from January to December. The chart is organized by month and day, with personnel names and roles (e.g., Mob, Contig, MNT, MNT4) listed in colored blocks. Arrows indicate transitions between locations. Key annotations include "Pt. Sur MTM4 deployment" and "WE/TIBURON MSE deployments".

Phase 1 (Shelf BIN) schedule detail

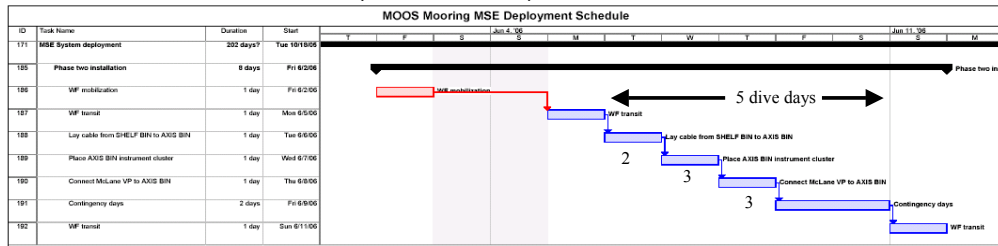


- Equipment to load
 - Shelf, Axis BIN frame
 - Shelf BIN + spare
 - Test lay cable
 - Benthic cable 1 + spare
 - Elevator
 - Homer pro
 - Sonardyne beacon
 - Tiburon Toolsleds
 - Cable lay toolsled
 - Benthic toolsled
1. Sail with cable lay toolsled in position.
 2. Test cable lay in ??? Meters depth.
 3. Place shelf and Axis BIN frames in place using WF A-frame and winch. Locate using beacon. (could be placed by Charlie earlier?).
 4. Dive on mooring base.
 - Remove loop-back connector and stow.
 - Pull out 10 meter cable from mooring base and connect in-line with Benthic cable (has loop-back installed).
 - Lay cable toward BIN frame location while monitoring continuity.
 - Drop cable reel close enough to reach BIN with cable end.
 5. Swap to Benthic sled.
 - Send Shelf BIN and camera down with elevator (and Sonardyne Beacon).
 - Dive and place BIN.
 - Remove loop-back connector and connect using 2 meter in-line cable.
 - Place remote camera stand and connect using 10 meter in-line cable.
 - Recover Tiburon.

Comments:

- Cable test lay should take place in same depth as planned operational cable lay, 3100 meters. Suggestion that test lay take place on canyon slope on phase one deployment expedition. Would help resolve question of which direction to lay cable to canyon AXIS BIN.
- Phase one installation should also include test cable lay to McLane.
- Phase one should include dive to AXIS BIN FRAME location to confirm placement and location.
- Consensus that cable lay should start at McLane and proceed away to AXIS BIN.
- Placement of BIN frames:
 - Placement accuracy for BIN frames is about +/- 25 meters.
 - Sonardyne Compatt beacon on lowering line.
 - Removable Homer Pro on BIN frame. Would be removed when BIN placed, which has it's own beacon.
 - SHELF BIN FRAME could be placed in March by Charlie on his Shepard Meander cruise.
 - AXIS BIN FRAME could be placed on phase one installation cruise and position verified on contingency day.
- Each cable lay will include a go no-go decision point that determines if one tries to recover the Benthic cable or drops the spool in case vehicle problems cause a mission abort.

Phase 2 (Axis BIN) schedule detail



1. Sail with cable lay toolssed in position.
 2. Dive on canyon axis.
 - Attach cable to frame and lay up-slope 3 km to Shelf BIN location (*has loop-back installed*).
 - Drop cable reel close enough to reach BIN with cable end.
 - Using single arm and connector holder, pull out 2 meter connector from BIN and connect in-line with Benthic cable (with loop-back on end).
Alternate: recover and swap Toolsleds to use Benthic sled for connection.
 - Test cable connection
 - Recover
 3. Swap to Benthic sled with small cable reel in drawer.
 - Send Axis BIN and camera down with elevator (and Sonardyne Beacon).
 - Dive and place BIN on BIN frame.
 - Remove loop-back connector and connect using 2 meter in-line cable.
 - Place remote camera stand and connect using 10 meter cable.
 - Lay cable to base of McLane profiler (75 +/- 100 meters) and connect with 10 meter in-line cable. Use small cable reel in drawer?
 - Recover Tiburon.
- Equipment to load
 - Axis BIN frame
 - Axis BIN + spare
 - Benthic cable 2 + spare
 - Elevator
 - Homer pro
 - Sonardyne beacon
 - Tiburon Toolsleds
 - Cable lay toolssed
 - Benthic toolssed

Comments on phase two operations.

•Lay cable upslope or downslope? Noted that test cable lay was upslope. Upslope has the advantage that you have better bottom visibility. Downslope cable lay allow one to use the built in cable health check during cable laying operations. Tiburon also had power limitations laying cable upslope. – Buck

•If you laid cable downslope you could payout as per calculated depth schedule. - Gene

•Pretty evenly split difference of opinion on which direction was better with cable sled folks (Larry and Gene arguing for upslope and Charley and maybe BUCK arguing for downslope) . Discussion on laying additional cable test piece and seeing if downslope lay was possible.

•General agreement that upslope lay should be baseline plan and downslope lay can be considered based on testing results during phase one operations.

Testing and contingency

- Deploy surface mooring and riser cable
 - Loopback power and optics to verify riser cable OK before beginning ROV operations.
- Lay cable to shelf BIN location.
 - Loopback power and optics to verify cable OK as it is deployed.
 - In case of failure:
 - Recover cable?
 - Deploy spare cable
- Installation of shelf BIN instrumentation.
 - Plug in and verify communications and power to BIN.
 - In case of failure:
 - Replace Loopback connector.
 - Recover BIN and deploy spare.
- Installation of axis to shelf cable.
 - Loopback of power and optics.
 - Cable is tested when plugged into shelf BIN.
 - In case of failure
 - Recover Loopback connector
 - Deploy spare cable
- Installation of axis BIN instrumentation.
 - Plug in and verify communications and power to BIN.
 - In case of failure
 - Replace Loopback connector
 - Deploy and install spare BIN

Comments:

- *Most of the information on these topics was covered in earlier discussions.*

Testing and contingency continued..

- Connect McLane profiler cable to BIN.
 - Data com and power Loopback on end??
- Lay cable to McLane anchor location.
 - Plug into McLane and verify power and communications.
 - In case of failure:
 - Replace Loopback and test.
 - If cable OK recover McLane?
 - If cable not OK deploy spare cable.

Comments:

•Data and power Loopback testing on McLANE PROFILER is still TBD based on if MOOS has the ability to Loopback test EIA 422.

Needed equipment and supplies

- Tiburon cable laying sled.
- Elevator with space for two instrument BINS and camera stand.
- Benthic toolsled (two-arm configuration). *Tiburon no longer supports two arm operation.*
- Two deployed benthic cables and connectors + spare cable on reel.
- Live during-deployment hybrid test connector male and female.
- Vertical profiler benthic copper cable and spare.
- All MSE BINS + spare + all instruments.
- Equipment and software for dynamically monitoring optical receive power and 400V current and GF's while working on seafloor.
- Sonardyne beacons for elevator? *Compatt Sonardyne beacon recommended.*
- Number of homer pros needed?
 - Base of McLane
 - Shelf BIN
 - Axis BIN
 - On end of cable?
- Other? *Number of releases needed? Coordination of release codes?*

Outstanding issues

- Technique, tooling and testing for Benthic connections.
- Mooring position in relation to expected current and Shelf BIN. *See previous notes.*
- Should there be a dead-man holdback on the top of the slope to restrain cable? *Consensus is no.*
- Will elevator have space for two instrument BINS and camera stand.
- Can the BIN be carried and placed by Tiburon with the cable laying toolsled in place?
- Can we change to Benthic toolsled (two-arm configuration) at sea? *Tiburon no longer supports two arms (payload issue). Toolsleds are difficult to change at sea although WF can run for sheltered water to make the switch.*
- How well does the connector holder work for one-armed cable connecting operations? *Deck tests worked well.*
- The MOOS mooring design supports continuous testability for cable lays from the mooring outward but not the other way. Cable laying should be up-slope for canyon wall. Raises question on test procedures.
- Is the Tiburon DVL up and running again? *Yes.*
- Is the Tiburon software fixed for reporting toolsled data through to DataManager and GUI (support eng)? *Not confirmed.*

MSE deployment and maintenance staging

