Southeast Florida Coral Reef Initiative (SEFCRI)

Technical Advisory Committee (TAC) Biannual Fall Meeting

Report of Proceedings

November 28-29, 2017

Nova Southeastern University Oceanographic Center

8000 North Ocean Drive

Dania Beach, Florida

MEETING ATTENDANCE

Technical Advisory Committee (TAC)

Name	Affiliation	Day 1	Day 2
Ken Banks	Broward County	X	
Don Berhinger	Fisheries and Aquatic Sciences UF/IFAS	X	X
James Byrne	The Nature Conservancy	X	X
Nancy Craig	Broward County		
Dick Dodge	Nova Southeastern University - Oceanographic Center/ NCRI	X	X
Phil Dustan	COFC	X	X
John Fauth	UCF	X	X
Piero Gardinali	FIU	X	X
Dave Gilliam	NSU-OC/NCRI	X	X
Lew Gramer	UM RSMAS/ Keys Marine Lab	X	X
Kurtis Gregg	NOAA	X	X
Dale Griffin	USGS	X	
Judy Lang	AGRRA	X	X
Diego Lirman	UM RSMAS		
Jose Lopez	NSU-OC	X	X
Arthur Mariano	UM RSMAS		X
Valerie Paul	Smithsonian Marine Station	X	X
Esther Peters	George Mason University	X	X
George Sedberry			
Manoj Shivlani	Center for Independent Experts (CIE)	X	
Jack Stamates	NOAA	X	X
Brian Walker	NSU-OC	X	X
Dana Wusinich-Mendez	NOAA	X	X

Department of Environmental Protection (DEP) Coral Reef Conservation Program (CRCP) Staff

Name	Affiliation	Day 1	Day 2
David Cox	FDEP CRCP	X	X
Francisco Pagan	FDEP CRCP	X	X
Kristi Kerrigan	FDEP CRCP	X	X
Meghan Balling	FDEP CRCP	X	X
Joanna Walczak	FDEP CRCP	X	X

Aubree Zenone	FDEP CRCP	X	X

Additional Presenters and Observers

Name	**Affiliation**	**Day 1**	**Day 2**
Kory Enneking	NSU	X	X
Wendy Wood-Derrer	NSU	X	X
Dan Kapnis	SEFCRI	X	
Mike Dixon		X	
Doug Seba		X	X

Southeast Florida Coral Reef Initiative (SEFCRI)
Technical Advisory Committee (TAC) Meeting, Nov. 28 & 29, 2017
Nova Southeastern University, Oceanographic Center
Center of Excellence in Coral Reef Ecosystem Science, 3rd Floor Auditorium
8000 N. Ocean Drive, Dania Beach, FL 33330
Phone: 954-262-3600

AGENDA

DAY 1 – November 28, 2017

8:30 am	Registration
9:00 am	Welcome, Introduction of TAC Members *– David Cox, Florida Department of Environmental Protection Coral Reef Conservation Program (FDEP CRCP). Coordinator, Land-Based Sources of Pollution (LBSP)*
9:10 am	Meeting Guidelines, Agenda Review and Meeting Purpose
9:30 am	**Session I: Outfall Biomarker Project** *(Dale Griffin, USGS & David Cox FDEP)*
10:30 am	Break
10:45 am	**Session II: Outfall Biomarker Project** *(Dale Griffin, USGS & David Cox FDEP)*
12:00 pm	Lunch
1:00 pm	**Session III: Disease Intervention Workshop Summary & Disease Coordination Update** *(Kristi Kerrigan FDEP)*
1:30 pm	**Session IV: SEFCRI Next Generation LAS Projects** *(Aubree Zenone FDEP)*
2:30 pm	Break
2:45 pm	**Session V: SEFCRI Next Generation LAS Projects** *(Aubree Zenone FDEP)*
3:45 pm	**Presentation:** Overview of Florida International University's CREST Center for Aquatic Chemistry and the Environment *(Piero Gardinali, FIU)*
4:15 pm	**Public Comment** (Three minutes per individual)
4:30-5:00	**Updates/Wrap Up**
5:00 pm	**Meeting Adjourn/Reception**

DAY 2 – November 29, 2017

8:30 am	Registration
9:00 am	Welcome, Meeting Guidelines/Agenda Review/Overview Day 1 Discussions
9:15 am	**Session I: SEFCRI Next Generation LAS Projects** *(Aubree Zenone FDEP)*
10:30 am	Break
10:45 am	**Session II: SEFCRI Next Generation LAS Projects** *(Aubree Zenone FDEP)*
12:00 pm	Lunch
1:00 pm	**Public Comment** (Three minutes per individual)
1:15 pm	**Presentation:** Physical Oceanography of SE Florida *(Dr. Arthur Mariano, RSMAS)*
2:15 pm	Break
2: 30 pm	**Presentation:** Current observations near the St. Lucie Inlet *(Jack Stamates, NOAA AOML)*
3:00 pm	**Updates/Next Steps** *(TAC, David Cox, FDEP)*
3:30 pm	Closing Remarks and Meeting Adjourn

SEFCRI Technical Advisory Committee Meeting - Day 1
Join us for a webinar on Nov 28, 2017 at 9:00 AM EST.

Register now!

The Southeast Florida Coral Reef Initiative's Technical Advisory Committee will be meeting Nov. 28-29 from 9:00-5:00 pm at Nova Southeastern University's Oceanographic Center in Dania Beach, After registering, you will receive a confirmation email containing information about joining the webinar.

View System Requirements

TAC Meeting Minutes/Summary: Tuesday, Nov. 28th & Wednesday, Nov. 29th 2017

Meeting Guidelines

David Cox welcomed everyone to the TAC Meeting of 2017. Roll call was given for the members present. Francisco Pagan also welcomed the SEFCRI and TAC members. David announced the two open seats, and asked for suggestions for people to fill those. David reviews the agenda and public comment card procedures for members and general public.

There are two main objectives for the meeting: One is to get into the project details of the SEFCRI project ideas for input on the next steps, and the second is to get the outfall project logistics worked out to get divers into the water.

Session I: Outfall Biomarker Project (Dale Griffin, USGS & David Cox FDEP)

- Outfalls having a negative impact on environment
    - Antibiotic resistant bacteria affect ecological change
    - Antibiotics are present in wastewater in high abundance
- Some Vibrio species are resistant to certain antibiotics
- Developed marker for a hotspot based on number of "hits," or genes, per sample of soil
    - The hottest hits occurred in Washington DC
    - These were near sewer overflows
    - When you reach five or more genes detected it indicates anthropogenic influence
- Sediment samples around the outfall
    - Took samples near and far (FTL3 site=control) from the outfall
    - Antibiotic effects were evident
        - All the species in the sample were overlaid. Clear areas on the auger indicate inhibited growth
        - There are always a small number of "persister cells" that can withstand environmental stress (in this case, antibiotics)
        - Persister cells near the outfall demonstrates some antibiotic resistance.
- Preliminary sample plan
    - Central site at the outfall—take sediment sample
    - Take a sample every 25m North, South, East, West, NE, NW, SE, SW
    - Total of 26 samples

<u>Questions & Comments for Dale</u>

1. (Phil Dustan) *The antibiotics you show that there was resistance to chloropentanal and tetracycline those really aren't used very much, or are they still? Because I know chloropentanal is a mitochondrial handler, so I don't think that is used in the medical sphere for humans, but maybe for pets now.*

- (Dale Griffin) *That was just some of our collection of antibiotic disks that we could use years ago that we could look at for the presence of culturables in African dust for what resistance might be present. That was just the opportunity that I had those and I just put them on the plates to see, and clearly there is inhibition when you get away from the outfall, but not complete inhibition. So, there is still some use for it now.*

- (Phil Dustan) *If you're looking at the selection pressures now, you'd want to use second and third generation siliceous forams and things like that instead of chloropentanal.*

- (Dale Griffin) *If you're looking at most major hubs that are screening for auto resistant genes and those target genes are what you are seeing now from the people screening soils and waters. That's where I pulled those 15 different targets from different papers and those were recent publications.*

2. (Jose Lopez) *That's a good point about having selection pressures. The types of antibiotics that are being applied, we're assuming that what's coming out of that pipe is derived from sewage and effluent. That selection pressure in order for it to take place at whatever hospital or whatever to cause the resistant bacteria to appear. Now we're saying that we're going to see them near the outfall because of the pipe, and to try to detect those genes?*

- (Dale Griffin) *My view is that it's the antibiotic in the wastewater that's causing these genes to appear and be stable in the environments that are under the influence of the pressure. Not that MERSA is surviving through the pipe and falling into the sediment and surviving. It is the end result that is influencing the microbial community around that site.*

- (Jose Lopez) *Measured from the pipe itself, the amount of antibiotics right?*

- (Phil Dustan) *Antibiotics that are used today for kids' ear infections, and things like that are given when you go the doctor. Mostly like Cipro and ampicillin and maybe some higher ones like Rocephin.*

- (Judy Lang) *Should be possible to ask the local hospitals what they're seeing resistance to and what their doctors mostly prescribe? I like the idea of putting a couple animal antibiotics that are not used on people as well.*

- (Phil Dustan) *I wonder if you're finding resistance to things like Prozac, or other pharmaceuticals because we know there is tons of that going through the waste water community.*

- (Dale Griffin) *When you look at a microbial community, you can see resistance to metals. Mercury is one that's common, you can find mercury resistance. You can also find Copper resistance. Anything that causes stress you can get some resistance to.*

- (Jose Lopez) *You can look at the big resistant colonies in the plates. It could be interesting to look at because you can usually detect resistance in the plasmids. That is a characterization of resistance.*

- (Dale Griffin) *John Lyle [SP?] from USGS Saint Petersburg, his Ph. D. was on mercury resistance. He was able to show what colony that had the gene could not only be shared across species, but across genera. If you take one that didn't have it and put them on plates together in a river and they can exchange. They are very promiscuous with genes and some types of genes can more across multiple genera.*

3. (Esther Peters) *That may get you the antibiotics that are being used, but not whether the antibiotic resistant plasmids are being exchanged into the marine environment.*

- (Dale Griffin) *This does.*

- (Esther Peters) *Are you're going to be culturing the bacteria on augur?*

- (Dale Griffin) *No, I will get a tube with about 40 mills of sediment in it. I would pour off the water and take a quarter gram of wet sediment, use up a biokit, and extract DNA from that quarter gram sample for the community. Then screen the sample for those 15 genetic targets*

- (Esther Peters) *So you are just looking at the molecular level, and not doing the culturing.*

- (Dale Griffin) *That's the easiest thing to do. Shake the sample up, take 100 microliters out, do spread plate on TSA which has disks around it to measure the width of the zones to compare it. Many people have done that, this is just using a molecular tool like PCR to screen for the presence of about 15 different targets.*

- (Esther Peters) *Is anybody doing this on beach samples?*

- (Dale Griffin) *Surprisingly nobody's done this type of work before. If you look in the literature, it is just not out there. I think there was something I saw in Japan or China where they screened marine sediments, but it wasn't for as many targets as I did. I think they cultured the bacteria, and did not do the molecular approach. Not many studies at all, in the literature, where people went out into the marine environment and looked in near-shore communities at what the frequency of these genes were. The least information you get out of it is the naturally occurring frequency of these genes in the near shore marine ecosystem. Hopefully what we show like in the big study on the east coast as you get near in shore sources you will get more genes lighting up. I think the same you get near sources, more genes that are lighting up with PCR. I think that is what you will see here, I think the culture was a little preliminary evidence that there is some resistance in the communities by the outfall. Go ahead Brian.*

4. (Brian Walker) *I just want to ask how we came up with the distances between the samples and do we think that's sufficient to capture a gradation from the pipe. Fifty meters seems like short distance.*

- (Dale Griffin) *It is. This is a proposed sample plan, I came up with it. Brian and I were talking, and he asked what I would imagine doing. So, if it was me I would lay it out like this because I'm trying to show influence. I know this sampling group is tight, but we should see something about 50 meters out, but then we're going to get up to 600m [sic 800 meters] away.*

- (Brian Walker) *Oh I see, it continues out.*

- (Jack Stamates) *Can I just add one logistical thing. That close to the outfall you are going to be measuring a bunch of heavy particulates that are falling out of the rising buoyant plumb that will disperse at the surface. The heavy particles will be falling out around this radius in the near field, so you are going to have things attach to the particulates. Understanding that might be very valuable.*

- (Dale Griffin) *It might help to see that by taking the effluent water sample going out of the plant from the pipe, and then the rest of these are from the sediment.*

- (Jack Stamates) *This area's going to have a disproportionate amount of particulate loading then the distal sites will be, this will have big particulates. I just wanted to make that point, but that can be dealt with and handled.*

- (Dick Dodge) *I thought secondary treatment eliminated the big heavy stuff.*

- (Jack Stamates) *Not all of it, there is still particulate in the outfall.*

- (Kurtis Gregg) *It's a grinding process, they just change the size of that material. Jack is right that it is just raining down on that radius.*

5. (John Fauth) *I love this design. The only thing that I might tweak is that last distance. What you have is 25, 50, 100, 200, 400, the next number is 800, not 600 because it is doubling every time. I am suggesting this to keep it consistent, and to guard against the thought that the particles will falls right down, but we might be wrong. Let's go as far away to what we think is reasonable, or beyond what we think is reasonable to see if it is there.*

- (Jack Stamates) *The particles are theoretically being launched to the surface. That is the plan, it hits the surface and then disperses among the surface.*

6. (Phil Dustan) *Do you have a control site?*

- (Dale Griffin) *My view was, no. Not like FTL3 that they sampled before. We could use, and that add that in, but that is just one more site. I was kind of hoping that when we got out by the 800 meters, we'd be out of the zone of influence, at least*

concentration wise. Yes, it would still be impacted, but hopefully not high enough to maintain. The rule in genetics is use it or lose it. If they do not need it they will dump it, this happens all the time.

- (Phil Dustan) *Let's just suppose that there are sources of water that are leading the antibiotics all over the place, not just from the outfall. It would be good to have some sort of control site because they all look the same, even in the control site.*

- (Dale Griffin) *We might want to add a surface water site on an outgoing tide, or one at the mouth of the port and one at a situ site for a negative control. Also, I agree to go out to 800 meters.*

- (Dave Gilliam) *We need to consider, this is just collecting sediment? Your center point is in 100 feet of water. If you go 50 meters further out, you're going to have to hire technical divers to get those sediment samples. That looks good on paper, but your northeast, east, and southeast you are going to have to hire someone who can dive deep to collect your samples.*

- (Dale Griffin) *Ken mentioned that, and if it's too deep, then we're not going to collect those samples*

- (Lew Gramer) *Are grab samples infeasible for this method?*

- (Dave Gilliam) *Yes, if you think you can get a sample at the 50-meter mark in current. I don't think you exactly know where that sample's being collected from though.*

- (Judy Lang) *Back to particles truly a lot of the bacteria are going to be adhering to the surface of the particles and fall back down.*

- (Dale Griffin) *I prefer not to use a ponar, because when you pull it up the sediment gets flushed. Half the time when you get it to the surface it's not a real sample, you have sediment, but your community might be changed.*

- (Phil Dustan) *How about a short piston core or a core?*

- (Dale Griffin) *A core device if you do not hit hard bottom. I really only need a gram of sediment, I am only going to use a quarter, but I'd like to archive some.*

- (John Fauth) *I was thinking the same thing that Dave and Phil have both mentioned about the logistics of it and the control site, especially if we can't get those deeper sites. I assume that the 26 samples were a financial cap, right? If you have some samples that we are not going to get on the ocean side. Because these things have human health concerns, maybe put those samples on a transect going back towards the beach?*

- (Dale Griffin) *I'd like to show the human health risk, and that means we need to get near the beach.*

- (Judy Lang) *How close is the beach from the site?*

- (Kurtis Gregg) *I had asked Dave, and he is not sure if those sites are 130ft or less. I and some EPA divers will be working in the vicinity in the near future can improve this data collection by getting the three samples during our data collection.*

- (Dale Griffin) *Ken do you know how deep it is?*

- (Ken Banks) *We ran our boat out, and we were looking at the ball that can be displaced. It wasn't much deeper than 50 meters, but we didn't record at the outfalls.*

- (Jack Stamates) *The currents are pretty much bidirectional around here, so it's either going north, or 180 degrees to the south. It is pretty much aligned with the topography.*

- (Brian Walker) *Depending on the technical nature of the collection, which it doesn't sound very technical, I can probably hook you up with some technical divers who would be willing to go out and do the data collection.*

- (Dale Griffin) *The thing about the collection is that it doesn't have to be the same day. We are trying to get seasonal: wet and dry, so in a three or four-day period.*

- (Brian Walker) *These project baseline people, they have a list of technical divers that are willing to do it. Even if you wanted to go deeper, they can use their sub training to collect the samples.*

- (Kurtis Gregg) *In collecting the sediment, are you trying to get a sediment profile in the 50ml tube?*

- (Dale Griffin) *When I go out I just do a quick scoop, and usually get 35-40ml of sediment.*

- (Kurtis Gregg) *Do you ever need to double dip?*

- (Dale Griffin) *You may in a shallow environment have to. I'm looking at the top surface, because it goes anoxic really quick.*

- (Kurtis Gregg) *You want to stay out of that?*

- (Dale Griffin) *You want to get the aerobic community.*

- (Jack Stamates) *I second the thought that the outer deeper sites will not be the best. It would be best for inshore, I don't think you will see much because the currents don't transport that way.*

- (Dale Griffin) *So eliminate the eastern two, and put them in shore?*

- (Jack Stamates) *Yes, put them inshore.*

- (Jose Lopez) *Another benefit of this project is you're going to have archived sediment. You will have more than enough to do a microbiome analysis, and save the data. It will tell you about the microbial community to have down the line. Then you could identify some resistant bacteria. Then the control issue is easy, just taking samples on the way back in, away from the outfall.*

- (Dale Griffin) *I plan on archiving everything at -80. I have a colleague at the University of Oklahoma named Boris Waller [SP?] who's big into transcriptomics and, is always offering to run samples for free because it is so cheap. It might be interesting if we get a real hot site and what we consider a natural site to have the transcriptomics done, and microbiome.*

- (Jose Lopez) *That will have to be preserved in RNA later though.*

- (Phil Dustan) *Not only sediment, you could do coral surfaces or sponges to see if microbiome's being impacted.*

- (Dale Griffin) *Yes, I think if the data pans out like I think it might, it could open a lot of doors for communities of mucus in corals also.*

7. (John Fauth) *I know what is on the x-axis, so I'm thinking analysis. The x-axis is just direction, what's on the y-axis or the response variable?*

- (Dale Griffin) *I'm looking at presence/absence of genes*

- (John Fauth) *So, what will those numbers vary between?*

- (Dale Griffin) *The number of positives in presence/absence of 15 genes per site.*

- (John Fauth) *So it could be for 0-15.*

- (Dale Griffin) *With the control of a hotspot of a sewage sample. We have data from the first run, the first sample lit up 11 of the 15 targets. I look at anything over eight considered to be anthropogenic influence. That is what we saw on the New England coastline.*

- (John Fauth) *Can be from 0-11.*

- (Judy Lang) *You don't know what those numbers are here?*

- (Dale Griffin) *No, the we only have sewage samples, from the Broward county sewage treatment plant, which was 11-15. I haven't done anything of ABR other that the few samples Ken sent me using the culture base and the abiotic disks.*

- (Judy Lang) *It will be really interesting to compare the North Miami plant to the other plants, if it is really similar.*

- (Jack Stamates) *I can't tell you what they did, but I do know they've been doing some work.*

- (Dale Griffin) *So we have one outfall pipe that is tertiary treatment, while the others are secondary?*

- (Jack Stamates) *Yes, some higher level of treatment at Miami North.*

- (Dale Griffin) *At least if we could get an effluent sample from the point to see what is being pumped out.*

- (Jack Stamates) *I'm sure they must have published something about that.*

8. (Judy Lang) *Are these genes in the water or in particles that are falling to the bottom?*

- (Dale Griffin) *It's a combination. It is in particles, where cells are coming out of the plant, then you have antibiotics in the water column going out with the waste. So, what we are looking at is the cellular extracts from sediment. There could be some dead cells from wastewater plume, and culturable ones that are alive that are resistant.*

- (Don Berhinger) *So you are going to be doing just molecular techniques. Would it be feasible to also try some culturing for affirmation to know there are actually live cells?*

- (Dale Griffin) *Yes, it is the simplest thing in the world to do. TSA plates, which you have to buy the disks that Fisher Scientific sells. You pick the targets you want and plate them out like I did before. First you do your overlay, you put the communities on there, you put the disks on, and then culture them. It is not costly, might be something that we ought to do.*

- (Don Berhinger) *If it's easy and cheap why don't you?*

- (Dale Griffin) *Down in the Keys we saw that we have human enteroviruses in the canals, the first question the EPA had was are they alive. That may be a question here too. That may be something additional we might wat to include. Cause it's simple and quick. I'm sure we can add that.*

9. (Lew Gramer) *I don't know if this is of use or not, but microbial communities change on a very rapid timescale, on the order of days. Evidence seems to suggest that they respond to waves particularly inshore sites around 10m or 15m. We find that wave conditions are changing rapidly in the winter. I do not know if the sampling design inshore should take account of that. It is just a thought, especially in regard to vertical mixing of buoyant plumes. Waves are probably very important.*

- (Phil Dustan) *If you want to get a little nuts, if you take your sediment and have it in a little dish. Take a sample, then treat it with effluent water then wait a half hour to take another sample. You could do the selection experiment in the lab. You could even get sediments from the Bahamas and dose them, that would be a really dramatic experiment.*

- (Dale Griffin) *I have some preliminary antibiotic data from the toxicology study we did where we took plume samples and screened for various pharmaceuticals. There were a number of them in there. Of course, there are always the limited detections issues with some of the chemicals, but some of them were there. Maybe create a guide for this type of experiment on what to choose.*

- (Phil Dustan) *Would be a great master's project.*

- (Dale Griffin) *Yeah, that would be a great project for a student, it would be easy.*

10. (Dick Dodge) *I have a question. You said some number out of 15 indicates influence. If Anthropogenic influences [sic], is that necessarily bad?*

- (Dale Griffin) *I would say so. That was based on soils. You wouldn't want your kid playing in soil that has high frequency of antibiotic resistant microorganisms.*

- (Dick Dodge) *What I want to know is, you said 3-4 is okay.*

- (Dale Griffin) *Well, that is The Griffin Scale.*

- (Dick Dodge) *That's my question. What's the real scale?*

- (Dale Griffin) *I'd say the real scale is, you saw the color coding on the northeast coastline being white and yellow. White meaning nothing, and yellow meaning 2 or less. I'd want to say 2 is the natural, then being conservative, maybe 3 or 4 might not be that unnatural. When you get up high in a sewage sample indicates, if you look at the data we were near a zone of influence. There might be a zone of influence, it might be a sewage site or agricultural site, where we know what antibiotics are being released into the environment. When you get near them, there is a resistant gene and your soils go up. So, your risk is greater if you are exposed to those soils.*

- (Judy Lang) *So, what number would you allow your children to be exposed to?*

- (Dale Griffin) *I wouldn't want them playing in sewage.*

- (Judy Lang) *3 or 4?*

- (Dale Griffin) *I always told people in the Florida Keys don't swim in canals in the morning. You usually ingest by licking you lips about 50 milliliters of water. So, when your neighbors are flushing their toilets and you are thinking it's a good time for a swim, it is not. I cannot tell you the risk levels, but it is greater than if you don't swim. It is the same here with antibiotic resistant genes. The probably of encountering an infectious organism and acquiring a MRSA type infection is greater in an environment where you have more genes present.*

- (Jose Lopez) *I think that is the key, we have to find out the natural variation.*

- (Dale Griffin) *That's what we're doing here in the marine environment. No one has ever done that before. There are no papers on it in the literature. As long as we are talking about the antibiotic resistance, no one has done it in the Keys, or in our offshore environments to look for the prevalence of each gene in the microbial communities. We have all these sources, septic systems down there and outfalls up here.*

11. (John Fauth) *I guess the only other suggestion I would make is to counter something that is already in the notes. Is to try to do this all on one day or two days or as tight of a frame as you can. Because the more possible sources of variation you get, like the waves you get here, it becomes easier for the naysayers to shoot holes.*

- (Dale Griffin) *I agree, it is just bottom time, it's how quickly that you can do the 25's and the 50's. Once you did the core, that is the majority and there are only 8 other sites.*

- (Dick Dodge) *I thought sediments were repositories over time, not instantaneous amounts.*

- (Dale Griffin) *I would say that the community is pretty stable.*

- (Dave Gilliam) *I think that would change inshore because they certainly weren't stable this past fall, or today.*

- (Dale Griffin) *The wave action at that depth I don't think will be an issue. The transects we have are more south on that depth line. I think the wave action will be a lot less than what you might have in nearshore or shallow environment you might get blowout. When you get sediment suspension in a community, when you go out and do the ecology it will be dramatically different. It is constantly being disturbed.*

- (Lew Gramer*) More likely an issue the closer you get to shore, but definitely below 10 meters.*

- (Dale Griffin) *At that depth, you feel currents down there.*

- (Ken Banks) *Hurricane reset everything.*

12. (Judy Lang) *Have you tried to work out how many divers it is going to take to do this?*

    - (Dale Griffin) *No, Judy?*

    - (Judy Lang) *You are going 30 meters and 25 north and south, 50 north and south, 100 north and south, 200 north and south, 400 north and south, and 800 north and south. That's a lot of divers. How many divers is that going to take, just for the north south parts?*

    - (David Cox) *So I would like to suggest that we create a dive team logistic for this. We did start some talks, I started talking with Joanna about the pilot project which I think a few of you were on the pilot project. That's something we need to talk about.*

    - (Judy Lang) *Do you have scooters that you can get your people who go north and south?*

    - (David Cox) *I believe DEP has some scooters.*

    - (Joanna Walczak) *We have some scooters.*

    - (David Cox) *Especially at those sites running from the south. One of the groups is going to be hit with a current in the face. So, we were just thinking out loud last week and could it be four teams of two divers each? Eight divers on the boat?*

    - (Phil Dustan) *Could you use an ROV? Can the ROV's collect cores somehow?*

    - (David Cox) *Can you get us one? We talked about ponars, but the accuracy is questionable of where you're hitting, and difficulty of getting those to the surface with a sample on it. If anyone has ever dropped one of those, a shell can open them up. Who wants to haul up one of those 15 pounders from 100ft trying again and again? This is a really big part of the planning because of the depth involved. Bottom times would hopefully be pretty minimal, but you are going to have one group going with the current and one group going against the current. Are there any volunteers to be on a dive logistics team, to really hammer this out?*

    - (Dave Gilliam) *I can help out. Thinking about it now, ideally you want two-five man teams. Each team takes a distance, or you will be asking them go to 100 meters.*

    - (Ken Banks) *They got scooters.*

- (Judy Lang) *You have to have scooters, and you will need two boats. The team going with the current is going to have to get picked up.*

- (Dave Gilliam) *They will all have to be picked up in that current.*

- (Brian Walker) *Like I mentioned earlier, I'm in touch and work with a group of tech divers who work with rebreathers, and do things at this depth all the time. They would probably would be very interested in helping with an outfall data collection. I bet you they'd do it for free, it would just be a matter of coordinating and getting them out there for samples.*

- (David Cox) *Do we put them on one of our boats, or do they use their own?*

- (Brian Walker) *Yes, or they also have their own vessel too.*

- (Ken Banks) *You can't do that though. Are they AAUS?*

- (Dave Gilliam) *They can't go off our boats.*

- (Brian Walker) *It wouldn't be off our boats.*

- (David Cox) *What was the number you threw out Dave in terms of number of people if we were trying to get this design done one day?*

- (Dave Gilliam) *If we eliminate the eastern components that still leaves five transects. Each transect if you want to make it back to the beginning is 100 meters, 50 meters out and 50 meters back. Scooters always sound nice on the surface, but sometimes they are a pain when you get in the water and are trying to work. I think to ask one dive team, maybe with the scooter to do two, without a scooter you can only do one transect. You are asking them to swim 100 meters in 100 feet of water.*

- (Dale Griffin) *So, on the eastern transects are we going to eliminate all three of them? There are three of them, you got two 45 [degree]s from east.*

- (Dave Gilliam) *Even on nitrox 36, you can't go any deeper than 100 feet. If you have to go deeper you are back to air and that cuts down your bottom time. You don't have that much bottom time.*

- (Brian Walker) *That's where this other team get their advantage, they are on rebreathers.*

- (Dave Gilliam) *Well if you are able to get them to do that, then get them in the water.*

- (Brian Walker) *They could do the eastern sites, the guys I worked with were really good.*

- (Phil Dustan) *Brian, this would be perfect for a tech dive club. They would love this, they would be all over this.*

- Jack, Judy and Phil discuss letting Tech diving clubs design the full dive experiment. [inaudible]

- (Brian Walker) *These guys would do it, I'm telling you. They are into the outfall idea.*

- (Phil Dustan*) So many divers want to do something to help, and this allows them to use their technical expertise. Which they can do since scientists cannot go there.*

- (David Cox) *Alright, where are we at? Okay, what we wanted to accomplish today we have taken a good step in. You have heard about the project, you have asked your questions We've got a dive team to talk about this and work it out and some really good suggestions on getting some people who could do it for us, which would be great. I am very optimistic.*

13. (Dale Griffin) *I am going to bring up the sample map again because I do not believe there is a consensus on that. On the eastern side, which is deep water, we could eliminate the 50 meters and only do the 25s and leave those three 50 meters inland towards the beach.*

- (Jack Stamates) *I do, the currents are rarely moving that way.*

- (Dale Griffin) *I say that's what we do, and then we get three more towards the beach.*

14. (Phil Dustan) *Dale, is cost of samples driving the number of samples you can take, is it really that expensive? We were talking, you get a tech dive club to do this and they will go down 200 feet on rebreathers and they will do this and have a blast planning it out. You just have to sit down with them and tell them "guys, this is what we need" they will say "yeah." They can probably get you all the samples you want in that radius. How much is cost of the sampling processing?*

- (Dale Griffin) *If we use non-scientists as samplers, it's fine. We just have to advise them to wear gloves when you do the sampling. I always do, even though I'm diving I am always putting on rubber gloves. There are microbes all over the water column, but you know what is on your skin is getting into your sample.*

- (Phil Dustan) *Sure, I just think most divers are such techies and most divers that want to help will do it correctly.*

- (Dale Griffin) *Yeah, it's a very simple thing. Wear gloves, open the tube, scoop, and then cap it.*

- (Judy Lang) *They'll be more careful at it then we will be.*

- (Dale Griffin) *Probably.*

- (Phil Dustan) *So suppose you end up with 50 samples instead of 36, does that drive the budget off limits, is that something worth doing?*

- (Dale Griffin) *So, remember I am doing 15 genetic targets doing them in duplicates. So, the numbers right now are at like 36 samples.*

- (Judy Lang) *Is it the time to do it, or the cost to do it, or both?*

- (Dale Griffin) *The timing is, we can get the samples. That is not something I am looking at as cost. Ken may need a budget for taking the boat out, Nova may need a budget for taking the boat out. We have to consider it, but from my end, I'm at 36. Remember, we're doing a wet dry season.*

- (Don Berhinger) *The big drivers are the PCR and extraction kits. If we can get tech divers to get these samples, it's better to have more samples that you don't end up processing, then not have the samples. If they are capable and willing to get those samples, then get the samples. Then start in the middle and process them on the way out with as much money as you have for reagents. If there is a really cool pattern, then you should go further out.*

- (Phil Dustan) *And if they did it with their own boats, it would save a ton of money that could be put into processing.*

- (Judy Lang) *We could buy the gas for the boats.*

- (Dale Griffin) *I would like sediment from the plant that's pumping out tertiary treated water. A sediment sample there, and another one from the pipe that is right up here.*

- (Phil Dustan) *You need to go talk to this club.*

- (Dale Griffin) *I wouldn't mind adding, on a 96 well plate doing 15 different targets. You run six samples at a time, each row has 12 wells, you are setting up controls. The most costly part of this, doing quantitative PCR is: I'm using qPCR in presence/absence format. You are labeling your probes; each probe is about 500 dollars so 15 times 500 its expensive. The cost of PCR reagents are cheap now compared to what they use to be, it is just the probes are expensive. If I don't do too many, I can buy the cheaper probe where the concentration isn't as great, which is about $250-300 per probe.*

15. (Jack Stamates) *Getting back to what we're saying about doing the dishes as well, this doesn't tell us about viability correct?*

- (Dale Griffin) *The dishes are a very visual thing.*

- (Jack Stamates) *PCR doesn't tell us about viability. This is a wastewater stream and we are assuming that they are alive. But if they are present, but not viable then the treatment process was successful, and we have these nonviable critters coming out. That is what it is for. I think viability will be extremely important.*

- (Dick Dodge) *So when you send your kids to a beach contaminated with nonviable organisms.*

- (Jack Stamates) *Theoretically, that is not going to hurt you.*

- (Dale Griffin) *I agree that we should do that, and I will do that for the study. That is cheap and easy. What I can do is target with my genetic markers each corresponding antibiotic to use to match up and account for our dead cells that we detect a gene, are any viable cells getting out, and differentiate particle matter from anything in the community.*

- (Jack Stamates) *If the goal is to say we have an actionable item in the sediment, then that is critical.*

- (Jose Lopez) *The thing is, for viability, most microbes can't be cultured. It is a given that we can only culture 10% at best. To your point Jack, you could worry about what's going on in a nonviable environment because DNA is what is causing the resistance in plasmids by transformation. It doesn't matter if bacteria's alive or not because if the DNA is still intact it can transfer to something that is alive and not resistant. That is a classical Avery [SP?] experiment.*

- (Jack Stamates) *Does that happen at large scale out there?*

- (Jose Lopez) *I don't know.*

- (Dale Griffin) *I think the culture method works even though we know it's limited what we can grow. It is always informative to what, we always get that question when we find stuff. In the Keys with the Enteroviruses "are they alive?" that's the question we are always getting.*

- (Judy Lang) *You know you don't need it but it's good for people like Joe and the politicians, because they will respond faster to the agar plate and the clear circle around the antibiotic or antibiotic resistant gene than they will to microbiology.*

- (Dale Griffin) *It's very easy to see, even if you don't have a background in microbiology you can see the difference. That's a great tool.*

- (Judy Lang) *It is also important to say you are only able to culture about 10% of the bacteria that could be out there. This might not be the real situation.*

16. (Don Berhinger) *Just to make sure I completely understand this. My initial thought is that we were trying to look at antibiotics that might be coming out of these pipes and creating antibiotic resistance in bacterial communities on the benthos, or are we talking about the potential of still-viable bacteria coming out of pipe, or both.*

- (Dale Griffin) *Well, you get about 90-95% kill from chlorination which is what they do, but I have sampled the plume and Ken has backed me up in it before. It's rank, you get off there and you can culture fecal forms of enterococci. The numbers are much less, but there are certain amounts that survive. My goal for this study is to demonstrate the influence antibiotic resistance on a microbial community. It may happen that some survive, but that's not their natural environment. They may be able to adapt, but they are not going to be able to replicate well and survive. They are not part of natural community.*

- (Don Berhinger) *There is no reason then once you plate these things out, you can sample the colonies if it came to this and if there was more funds to identify what those things were.*

- (Dale Griffin) *Yes, you can go and pick those colonies with a tooth pick extract the DNA, and we can have it sequenced. We can tell you what the genus and species are.*

- (Don Berhinger) *So we can determine what that actual thing, whether human inherent bacteria out of pipe verses a marine bacteria that will not identify where the antibiotics are coming from.*

- (Dale Griffin) *Exactly. Doing the culture work, if we have what we showed earlier, then I just pick and choose and grow them on media in a broth, overnight, add some sucrose to it and stick them in the freezer. Not sucrose what am I talking about Glycerol*

17. (Jack Stamates) *We have to remember there are particulates falling out in nearfield, and that's a different animal than the liquid that is being transported. That is something we have to keep in mind.*

- (Don Berhinger) *Something out of the sample, or in the tube? Which do you want?*

- (Dale Griffin) *The particulates I think would be carriers of the dead cells or any live cells of the genes that are associated with the sewage. Whereas the antibiotics are more in the water column.*

- (David Cox) *That would be something for your actual sample collection. Would you want to sweep the surface at all?*

- (Dale Griffin) *No, I mean these are little things that we can address another time. I am going to archive these samples.*

18. (Judy Lang) *Do we know how long it takes for the fluid that leave the plant to leave the outfall? Is it a matter of minutes, hours?*

- (Dale Griffin) *Hours*
- (Judy Lang) *I was just wondering if it was long enough for a biofilm to develop.*
- (Jack Stamates) *I'd have to refresh my memory on this, but I think it's on the order of hour.*
- (Judy Lang) *That is quite a long time.*
- (Lew Gramer) *The pipes are on the order of 3 kilometers long.*
- (David Cox) *I think Hollywood is 10,000 feet off shore. I don't know how far inland the plant is.*
- (Jack Stamates) *I think I can try to look it up.*
- (Judy Lang) *There is plenty of time for things to happen on route.*
- (Jack Stamates) *Definitely around an hour.*

Session II: Outfall Biomarker Project (Dale Griffin, USGS & David Cox FDEP)

I. David opened up the floor to ideas on sampling
   a. Going over the compass rosette design
   b. Options of changing sites due to depth or using technical divers

<u>Questions and Comments for Dale and David:</u>

1. (David Cox) *We have a couple ideas we have come up with are we would change 600 to 800 meters. If we added sites moving westward, would we mimic the north and south transects at 100, 200, 400, and now 800 feet. Another idea suggested would be to collect samples at the outfall pipes of Miami North which is Haulover inlet and Broward North.*

- (Dale Griffin) *At least one of them*.
- (Dave Gilliam) *David, just for clarification, the 100, 200, 400, and 800 are complete sampling rows?*
- (Dale Griffin) *No, a north, south, and a west. So the northwest and northeast are only out to 50 feet [sic] [meters].*
- (Dave Gilliam) *So there are just three transects at each of the other ones?*

- (Dale Griffin) *Three long transects, and the short little one right around the site.*

- (Judy Lang) *Now I am getting confused.*

- (David Cox) *So, what I would like to do is get a consensus on this design. Any suggestions for modifications?*

- (David Cox) *To recap: one suggestion is to add a west transect, that was suggested earlier initially because they thought the east sites would be too deep. It seems whether or not we use our collective divers we may be able to get those, but if we use technical divers we can definitely get those. Funding permitting, the suggestion is to add a west transect that mimics the north and the south at 200, 400, and 800 meters, then collect single samples at the pipes of the outfalls. The samples come from the outfall to the north and the outfall to the south. The third suggestion was a control which would most likely be somewhere right here. Get a sediment sample right around the mouth of the inlet.*

2. (Kurtis Gregg) *The other two, outfall north and outfall south, the sediment sample or water sample?*

- (David Cox) *Sediment, so that would be basically a single dive at each. Also during the break, I talked with the people that volunteered to be on the dive team. We are going to work outside of the meeting to come up with the logistics of actually how to do it and collect samples.*

3. (Dick Dodge) *Did you say that the control was going to be at the control would be at the mouth of the inlet?*

- (Dale Griffin) *No, that was just to cover potential influence of land based sources.*

- (David Cox) *So, that is not a control.*

- (Dale Griffin) *So the control would be, either the outer part of the transects, the north and south transects. We could add a sit like the FLT3 site Ken used last time, and have another situ site.*

- (Don Berhinger) *And have another complete.*

- (Dale Griffin) *Well it would be a sample out there. I think on the transects one of them, as we get out away from the pipe, we will get a feel for what the natural community is like. Because we have a three way transect, one going inland, one going north, and one going south. It is a tight little group around the outfall.*

4. (Don Berhinger) *At each one of the points, were you going to take one single sample?*

- (Dale Griffin) *Right*.

- (Don Berhinger) *So, do you think it is valuable to take how much space variability, maybe three samples with in a meter square area, and create a composite at the end? Do we have an idea on how much variability there is on a spatial scale?*

- (Dale Griffin) *My view was kind of "Oh we can do that." I am using such a tiny 40-gram sample, which is a portion of the whole thing.*

- (John Fauth) *The problem is with compositing, that doesn't give you information on the heterogeneity*.

- (Don Berhinger) *No, but It hedges your bets a little bit. Without doing them individually to capture them, you won't know in the end if there was any variability. I would suggest hedging your bets to capture the variations.*

- (John Fauth) *You have 2 times, wet season and dry season. That will give you some idea of how much variation there is in temporal. The spatial comes out of the sampling design.*

- (Don Berhinger) *That will give you any sort of predation away from the outflow. Not weather there is a lot of variability, if there is a lot of spatial variability and you don't capture that. If you take a single sample along that transect it might wash out the gradation, that would be my fear.*

- (John Fauth) *That is the error variation in the analysis. When you are doing regression better more points. They are giving you two pieces of information: there will be location and their responses. You can get triplicates just at the same location, get that off the residual error.*

5. (David Cox) *Was that suggestion to add replication?*

    - (Don Berhinger) *Well we just don't know what spatial scale and how much variability there is. Unless it is true and you want to analyze on a large scale. To capture, just do more along that transect. I do not know what the right number is, because I don't think we have the right information to gauge the number of samples. I guess we are just limited by the logistics and the financial cost.*

    - (Phil Dustan) *And keeping track of all those tubes underwater.*

    - (John Fauth) *And having a new pair of gloves for every sample. That's a lot of fun.*

6. (Esther Peters) *If I am available to come I will stay topside to help.*

    - (John Fauth) *I am talking the divers.*

    - (Esther Peters) *Well yes, the divers will have to do that under water too.*

- (John Fauth) *That's not fun re-gloving every time.*

- (Dale Griffin) *For each site we can label all the tubes and they can just take that set.*

7. (Don Berhinger) *If you are taking the tubes and scooping the sediment with the tubes, why would you even bother with the gloves?*

- (Dale Griffin) *It is an extra level. I think the average per hour you shed .05 grams of cells as you sit there. It is amazing how many cells you slough. It is just incredible, it is just amazing. You know what, if you sample from a down current position, there is none. I just do it when there are some scientists that are not thinking. Like Judy said, they may sample better than you do because they are extra paranoid. It is just to keep a lot of the things we look for, I have in the past found them on your skin.*

8. (David Cox) *Does that mean we have a consensus?*

- (Judy Lang) *I would like to see it drawn out.*

9. (Dale Griffin) *So I do have a question. Now that we have added a western transect, do we want to keep the distances the same on the north south transects? So, 100, 200, 400, and 800 inland. I think it would be consistent.*

- (Dave Gilliam) *So that is right along the pipe?*

- (Dale Griffin) *Yeah, going towards the beach, 800 meters in on it gets fairly close. If there is an influence we should be able to see it.*

- (Judy Lang) *That is nowhere closer to shore. If it is a mile and a half off shore, that is only a third of the way in.*

- (Dale Griffin) *Yes, but there is a trend. That is the question, should we gap further, or keep it on the same order as the north and south?*

10. (Kurtis Gregg) *I have a question, are these sites being added on the expense of the eastern sites that are close, or are they in addition?*

- (Dale Griffin) *No, we are just adding them.*

- (John Fauth) *You can get one off the beach.*

- (Dale Griffin) *We could get a beach site too. Just wade in and scoop.*

- (Jack Stamates) *We got the beach influences, you know, kids and dogs.*

- (Ken Banks) *There is a whole paper out on these microbes.*

- (Lew Gramer) *To Jack's point, what you are looking at across shore is largely the dispersion rather than transport and the scales of dispersion are probably smaller. But we are talking particularly in the summer time the long shore transport that is particularly for surface slicks if there are offshore waves.*

- (Dale Griffin) *Yeah, I don't mind adding a beach sediment sample.*

- (Judy Lang) *If you did 1600 meters that would fill the gap between the 800 and the shore.*

- (Dale Griffin) *So that would put us halfway between the beach?*

- (Brian Walker) *Well, it looks like it is about 3 kilometers.*

- (Judy Lang) *Oh, 3 kilometers.*

- (Dale Griffin) *Well 1600 is half way.*

- (Brian Walker) *This is the Hollywood outfall, right?*

- (Judy Lang) *Which one are you doing?*

- (Dale Griffin) *Hollywood.*

- (David Cox) *Did you say 1600 meters?*

- (Dale Griffin) *Well that is consistent with doubling the sampling size.*

11. (Kurtis Gregg) *So, Jack's early work, well Jack and Tom, in their outfall study was the signature at about 500 meters.*

- (Jack Stamates) *To the detection threshold of the chemicals that you are analyzing. I would say the 500 meter sites would show the increased level, but the 1 kilometer site water quality and detection threshold are down to nitrogen and phosphorus and those types of chemicals. Chris and Mary Beth also did some microbial analysis that I can't site right now, showing similar pollutions.*

- (Kurtis Gregg) *So that kind of tells us that the 800 meters is an appropriate distance to get the tail end. I think 1600 meters will definitely give us background. Do we need to spend money on that? We are adding a lot of samples.*

- (Jack Stamates) *Right, to that point, the detectability is similar to the nutrients that by one kilometer you are about done.*

- (Judy Lang) *So at 1600 it should be okay, if it is the same. If it is easy to collect for the divers.*

- (Kurtis Gregg) *We are literally adding days of dive time.*

- (Jack Stamates) *Combined with the not so frequent eastward flow or transport.*

- (Judy Lang) *It seems to be that questions like that, when you get together with a dive team will be easily resolved.*

12. (Dave Gilliam) *We, sitting here now do not need to figure out how to actually do the diving, it is to decide where we are going to do.*

- (Judy Lang) *That might also limit the number of samples.*

- (Kurtis Gregg) *Is it better to get the 1600-meter site or get the dives at the other locations?*

- (Dale Griffin) *I would like if it is possible to get at least one or two more outfalls. It would be interesting to see the sediment from the outfalls that have tertiary treatment if there is any difference.*

13. (Kurtis Gregg) *The other interesting point is the one in Delray outfall is closed effectively for several years now. What is that sediment like?*

- (Dale Griffin) *How far away?*

- (Kurtis Gregg) *It is not doable for the Broward plant, but I think it would add a lot.*

- (Dale Griffin) *Yeah, I think it would be very interesting.*

- (Jack Stamates) *That has been closed now for 5 or 6 years*

- (Kurtis Gregg) *They only use it for high rain events. They are doing deep well injections, I think both of those going the same route they planned on using the outfall only for overflow.*

- (Jack Stamates) *That's just the water they can get rid of.*

- (Dale Griffin) *What's the outfall that is just north?*

- (Ken Banks) *Broward.*

- (Dale Griffin) *So this is Hollywood right here. I would like to get at least Broward, if we can get others I don't mind doing them if we can get them. I don't want to overwork the dive teams if they are getting samples from far away.*

- (Ken Banks) *If we can do it at different times it's not that big of a deal.*

- (Dale Griffin) *Yeah, like I said, the shorter sampling time the better. But if we can get the others in like a week or so, there would be more information and it would be nice to look at.*

14. (Judy Lang) *For the technical divers, are you dependent on the weekends?*

    - (Kurtis Gregg) *You never have weather on weekends.*

    - (Dave Gilliam) *Actually we always have weather on the weekends!*

    - (Judy Lang) *I mean because of their schedule.*

    - (Dave Gilliam) *Is there actually a budget? I think the technical divers or the group that Brian works with is wonderful, but there are always issues working with volunteers. This project is really something that needs to be done, I don't think we can close off doing it based on when the independent divers are there for us. I think trying to work with a diver volunteer group is never as easy as it sounds when you are sitting here talking about it. It is always a little bit more then you think it is going to be.*

    - (Don Berhinger) *Do you have a plan A and a plan B if those divers are available it is this design, if the divers are not available you do this design at this site, this site, and this site.*

    - (David Cox) *It seemed like when talking with a couple of you during the break that the east sites would not have to be eliminated. If we had to go and take an internal dive team. It almost seems like we may not have to come up with a plan A and plan B. Unless you did want to add a whole bunch of sites and get that all done in one day. But yes, that topic has come up, as well as what Dave has mentioned. Also, the potential liability for the project if they are diving under a DEP project, so we will have to check into that. The folks that joined the dive team mentioned that we will come up with a plan and it shouldn't change too much if it is the technical divers or the volunteer divers.*

    - (Ken Banks) *I think we should assume we do not have technical divers, and we come up with what we can do.*

    - (David Cox) *That is the plan to do, come up with a list of people, there is the budget if you want to see it. A total of $24,200, and $1100 of that is matching funds so that*

needs to be spent by the end of the current fiscal year. So then if we were not to use that…

15. (Francisco Pagan) *David, this also needs to happen inside the window of the agreement with the dry season sampling happening in 2018.*

- (Dale Griffin) *Is it happening, when is it happening? Is that what you are saying?*
- (Francisco Pagan) *The sampling needs to happen in 2018.*
- (Dale Griffin) *Yeah, if some funding needs to be spent in this fiscal year, is that what you are saying?*
- (Francisco Pagan) *No, $1100 needs to be spend before June 2018.*
- (Dale Griffin) *I don't think that will be a problem.*
- (Francisco Pagan) *I don't think so either, the sampling and everything needs to fall inside the window of the agreement during the calendar year of 2018. You do have a dry and wet season there.*
- (Dale Griffin) *Yeah*.
- (Francisco Pagan) *This is the last meeting before we have to take action is what I am trying to say.*
- (Dave Gilliam) *We need to do the dry season this next couple months.*
- (David Cox) *Hopefully by the time the next TAC meeting rolls around the first round of sampling will be complete.*
- (Dale Griffin) *March is going to be blowing like crazy as usual.*

16. (Brian Walker) *Bear with me, but I am sketching something. Is this the type of design we are looking at? This is the Hollywood outfall. This would be the outfall pipe, this would be the exit. You are looking at the black lines.*

- (Dale Griffin) *Yes, that is it. So north, south, east, west, the southwest, the northeast that type of layout. So, the 45-degree northeast southeast they go out only to 50 meters. The north south go out to 800 and the west goes to 1600 now.*
- (Dave Gilliam) *Essentially the north south is 25, 50, 100, 200. It is not just a sample at 100, 200 just like there is a sample at 25, 50, 100, 200.*
- (Dale Griffin) *Yes, only north south for the longer ones outside and a western component.*

- (Dave Gilliam) *I was thinking each one was at 0, another at 100*

- (Judy Lang) *I want to know if 50 and 100 are plan view [?] or over the water.*

- (Ken Banks) *Plan view.*

- (Judy Lang) *I was thinking about the deep sites and how they are going to find them.*

- (Lew Gramer) *Are you thinking about the dive logistics, sorry, just so I can understand.*

- (Judy Lang) *Yes*.

- (David Cox) *Can everyone see that okay?*

- (Dale Griffin) *Yes.*

- (Kurtis Gregg) *So the 100, 200, 400, and 800 are going to be drop on site with presumably high current, so positional you are not going to be right on the same spot.*

- (Dale Griffin) *As close as you can.*

- (Kurtis Gregg) *But there is going to be 50 meters up current dropping divers in kicking up the bottom and then have to still take a sample.*

- (Dale Griffin) *Yeah, there almost going to be no buffer time. You go to the bottom get the sample and then you are up.*

- (Kurtis Gregg) *So these are bounce dives.*

- (Phil Dustan) *Can you drop weighted floats on GPS coordinates?*

- (Jack Stamates) *You can, but the currents can be up to 4 knots*.

- (Phil Dustan) *I know, I have been out there.*

- (Kurtis Gregg) *Put floats with a GPS on the bottom, the line is a meter off the bottom.*

- (Phil Dustan) *Maybe if you are going out and it is blowing like that, you should just bag it. Or take your line and mark it off in meters and let it go down to the bottom to see how it is blowing.*

- (Judy Lang) *So you need a chase hook.*

- (David Cox) *Now we are getting into dive planning.*

17. (Ken Banks) *Can I say one thing? The Delray think [sic], I was in Tallassee the other week where a legislator was pushing that the outfalls were not bad, and I know that question will come up that "well you closed Delray, did it get better?"*

- (Jack Stamates) *Delray is puny.*

- (Ken Banks) *But they don't get that. The elected officials see that it is an outfall. I wouldn't rule out going up there and getting a sample. I have a feeling that it is going to be asked. If they close it, is it going to get better is what they will ask.*

- (Jack Stamates) *In the terms of antibiotic resistant things, is that relevant?*

- (Dale Griffin) *I would think so; the presence of those genes should no longer be there.*

18. (Kurtis Gregg) *I have a question related to the sampling of the other outfalls. It is getting back to what I was commenting on earlier of adding additional samples and additional work. If we did a point in Delray and Miami north, I would suggest we do a sediment sample at the end of the pipe and 5 and 50 just on the north drift or where the current is going on that drift. So, we are taking 3 at similar spacing of what we are at Hollywood in one direction.*

- (Dick Dodge) *Show me on the diagram what you mean.*

- (Dale Griffin) *He just means that you are going to take at the mouth of the outfall and 1.*

- (Dick Dodge) *At the center of the star and a point to the east where?*

- (Dale Griffin) *North, 25 and 50 meters, for each outfall site, down current.*

- (Kurtis Gregg) *If there is a gradient that you can show at Hollywood, and you are taking these other samples and you just have one, you are really not adding value by going to the other sites and taking one. The expensive part is getting there and getting the divers in the water. You might as well collect at least one branch so you can compare the differences.*

19. (Jack Stamates) *One thing about Miami north is it is a diffuser system, it has many pipes. It is not as strong, but there is more than one pipe.*

- (Judy Lang) *Over what spatial gradient?*

- (Jack Stamates) *It is over 100 meters and maybe 5, 6, or 8 pipes I think is what that is. That was what was done at Miami north, Hollywood was a single pipe, but Miami north was a diffuser system.*

- (Kurtis Gregg) *So apples and oranges.*

- (Jack Stamates) *A little bit, there is still downstream and upstream.*

- (Judy Lang) *If you started in the middle, you would still be in the diffuser system entrance. Then you do the 25 and 50.*

- (Jack Stamates) *I think the diffusers, and down quote me on this, are running east to west.*

- (Judy Lang) *So they are all at the same depth?*

- (Jack Stamates) *No, they are running east to west progressively getting deeper. Where it is, I don't think there is a big gradient. It has been a long time since I have seen a picture, but I'll try to find out if there is an additional treatment and what their diffuser is. I know it was controversial that the effluent wasn't where they told us it would be.*

- (Judy Lang) *It would be worth getting a map.*

- (Kurtis Gregg) *A note I would add a zero point. So, 0, 25, and 50.*

20. (Dave Gilliam) *What happens at the end of the day? Are these samples just fixed or do they have to be on ice? Do they have to be sent to Dale that evening?*

- (Dale Griffin) *No, they can be refrigerated, and send to me as soon as possible.*

- (Judy Lang) *Refrigerated or minus 80?*

- (Dale Griffin) *Refrigerated, I do not want them frozen.*

- (Jose Lopez) *But it could be subsampled too right? Some of these could be frozen for later microbiome analysis, and if you want to grow something to be cultured you can put them in glycerol. Like you said, a 15-milliliter tube is a lot of material for a microbial study, so you can subsample that very easily.*

- (Dale Griffin) *I would just want the ones that come to me to be refrigerated and shipped cold with cold packs. I will archive them when I am done with them, but we may want to collect two tubes and maybe keep a set down here.*

- (Jose Lopez) *Well you can just subsample that tube, or you can get two tubes.*

- (Kurtis Gregg) *That is a dozen of extra tubes, underwater when you are trying to deal with all those tubes that are floating out of your bag.*

- (Esther Peters) *I just mentioned to Dale that filling the tubes with sterile seawater so they don't float.*

- (Kurtis Gregg) *What are the tubes made of?*

- (Jose Lopez) *Polypropylene.*

- (Kurtis Gregg) *They are still positive.*

- (Esther Peters) *Yeah, they will still be a little positive, but you do have to control them underwater. Any AAUS diver hopefully will know how to do that.*

- (Don Berhinger) *How many divers are you actually talking about doing on a single dive? Would it be the 25 and 50? You are not going to have them go all the way to the 800 meters*.

- (Kurtis Gregg) *No.*

- (Dave Gilliam) *Depends on the current. You also won't know when you are at 800 meters, you are just guessing.*

- (Judy Lang) *Yeah, you are not doing that.*

- (Dale Griffin) *I use to have a dive mask bag, you let it float and you can open it and stick your hand up in there, you get the tube you pull it down, get your sample, and then do your next sample.*

- (Kurtis Gregg) *I was thinking about a shotgun shell bandolier.*

- (Dale Griffin) *That works good.*

- (Kurtis Gregg) *Nothing is floating.*

- (David Cox) *It looks cool.*

- (Phil Dustan) *Have one diver take the sample, and have another diver get a new tube.*

- (Ken Banks) *We are in the weeds here.*

21. (David Cox) *We have gotten back deep into the weeds. Does anyone have any more comments on the sampling design or the number of sites that they are doing? If not, that was something we really want to lay a foundation and then we will talk offline about the weeds. We do have a couple folks that want to give short presentations before we break for lunch. Lew are you ready to go up first?*

Presentation: SEFCRI Relative Turbidity Using Remote Sensing (Lew Gramer)

II. Introduction
- a. Absolute Turbidity- NTU
  - i. You need to calibrate the area in situ for remoting sensing turbidity
- b. Relative Turbidity
  - i. Changes are in pixels, overtime, but doesn't allow pixel to pixel comparison
- c. Pixels are sampling the ocean color using a color index
  - i. Pixels are 250 meter squares
  - ii. Measures ocean color in 2-7 meters of water
- d. Surface waves are important for models
- e. Eco-forecasts
  - i. It looks for relative turbidity above certain percentiles which are binned anything above the certain percentiles creates automatic "Events" depending on the scores
  - ii. About 15 years of data in the data set
  - iii. The satellite views color
    1. Depth with the algorithm was not made for offshore
  - iv. Summary of the eco-forecast results
    1. When waves were high relative turbidity was high
    2. Everglades- Events occur north
    3. Events in port of Miami
       a. 2012 was an active year
       b. Turbidity plumes moved north
       c. 2015 there may be channel outflow
       d. only two events in 2016
       e. 2017 had more frequent events
    4. Port Everglades suggests flow to both north and south between years in turbidity
    5. Palm Beach has a few turbid events
    6. All data is in a report in shared with the DEP
- f. Sampling of bacteria at sites shows correlation between turbidity and bacterial abundance

<u>Questions for Lew:</u>

1. (Kurtis Gregg) *Lew, you mentioned that the Palm Beach section didn't have a port, and the tidal gradient was much greater than in most of southeast Florida, during the dredging of Port Miami. It was pretty high magnitude inlet, I am surprised that you are not seeing anything, or if you didn't it might be the greater current.*

- (Lew Gramer) *One thing we haven't looked at, Brian Barnes who is a post doc and now is a researcher that works at USF that I worked with on this data. He actually published a paper on the port of Miami that looked at outflow rates from south Florida water management for that area. We have not yet done a similar analysis for*

Everglades and Palm Beach, my expectation is that there is an effect there. That would be a really interesting project to fund going forward.

2. (Phil Dustan) *So Modus is an ocean color satellite, and when you get turbidity you get a shift in the optical green, you are also going to see that when you get more chlorophyll. How do you distinguish between turbidity and chlorophyll?*

- (Lew Gramer) *The color index is designed to be relative orthogonally to the chlorophyll-A algorithm that they run. The same scene is available when you use the both the Carter chlorophyll-A algorithm and the color index. You can actually map and control.*

- (Jack Stamates) *However, the chlorophyll and phytoplankton increases quite significantly.*

- (Lew Gramer) *You want to be careful that you don't subtract out the signal.*

- (Phil Dustan) *If you have in increase in the chlorophyll, then you will have an increase in the bacterial diversity.*

- (Jack Stamates) *Right, they you will have increased turbidity.*

- (Lew Gramer) *I have been given the wrap up, but see me at lunch.*

Presentation on coral bleaching video (Phil Dustan)

III. A video was created on coral bleaching in Bali
    a. This video was made around the same time as "Chasing Corals"
    b. Premise was to show reef degradation and explain it
    c. Additionally, it is to talk about what you can do to help
IV. This video was a trial of a model for future videos

Lunch Break

Presentation: Disease Intervention Workshop Summary & Disease Coordination Update (Kristi Kerrigan)

I. Disease progression is shown with the boundary
II. Funding from state legislature and EPA for the study of the disease
III. Management questions
    a. Where is disease
    b. Species infected
    c. What is causing disease
    d. How to control the disease
IV. Coral Disease Investigation Training occurred July of 2017

V. Post-Irma surveillance survey from Martin County to Key West.
VI. Boundary surveys were conducted to study transmission and location
VII. Coral Disease Workshop occurred November 2017 to identify sampling techniques
VIII. Cheeca Rocks Photo Mosaics for bleaching and disease comparisons
IX. Disease database and epidemiological analysis
X. Coral disease workshop identified some disease intervention techniques working within the constraints of permitting.
XI. Post-Irma results
    a. Focus on high value reef sites
    b. Two transects and one roving diver at each site for hurricane damage
    c. 10 large coral sites were visited
    d. two acropora patches survived the storm

Questions for Kristi:

1. (Judy Lang) *You have a lot of money, are you getting more interest from the universities or other people to help you with this disease work? It seems to me that you have all these things that you want people like Esther to do that are always in short supply.*

- (Kristi Kerrigan) *We have been funding universities to help. We had one with NSU and soon one with FAU.*

- (David Cox) *We will have an update on some of the funding later on as well.*

- (Kristi Kerrigan) *Right now we are still kind of finalizing where it is all going. We had this workshop and now we are trying to figure out where we are going from there.*

2. (Phil Dustan) *So, to be a curmudgeon, I have seen this before, over and over and over. Now you have some tools, but it is the same basic design. We saw this in 1996 to 2000, it was a dramatic spread that was probably linked from the release of water coming down to flush out the Florida bay. We have seen diseases in the Keys since the 1970's, so are you planning to take that information and historic information and to look at the expectation over all, or are you starting over from the little patches?*

- (Kristi Kerrigan) *We are going to take all this information that we have, we have this disease database as well. The ultimate goal was to develop a disease response plan, which will be able to set in and be able to use for the future to help us with lessons learned and what can we do better in the future.*

- (Phil Dustan) *Does that extend to changing what happens on land, does it extend to the jurisdiction of the Army Corp. of Engineers?*

- (Kristi Kerrigan) *All of that will have to be considered as we develop it. We are gonna have to have the right conversations, and hopefully be able to have some kind of emergency plan.*

- (Phil Dustan) *Because what you are looking at now, those corals that are dying now are essentially disease resistant up until now. It is just ramping up now it was just Helioseris cucullata, Montastraea annularis, then orbicella franksi, and on and on and on until now you are down to the last 8 or 10 species.*

- (Kristi Kerrigan) *We are trying to respond the best we can. This one is definitely unique. So, we are going to try to answer as many questions as we can.*

- (Aubree Zenone) *The way that we have been approaching this is that the scale of this disease outbreak is pretty unprecedented. What we are doing now is making sure we are working with everybody. Everyone internationally and within the United States.*

- (Phil Dustan) *It is unprecedented?*

- (Aubree Zenone) *To our knowledge, yes this is. To this scale and severity of the disease outbreak it is unprecedented. So, we are working with everybody to determine how to not only handle this here, but also how to prepare for this elsewhere. We suspect something like this could increasingly occur somewhere else much like this outbreak. So, the world is watching how we respond to this, so we are doing our best to do that in as many ways as possible.*

- (Valerie Paul) *I guess the white band on the acropora we would have to say is more extensive in the 80's to 90's, but this entire reef tract I have not seen something like this. It is crossing some species, it numbers like 20 to 25 species, even the poor M. cavs are getting it at the end. They are like the last ones to get it.*

- (Esther Peters) *And the S. sids.*

- (Valerie Paul) *The hardier species are getting it.*

- (Phil Dustan) *Well it is the hardier species getting wiped out now, but I fail to see that widespread disease in the Florida Keys is unprecedented. I mean, we have measured from the Dry Tortugas to essentially Carysfort [reef] before the was anything going on here. You don't have information from this time so 400% increase in disease in the localities in 4 calendar years. That is not the scale you are seeing here.*

- (Valerie Paul) *This is something else, I wish we had.*

- (Phil Dustan) *It is probably a newer more virulent form that was killing the corals that were resistant then.*

- (Valerie Paul) *The only good thing about this one is it is not hitting the acroporas. It is quite amazing though. Too bad we don't have Rob Rizuka's video, because that is really powerful.*

- (Aubree Zenone) *Do you think it is available online? Do you think we can locate that?*

- (Kristi Kerrigan*) I think we have it from the workshop.*

- (Valerie Paul) *I have never seen anything like it.*

- (Phil Dustan) *No, and I have never saw anything like I saw in Bali last year and I have been doing this for over 40 years, so what is happening is that the severity of things is escalading. But there ought to be some knowledge and wisdom in what has happened in the past.*

- (Aubree Zenone) *The problem is that when it comes to coral disease we are in the 1700's on what exactly brings the disease to the corals and how it is transmitted. I mean we know about some very specific diseases, but this is affecting so many species at once it is really hard telling if it is just one agent or multiple. Isolating those things is taking a long time, figuring out how to prevent that is taking longer.*

- (Judy Lang) *We also have the tools nowadays that we didn't have before.*

- (Aubree Zenone) *That is true, hopefully it is moving quicker than it did 30 years ago.*

- (Valerie Paul) *We still don't understand white band and that has been around for 30 plus years.*

- (Brian Walker) *I will just say for here, we just did 41 sites I have probably dove at least half of those. Our data sheets were woefully filled out, like we targeted sites that had recorded the highest richness or the highest cover density in the region before, and we did have hardly anything on our transects. We are talking about a few porites and a few favids I mean the community has just been wiped here.*

- (Phil Dustan) *That is what has been happening everywhere. The highest diversity places are going to be hit the hardest first.*

- (Brian Walker) *What I think Val was saying and what you saw in the past was certainly cover and virulence spread of the disease probably certainly matched, but the number of species and the end result, I mean we are talking about the landscape has just changed. But that is here, not in the Keys of course. Not the same further south hopefully.*

- (Phil Dustan) *Well, the Keys have lost probably 80-90% of the live coral cover in the past 30 years. Now you are going to take out the last one or two percent, and you are saying "oh God what are you going to do? Are you going to solve the problem?*

- (Aubree Zenone) *That exact line of thinking was why we hosted the workshop. We were very frank with everybody and very open with the fact that we had to target the important corals and we are getting to the point that those kinds of direct singular interventions of the coral colony is an option. So that was the subject of the workshop and we do have to move on to the next section, if we have some free time we will come back to this before or during breaks*

SEFCRI Next Generation LAS Projects (Aubree Zenone)

I. TAC vacancies are for two open spots. The open seats are for coral biologist, ESA species monitoring, and fisheries scientist
II. 32 new SEFCRI projects have been selected
III. 30 projects will be divided into 4 groups and will be discussed, and input is requested on the projects from TAC
IV. Methods for the projects are invited, and these drafts for projects will be updated, and voted on by SEFCRI to review and vote on the projects to be approved

Questions for Aubree:

1. (Dana Wusinich-Mendez) *We are supposed to get through 7-8 projects in one hour?*

- (Aubree Zenone) *Yes, keep in mind a lot of these projects are already very straight forward and outlined. If you see things like that, don't spend too much time on those projects.*

2. (Valerie Paul) *So all of these projects are going forward at this point?*

- (Aubree Zenone) *At this point they are going forward to go back to the SEFCRI body. They are going to get them and review the edits that you have given. Then they will vote on them and approve them as final.*

3. (Judy Lang) *By the time any of these projects start will there be anything left?*

- (Aubree Zenone) *That is why we are trying to get things rolling now. We want to send this to them so they can start moving on the projects. We very much hear you and we are trying to push this forward as fast as we can.*

4. (Phil Dustan) *Can we propose ideas, and solutions, and experiments that might not be reasonable in the current political climate?*

- (Aubree Zenone) *If you believe it will achieve the objective, you should work with your group and put that down. Whether or not that will happen is an entirely different story.*

5. (Dana Wusinich-Mendez) *At some point are we going to see the full list, or have the opportunity to identify any gaps?*

- (Aubree Zenone) *If you do identify gaps as you go, please do mark it.*

- (Francisco Pagan) *All of you will see them all. There are four folders and four sections. After you have done your 7-8 projects, you will get a different folder. By the end of the exercise all of you will see all of the ideas.*

- (Aubree Zenone) *All of them are grouped that if there are multiple projects that if one builds off another they are grouped together. if you are talking about outside the scope of the ideas and there are still things that need to be written down unfortunately that was a SEFCRI thing. They did write ten new projects at the meeting itself, outside of that I am not sure what we can do at this point.*

6. (Dana Wusinich-Mendez) *Could we recommend new products to them?*

- (Francisco Pagan) *You can suggest new ideas, if they are new I will take them to them and the SEFCRI body will see what to do with them*.

7. (Lew Gramer) Is there a report out?

- (Aubree Zenone) *Currently we don't have one planned, but I will look into that.*

Breakout Session begins

Presentation: Overview of Florida International University's CREST Center for Aquatic Chemistry and the Environment (Piero Gardinali)

I. FIU has created the Institute of water that has three centers within
    a. CREST goal is mainly to development researchers of the future generation
    b. CREST CACHE is currently involved in environmental contamination
        i. Advance sensing of environmental exposure
        ii. Quantifying the fate and transport of contaminants
        iii. Interpretation, analysis and visualization to convey environmental issues to policy and decision makers
    c. Detection and identification of pollutants
        i. Development of new analytic methods
        ii. Development of advance instruments
        iii. Citizen science projects to identify bacterial contamination of water
        iv. Finger printing of water to identify compounds and contaminants present in water samples for pollution
    d. Fate and Transport
        i. Understanding the changes in vegetation from input water from outfalls
        ii. Nutrient transport from agriculture through canals

e. Impacts and Visualization & Data synthesis and Risk Assessment
    i. Annotation of the research projects
f. Work has been conducted in the everglades, mangroves in Puerto Rico, and shallow marine habitats
    i. Seagrass in Florida Bay by cellulose decomposition in seagrass beds
    ii. Fish population dynamics using acoustics and swim bladder size.
    iii. Environmental Epigenetics looking at gene expression and biomarkers

II. FIU is looking for partnerships and collaborations.

Questions for Piero:

1.(Valerie Paul) *You mentioned this was a training ground, is it targeting graduate students or undergraduate students?*

- (Piero Gardinali) *We first thought it was a Ph. D. agreement, we went back and talked to the office and they said no. They said you need to provide a pipeline for students weather it was an undergrad or a master's student or a Ph. D. student. We have had REU programs going over the summer also.*

Public Comment:

(Dan Kapnis) *Hi, it is very nice to be here again. I love these meetings because you are the experts and SEFCRI really relies on what you give us. I am a vice chair and represent recreational anglers, and I guess that is good enough to be vice chair. My real concern and what I found at the last meeting a month ago was that we are really concerned with what is going to be happening in the Port Everglades with the dredging here and the turbidity levels, and what turbidity does to corals. It came up over and over and over again.*

My public comments having dealt with the port of Miami and having sued Army Corp. of Engineers which is still in court, which is now four years it is still there. There will probably be mitigation on this. I know I have a lot of agency people here and people that work with agencies. We went to sue them and we said, if you do not follow the rules you are going to mess up the reefs, and loan behold they obliterated everything out there around Miami. So, you have to stick to the established to the established NTU rules with no variances. They had rules there that were very specific, but variances that were treaded to the Army Corp contractor were three times more than what they actually were. That guarantees that you are going to have a disaster if you give those variances. Sampling should be done by an independent sampler, they only went over their limit once in two and a half years. I have satellite pictures that show plumes that were miles long that were getting sucked into Biscayne Bay and government cut on an incoming tide. Subsequently we lost much of our seagrass if not all of it in north Biscayne Bay, and we have huge plumes of turbidity that a lot of it has to do with what got sucked into the bay which happened over a two-year period. A lot of that had to do with the seagrass dying, I am not saying that was the only reason.

We have to have independent samplers I would like to see the state run that, DEP or someone that can act on it immediately. We in our settlement was told by the Corp. of Engineers would get conditions on their NTU samples as they happened within a day or two. Three weeks to a month later I was getting the samples, I went out and sampled NTU readings there and corresponded them to the dates the Corp. had given me the month later. I took them up to the state and found that my samples were way above and should have shut the project down. The project was never shut down because the contractor relies on a sampler who is hired by the contractor. He is not going to shut that project down at the cost of $100,000 per day. So, if you want to make sure you protect yourself here have a third party do that.

Also, 24-hour sampling, we only had daylight hours. They were working 24 hours a day. We need to know what is going on all the time. Real time reporting, that was a bummer, I would get it three weeks later, I would get the sampling from the previous month. I would go through all of these samples, and you can't do it. You can't shut down a project down, you can't know what it if you do not have real time reporting and they know what to do with it. You have to enforce the work stoppage. I don't care if it is $100,000 a day if you are killing live reef out there because they have exceeded their NTU limit. It needs to be stopped until it is cleared up. So that is enforcement, which is NOAA, DEP, and all the agencies that are here. Just as a heads up, Army Corp. of Engineers told NOAA when they said you are killing our reefs: "We don't care, you can't stop us, we are the Army." Bottom line, please if you are in an agency, let's not let what happened in Miami happen here. Thank you.

Presentation: Water Quality Monitoring Update (David Cox)

I. $400k for water samples
II. Analytes are same as Dave Whitall monitoring plan
III. Preliminary data
    a. Nitrate at outfall is lower than inlets
    b. TSS is higher at STL
    c. Inlets have the highest TSS
    d. Few differences in depth (surface vs bottom samples)

<u>Questions for David:</u>

1. (Jack Stamates) *Are all the inlet samples being taken in a boat, or are they from shore*?

- (David Cox) *Boat, for surface and bottom water except at the outfalls and that is mainly because of depth and the equipment used.*

- (Dave Gilliam) *It was a bigger bite than what should have been taken. That will have to get reevaluated if this gets continued. So far though they are 3 for 3 on getting all of the sampling done in September, October, and now November. The work if pushed; sic] is not even close to what the guys are going through to get these samples.*

- (John Fauth) *You are doing this monthly?*

- (David Cox) *They can pretty much only sample four days a week.*

- (Dave Gilliam) *There are all of these targets. All of these inlets are supposed to be sampled, and the samples are taken two hours into ebb tide, and samples can only be done Sunday through Thursday during the day. All of these constraints in addition to getting the samples taken, there are a lot of constraints involved.*

- (David Cox) *They have been impressive though. They have been audited once by Broward county lab and they did a great job, and DEP is going to send an auditor down if not in December, in January to give their official stamp of approval.*

2. (Judy Lang) *This is going to go on for how long?*

- (David Cox) *Ten months, because it is a fiscal year funding, and you couldn't get it to start on July 1st, it was kind of got blind-sided a little bit because the money was coming from the legislature, we didn't really know still when the budget was signed when the money was actually going to be delivered. It was a quick learning curve. These guys are running up from here to St. Lucie.*

3. (Kurtis Gregg) *I think it would be important to have some observations during wet season to see if that would change the approach.*

- (David Cox) *It would be interesting to see now. We still process the total suspended solids in house for St. Lucie and Government Cut and the St. Lucie samples have barely been getting through the filters. You can see the impact of not only the discharge, but the rainfall that has come. So, Dave is going to come down in a couple months, so if anyone is interested we will probably have a small group gathering to look at the combined data of the new project and the old.*

4. (Jack Stamates) *One of the things you can do if you know how many times you are going to do it. I mean 10 months, now you are talking about 1150 samples which is close to infinity. Some of the things you can do on the inlets you can do a chain design you can randomly pick and do sites one and two, and the next time it is one and three, one and four to get all those combinations. You then randomize them so that way you can build up a model where you can predict the missing ones from what you have, assuming there is some sort of decent relationship. That could cut your sampling in half.*

- (Judy Lang) *Is that going to variably [Inaudible] save the tide too?[sic]*

- (Jack Stamates) *Well it sounds like you have that standardized.*

- (Dave Gilliam) *So far it is successful.*

- (David Cox) *The monitoring plan does call for in the future to capture samples at different stages of the tide, so it is not always targeting the ebb.*

- (Jack Stamates) *There are different clever ways to rotate the samplings so that over time you are still building up the data set, but it has a temporal component to it.*

- (Judy Lang) *They do that in the creeks for water quality for E. coli, in Virginia, but they also have to standardize it for the tides. It takes like 3-4 years to get enough samples to get stable.*

- (Joanna Walczak) *Currently it is one year of funding.*

- (Piero Gardinali) *For now, we have the money to do it as planned. It seems like sampling even though it is a little tricky, it is going as planned. Why do we want to modify it half way?*

- (Francisco Pagan) *Please see these as a movie preview, this is going to be one of the main topics for the next TAC meeting. We will have at least 6 months of data pre-analyzed, and this is a preview of a conversation that you will be having at the next meeting.*

- (Joanna Walczak) *Piero, to get to your point, there is a possibility of additional funding. Even though this is from the Florida legislature, the stakeholders have voiced their support for it strongly and should continue to. The department has put in into their annually recurring budget request to the legislature which might get this reoccurring, including the coral disease money. So, the more people that can be vocal about this the better. We have always known this was a pilot and we didn't know what was going to be out there. We just don't know what is out there so we just had to go for everything and then scale back and look at the things we are discussing.*

- (Piero Gardinali) *What I am saying is that if you look at one of the most successful programs at NOAA, we are hurting because we are dropping stations. We are doing all the thinking and why they should be dropped and now we are craving for the station in such place. So, if we manage to assign and vet a project that works, let's try to make the effort to keep it working and find the funding and not piece meal it. I trust that we put a lot of effort into this*.

5. (Phil Dustan) T*he amount of effort that goes into doing this is extraordinary, going out to sea in all the conditions. I would really suggest making a video about doing it as a public service announcement to get people on board. Then they realize it is not all just Ra, Ra marine biology. Show that it is blood and guts work. I think you can make an exciting little video that you can put out about this.*

- (Dave Gilliam) *If you have ever worked in the Boynton inlet in 3-5 foot seas.*

- (Joanna Walczak) *How to be a marine biologist!*

6. (Jack Stamates) *How are you collecting the samples?*

- (Dave Gilliam) *With water grabs and Niskin bottles.*

- (Jack Stamates) *If this is going to be a recurring thing, there might be an element of adding some sampling technologies like a rosette. It makes like a lot easier and makes the bottom and surface samples a lot simpler. That is an investment in equipment, but it would make like a lot easier. I want to bring this up, we have been getting reports that people have been reporting this layer of discolored water laying over the surface here, and we got a request the other day, and I saw it last Thursday. That is just something to argue for both surface and bottom samples. Has anyone else seen that?*

- (Kurtis Gregg) *That was an observation that during the reef visual census survey had started in about 2014. In the first two years we didn't really see that lens of greenish-yellow water, but from about 2014 to right about currently, pretty much every safety stop is right at that elevation right above it or below it of this lens of yellow-greenish water.*

- (Jack Stamates) *It is on the surface right now, or it was last week.*

- (Dale Griffin) *When we did the plumes study with Erin, our sites extended way off shore. On an outgoing tide, there was a big difference in the surface and bottom water.*

7. (Jose Lopez) *I echo the idea of staying on course for these sites, because it has been well planned out. There is value in doing that, as Piero mentioned in his talk, for example working with the south Florida water management. You have all those planned sites around the canals and there is great value in that. Looking at the DBHydro data base for example, you can go back decades that they were collecting water samples and doing analysis. You can do the same thing here in parallel now to the whole marine system, and this is just a start. You can make a case, you have freshwater canals in their database, and do a parallel for a marine database, finally then connect them.*

8. (Dale Griffin) *What are you screening the water samples for?*

- (David Cox) *Primarily nutrients. We do take salinity readings, but that is just for the calibrations.*

9. (Dave Gilliam) *I think what John said is important if we are going to discuss this in our next TAC meeting, we may have more information available to us on needs and funding available to us after June 30th. I think we should be at least prepared to think about reduced resources and what we want to do with reduced resources, and what we can and what we learned. Ideally, we would like to continue to keep doing what we are doing, but if we have less resources, to what we can do so we don't come to July 1st and realize we don't have money and now go "oh what can we do?" It would be nice to have some sense of what we can prioritize.*

- (David Cox) *That is a definite must because Government Cut and St. Lucie lab analysis is currently paid for by NOAA, and that money is not really expected to come back. I think that may last through December. So, the money that pays for the lab analysis of those two inlets will dry up.*

- (Judy Lang) *December '17 or '18?*

- (David Cox) *December '18.*

10. (Piero Gardinali) *If the data shows that there is stratification, or differences. We need to advocate for the money to continue for these differences. I would rather support the effort in every way I can instead of making a decision of what I am going to cut out.*

- (Judy Lang) *We can't make the decision now, because we do not have that information.*

- (Piero Gardinali) *I know, I want to stress on the good things coming out of this and why we should move forward in the same thing rather than preparing for doomsday.*

- (Joanna Walczak) *A little bit speaking on the sustainable funding side of it. The legislative proposal for the funding came from our counties. This is from the county commissioners in Miami Dade, Palm beach, and Martian county. The more you can educate those folks on the need for this stuff, those folks at least get it now. That is why they made that request to the legislature and got it all approved. They even said that if the legislature doesn't come through they are willing to divvy it up and find a way to fund it from the individual counties. The more we can communicate with the local elected officials the stronger we are going to be for this stuff. Big shout out to Broward county who was a big contributor in all of this.*

11. (Jack Stamates) *How long does it take and how many days?*

- (Dave Gilliam) *It is a day per inlet. That is just collection. It takes a day to run up to St. Lucie from here. It is a whole routine. I have cars and boats running back and forth constantly.*

- (Judy Lang) *What about Government Cut?*

- (Dave Gilliam) *Government Cut we have been using DEP (boat).*

- (David Cox) *There is a little more leeway with Government Cut because the samples don't have to be acid preserved in the field, or anything. Because of Broward county's NELAC certification and DEP requirements we can't freeze the samples. I don't know if it would be bad to lobby DEP to allow the samples to be frozen and use smaller volumes or change methods, that is something that requires more logistical planning. When they come off the boat in Jupiter for example, they have a 48-hour hold time, but the lab needs them the next morning or next day. That is why they can't*

sample on Thursday, because they can't deliver on a Friday morning. They can sample on a Sunday and deliver on a Monday, but they really need to let the lab know several days in advance so the lab can prepare. It is pushing Broward's capacity as well.

- (Dale Griffin) *It will be interesting to see the data set.*

12. (Jose Lopez) *What is the volume of water collected at each site?*

- (David Cox) *It's about 2.75 liters for the new sites for each surface and bottom, and the old pilot study at St. Lucie and Government Cut should be about 1.125 liters. It is a liter and two 60 milliliters the two get frozen and the liter I TSS for the solids. They have actually had to collect a third liter for QA purposes for the TSS and turbidity at some sites. Broward has figured out that they don't need this anymore, so it is roughly about 2.75 liters at the surface and at the bottom. So, dropping the Niskin in at least two of three times when you have that third liter, you want to make sure you don't run out of water.*

- (Jack Stamates*) If you get a rosette you can do that all with one shot. Is there a winch?*

- (Kirk Kilfoyle): *No winch.*

- (Kurtis Gregg) *That is your Christmas present this year.*

- (Judy Lang) *If this program is going to continue on after the first year, it has to be properly equipped.*

- (Dave Gilliam) *As Kirk will tell you, we are learning a lot.*

- (David Cox) *My hats off to Nova, they have done an amazing job.*

- (Francisco Pagan) *Broward too.*

- (Jack Stamates) *I do not know if there is any thoughts to get some water to people who are doing microbiology, but from the inlets a time series of samples.*

- (Judy Lang) *When you have rosettes.*

- (Jack Stamates) *There are probably auxiliary groups who would take water to examine PCO_2.*

- (David Cox) *Maybe that is something for the future to be figured out if we can add something, at this point there is barely room on the boat.*

- (Piero Gardinali) *You need to start a program where "We are going to be here, if you have a need for a specific sample, contribute an X number of dollars to it here." Some*

people may do it, I know your crew might be to the top, but if they contribute to the problem either resources or people.

- (Judy Lang) *With other people getting interested it is more likely for it to continue.*

- (Jack Stamates) *A time series like that is invaluable and hard to get.*

(David Cox) *If there are no other pressing matters, it has been a long day, I would like to adjourn. We are having a reception downstairs, thank you to Nova. I would like to say good job on maintaining a wonderful attitude running through all these projects as if they were fresh. It was really nice to see everybody tackling them with laughter in the room. Tomorrow morning, we will pick it up again, we will keep the same groups. There will be a couple additions here tomorrow, we may have another person. The packets are already set with the groups to start right back up. Thank you very much and enjoy the reception.*

DAY 2 FALL 2016 TAC MEETING

Welcome, meeting Guidelines/ Agenda Review/ Overview Day 1 Discussions

(David Cox) We are just going to pick up where we left off you all have new packets. Any questions? We are going to work on this up to lunch. We will be here to help out and answer any questions about the documents.

(Francisco Pagan) You will get a package at 10:45. You will have another one.

Groups are divided up for continuation of SEFCRI Next Generation LAS Projects

SEFCRI Selected Ideas: (Aubree Zenone)

- (Aubree Zenone) Before we moved on we did have a request to go through the SEFCRI ideas selected in the spring and outline the projects that are associated with the ideas that were selected. At this time, we would like to see if you identified any potential gaps in the projects.

<u>Maritime Industries and Costal Construction Impacts Projects 28-29</u>

1. (Aubree Zenone) *Did anyone identify any gaps in the MICCI projects 28-29?*

2. (Kurtis Gregg) *When we reviewed them, it seemed like there was some overlap between the three. Between 28 and 28b we could see that distinction.*

- (Aubree Zenone) *That was intentionally because project 28 was to specifically identify the new technologies and methodologies available. The proposal at the SEFCRI meeting was to add a subproject or wrap this up into 28, we are not really sure if we want to keep this as one project or two. But to actually test the technology and those new methods instead of just identifying and recognizing the new methods, they wanted to get data whenever they bring to the table new monitoring methods. That is the essence of project 28b, so there is a bit of overlap and it is unclear if they are going to consolidate them or keep them separate. Do you have any recommendations?*

- (Kurtis Gregg) *No, I was just point out that when we were reviewing that.*

3. (Dave Gilliam) *You kind of need 29 before you do 28.*

- (Aubree Zenone) *Project 29 is more to actually take the methods and see how we can use it in the field. I haven't read project 29 in a couple of days so I can't speak to that one off the top of my head.*

4. (John Fauth) *One of the things our group noticed is that these belong together, and there are different steps in the scientific method and the steps are out of order. There is one of them that needs to go first, which is the observational part, which is the literature review. Then you go through the methodology part. Then the last is the scientific testing of it.*

- (Dana Wusinich-Mendez) *Isn't the lit review 28?*
- (Lew Gramer) *Yeah, the lit review is 28, and 29 are tank studies.*
- (John Fauth) *Some part of it at least was out of order.*
- (Dave Gilliam) *So 29 is tank studies? I think we should just change the title.*
- (Piero Gardinali) *Yeah, 29 has nothing to do with new technology, it is just the assessment of grain size to coral growth.*
- (Dave Gilliam) *That was 29?*
- (Piero Gardinali) *I believe so.*
- (Lew Gramer) *I think it was grain size transport and also distribution.*
- (Kurtis Gregg) T*hat was the one with the hydrodynamic model?*
- (Lew Gramer) *Actually no.*
- (Judy Lang) *No, turbidity was different than grain size testing.*
- (John Fauth) *Yeah and so the other thing is that you have turbidity with sedimentation which are distantly different phenomenon. They are interwoven together and it would be productive to have them separate.*
- (Aubree Zenone) *Those two as well?*
- (Lew Gramer) *Our concern was the scope of the tank experiments without direct field information and some modeling beforehand would be too broad. So, it would be a massive effort.*
- (Dana Wusinich-Mendez) *Well, 28 would help you narrow down 29, the scope of 29.*

5. (Phil Dustan) *I have a general question about what you want to do. There are probably more companies than we know of that are probably trying to measure turbidity. So, you want to take on an additional in respect to all of those guys as well? If you really want to learn how to measure turbidity, you are going to have to go deep into nee [SP?] scattering and scattering in the ocean. It is a huge issue to do that, and by the time you really get into the literature, I presume this is all in preparation for the dredging and the monitoring. It is*

going to be over by 10 years, because people have been trying to measure turbidity for years and years and years. So, this is something we should want to do, but I think this is way over your capabilities. Unless you want to take measurements with existing instruments and see which one works best.

- (Lew Gramer) *The new technology wasn't necessary in-situ like optical measurements or drone measurements.*

- (Phil Dustan) *When you say optical measurements you are in the water measurements?*

- (Lew Gramer) *No, this is above the water measurements potentially. It is mentioned.*

- (Aubree Zenone) *There are multiple methodologies mentioned in there.*

- (Judy Lang) *That makes it even longer to accomplish.*

- (Phil Dustan) *Again, to really hammer that down, how many optical measurements are you going to see in the ocean. If you just want to track plumes that is a different thing. I think it is a huge development method that you need to redefine the law to do. I think you are just way over your head.*

- Arthur: *Do you think you should just take an off-shelf product?*

- (Phil Dustan) *There are a lot of off- shelf things to measure NTU's, there are a lot of people who say NTU's are crap and you should just measure beams transmittance. There are other people who say you need scatterometers to measure it true. But what you really want is something that is going to track this plume which it is an off the shelf turbidity hoc turbidity meter or things like that with offsets to be made. Those companies are going in and trying to get legislation and they are trying to get the rules and regulations. No one agrees on an NTU.*

- (Jack Stamates) *The NTU, and you are absolutely right to get an absolute calibrated instrument for all applications, but a lot of this is the function of the grain size, which is changing. If there are relationships done in laboratory studies with suspended sediments form actual samples, and turbidity units and NTU's at milligrams per liter. Those calibrations can be used to improve the measurement significantly without having to reinvent new technology. So, having knowledge to the local sediment and how it relates to the total suspended solids.*

- (Phil Dustan) *So you want to develop a better way to calibrate an existing instrument?*

- (Jack Stamates) *Using local sediment. Which during the dredging project the sediment size is changing depending on where they are digging and how deep. You need a library of calibrations.*

- (Aubree Zenone) *If you can excuse me guys for just one second. Although this is excellent discussion and will be very useful, but in the future, we are going to take these to the SEFCRI teams in the spring and develop the project teams and then when we sit down and start moving forward on these that is when we will need this level of input.*

- (Phil Dustan) *We are trying to figure out the scale.*

- (Dana Wusinich-Mendez) *We are trying to identify gaps.*

- (Aubree Zenone) *If there are anything here that doesn't achieve the ideas that they have selected, that is what we are looking for at the moment. The projects themselves are pretty broad because we are trying to encompass everything we need to try to achieve this idea. You are right, right at this moment it is very broad, it is going to be very easy to get down to the rabbit hole and we are not quite there yet.*

6. (Judy Lang) *Can I ask when the dredging is likely to start?*

- (Dana Wusinich-Mendez) *I don't think that was just about the Port Everglades project. I think this was about monitoring the development of costal construction projects in general.*

- (Judy Lang) *Was it kind of short term?*

- (Aubree Zenone) *No, it was because there are rather large differences in the NTU standard in the Keys and here so we want to bring everyone back to the same page.*

7. (John Fauth) *One of the gaps that is in there, on beach nourishment projects, the engineers, they design the sand to not go towards the reef. That is based on engineering models, but engineering principals are not the same as the scientific method. So, they make that prediction and walk away from it, and so we need to go back and look at some of those studies and we need to say, "here is where the engineers predicted the sediment to end, here is where it actually is." Now you guys have to have new models that reflect reality and get them to develop better models. Because they won' t do it, they will continue to plug numbers into the same models over and over again until someone makes them stop. That's not how engineers work.*

- (Dana Wusinich-Mendez) *So, are you proposing a new project that is evaluating the efficacy of the holistic models?*

- (John Fauth) *Right, because we know they don't work. But until you get them to change models they are going to continue to plug them in to the same models.*

- (Lew Gramer) *Lets clarify, it's not so much the modeling efforts, it's the parameterization that goes into the model.*

- (John Fauth) *Right, and you know that with the scientific method you can say "here is the predicted model and here is where it is." Now you have to take that into account if you are saying it will stop at the 12-foot line and it is stopping at the 20-foot line over and over again, then we will know what we will actually get out of these beach nourishment projects.*

- (Piero Gardinali) *That can be packaged on either 28 or 28b. When you say technology, you can include modeling in there.*

- (John Fauth) *It is not sedimentation or turbidity, it is transport.*

- (Aubree Zenone) *I would make the suggestion that this could be considered methodology and could be wrapped up.*

- (John Fauth) *No it is not methodology.*

- (Dave Gilliam) *I don't think that you should muddy the water. I think this is a really important project that the team really wants to work on. I don't think you should make that broader if there is a gap that neatly ties into the project that is fine. John, what you are think has value, but I don't think it is the way the team was thinking for this project.*

- (Don Berhinger) *It is fundamentally a different project.*

- (John Fauth) *That is why it is a gap.*

- (Dave Gilliam) *I think sand movement due to the placement of sand is different than turbidity and dredging.*

- (Don Berhinger) *I think it is a whole new project.*

- (Dave Gilliam) *Yes*.

8. (Aubree Zenone) *We have noted that and we will bring that to as a recommendation to SEFCRI to see if they agree with it as well. Thank you, is there any other gaps noted in this one?*

<u>Maritime Industries and Costal Construction Impacts Projects 30-34</u>

1. (Dana Wusinich-Mendez) *No critical gaps in my mind.*

2. (Kurtis Gregg) *Our group discussed putting them all together to one cohesive plan.*

- (Aubree Zenone) *That has been discussed.*

- (David Cox) *The SEFCRI team did as well.*

Projects Reef Resilience Projects 1-4

1. (Dave Gilliam) *I have a broader comment literature reviews, we keep seeing the need for a literature review. It is just stalling the inevitable from getting done, if we need a literature review, if it is this one or tying fisheries to a habitat. If we want a literature review has got to be a real commitment, not just what we have been doing for literature reviews. There has got to be real support for it. It is not a master's thesis, literature reviews are not theses, they are above that. It has to be done by someone who really understands the literature that can really come to some clear recommendations, otherwise they are exactly what they have been in the past. They are a weak product that a box gets checked off the list and the it is shelfed somewhere and never used. We keep wanting literature reviews and they are not doing anything. They can be of value if they are done by someone that really has the knowledge to do something with them.*

- (Lew Gramer) *It needs to be peer reviewed.*

- (Dave Gilliam) *This is almost like a post doc, who can really take these and run with it.*

- (Aubree Zenone) *We will make sure to make a note of that.*

- (Lew Gramer) *They are usually written by PI's.*

2. (Esther Peters) *You are going to need PI's here who are ecotoxicologists and environmental chemists and ecological risk assessment, you need these people for those kinds of expertise. Piero and I identified issues in the terminology in the LAS, we edited them and hopefully that will help. There is already stuff out there and resources to begin this process so consult with us.*

- (Aubree Zenone) *We will talk to you two when we get started.*

3. (Dana Wusinich-Mendez) *In terms of a gap and I will ask the group, since our time like as three years, it is feasible, but it seems like after you do a literature review to understand those thresholds and awareness as for all our other pollutants as is target actions to reduce those pollutants. It seems to be missing and whatever approach we are taking is the water shed management approach where you are starting off small and coming up with a management plan. Do we want to connect these things and include that by the time we have do the first projects we will have a water shed management plan in Boynton community area? Do we want to add, because I don't think that will include toxins, do we want to add some specific target actions in that plan to reduce the toxins in that one specific area?*

- (Kurtis Gregg) *Because of the time line and the contracting involved, it would be additional projects.*

- (Dana Wusinich-Mendez) *Separate projects. It seems to be a gap.*

- (Kurtis Gregg) *Depends on what the toxins are.*

4. (James Byrne) *A gap that I see, it is highlighted here and throughout a lot of these projects, at one side of this we are talking about the ecosystem and we have to think about the whole ecosystem and how different components are a part of that ecosystem, and plan for them. Then we are getting into these types of studies that are only focused on corals, and we are actually ignoring a majority of the ecosystem. Especially when you look at the ecosystems around here. Corals are only a minor component in our local ecosystems out here and we are ignoring the rest of it. It may not even be one of the most sensitive to these toxins. I just see that as a big gap with these toxicity studies and everything else we are doing. We are ignoring the rest of the ecosystem and we focus just on the coral. But then we get into management where we forget about the coral and just go towards the other stuff. I just think there is a gap and disconnect in how we approach and talk about all of this.*

- (Aubree Zenone) *It mainly because the SEFCRI body as a team has decided to focus on those main groups. It is not like they set that out as an entire ecosystem, they are the coral reef initiative so they were mainly focusing on the corals. Especially when we start dealing on the large trends that starts getting into FWC's purview which we are working on with them.*

- (James Byrne) *That is why there is always pushback why you try to say what management needs to happen.*

- (Dana Wusinich-Mendez) *It has to be an ecosystem based initiative, it is not just about the corals.*

- (Aubree Zenone) *For these particular projects, their thought process was that this would most particularly help the corals.*

- (Dana Wusinich-Mendez) *I wonder if it was explicated or just an oversite.*

- (Aubree Zenone) *It could be, that is a gap. Thanks James.*

- (Phil Dustan) *Corals build the ecosystem, they are the structure of the system. Corals are the framework building creatures out here, and that is why we choose to focus on corals. You can't really manage anything once you take out the fish. You might not drop an anchor on anything, but for the most part corals are a part of the endangered species act. It is like if you manage for an owl to save an ecosystem. For corals we try to do something for the ecosystem. Sure, we can manage for algae which is the most ubiquitous thing out there, but it makes no sense.*

- (Aubree Zenone) *It is a key gap. And we will bring it back to SEFCRI to make sure it is talking about the things they want it to talk about.*

5. (Dana Wusinich-Mendez) *What I propose is to actually be incorporating actions to reduce toxins in the Boynton inlet. Specifically, that one particular management plan*.

- (Lew Gramer) *And the peer review piece wasn't mentioned in the first time.*

- (Dale Griffin) *All the projects that say literature review should say peer reviewed.*

6. (Esther Peters) *In an ecological risk assessment, corals would be one end point, but we need to consider multiple species here because another concern is that the food for the corals, the plankton, may have been effected by the pesticides and things like that. People are concerned that their whole communities have been changed as well. Then we look at species sensitivity distribution and an ecological risk assessment, and may actually want to manage other species than corals. To protect the corals, you may want to manage other species.*

- (Jose Lopez) *To add to that corals are the basis for the ecosystems, but is also the poster child for symbiosis. You can't ignore algae and microbes, they are all interconnected. You have to target something but symbiosis is kind of the key to a lot of functions*.

- (Aubree Zenone) *I think that is a good link justify boarding it a little bit.*

- (Piero Gardinali) *I just want to tie up everything, what we are trying to do here is ecological risk assessment. Now we have exposure for the chemicals that are out there, part of this is to look at the inventory for chemicals of concern. You go to the literature and find first species that are sensitive to the chemicals you found. That is not restricted to the corals, then you go to the coral literature and you find these corals are sensitive too. These two lists of chemicals may not overlap, but eventually you are going to have a list of things that you know are there, and the things which the corals could be effected for and we need to monitor, we thought that would feed to the next project that will measure the things we haven't measured. Once we have the complete set of toxins, someone will have to decide how to prioritize those into the toxicology studies. It is all inked together.*

- (Esther Peters) *Ecological risk assessment offers a framework, before you even develop, the EPA has tons of framework on this. You have to follow it and you have to have the people dedicated to work, and that is what hasn't been done in this.*

- (Aubree Zenone) *Does it seem like all of your comments have been accurately captured?*

7. (Kurtis Gregg) *I would just add to the species distributions, I think you need to add octocorals and sponges. That is what I think that James is getting to that is what is providing habitat to other reef users and reef organisms that are usually ignored in the conversations.*

- (James Byrne) *I would say the users you just classified, we need to look at the toxicity in them. We are ignoring the fish, and that is actually one of the bigger bioaccumulators out there. That is where people are going to relate to, that is where you are going to get action. No one cares about the rocks, that is what they call them, but they do care about the fish they eat.*

- (Aubree Zenone) *That is possible. Thank you.*

Reef Resilience Project 5-7

1. (Esther Peters) *I know that coral disease and health consortium has already came up with an outbreak response plan. Maybe this just has to be tailored for this area, that is what Valarie was considering at one point.*

- (Valerie Paul) *That was distributed at the disease workshop, so Cheryl was saying to just update that which was written over a decade ago.*

- (Aubree Zenone) *This is more for local stuff, this is to collect a local dataset to update it and tailor it specifically for our region.*

- (Esther Peters) *So, this is directed towards that.*

- (Aubree Zenone) *It is to the southeast Florida area.*

- (Lew Gramer) *I think one open question that we have both had on this is that there is both a focus on peer review and ongoing research and on public reports. It wasn't always clear on which projects were for which.*

- (Dana Wusinich-Mendez) *I think that was the data base. We did provide comments.*

2. (Valerie Paul) *Going back to that again, how extensive do you want it? Are you trying to include the Pacific corals, or if you are going to tailor it for here? If it is for here, there is like one paper so.*

- (Aubree Zenone) *Yeah, it is very variable depending on what is available.*

- (Valerie Paul) *On the current outbreak, there is only one paper*.

- (Aubree Zenone) *The idea is to have all the information on the southeast Florida area, and if that is only one paper so be it. We want to make sure we have all the information available to move forward in the best way.*

- (Judy Lang) *Then can't you just get it from the disease people? This was probably designed before the current disease outbreak, and events over took this plan, and now money has been found.*

- (Aubree Zenone) *That is exactly right, the plan has been around for a while and now the money is available.*

- (Judy Lang) *You may not even need this. It might be better to put your efforts in areas that are not being funded like resistance studies in Boynton inlet.*

- (Dana Wusinich-Mendez) *This might be covered basically.*

3. (Kurtis Gregg) *Thinking back to the SEFCRI team and the discussions, there has been some outspoken team members and stake holders who have not seen movement on the disease response like they were hoping to see. It kept coming up, and they responded to that with this.*

4. (Francisco Pagan) *Also the objective here is to look over these to make them local action strategies. This is not a small project that we are trying to get funding for or not, a couple of things might already be kick started or ongoing. The SEFCRI intent is to put it on the big picture, to make this a local action strategy which will always be referred to that could also inspire other jurisdictions to do similar endeavors into the future. It is formalizing a higher way, any project that you already think is out there being worked on.*

5. (Aubree Zenone) *Thank you Francisco, looks like we will move on to the next.*

<u>Reef Resilience Project 8</u>

1. (Aubree Zenone) *Was there anything that might be missing? Okay. Next please.*

<u>Fishing Diving and Other Uses Projects 51, 52, 53, 54, 57</u>

1. (Dana Wusinich-Mendez) *What does coordinating adaptive monitoring strategies mean? I remember a priority to improve bad fisheries management, which seems relevant to this.*

- (Aubree Zenone) *That should say management.*

- (Dana Wusinich-Mendez) *Coordinate adaptive management strategies? Okay*.

- (Judy Lang) *Monitoring has to be involved too, it's the ecology*.

- (Dana Wusinich-Mendez) *Sure, the projects didn't seem to be related to monitoring.*

- (Aubree Zenone) *How don't the projects seem related?*

- (Dana Wusinich-Mendez) *To monitoring.*

2. (Aubree Zenone) *Oh, okay. Any gaps here?*

- (Dana Wusinich-Mendez) *Was that really the language for the priority idea devised by SEFCRI back in February?*

(Aubree Zenone) *I believe so, I can double check on my computer. One second.*

3. (Francisco Pagan) *While she is verifying the language, are there any gaps that you want to identify here on the projects?*

- (Dana Wusinich-Mendez) *Gaps towards what?*

- (Francisco Pagan) *The main intent here is to coordinate and improve the monitoring that is going on towards management. Not all monitoring going on deals with the datasets that are actually used for the management actions. So, to coordinate an effort to evaluate and suggest potential changes to monitory programs. Alongside to us is to identify something that is needed. I understand that managers need to be more proactive with the questions that need answered, but also all the effort out there need to answer management ones. So, multiple projects that includes 52 that FWC identify, and they do have some questions to identify and they need to gather some data to answer the questions they need.*

4. (Aubree Zenone) *The actual wording was to coordinate adaptive monitoring strategies, not manage.*

- (Dana Wusinich-Mendez) *Remember the slide that you kept putting up at the team meeting? On day one, it showed the list of priorities and ideas that were developing projects?*

- (Aubree Zenone) *This is directly from it.*

- (Francisco Pagan) *She separated all of those into separate slides.*

- (Aubree Zenone) *Yeah, so what I did was took that big long list and I made a separate slide for each of the ideas.*

5. (Don Berhinger) *Did this incorporate the study that we funded that was Jerry Ault and somebody that did this probably 8 years ago, that assessed the status of fishery recourses in the SEFCRI region?*

- (Francisco Pagan) *I think Kurtis can answer that.*

- (Kurtis Gregg) *Yeah, it was Alton Franklin [SP?], the findings from that were, if you read some of the project talking about the FWC, that was a reaction to the Alton approach of using the fisheries management stock assessment tools on a very small region of where that stock occurs. So, FWC's fisheries assessors disagreed with the approach in that, and that is why "Okay, you don't like that approach and you had*

your criticisms of a fisheries independent data collection. Fine, you do it with your experts." They offered to, it was FWC staff who proposed the LAS money.

- (Francisco Pagan) *So, some of these are directly for the needs of some of the management agencies. That particular case, 52 comes from FWC.*

- (Lew Gramer) *The reference is AULT and Franklin.*

- (Kurtis Gregg) *That was in 2011.*

6. (Dana Wusinich-Mendez) *The names, I suggest when the team regroups to identify names that better represent what the project is. A lot of these you have no idea what the project is by looking at the names.*

- (Aubree Zenone) *After this session, those selected ideas are pretty much done. These project titles were me with 15 minutes because you requested some slides, so if they are not describing what the projects are I apologize. I will definitely be working closely with the project teams to make sure the titles accurately reflect what they are trying to get at.*

- (Valerie Paul) *The titles we had on the forms that we were working with weren't descriptive either. They need good titles.*

7. (Aubree Zenone) *It certainly will be addressed, but that is the nit-picky finalizations. Are we missing any gaps in adaptive monitoring strategies?*

- (Lew Gramer) *Just a plug for what is going to be discussed all afternoon. Just dynamical data as well as marine planner updates.*

8. (Kurtis Gregg) *There were two projects, one that was FWC staff proposed and another that I had a hand in putting together. I think the FWC proposal was intended to replace the other one.*

- (Aubree Zenone) *Meghan, would you be able to address this question?*

- (Meghan Balling) *Sorry can you repeat the question?*

- (Kurtis Gregg) *There was an FWC LAS project proposed that FWC was going to take the lead on evaluating the fisheries independent and dependent datasets, and looking at a regional management approach for southeast Florida. There was also another project, and I am not sure which number it was that I had talked about looking at the fisher's independent data and partnered with the FWC proposal. I think the FWC proposal was to replace that and was the other one pulled out?*

- (Meghan Balling) *I am not sure if it was pulled out, I am going to check the list and see.*

9. (Aubree Zenone) *Kurtis, if it is okay with you, I am going to move on to the next section. Okay, thank you guys.*

Fishing Diving and Other Uses Projects 55-56

1. (Aubree Zenone) *Does anyone have any gaps that need to be filled on this one? Okay, next one.*

Land-Based Sources of Pollution Project 33

1. (Aubree Zenone) *Did anyone see any gaps in this project to achieve these ideas?*

2. (Lew Gramer) *I might be mixing up the groups, but one big open question was subterranean ground water.*

- (Aubree Zenone) *To my knowledge, that is a non-point source. This is specific to point source. It was identified in some LAS about 10 years ago that trying to track subterranean ground water would be nearly impossible.*

- (Dana Wusinich-Mendez) *The project yes, but the idea no. What Lew is saying that a gap to address that idea is a different project to evaluate ground water.*

- (Judy Lang) *Jean told us at one meeting, that a lot of the ground water is going to flow into the canals and come out the inlets rather than going under the canal and continuing to go offshore. Not all of it, but the stuff that is shallow will end up in the canals.*

- (Dale Griffin) *We did an SGD study here years ago, it was funded by the EPA looking for possible freshwater seeps out here and they really didn't see anything. The intercostal water way cuts off the fast-moving shallow part. You are going to have a little bit out here, but it is going to be not as substantial as if the intercostal was not here.*

- (Lew Gramer) *I am not a geologist; do we have a geologist in the room? I think it is going to be regionally dependent.*

- (Dale Griffin) *Yeah, of course.*

- (Kurtis Gregg) *Ken has the best information, and he is not here at the moment.*

- (Lew Gramer*) Yeah, but he was on our team when we were talking though.*

- (Jack Stamates) *I know that the USGS office in Fort Lauderdale is doing some new work in the Dade county area.*

- (Piero Gardinali) *You are talking about Biscayne Bay area.*

- (Dale Griffin) *The USGS group for years has done studies of groundwater movement.*

- (Aubree Zenone) *Lew thank you, that was an excellent gap identified. We are going to move on to the next set.*

Awareness and Appreciation Projects 39, 41, 42, 43

1. (Aubree Zenone) *These are all new ideas, so you do not need to identify new gaps here. Next ones.*

Awareness and Appreciation Projects 40, 44

1. (Aubree Zenone) *Were there any gaps missing on the proposed projects?*

2. (John Fauth) *Not a gap, but there is a concern, especially for project 44 which has been preempted, there is a grass roots effort to get that done.*

- (Aubree Zenone) *The idea is to localize that, and actually push for that locally.*

- (John Fauth) *You are behind the wave. You have lost the ability to ride that wave. One of the questions we need to ask is: how we best utilize our efforts. Part of it is to not to put efforts where others already have it underway, they are rocking and rolling. We do not have the same advocacy for the land-based sources of pollution or some other aspects other than sunscreen.*

3. (Dana Wusinich-Mendez) *It seems like one of the main mechanisms for implement the coral safe sunscreen was working with the boat operators for diving and recreational fishing operators. Some of us, we actually wanted the team to look a little bigger than sunscreen and look at the blue star program in the keys and look at getting something like that and that is one item on the checklist for what you would want a blue star operator requirement that you want them to be meeting. That would be promoting the use of reef safe sunscreen, but you would want a bigger list, so why not think about developing a blue star program in this region and include that as one item on the list. That seems to be one of the primary vehicles in the project.*

- (John Fauth) *That was one of the recommendations from the OFR projects.*

- (Don Berhinger*) I think AA 41, the whole idea of that was to reduce the redundancies and increase the effectiveness of all of them. We came across many different educational awareness components in the different projects. We need to coordinate that and prioritize that and where there are redundancies find ways to combine things. That sort of needs to be a solid project in itself.*

- (Aubree Zenone) *To consolidate, absolutely. I would say at the AA table itself, it was specified to me several times that we need to ne reinvent the wheel.*

4. (Piero Gardinali) *I do have one question, and I am sorry if this was covered the other day. What is a coral safe sunscreen?*

(Aubree Zenone) *Avobenzone and oxybenzone and several compounds in that group are known to hinder reproductive success in corals. Endocrine disruptors, so just small amounts can create acute effects on the reefs and there are many popular sunscreens with them included.*

(Piero Gardinali*) I do analyze for sunscreen components in saltwater, there is about 20 something of them. I am afraid we have information for the first three, but we do not have information for the other 15. By the time we gather the information for the other 15, there are going to be 20 more, so I am not sure where to head in that direction. The information we have on the effects of corals is maybe limited to 2 or 3 compounds.*

(Aubree Zenone*) But that is not to say that the others aren't going to be too.*

(Piero Gardinali) *We have no idea, we have to be attentive to that. I know you may say it is reef safe today, but it may no longer be reef safe tomorrow. I do not know how to handle that, other than tell people not to use sunscreen, which is not going to go well with anybody. I have to force our crews not to wear sunscreen while collecting water samples, they don't like me for that.*

(Esther Peters) *People need to cover up.*

(Piero Gardinali) *I would promote covering, before spraying messy chemicals everywhere.*

(Esther Peters) *I am working with a student here, I am her advisor for her master's project, and that is included in an extensive literature review of sunscreens and their components. That may be useful to some people, she hasn't yet defended yet.*

(Aubree Zenone) *Thank you very much for the heads up. If there are no further gaps that takes through everything and we need to take a break for lunch. I want to thank you all very much. We have heard all these comments and we have them on record. We will go through the minutes and make sure we didn't miss anything later. We will be taking them all to the SEFCRI team and you may see that some of the projects you looked at today contain some of your influences and recommendations from the spring. We are doing our best to present this information to them so they can incorporate this and really think about it.*

Lunch Break

Public Comment:

No Public Comments

Discussion of Outfall Sampling Modification

1. (John Fauth) *I was thinking about the project, and I got concerned. I understand what Dale is talking about there being a selection pressure, or there not being a selection pressure on these microbes and they are going to lose their disease resistance. What we expect to get from that sampling is assisted selection pressure that will occur around the outfall and how the prevailing currents move and stuff like that. What we won't have a good handle on is, what organisms that are bioaccumulating or biomagnifying anything that is coming out of the outfalls and we can expect that to be a larger distribution, right. We are likely to get the zone of influence of an outfall consistently on fast growing microbes, but we don't have any information on how large the zone of influence to anything that is eating those or bioaccumulating or biomagnifying. So, what I was thinking is to sample something like stable isotopes to get that signature, and it is pretty cheap and efficient and get the signature from the outfall. Preferably on something that would be a bioaccumulator or biomagnifier. Now a third possibility is that Dale mentioned that his sample collection, he is going to have a lot of sediment left over. We can evaluate the sediment and that might have a stable enough community so that you can see the signature on a larger scale. So, that is the idea, the sampling design itself I think is beautiful, I think it will work. To incorporate stable isotopes is an economically efficient way to get the signal of the larger zone of influence. It would be great if we could do it in a sponge or a coral, but from our pilot study and stuff it wouldn't be as likely at all the sites at the given time given the time restraints. So, maybe sediment for looking at the carbon and nitrogen signature might be all we need and those cost about $10 per sample so it is cheap and we don't need to collect any additional samples, so that is the idea. We are talking about getting the idea of pollution at the outfall, the counter to that is the bioaccumulation or biomagnification at the site, and let's make sure we get that signal.*

- (Don Berhinger) *Yeah, for $560 and no additional you can freeze what he has got and he does what he needs to do plating and sampling and just freeze the rest. Whoever can just do the isotopes.*

- (John Fauth) *I don't work on stable isotopes, it is not like I am promoting my own stuff.*

2. (Phil Dustan) *Question, stable isotopes in what? That is a complex mix of calcite as well as aragonite.*

- (Dick Dodge) *It is not on the sediment.*

- (Don Berhinger) *No, you get rid of all the inorganic. We are just talking organic carbon and nitrogen that is in those sediments.*

- (Judy Lang) *Are there concerns in changes in the organic carbon? Because, there is going to be bacterial reactions going on in the sediment which may be very different that at the outfall than what they are away from the outfall.*

- (Don Berhinger) *Exactly, that is what we are trying to capture. Difference in the gradation and difference in the carbon nitrogen values across the range.*

- (John Fauth) *Because they are coming from land based sources opposed to marine, and can you pick up that signal.*

- (Dick Dodge) *Has anyone measured that?*

- (Don Berhinger) *In sediment, yes. We are doing that right now.*

- (Judy Lang) *I think you also need to know your total organic.*

- (Don Berhinger) *I mean you could get your percent carbon and your percent nitrogen, for $2 more you can get that information.*

- (Judy Lang) *I think that would be a good idea, because as you increase the density of the organics, you are going to change the reactions of the group.*

- (Don Berhinger) *Right, we can get that information, that is a part of it.*

- (Judy Lang) *In a low oxygen environment you have to add your abundance.*

- (Don Berhinger) *It might suggest that we should do a broader stable isotope study which we discussed in the last SEFCRI meeting. If we do see something in the sediment, that would indicate that we may want to revisit the idea of doing a broader stable isotope study or the micro communities.*

- (Dale Griffin) *I agree, I think that is an opportunity to increase the resolution of the study. I was telling John earlier, I have done this in spring studies where we combine microbiology research with isotope research. It is interesting that you can age date waters with nitrogen isotope ratios usually when you get a younger body of water it indicates a recharge and that is usually where you see the pathogens pop up. We have seen a lot of correlations between the nitrogen isotope data and the microbiology data. I just think it is a good thing to add onto the study if we can do it cheap. It will also provide preliminary data to a more comprehensive isotope study.*

3. (Dick Dodge) *You can take ages of seawater with nitrogen in it?*

- (Dale Griffin) *I do not know, a colleague of mine age dates freshwaters with nitrogen type isotopes.*

- (Piero Gardinali) *I am a little worried, with sediment, you can find the organic amount by acidifying it. So, you are going to be left over with the organic proportion, that is a compilation of whatever is natural things that grow there plus anything from the pipe plus whatever maybe somehow transported. Unless the isotopic difference*

between the two endpoints are going to be so different, you are going to get a very average isotopic composition.

- (Don Berhinger) *But I think, the idea is not necessary to associate with a pipe specifically, but if you are doing the stable isotopes in the same gradient that he is going to be looking at the microbes. You would see a difference in the isotopic signature as you move outward from that point.*

- (Dick Dodge) *Why?*

- (Don Berhinger) *Because, potentially coming out of that pipe are nutrients from a different source. If they are incorporating nitrogen from a source that is from the pipe or whatever that is. Brian has done a lot of this*

- (Piero Gardinali) *On an organism, but that is a little bit different.*

- (Don Berhinger) *Right, ideally if we really wanted to do this we would target organisms, but sediments are still a part of that story, you can't tease apart the microorganisms and algae.*

- (Piero Gardinali) *If you really wanted to use an isotope signal as say the distance from pipe, and there is a trend, that is fine. I don't think you can interoperate beyond that.*

- (Don Berhinger) *No, I think that is sort of the idea that the pipe is having some sort of influence. Then if you do see something, then the next step is a broader study.*

- (Dale Griffin) *You would expect to see a difference with that much organic material being pumped out and the bigger material settling out in the sediments and some convection due to currents and tide. I would think you would see something, you would see enrichment certainly.*

- (John Fauth) *Then if we see that pattern, then it goes back to what James was saying, we need to look at the higher trophic levels where stuff is going to bioaccumulate. Then that may be a different sampling project for targeting fish that is not something someone is going to be able to do on a bounce dive like getting sediment samples.*

- (Don Berhinger) *That is exactly the preliminary effort you need for a grant proposal, because if you show that pattern.*

- (John Fauth) *That is a good reason, you are not shooting in the dark. If you know what the distribution is, then now you have an idea. If the microbial samples are like this and the isotope sample is like this, then you know biomagnification ought to be like this. Now we don't need so many of those samples close to the pipe, you can spread them out more so you can make a more efficient design out of it.*

4. (Piero Gardinali) *Would it make sense to do it with something like cadmium? There is no x-ray construct, you can analyze for it. I do not know how expensive it is, but it is a signal only directly to the path. There is no organism in the universe that will produce that. You know, if your point is to see if the pipe is effecting the sediment somewhere and you are looking for a tracer.*

- (Don Berhinger) *I know nothing about that so.*

5. (Dick Dodge) *What the tracer is assuming is what you are trying to find.*

- (John Fauth) *Also some signal that would integrate overtime through bioaccumulation. The big thing we still don't have a handle on biomagnification.*

- (Kurtis Gregg) *I think Dick to get to your point, what needs to happen is not just is there an effect, is there a management step, is there an action that can come from the finding.*

- (Judy Lang) *That is why you have to do the comparison with Boynton.*

- (Kurtis Gregg) *And the North Miami-Dade*.

- (John Fauth) *But, those are separate projects, and what we learn from this one will help set that one up. How many samples we need, and how far, and stuff like that.*

- (Kurtis Gregg) *Do we know that stuff is coming out of the pipes? Yes. What we don't know is the effect it is having on the organisms.*

- (John Fauth) *Yes, and how far away is it being reliably detected.*

- (Dale Griffin) *That is what this shows, and influence on genetics at the bottom of the pyramid.*

- (Kurtis Gregg) *With implications to human health.*

- (Dale Griffin) *Yes, and ecosystem.*

- (Judy Lang) *It is an easier way than the sponges and the corals.*

6. (John Fauth) *Anyways, that is the proposal to add an extra analyte that is low cost, but can then say, "here is the influence of the products going through the outfall." That gives some additional information.*

- (Kurtis Gregg) *Is there room in the budget to add that, and are there lab connections to get that analyte done?*

- (David Cox) *I have talked to a couple people*.

- (Dale Griffin*) I can route the samples once they get to me after I am done with them. I am going to archive them and we could set up a schedule, whatever is wanted.*

- (David Cox*) I have talked to several people at USF, UCF, and I can't remember about FIU, but the prices are what you are saying, and there is room in the budget. There are people that we have identified that can do the work.*

- (Lew Gramer) *RASMS as well, although I have never priced per sample.*

- (Dale Griffin) *We have people here that can do that too.*

- (Don Berhinger*) Like I said, we are doing it right now as we speak. We are processing stable isotope samples for the keys for other stuff. There is a mass spec lab at UF.*

- (Kurtis Gregg) *Who analyzes the results and reports them in a format that reef managers can use?*

- (Don Berhinger) *I mean this was his idea, but I am happy to do it, but if John is interested in doing it.*

- (John Fauth) *Analyzing the data is easy, and I have a graduate student. The whole reason this popped into my head is I have a Ph. D. student doing stable isotope study for forensics. He is using carbon, nitrogen, and sulfur maybe. I got ready assistance in the lab, I can do the analysis and say, "hey Kevin does this make sense?" so that is easy.*

- (Don Berhinger) *There are standard ways to look at it, and we are not going to have tons of data.*

- (John Fauth) *There will be a biplot with a scatter of data with concentric circles or something like that from the outfall. Hopefully, but the data are easy to visualize.*

7. (Jack Stamates) *I know that I am throwing wrenches in the work, by the plume dynamics, the closest site might not be the site that gets the most particulates because the velocity and it is going to lose some of that velocity and the particulates are going to start falling out or is it going to start mixing down. So, you might find the third site out is the highest.*

- (John Fauth) *Right, but then we are learning.*

- (Kurtis Gregg) *My recollection of the dive is it is raining right at the pipe. The plume is at the surface and it is immediately dropping and tailing in the direction of the current. It is very apparent.*

8. (David Cox) *I think we have gone over into the time slot, so it sounds like we will pursue this?*

- (Dale Griffin) *That's my vote.*

Presentation: Physical Oceanography of SE Florida (Arthur Mariano**)**

- Data was presented on the 1997-1998 Anomalies causing coral bleaching
- Velocity of the gulf stream was modeled which has a mean rate of 1.4 m/s velocity
- The Florida shelf causes the flow to be nonlinear which creates high variability
- Convection currents are important in the coral reefs on the SE Florida coast
- Small cyclonic Frontal Eddies cause cold water upwelling bring nutrients up from upwelling causing plankton blooms
- In SE Florida has significant southern flows of water
- As velocity changes, the path of divergence and convergence changes.
- Seasonal variations occur for northern and southern flow for about 6 months each in SE Florida.
- There is high temperature variability daily on Florida Keys reefs
- Oil dispersion, 20-30 percent of the oil from an oil spill will reach the Florida coast, in a strong eddy simulation could cause 40-50% on the coast.

<u>Questions for Arthur:</u>

1. (Lew Gramer) *Those are surface features, the near shore features, are they related to the inshore wind field?*

- (Arthur Mariano) *The closest points, it is tides. Inertial variance and everything else.*

- (Lew Gramer) *I am looking at the vortices in particular.*

- (Arthur Mariano) *The vortices are coming up from south to north*.

- (Lew Gramer) *I am just wondering if you guys did an analysis to see if those could be related to the wind field versus frontal dynamics at the edge of the Florida current.*

- (Arthur Mariano) *I think there are multiple different mechanisms that form these. One is the meandering Florida current, second is the other eddies breaking up into smaller eddies, and given local wind speeds in part with it you can generate local eddies.*

2. (Valerie Paul) *The right-hand side of the screen is cutting off the Gulfstream of the Florida current, but is it cutting off midway through the current?*

- (Lew Gramer) *More like 6 nautical miles*

- (Arthur Mariano) *No it is only a section.*

- (Valerie Paul) *It looks like the outer side of it you see less variation than you do inside.*

- (Arthur Mariano) *Right, the mean current is so strong it is on the order of two meters per second. Now this part of the Florida current does get eddies, but you have to take out the mean flow to see them, because the mean flow is so strong.*

3. (Dick Dodge) *How would you redesign the outfall site sampling?*

- (Arthur Mariano) *My idea of sampling: I believe in stratify random burst sample adaptive, this is it. No one should be sampling the ocean with a uniform grid, but that is what everyone does. Rory Thompson [SP?] at Woods Hole took a review at the electrical engineering that studied this problem to death and wrote a really precise paper about this 40 years ago saying you shouldn't do uniform sampling, but people do. If you really want to sample a broad band system, you can't do it with uniform sampling with will end up wringing some part of the spectrum and is going to bias your results. What you need to do is go in there and stratify different samples, break up your domain in ten places and go random bust sample at each. What I mean by burst sampling is you are sampling at different scales. If it is adaptive and you see something interesting you burst samples right there.*

- (Alex *Soluive [SP?]*) (NSU): [Inaudible]

- (Arthur Mariano) *I think part of the upwelling and why we don't have a finger on it is that it is different upwelling.*

- (Lew Gramer) *There is no question it is, you can see it when looking at your data. You can see there are periods of temperature variability that have very high frequencies that are less than 10 hours and then there are times when it is inertial. There are different mechanisms working there. It is hard to imagine what the modeling effort would look like. There would be multimesh grids and very high atmospheric forcing and waves you didn't really talk about here. I think on the cross-shore transport on the reef tract particularly for surface, oil, larvae I think they are important*.

Presentation: Current Modeling (Jack Stamates**)**

- **St. Lucie Inlet Circulation Study**
  - This project was done on almost zero budget
  - Seven sites were chosen, and two instruments were destroyed by hurricane Matthew, and Bathtub reef was destroyed after a month of being deployed
  - Current is modulated by tides near shore, but is still variable
  - Large drops in temperature call for the possibility of upwelling
- **NOAA/AOML Temperature logger monitoring**
  - Temperature loggers are able to be made for under $15
  - Sensors placed at top and bottom of 15 mooring buoys

- Dramatic cooling occurred after hurricane Irma and temperature never fully recovered
- They are looking for places to deploy telemetry buoys

Questions for Jack:

1. (Dave Gilliam) *How long is the battery life?*

- (Jack Stamates) *Right now we are estimating three months.*

2. (Piero Gardinali) *Is there a reason why you guys didn't go to a 3-volt button cell?*

- (Jack Stamates) *Our primary driver was to keep the cost low. So, they are just running on the AA cells.*

- (Piero Gardinali) *If you were to get one of those button cells, they would cost about the same and make them much smaller.*

- (Lew Gramer) *I would say when Mano is not in the lab, he is on Alibaba, so he may have not considered others.*

- (Piero Gardinali) *You can make it, if you buy one that already has the battery holder wired into it. It will cut down the size by a lot.*

- (Jack Stamates) *Thank you, we are going to keep making improvements on this. This is the first shot at this.*

3. (Ken Banks) *Val has some sites that she is working with for coral disease, and these would be nice.*

- (Jack Stamates) *We are going to make these available, you can contact me, Lew, Jim Hendee and we can get you some of these. Again, we bought supplies to make 1000 so they are available.*

4. (Lew Gramer) *Last think to mention about this study was it was actually stratified by depth and seafloor slopes. It covered a range of depths from seafloor slopes .5% to a .25% slope, so that is a 25% slope. It also covered a range of -5 to -10 offshore so there is some topographic variability in there.*

5. (John Fauth) *Have you thought about dunking some of these in lake Okeechobee? That is going to be a way to get the signal, because Okeechobee is going to be influenced by the water interface, but not things like upwelling.*

- (Lew Gramer) *Unless the water is stratified. Upwelling occurs in the great lakes. I haven't looked at Okeechobee.*

- (John Fauth) *Okeechobee is not that deep.*

6. (Jack Stamates) *So, we are hoping to open up options to do things with these. One thing I want to say is thanks to Ken Banks, these buoys are everywhere, and it makes an efficient way to get stuff in the water, it is on the buoy so you can just go and tie off at the buoy and get in the water so you can do your work quickly. It is a platform for opportunity to maybe expand the measurement suite beyond temperature, to get a nice suite of measurements to get 100's of them up and down the coast.*

7. (Lew Gramer) *I think this is significant, you know they say new instruments bring new science. You could potentially deploy 8 of these where you could have potentially deployed one hobo. You were measuring spatial scale variability that you could not measure before.*

8. (Judy Lang) *What is your labor cost?*

- (Jack Stamates) *I can' answer that question directly, right now it is probably high because we are paying a guy with a Ph. D. to solder.*

- (Judy Lang) *How long does it make to take one?*

- (Jack Stamates) *Not long, if you look at it, the computer is there and there are a few solder joints and components that need to be soldered on to the board. We had a couple students helping with those and we estimated 4-5 a day per student.*

- (Judy Lang) *That is not a lot.*

- (Jack Stamates) *There is some labor.*

- (Lew Gramer) *When he says student, my stepson who was a high school student at the time did 5 in one day.*

9. (Kristi Kerrigan) *Do you by chance need any permits for these?*

- (Jack Stamates) *Because the buoys are permitted, and these just clamped on the buoys, I didn't consider that I needed one, I hope I was correct. The buoys were already there so it should be fine. I just want to mention real fast, Jim Hendee's group has been acquiring these buoys that are self-contained and have the capabilities for telemetry. We would like to place some of those off shore here. We have been looking for ideas, Ken and I have been talking about this.*

- (Ken Banks) *On the permitting comment, we consulted with the permitting agencies about this and to an artificial reef. There is an exemption from the state and nationwide by the Corp. that covered it. If you drill into the bottom of the ocean floor to keep them in place, you need a permit for that. We talked to them about the buoys.*

10. (Jack Stamates) *All of this technology at AMOL, we didn't invent it, we bought it. We can manage it and if we have some good ideas coming from the group. We are also looking for sponsorship if we can. We would like to get them with turbidity sensors on them and put some around the port area proceeding and during the dredging which would be powerful and we would get real time data back.*

(Lew Gramer) *A comment on those is that the technology itself is not really the limiting factor, as the partnerships. Any sensor that takes measurements, even a Hobo takes maintenance and salinity and light sensors take a lot of continuous maintenance, so the partnership is really key. We can add sites that are frequently visited where divers are in the water if they are willing to bring a brush down and do some scrubbing.*

Closing remarks:

(David Cox) *Thank you very much, we are at that time of the meeting again. I would like to thank you again for your dedication and diligence that amounted in quite a lot of work. Great job, and thank you again. Francisco will give you a couple closing remarks and that's it.*

(Francisco Pagan) *I would like to thank the Technical Advisory Board for all the work today. It is very important that you are providing the South-East Florida Coral Reef Initiative information on their ideas and we are looking forward to start adding local action strategies. All of your comments will be submitted to SEFCRI during this next meeting and we will be compiling all of these comments. I want to thank you all and the different members of the team that are here and the different members of the general public that attended the event. Also, I would like to thank all the support that we have received from the Department of Environmental Protection, the Governor Rich Scott, and the legislature for providing the funds for allowing us to work with the water monitoring and the disease response that are ongoing and hope to keep on going to keep finding out what is happening outside here on the southeast Florida coral reef tract. Once again to all of you, thank you. I hope you all have safe travels home and I hope to see you all at the next meeting next year.*