

Florida Red Tide Mitigation and Technology Development Initiative

Technical Advisory Council Meeting

January 17, 2020



MOTE.ORG

Florida Red Tide Mitigation and Technology Development Initiative



June 2019

Meeting Agenda

- Welcome, Meeting Logistics, and Agenda Overview
- TAC Introductions, Role, and Setting Quorum
- Florida Sunshine and Public Records Laws
- Initiative Overview
- Break
- Mote Marine Laboratory Initiative Projects
- Public Comment and Comment Cards
- Next Steps and Next Meeting
- Closing Remarks



Technical Advisory Council

Dr. Michael P. Crosby – Mote President and CEO

Dr. James Powell – House Speaker Appt

Dr. James Sullivan – Senate President Appt

Dr. Katherine Hubbard – FWC Appt

David Whiting – DEP Appt

Governor Appointee Pending



Florida Red Tide Mitigation and Technology Development Initiative – 379.2273 Florida Statutes

Technical Advisory Council

- (3) There is established within the initiative the Initiative Technology Advisory Council, an advisory council as defined in s. 20.03(7), that includes marine science, technology development, and natural resource management representatives from governmental entities, private organizations, and public or private research institutions. The council shall meet at least twice annually.
- (a) The council shall be chaired by the president and chief executive officer of Mote Marine Laboratory and shall consist of the following:
1. One member from a private commercial enterprise, appointed by the Governor.
 2. One member from a public or private university in this state, appointed by the President of the Senate.
 3. One member from a nonuniversity public or private marine environmental organization, appointed by the Speaker of the House of Representatives.
 4. One member from the Department of Environmental Protection who has expertise in red tide, appointed by the Secretary of Environmental Protection.
 5. One member from the Fish and Wildlife Research Institute who has expertise in red tide, appointed by the executive director of the Fish and Wildlife Research Institute.
- (b) Council members shall serve staggered 2-year terms and may be reappointed.
- (c) Council members shall serve without compensation, and each organization represented shall cover all expenses of its respective representative.



Technical Advisory Council Role

- 379.2273(3) F.S.” There is **established within the initiative the Initiative Technology Advisory Council**, an advisory council as defined in s. 20.03(7) ...**The council shall meet at least twice annually.**
- 20.03(7)F.S.: “Council” or “advisory council” means an advisory body created by specific statutory enactment and appointed to function on a continuing basis for the study of the problems arising in a specified functional or program area of state government and **to provide recommendations** and policy alternatives.
- 379.2273(2) F.S.: The Florida Red Tide Mitigation and Technology Development Initiative is established as a **partnership between the Fish and Wildlife Research Institute within the commission and Mote Marine Laboratory.**
- **FWC contracted Mote** to lead the Initiative under State Agreement #19153.
- **Thus, the role of the Technical Advisory Council is to provide recommendations to Mote on the Initiative.**



Florida's Sunshine Law



Florida Sunshine Law

- The **Florida Sunshine Law applies** to the Florida Red Tide Mitigation and Technology Development Initiative, Technical Advisory Council.
- Florida's Sunshine Law was created to protect **every Floridian's right to public access of meetings and records** concerning government programs, which provides transparency.
- **This applies to any meeting** where official acts are to be taken or **public business will be discussed.**



Reasonable Notice of Meetings

- The **public must be given reasonable notice of meetings** that are to occur.
- FWC recommends notice for public advisory group meetings to be published in the **Florida Administrative Register** no less than 7 days before the meeting (posted on Jan 2nd) and ensure that it is posted on the **Initiative website**.



Minutes of Meetings

- **Minutes of meetings must be taken** and documented, but do not have to be verbatim.
- This meeting's minutes will be posted on the Mote Red Tide Initiative website.
- Advisory Boards are not required to have audio recordings of their meetings; but if a meeting is recorded by a member or staff then it is a public record.

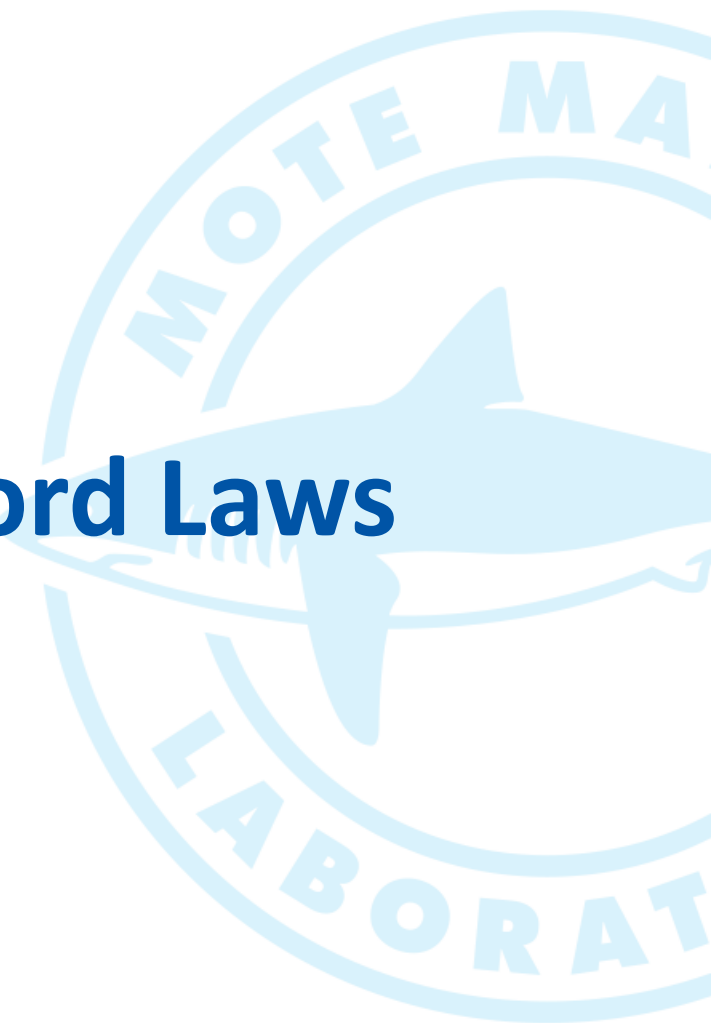


Restrictions on Outside Discussions

- Any discussion between two or more members of the Technical Advisory Council discussing a topic which may foreseeably come before their board **must occur in the sunshine.**
- You are not restricted from socializing with other members of the Council, **but you may not discuss anything that may foreseeably come before the board.**
- **Discussion of official matters outside of a public meeting is a violation of the Sunshine Law.**



Florida Public Record Laws



Public Records

- **This Technical Advisory Council is subject to Florida's Public Records Law** (even if you yourself are not a government employee), because records relating to the Florida Red Tide Mitigation and Technology Development Initiative are made or received in connection with the transaction of the official business of the State.
- Public Records are **ALL** documents, papers, letters, maps, books, tapes, photographs, films, sound recordings, data processing software, etc. regardless of the physical form...or means of transmission made or received in connection with official action of an agency. Sec. 119.011(12), F.S.
- **Public records must be open and available for the public to inspect and copy.**
- **This includes emails, text messages, and social media.**



Florida Sunshine or Public Record Law Questions or Comments from the TAC?



Florida Red Tide Mitigation and Technology Development Overview



Florida Red Tide Background

- Annual Florida occurrence
- Impact varies in size and duration
- Can be skin, eyes, and respiratory irritant
- Can affect marine biota and the environment
- Forecasts, Reporting, Monitoring, and Maps:
 - Federal/State/Local Governments, Mote, Universities
 - Satellite imagery, cell concentrations, wind, public and business observations
 - Beach Conditions Reporting System
 - Aquaculture closures and fish kills



Initiative Overview

- Signed into law by Florida Governor DeSantis in June 2019
 - 379.2273 Florida Statutes
 - Partnership with FWC Fish and Wildlife Research Institute
- \$18 million over 6 years contracted by FWC-FWRI to Mote
- Legislative intent:
 - develop **prevention, control, and mitigation** technologies and approaches to address the impacts of red tide on coastal environments and communities in Florida
- Year one has three parts:
 - Infrastructure at Mote - culture lab and mesocosm areas for:
 - Mote led mitigation and technology development projects
 - Partner led mitigation and technology development projects



Initiative Overview

- Established Initiative Administrator and Administrative Support
- Executed state contract between FWC and Mote
- Council appointments and meeting
- Outreach: press releases, speaking events, conferences, meetings, forums, partner newsletters, webinar, DEP Protecting Florida Together website, and the **Mote Red Tide Initiative website**:
 - <https://mote.org/research/program/Florida-Red-Tide-Mitigation-and-Technology-Development-Initiative>
 - Partner institutions
 - Initiative progress
 - Initiative Technology Advisory Council
 - Requests for proposals
 - Reports
 - Contact
 - Quick links: Forecasts/current conditions



Initiative Reporting Requirements

- Beginning **January 15, 2021**, and each January 15 thereafter until its expiration, **the initiative shall submit a report that contains an overview of its accomplishments** to date and priorities for subsequent years to the Governor, the President of the Senate, the Speaker of the House of Representatives, the Secretary of Environmental Protection, and the executive director of the Fish and Wildlife Conservation Commission.
- Annual Workplans, Reports, and Invoices to FWRI
- Website, Public Records, and Meeting Minutes



Initiative Engagement

- Mote will facilitate funding engagement (as stated in Initiative statute):
 - Leverage state funds with private and federal funds
 - Mote may use a portion of appropriation to fund other marine science and technology development organizations in Florida and around the world to pursue applied research and technology



Request For Partner Proposals

- Open to any/all interested parties
- Anticipated grant funding in year one is \$1M
 - Likely \$150-\$250K for each grant, 4-5 organizations
 - Support not to exceed 1 year –
 - may request longer in second year RFP
- Proposal guidelines and to submit a proposal:
 - Mote.org
 - Announced November 7th at US HAB Symposium
 - Due January 31st to proposals@reddidemtdi.org
 - Webinar on RFP and to answer any questions next week
 - Notification of Awards in March
- Core infrastructure developed at Mote for projects
- Use of Mote facilities/infrastructure is encouraged
- Panel of scientists review
 - NOAA, EPA, FWC, DEP, and University scientists
 - Each scientist will review 3-5 proposals using provided questionnaire
 - Projects will be selected by Mote and presented to TAC in April



Florida Red Tide Mitigation and Technology Development Initiative

Overview Questions or Comments
from the TAC?



Florida Red Tide Mitigation and Technology Development Initiative

Mote Marine Laboratory Year 1 Projects



Mote Led Project Overviews

- Facilities
 - Mesocosm Facility
 - Culture Facility
- Technology Development in Support of Mitigation
 - Programmable Hyperspectral Seawater Scanner (PHySS)
 - UAV (Unmanned Aerial Vehicle, Drone) - based Detection System
 - Beach Conditions Reporting Systems (BCRS)
 - Quantitative Polymerase Chain Reaction (qPCR)
- Mitigation Projects
 - Compounds (Natural, Clay, Chemicals)
 - Laboratory and Mesocosm
- *Collaboration with Partner Led Projects*
- *Coordination with other funding sources*



Experimental Mesocosm Facility

Motivation

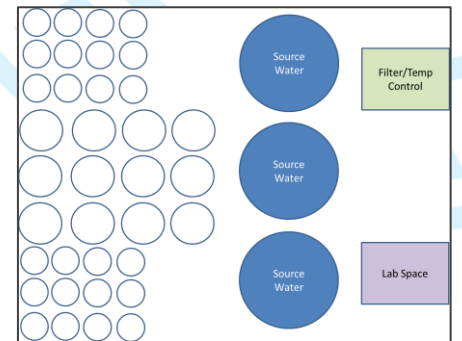
- To provide multi-scale, multi-user red tide research infrastructure for Initiative scientists

Goals

- Used by visiting scientists, graduate students, educational groups, and in-house scientists
- Ability to perform land-based mesocosm studies on red tide

Outcomes

- Enable the development of innovative technologies and approaches that are critically needed to address control and mitigation of red tide impacts
- Dedicated red tide mitigation mesocosm facility will allow more ecosystem-based testing of mitigation compounds in a controlled setting, reduce the need to postpone research or shorten experimental designs due to lack of available space and enable year-round, longer, multiple-use studies



Phytoplankton Culture Facility

Motivation

- To support the Initiative with *Karenia brevis* culture

Goals

- Meet the demands of the mitigation research with **consistent and reliable production of large volumes of *K. brevis***
- Expand collection of *K. brevis* species (growing and maintaining several different strains)

Outcomes

- Leverage Mote's strong foundation of ecology, advanced biology and physiology to collaborate at state, national, and international levels and improve scientific productivity - i.e. support this Initiative with culture and Red Tide expertise



PHySS - Programmable Hyperspectral Seawater Scanner

Motivation:

- Develop an instrument to aid in the mitigation of red tide and provide early detection and warning
- Developed at Mote; Similarity Index; fully programmable data acquisition with web-based data analysis tool

Goals:

- Develop a spectral library of different phytoplankton groups with variable morphologies and physiological states, optical signatures will be obtained for a range of cell densities
- Improve sensitivity, identify multiple phytoplankton groups
- Achieve concurrence with direct and remote observations of the SI estimates across different biological and physical regimes

Outcome:

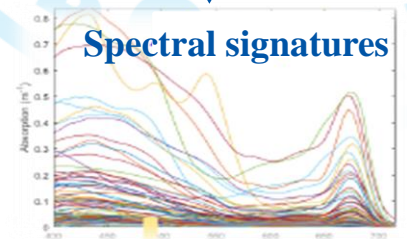
- Form observatory providing continuous high frequency data
- Data will be made publicly available in web based platform



Stock Cultures



Optical measurements



UAV-based Red Tide Detection System

Motivation:

- Patchy nature of red tide makes mitigation technology challenging
- Airborne hyperspectral sensors could allow the mapping of HABs with a high spatio-temporal resolution at local (drone) and regional (satellite) scales.

Goals:

- Conduct shore-based flights in local waters
- Collect hyperspectral data
- Develop data processing scheme, instrument calibration and deliver proof-of-concept
- Quality control check of algorithm performance
- Implementation of new approaches for algorithm development

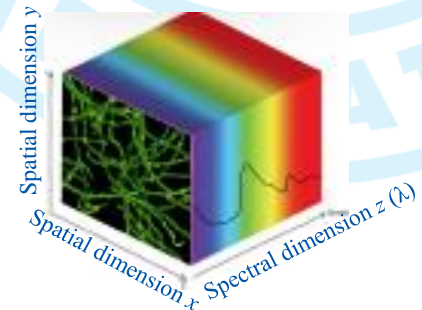
Outcomes:

- Develop an application tool to assist in management of events that may involve significant risk to the public
- Decrease costs of detection, improve mitigation application



Imagery of red tide collected from drone

Hyperspectral data cube



Advance Red Tide Reporting Technology

Motivation:

- Alert the Public of Red Tide and its Effects and minimize economic impacts to Florida
- Put red tide reporting technology in the hands of fisherman – coastal and offshore

Goals:

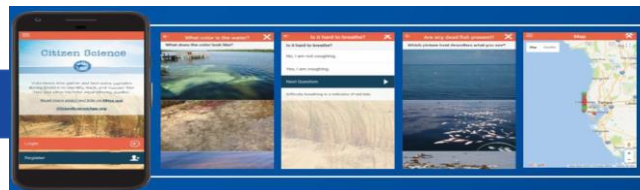
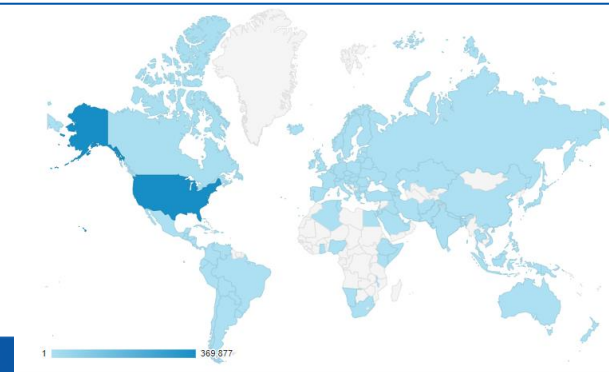
- Update/combine the Beach Condition Reporting System with the Citizen Science is Cool App
- Enhance validation components (thumb up/down), pictures, amenities and alerts for blooms and reporting
- Bloom Zoom for cell detection, App for Chl-a

Outcomes:

- Information disseminated to BCRS/App, GCOOS, SECOORA and NOAA
- Reporting to/by anyone With a Cell Phone, anywhere.

The screenshot displays the MOTE Marine Laboratory website interface. At the top, it says "SO COOL MOTE MARINE LABORATORY AQUARIUM" and "1-941-BEACHES (1-941-232-2437)". Below this is a "Beach Conditions Reporting System" header with navigation links for "BEACHES", "EMAIL ALERTS", and "CONTACT". The main content area shows a report for "GI Bridge" with a date of "2016-05-03 08:43:53". The report includes fields for "Flag" (Purple), "Water Color" (Moderate), "Red Drift" (None), "Red Drift Location" (Not Available), "Air Temperature" (77.68°F), "Water Surface Temp" (Not Available), "Weather Summary" (Clear), "Respiratory Irritation" (None), "Dead Fish" (None), "Jellyfish" (Not Available), "Beach Debris" (None), "Wind Direction" (Northwest), "Wind Speed" (4.13 MPH), "Rip Currents" (Not Available), "Surf" (Calm), "Surf Type" (Calm), "Surf Height" (0-1FT), and "Crowds" (Few). There are also sections for "Near By" amenities like "Beach Access-Parking", "Concession", "Picnic Tables", "Restrooms", "Showers-Outdoors", and "Volleyball-Outdoors", and "Activities" like "Dune Walkovers", "Fishing", "Picnicking", "Swimming", and "Volleyball". A "Venice Beach" report is also visible, showing a picture of the beach. A "Manasota Beach" report is also visible, showing a picture of the beach. The website also features a "Links" section and a "MOTE Marine Laboratory" logo.

Since October 15, 2017
Unique Users: 1.5Million
Page Views: >4.5Million



Acceleration of user-friendly, smart phone integrated qPCR technology development and Citizen Science integration for *K. brevis* mitigation testing

Drs. Cynthia Heil & Tracy Fanara

Motivation:

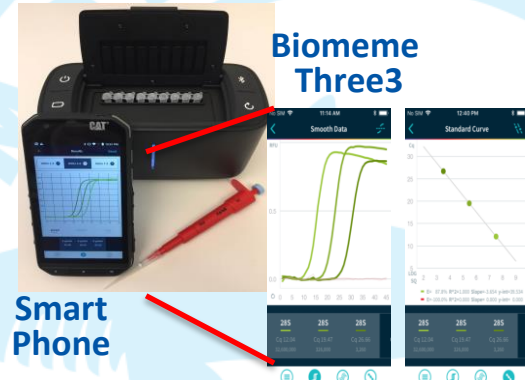
Meet the ongoing, well-defined, need for new public-friendly, automated, web-interfaced detection methodologies that can provide accurate and timely cell monitoring data.

Overall Goal:

Accelerate the development and validation of a hand-held, qPCR based *K. brevis* and *K. mikimotoi* detector (Biomeme Three3) and develop protocols for integration into Citizen Science program.

Outcomes:

- Develop cell-based DNA standards from Gulf *Karenia* cultures,
- Validate efficacy of existing *K. brevis* and *K. mikimotoi* primers for use on the Biomeme Three9 simultaneously in a single reaction,
- Provide training to Mote personnel on use of qPCR technology, and
- Establish pipeline/protocols for linking and cross-calibrating cloud-based qPCR data to existing Citizen Science databases.



- ❖ 9 samples per run
- ❖ 3 qPCR assays at once
- ❖ Stable reagents
- ❖ Smartphone interface
- ❖ Cloud-based data storage



Undergraduate use of Biomeme to monitor *K. mikimotoi* and *Gloeotrichia* in Maine



Mitigation Products & Processes

Introduction

Motivation:

To build on advancements made through the on-going FWC-Mote Cooperative Red Tide Research Program to develop science-based response strategies to reduce the intensity of red tide events and mitigate impacts on coastal ecosystems, Florida's economy, and public health.

Overall Goal:

To develop, test and implement the most effective and ecologically sound products and technologies for mitigation and/or control of adverse impacts of Florida Red Tides, in collaboration with experts from multiple external research institutions.

Outcome:

Implement a tiered approach to investigate products in a science-based protocol to identify the most effective and ecologically sound products and technologies for mitigation and/or control of adverse impacts of Florida Red Tides.

- Tier 1. Lab-scale tests to determine the effective methodology for eliminating *K. brevis* cells and toxins.
- Tier 2. Mesocosm-scale (larger volume, multiple organisms) to assess impacts of non-targeted marine organisms and water quality
- Tier 3. Open Field applications: Test the most appropriate method(s) under natural field conditions (timing depends on outcome of previous tests, permission for field application and red tide events).



Tier-1 Lab studies



Tier-2 Mesocosm- scale



Tier-3

Clay field application in canal



Mitigation Products & Processes Applications

Potential Mitigation Products:

- **Natural Products**
 - Macro Algal Allelopathy; Barley straw extract
 - Bacteria, Parasites, Viruses
- **Chemical Products**
 - Commercial algicides; Enzymes; Ozone; Bleach
 - Surfactants-emulsifiers; Hydrogen peroxide
- **Physical Processes**
 - Clay; Nano-bubbles; UV-C radiation

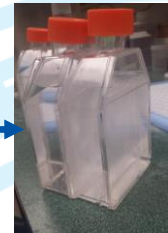
Parameters Monitored:

- Water Quality: DO, Temp, pH, PSU, CDOM, Nutrients
- Red Tide cells and Tide Toxins
- Phytoplankton Community Composition
- Impacts/Toxicity to Marine Biota
 - Mortality; Growth; reproduction
 - Cellular function



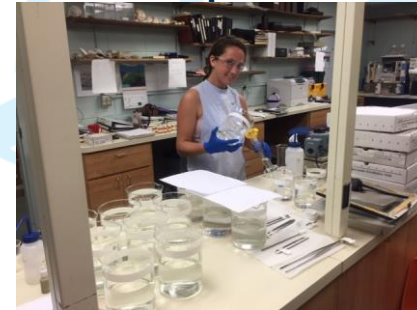
Gracilaria

extract



K. brevis

Chemical products



Water Quality



Nutrient s



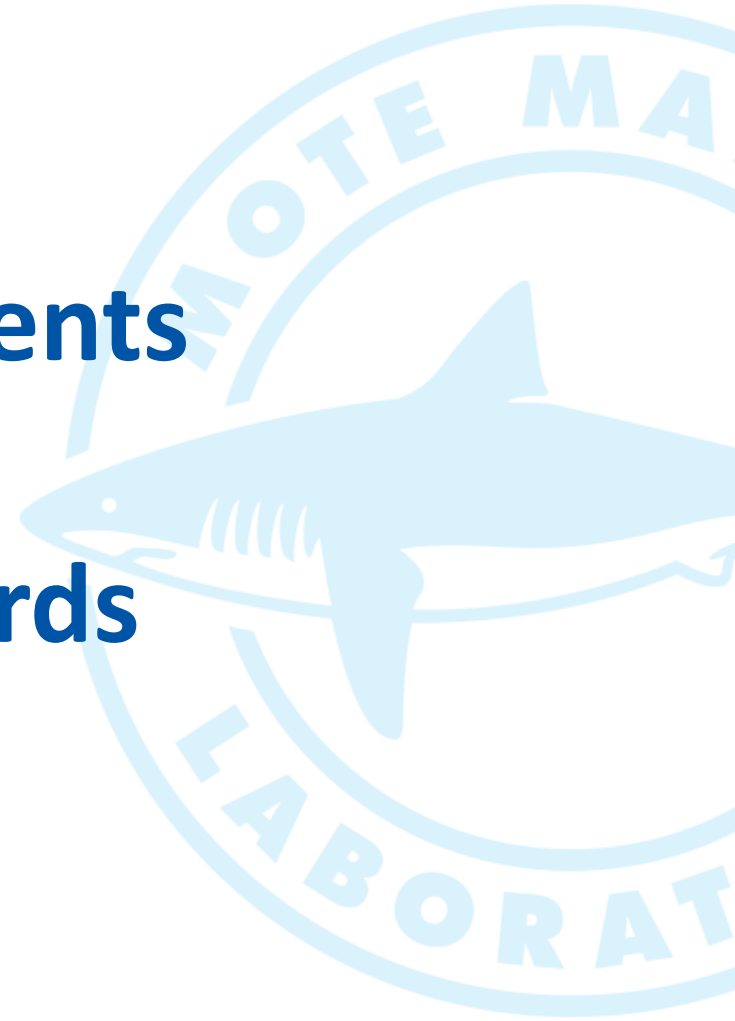
Toxins

Mote Marine Laboratory Red Tide Initiative Projects

Questions or Comments from the TAC?



Public Comments and Comment Cards



Next Steps and Next Meeting Date



Thank You!

