CHALLENGES WITH THE SHEL BACTERIAL STANDARD: NEWPORT BAY AS A CASE STUDY

Presentation to the California Water Quality Monitoring Council

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BACKGROUND

- **Bacterial monitoring and remediation has focused on the Rec-1 standard**
  - Enterococcus - 104/100ml
  - Fecal coliform – 400/100 ml
  - Total coliform – 10,000/100 ml
- **However, California also has a SHEL standard for bacteria**
  - Fecal coliform – 14/100 ml
  - The SHEL standard applies to almost all marine/estuarine areas regardless of whether shellfish are presently harvested
- **A study several years ago found that 40% of reference water bodies fail the SHEL standard**

NEWPORT BAY

- **Newport Bay is the first water body where the SHEL standard has become a regulatory focus**
  - Their bacterial TMDL must be implemented by 2022
- **Newport Bay achieves REC standard for most sites in the summer**
  - They have some problems with REC in the winter
  - They fail the SHEL standard year-round
- **They formed a Stakeholder Advisory Committee to develop their direction**
- **Their direction is a potential precedent for other water bodies**
  - That is why you asked for a presentation about their strategy

PREMISE

- **The Stakeholder Advisory Committee reached the conclusion that they can’t meet the SHEL standard**
  - They explored a range of engineering options, regardless of cost
- **The group felt the standard doesn’t have a scientific basis**
  - All parties (regulators, regulated, NGO) agree
  - Standard is nearly 100 years old without documentation or local validation studies
- **They want to work toward a Site Specific Objective**
  - However, the agreed that studies to create an SSO need to be robust
  - Don’t want to move to an SSO without meeting a heavy burden of proof
  - Group outlined studies they feel will meet that burden of proof

STUDY APPROACH

- **Fecal indicator bacteria in the water column are sampled concomitantly with pathogens in bivalves**

- **Hypothesis: There is a disconnect between water column fecal coliform measurements and the beneficial use they are intended to protect**
  - A disconnect would allow for implementation of a site specific objective

- **They also considered an epidemiological approach, but recommended against it**
  - There are both logistic and ethical issues associated with asking people to eat potentially tainted shellfish

WHAT MEASUREMENTS?

- **Measurements in water**
  - Enterococcus (using membrane filtration)
  - Fecal coliform (using both MF and multiple tube fermentation)
  - Coliphage (culture method)
  - HF183 Human marker

- **Measurements in shellfish**
  - Enterococcus (using membrane filtration)
  - Fecal coliform (using both MF and multiple tube fermentation)
  - Coliphage (culture method)
  - Viruses (All by polymerase chain reaction)
    - Adenovirus
    - Norovirus 1
    - Norovirus 2
    - PMMV

SAMPLING INTENSITY

- **Ten sampling sites**
  - Four sites at places with high fecal coliform counts
  - Two sites where there are low coliform counts
  - Last four sites to ensure habitat representation
- **Three sampling periods**
  - Wet season (Nov-Feb)
  - Post wet season (April-May)
  - Dry season (Aug-Sept)
- **For wet season, sample every other week**
  - Eight sample times
  - Want to ensure we get a range of post-rain scenarios
- **For the other two periods, sample four times**
  - One week, two weeks, three weeks and six weeks post-deployment

INTERPRETATIONAL CONTEXT

- **Everyone wanted to agree on use of the data before proceeding**
  - They are even developing a Time Schedule Order so that everyone is on the same page about timing for use of the results
- **Four potential outcomes**
  - Fecal coliforms in the water column correlate with pathogens in shellfish
  - There is a correlation, but the fecal coliform threshold is higher than 14/100ml
  - There is no correlation, but pathogens are present in shellfish
  - Pathogens are not present in the shellfish
- **Group agreed on the management implications for each scenario**

WATER COLUMN COLIFORMS CORRELATE WITH PATHOGENS IN SHELLFISH

- **This would mean the existing standard works**
  - A relationship exists between the present measurement parameter and the beneficial use
- **Get going on the TMDL and associated clean-up efforts**
- **A costly study to find that out, but provides justification for the much larger expenses associated with the clean-up effort**

PATHOGENS NOT PRESENT IN SHELLFISH

- **This is the other extreme**
- **There is no loss in beneficial use**
  - Therefore there is no need for shellfish-related clean-up actions
- **Would lead to periodic shellfish monitoring for confirmation over time**

NO CORRELATION, BUT PATHOGENS ARE PRESENT IN SHELLFISH

- **Proceed to a site-specific objective**
  - The existing standard is inappropriate
- **Challenge becomes identifying the alternative standard**
- **That will be easy if there is a correlation with another water column parameter**
- **Alternatively, could develop a standard based on pathogens in the shellfish**
  - That would likely require additional study to establish which pathogens and at what concentration level

CORRELATION EXISTS, BUT THE FECAL COLIFORM LEVEL SHOULD BE HIGHER THAN 14/100ML

- **Proceed to a site-specific objective**
  - The measure is correct, but the existing threshold is inappropriate
- **Challenge becomes identifying an alternative threshold**
  - That will require agreeing on an allowable number of pathogens in shellfish
  - A question comparable to how did we arrive at 32/1000 as acceptable risk for the rec water standard

IMPLEMENTATION

- **Using a phased implementation approach**
  - Total study cost was estimated at $1.2M
  - People wanted to understand likelihood of success before investing the full amount
- **Phased implementation will start with a single season and single species**
  - Sampling will begin this summer
- **Phasing provides some advantages**
  - Identifies SSO likelihood and whether funding of further study is warranted
  - Allows design refinement of later study phases based on the early data
  - Provides information (and time) to talk about the transition from a study to an SSO

POTENTIAL STUDY IMPLICATIONS

- Site specific objective or a statewide issue?
- What are the costs for implementing a new monitoring program?
- Are there leveraging opportunities if the program moves to one based on shellfish monitoring?

STATEWIDE ISSUE?

- **Study is being conducted in Newport Bay, but the water quality challenge is larger than that**
  - State Board is considering this topic for its Triennial Review of the Ocean Plan
- **If the State wants to consider a new objective, there are challenges**
- **How many studies in other geographies are necessary to determine whether a new objective is warranted?**
  - Would the same standard work in all water bodies?
- **To which water bodies would it apply?**
  - Would there be separate objectives for recreational and commercial harvesting?
  - Would use attainability analysis be required to determine which water body type is applicable?

COSTS FOR IMPLEMENTING A NEW PROGRAM

- **There is already a program in place for water column sampling**
  - Shore based water column sampling does double-duty for the Rec and Shel standard
  - Sampling for shellfish would be an additional expense
- **Many labs are not yet familiar with the coliphage method**
  - It was only recently that EPA even adopted a coliphage method
  - There would be a cost for labs to on-board the method
  - There would also be a cost for ELAP to create an accreditation process
- **Would likely require sampling design reconsiderations**
  - Newport Bay presently samples 30 water column sites weekly
  - Using that same intensity, a rough estimate is that shellfish sampling would cost $6M annually
  - That level of sampling intensity is probably unnecessary, but the required intensity is unclear

LEVERAGING OPPORTUNITIES

- **Shellfish are a sampling target for other endpoints**
  - NOAA and the State collaborate on a mussel sampling program for contaminants
  - Department of Health samples shellfish for harmful algal blooms
- **Shellfish monitoring is a shared program with the Department of Health and the International Shellfish Sanitation Commission**
- **This might present a coordination opportunity for the Council if sampling for the SHEL standard moves in a new direction**
  - Probably years away from such a transition, but a good topic for early Council consideration