Water Quality Monitoring Program

J. Michael Trapp
Laboratory Director
Environmental Quality Laboratory
Coastal Carolina University
Ocean Outfalls

• Potential Benefits
  • Rerouting stormwater currently discharged onto the beach face via small pipes
  • Installation of a series of stormwater treatment practices

• Potential Liabilities
  • Change of the hydrology of the coastal system
  • Injection of stormwater material past the surf zone
    • Changes to local and regional biogeochemistry
  • Effects on marine organisms
SC DHEC - OCRM

• As part of the regulatory permitting requirements for critical areas in the coastal zone, SCDHEC-OCRM has imposed a set of special conditions.

• The goal to evaluate the short-term and long-term effects of the ocean outfall post-construction.
  • “Localized and cumulative effects on water quality and benthic communities in the surrounding area of the discharging stormwater through offshore ocean outfall pipes during both wet and dry periods.”
SCDHEC- OCRM

Required Components:

• Flow volume measurements that will be used to evaluate dispersion and to establish an appropriate method to evaluate the plume of stormwater entering the ocean.

• Chemical characterization of undiluted freshwater flows to include dissolved oxygen, biochemical oxygen demand, fecal indicator bacteria, nutrients, and salinity/conductivity.

• Comparison of data with other historical outfall monitoring data and with existing conditions in nearshore Long Bay.
Monitoring Plan:

• Task 1: Expansion of *Enterococcus* beach monitoring program.
• Task 2: Characterization of terrestrial flows, loads, and concentrations.
• Task 3: Comparison with other data sets, including spatial and temporal trend analyses.
Task 1: Expansion of *Enterococcus* beach monitoring program.
Task 1: Expansion of *Enterococcus* beach monitoring program.

• Benefits:
  • Greater temporal coverage
  • Greater coverage of various meteorological conditions
  • Increased baseline data
  • Allows for statistical tests based on seasonal trends
  • Continued modeling allows for the examination of long term trends and cumulative effects
  • Trend comparisons can be viewed in terms of weather conditions
  • Greater public health protection
Task 2: Characterization of terrestrial flows, loads, and concentrations.

• The goal of this task is to assess the nature and quantity of materials in the stormwater runoff from the Main Street drainage area before and after construction of the MSOOS.

• This will be conducted over three years
  • Year 1 - untreated stormwater flows from three catchments to understand baseline conditions
  • Years 2 & 3 - untreated & treated stormwater flows to calculate pollutant removal efficiency of the new MSOOS
Wet Weather Sampling

• (1) Unfiltered Total Nitrogen and Total Phosphorus
• (2) Particulate Nitrogen and Particulate Phosphate
• (3) Nitrate + Nitrite
• (4) Orthophosphate
• (5) Ammonia
• (6) Turbidity
• (7) Total and Volatile Suspended Solids
• (8) Fecal Coliform bacteria
• (9) Enterococci bacteria
• (10) 5-Day Biochemical Oxygen Demand (BOD5).
• (11) In Situ - Cond, DO, Temp
Figure 2. Conceptual representation of pre-construction sampling design
Task 3: Comparison with other data sets, including spatial and temporal trend analyses.

a. Pre and post construction comparison of surf zone Enterococcus levels.
b. Pre and post construction comparison of terrestrial loadings from the Main Street drainage basin.
c. Post-construction assessment of loading reductions in the Main Street drainage basin collectively achieved by all of the newly installed BMP’s located upstream of the ocean outfall pipe’s mixing box.
d. Comparison with concentration and loading data from prior ocean outfall assessment work performed by the EQL for the City of Myrtle Beach (2004 to 2006).
e. Comparisons with concentration data collected in the swashes of the Grand Strand by the EQL with funding from the SC Sea Grant Consortium (2007 to 2008).
g. Comparison with Long Bay Hypoxia Monitoring Consortium (LBHMC) water quality data collected at Apache, 2nd Ave N, and Cherry Grove Piers.
Task 3: Comparison with other data sets, including spatial and temporal trend analyses.
### Time Frame

#### Attachment B. Project timeline

<table>
<thead>
<tr>
<th>Project Milestones</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jan</td>
<td>Feb</td>
<td>Mar</td>
<td>Apr</td>
<td>May</td>
</tr>
<tr>
<td><strong>Construction: Ocean outfall</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Construction: Ocean Blvd BMPs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Equipment purchase, QAPP development, site prep</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Site hydrographs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Baseline monitoring</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Baseline Data analysis &amp; report production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Project Meeting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ocean outfall site prep</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ocean outfall hydrographs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BMP performance monitoring</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BMP Performance data analysis &amp; report production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*to review baseline results and confirm BMP performance monitoring strategy*
DELIVERABLES:

• Electronic files
  • that contain the entire dataset from (1) land-based sampling, (2) *Enterococcus* monitoring in surf zone, (3) compiled comparative measurements from LBHMC piers, and (4) other swash and Long Bay water quality work. These files will be suitable for submission to SC DHEC OCRM to facilitate later data analyses.

• BMP report
  • for the Main Street drainage basin including calculations of EMCs and loading for each stormwater event. Pollutant removal efficiency of the upstream BMPs will be computed for each post-construction stormwater event.

• Trend analyses report
  • based on Grand Strand *Enterococcus* data. This will include statistical tests to check for significant post-construction changes.

• Data comparison report
  • based on historical background data to determine any localized or systemic changes that have resulted from the new ocean outfall. BHMC’s pier data will be examined for changes in dissolved oxygen, temperature, salinity, chlorophyll, turbidity and pH following construction of the outfall pipe using results from the two other piers in the LBHMC network to provide insight into concurrent temporal variability not associated with the ocean outfall.
Questions?