UNRBA Modeling and Regulatory Support

Path Forward Committee Meeting

December 2016

December 14, 2016

Project Status

- Developed model package selection criteria
  - PFC approved during October meeting
  - Memorandum was distributed to stakeholders in November
- Evaluated model packages using a two step process
  - Quantitative analysis based on scores and weights
  - Qualitative evaluate based on MRSW discussion
- Today we would like to
  - Get PFC input on the scores and weights
  - Present the MRSW recommendations for the model packages
  - Approve four of the five modeling frameworks under consideration

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Step 1. Quantitative Analysis

- Scoring metrics were assigned based on the number of potential answers
  - 5 answers (1, 2, 3, 4, 5)
  - 3 answers (1, 3, 5)
  - 2 answers (2, 4)
  - Also included “Informational” answers
- Weights were used to rank the importance of a criteria
  1. Criteria was identified as important by the MRSW, PFC, DWR, or stakeholders but is not related to the UNRBA project
  2. Criteria supports a key modeling goal
  3. Criteria was identified as high priority by MRSW, PFC, DWR, or stakeholders and supports a key modeling goal
  4. Criteria is a key modeling goal

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Summary of Scores for Step 1

- Raw scores
  - Total raw scores
- Weighted scores
  - Total weighted scores
  - Total for criteria with a weight = 4
  - Total for criteria with a weight = 3
  - Total for criteria with a weight = 4 or 3

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Step 2. Qualitative Evaluation

- The MRSW used the results of Step 1 to identify the highest ranking groups of models
- Selected models for recommendation based on a discussion of
  - Pros and cons of models within the highest scoring group
  - Gaps associated with the highest ranking models and how they could be filled with other models
  - Consideration of input from stakeholders
  - Likely acceptance by State and Federal agencies

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Summary of MRSW Recommendations

- **WARMF** – Watershed modeling package
- **EFDC** – Complex, mechanistic lake nutrient response modeling package
- **WARMF-LAKE** – Moderate or simple lake nutrient response modeling package
- **Empirical/Bayesian/Probabilistic** – Lake designated use model
- **CASM/ecosystem model** (depending on additional cost and availability of data)

MRSW Recommendation for the **WARMF** Watershed Modeling Package

- Direct access to the model developers if any special coding is required
- Ability to incorporate revised models being developed by the City of Durham (Ellerbe, Little Lick, and Eno River subwatersheds)
- Inclusion of a lake modeling component that can serve as one of the independent lake water quality models
- Past use for regulatory purposes in the Southeast
- Likely acceptability by State and Federal agencies

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MRSW Recommendation for the **EFDC** Lake Nutrient Response Model

- Two similar models ranked highest in this evaluation (EFDC and DELFT)
- EFDC is recommended for the complex, mechanistic model
  - Past use of the model for development of the Falls Lake Nutrient Management Strategy
  - Consistency with model applications may be better received by some stakeholders
  - The agencies are more familiar with EFDC

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MRSW Recommendation for the **WARMF-LAKE** Nutrient Response Model

- The MRSW recommends selection of a moderate or simple lake nutrient response model to
  - Corroborate modeling results (multi-modeling approach)
  - Develop a simpler model with shorter run times to assist with
    - Sensitivity analyses
    - Model scenario evaluation
  - Interface with cost-benefit model
- WARMF-LAKE was selected because of its
  - Ability to simulate more processes than BATHTUB (the other model considered)
  - Inclusion in the WARMF modeling package
  - Ability to directly link with the watershed model

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MRSW Recommendation for the **EPB** Designated Use Modeling

- EFDC and WARMF-LAKE will predict lake water quality
- The MRSW recommends an empirical/probabilistic/ Bayesian model to evaluate designated uses
  - Aquatic life
  - Drinking water
  - Recreation
- Model will be based on empirical relationships and input from subject matter experts

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MRSW Recommendation for CASM/ **Ecosystem Modeling**

- Provide a mechanistic simulation of how changing water quality would affect the food web
- These models are generally heavily parameterized and may require additional monitoring studies
- Ecosystem model could be driven by the EFDC hydrodynamic and water quality simulations
- The MRSW recommends considering CASM or a similar model, depending on the data requirements and costs

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PFC Discussion of MRSW Recommendations

- **WARMF** – Watershed modeling package
- **EFDC** – Complex, mechanistic lake nutrient response modeling package
- **WARMF-LAKE** – Moderate or simple lake nutrient response modeling package
- **Empirical/Bayesian/Probabilistic** – Lake designated use model
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List of Upcoming Deliverables and Corresponding PFC Meetings

- January
  - Conceptual multi-modeling plan
- April
  - Draft Modeling QAPP
- June
  - Two Year Work Plan

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