BUREAU OF RECLAMATION

Summary: CVP Water Temperature Modeling Platform, Modeling Technical Committee – Meeting #1

Thursday, 1 July 2021; 1pm - 4pm

Meeting Objective

Kickoff the Modeling Technical Committee (MTC) process to collaborate the development of Water Temperature Modeling Platform (WTMP) for the Central Valley Project (CVP), covering the Sacramento, American and Stanislaus River systems.

Agenda

See *20210701 WTMP_MTC01_Agenda_Accessibility.pdf*

Participants

See *20210701 WTMP_MTC01_Participants_Assessibilty.pdf*

Presentation

See *20210701 WTMP_MTC01_Presentation_Assessibilty.pdf*

Summary

This kickoff meeting launched the MTC as a technically focused forum open to stakeholders with varying backgrounds and interests to foster a collaborative and transparent process for the WTMP development. The first meeting featured a welcoming remark panel with Reclamation leadership and included introductory sessions on an overview of the WTMP project including the scope, approach, and schedule; an orientation for MTC to clarify the purpose and expectation; technical sessions on model selection and modeling framework selection for WTMP implementation; and next steps. The project team presented each topic with a prepared presentation and allowed ample opportunities for questions and exchanges. This 3-hour online meeting was attended by about 100 participants. The presentation provided detail of the topics for discussion. The next MTC meeting is scheduled on 7 October 2021 from 1pm to 4pm to expand further discussions on model and platform selection and implementation.

Meeting Logistics and Welcoming Remarks

Yung-Hsin Sun (Stantec) went through the logistic and expectations of the meeting and provided a summary of registered participants through June 30 by organization and by primary interest in joining the MTC meetings as reported during registration. The initial meeting invitation for participation was sent by Reclamation earlier in June to a list of individuals compiled from the lists of participants in past and ongoing efforts and relevant groups, with encouragement to further sharing of the invitation with others who may be interested.

David Mooney, Office Manager, Bay Delta Office (BDO); Kristin White, Operations Manager, Central Valley Operations Office (CVO); and Derya Sumer, Water Supply and Operations Analysis Branch Chief, Division of Planning provided their welcome remarks, highlighting the importance of this project and support for the project team. Mr. Mooney serves as the executive sponsor for this project, and Ms. White is his alternate. The panel emphasized that the platform is to be used for both operation and planning purposes and represents a major step for modernizing the tools and data for water temperature management.

Questions and Answers:

None.

Overview of the CVP WTMP and Orientation for the MTC

Randi Field, Civil (Hydrologic) Engineer, CVO provided a summary presentation on the needs for the project to modernize business practice for water temperature management to support the CVP operations. , and the anticipated outcomes of the WTMP to establish high standards of practice, build trust and confidence on tool and data use, adapt to changes with flexibility, leverage technology to improve compatibilities and efficiency, meet the needs for real-time, seasonal and long-term planning uses, and enhance organization capacity within Reclamation. Ms. Field also emphasized the importance of the MTC based on the positive experience for Shasta-Keswick W2 model development experience from 2016 through 2020. The continued support from and collaboration of the MTC is key to project success.

Mike Deas, Watercourse Engineering, provided a summary of the workplan and schedule. The project's technical charge is to develop tools to support Reclamation's water temperature management activities, including data management, model development, model management (framework), model reporting, documentation, and other relevant functions. The resulting WTMP is to be representative, useful, relevant and with longevity in its use. The scope of the project includes Sacramento/Trinity, American and Stanislaus River systems where Reclamation CVP facilities were operated to meet water temperature management requirements along with other obligations.

Mr. Deas explained the phased approach to the WTMP: Phase 1 with project organization and model development, and Phase 2 with model implementation and peer review. Activities within

these two phases are inter-related and thus, they are grouped by phase for their corresponding purposes, not necessarily the sequence of occurrence. A total of 17 tasks were required for the WTMP project:

- Task 1. Project Workplan (Phase 1)
- Task 2. Stakeholder Involvement and Outreach (Phases 1 and 2)
- Task 3. Develop Reclamation's Institutional Knowledge (Phase 1)
- Task 4. Data Management (Phase 1)
- Task 5. Model Framework Design and Refinement (Phase 1)
- Task 6. Model Selection/Design (Phase 1)
- Task 7. Data Development (Phase 1)
- Task 8. Model Development (Phase 1)
- Task 9. Calibration, Validation, and Sensitivity (Phase 1)
- Task 10. Documentation Phase I (Phase 1)
- Task 11: Phase II Workplan (Phase 2)
- Task 12: Implementation (Phase 2)
- Task 13: Estimation of Uncertainty – Sources (Phase 2)
- Task 14: Estimation of Uncertainty – Protocols (Phase 2)
- Task 15. Output Communication (Phase 2)
- Task 16: Documentation – Phase II (Phase 2)
- Task 17. Peer Review (Phase 2)

The activities associated with three river systems will be conducted strategically using the Sacramento/Trinity river system as the first application to work through system-specific implementation issues and common elements that would be shared by all river system applications. As a result, the development for the American River and Stanislaus River systems would require less time. In comparison, water temperature management for these two systems is less complex. Currently, the focused activities include Tasks 1 through 6 and draft technical memoranda for documentation are also in progress. Additional activities to assist Reclamation in organizing peer reviews under Task 17 in collaboration with the Delta Science Program under the Delta Stewardship Council are also underway. After these foundational tasks are completed, then Tasks 7 and 8 will

develop river system specific data and models with 3-month and 12-month "look ahead" capabilities.

Overall, the WTMP project is scheduled to be completed by October 2023 with the following scheduled milestones.

- Model and framework selection: Summer 2021
- Model development: Sacramento/Trinity, Spring 2022; American, Fall 2022; and Stanislaus, Winter 2022/2023
- (Phase 2) Phase II workplan: Fall 2021
- (Phase 2) Uncertainty sources and protocols: Summer 2022 through Fall 2023
- (Phase 2) Output communication: Fall 2023
- Documentation (task and system specific): As developed throughout the project period

Mr. Deas also provided a snapshot of the progress among various tasks in project scope, and the tentative schedule of major project milestones.

Yung-Hsin Sun, Stantec, provided an orientation and established for the MTC. The MTC is an open forum for collaborative model development with technical focus on tools, data, and applications. Quarterly MTC meetings will be scheduled on the first Thursday of the first month of each calendar quarter through the end of 2023. Each meeting will be three hours in length, from 1pm through 4pm. Subject to Reclamation's further direction, the MTC meetings will be held online until COVID restrictions are relaxed. The future in-person meetings are to be evaluated then; however, online participation may be likely facilitated throughout the project period. Mr. Sun also mentioned the additional opportunities for stakeholder involvement including contact email, project website and future manager briefings.

All meeting registers were automatically included in the MTC member list for future meetings and communication unless otherwise notifying Reclamation by communication recipient. Any interested parties can continue to reach out to Reclamation through email to mppublicaffairs@usbr.gov to be added to the list or through future meeting registration.

The meeting information and summary will be provided through a SharePoint site or project website at https://www.usbr.gov/mp/bdo/cvp-wtmp.html. In addition to quarterly MTC meetings, Reclamation also planned to organize annual manager briefings to provide high level summary reporting on progress. Reclamation will provide additional information when available.

Questions and Answers:

There were no questions from the participants about the scope and schedule for the WTMP. A few clarification questions were about the MTC process.

- A participant requested clarification about the availability of various technical memoranda for review.

  The project team clarified that the various technical memoranda will be distributed and reviewed by the MTC members as a major means for input. Reclamation will distribute the materials before the meetings to facilitate meeting discussion.

- A participant requested clarification about the future meeting invite and process.

  The project team clarified that all registered participants for this kickoff meeting will be automatically included in future meeting invites. Each MTC meeting will require a separate registration for adequate protection against disturbance by unwanted cyber activities.

Water Temperature Model and Framework Review and Selection

Next followed a two-part presentation for water temperature model and framework review and selection. The discussion was an introduction of these topics and will have additional follow-up discussion in future meetings with additional detail.

Mike Deas presented the current progress in water temperature model selection. Twenty-eight (28) criteria in 20 categories were developed based on the intended model functions and performance requirements for Reclamation's water temperature management.

- Model type (River/Reservoir)
- Number of dimensions
- System geometric representation
- Dynamic flow model
- Water temperature representation
- Time step
- Computational performance consideration
- System Model or discrete reach
- Modeling framework compatible

- Pre-processor
- Post-processor
- Data structure facilitates model calibration/application
- Model applications
- Actively supported
- Public domain, peer reviewed, and accessible model modifications
- Fee
- Documentation
- Training and/or user group
- Specific features:
    - Temperature control curtains
    - Submerged weirs/dams
    - Selective withdrawal
    - Automated simulations to targeted tailbay temperature
    - Automated simulations to targeted river temperature
    - Shade
- Qualitative
    - Ease of use
    - Credibility
    - Easy to incorporate uncertain input parameters
    - Collaboration with model developers

Separate considerations for system, reservoir, and river applications were included. Where applicable, the criteria were identified as "required" or "preferred" for a specific application for evaluation purposes. Each criterion was assessed, where feasible, with high, medium, or low priorities in evaluation based on the needs for Reclamation's water temperature management.

The models for potential applications identified through a broad scan of existing models were evaluated based on these identified criteria. While accurate representation is a must, computationally efficiency is an important balancing consideration to make sure the resulting applications are practical, relevant, and timely for Reclamation's operation and planning needs. Based on the

established criteria and evaluation, the preliminary recommended model selections include HEC-ResSim for systems, CE-QUAL-W2 for reservoirs, and HEC-ResSim for river reaches. All models are to reside in a modeling framework that was introduced subsequently.

John DeGeorge presented the concept of a modeling framework to organize and streamline the model application and management, and the status of framework selection. The objective of a modeling framework is to enhance accuracy, efficiency, consistency, adaptability, and transparency of the WTMP. The framework should accommodate the needs of different levels of users (e.g., model developers, expert modeler, power users, model operator) in performing their tasks assisted with programmed functions and utilities. The modeling framework will allow Reclamation to focus more on the strategies for water temperature management but less on mechanism of model operation and maintenance.

Following the same process for model selection, Mr. DeGeorge provided a summary of intended functions for a modeling framework to meet Reclamation's water temperature management needs, and selection criteria based on the identified needs. The general requirements for the modeling framework are:

- Efficiently use several models, individually or in a sequence
- Support workflows for several typical modeling activities
- Utilize common boundary conditions and operational controls across models
- Create reports using common formats across models
- Manage updates of model executable programs and configuration data sets
- Allow for introduction of new modeling tools over time
- Focus on the efficiency of production modeling activities

Additional specific criteria are of four categories: framework environment support, data management structure, user interface, and installation and configuration details. Similar to the model selection criteria, the attributes for "required" and "preferred" and for criterion priorities were also specified based on the needs of WTMP application.

The project team then performed the evaluation based on selection criteria for identified framework options through a broad scan of existing platforms. The HEC-WAT was recommended for implementation because the platform is supported by USACE, free for use, compatible for local and cloud-based implementation, compatible with the selected models for system, reservoir and river applications, and build-in capabilities in customized interface and functions for required data management and tasks.

Mr. DeGeorge subsequently provided an overview of the trial implementation of HEC-WAT for the Shasta-Keswick system as a proof of concept that includes options for different reservoir water temperature models (e.g., CE-QUAL-W2 and HEC-5Q), and options for river models (e.g., HEC-ResSim and HEC-5Q). Certain functions for model operation, data management, and report generation were also tested in the proof of concept. The results verified that HEC-WAT is capable to facilitate a more organized and control environment for model operation and scenario planning. The computational efficiency for the HEC-ResSim model for system and river modeling was adequate. The results of tested representative functions for workflow and reporting were also successful. With the successful proof of concept, the project team will refine the framework development and expand its capabilities for full deployment.

Questions and Answers:

- A participant commented that 3-dimensional models should be considered, including USEPA's Environmental Fluid Dynamics Code (EFDC).

  The project team clarified that many 3-dimensional models were included in evaluation (e.g., AQUATOX, EFDC, Delft3D, SCHISM, SUNTANS, Si3D). In general, these models have many features that may be preferred, but are not required for WTMP application, and would require significant run times and complexity for model implementation. More importantly, they often lack the capability to simulate selective withdrawal for water temperature blending to meet the targeted downstream temperature – a critical function required for the WTMP application. More details on the range of models and associated evaluation were documented in the draft technical memorandum that is under preparation and will be distributed to MTC for review.

Next Steps

The meeting was concluded with the following next steps.

- Next MTC Meeting: Thursday, 7 October 2021; 1pm – 4pm
  - A separate email will be sent out with meeting registration information.
  - Tentative topics:
    - Continued discussion on modeling framework
    - Model development for the Sacramento-Trinity System

- The meeting materials will be made available once the information sharing platform is finalized.