Jollyville Transmission Main Adaptive Management
July 2011

Concept
The Environmental Commissioning (EC) Team and Project Team have worked collaboratively to develop specific best management practices (BMPs) to avoid and minimize environmental impacts from Water Treatment Plant No. 4 (WTP4) construction, including the Jollyville Transmission Main (JVTM). Oversight of implementation and monitoring of the effectiveness of environmental BMPs by both the Project and EC Team will provide information on BMP effectiveness and functionality (team membership is defined below).

An environmental monitoring program has been developed to identify environmental changes that might be attributable to the JVTM construction. This information will be used in an adaptive management process to guide the project in; or identifying the need for designing and/or implementing changes to project protocols and best management practices. Adaptive management will be a collaborative effort by the Project Team, EC Team, design consultant (EOR Rep), and construction contractor (MWH Constructors). The adaptive management process will use information from field oversight BMP's and monitoring data to determine if EC goals and objectives are being met and, if needed, develop appropriate responses to improve BMP effectiveness or address environmental effects that may be the result of JVTM construction.., and construction contractors.

Adaptive Management (AM) Team
Project Team Representatives: Robyn Smith, Stacie Long, Jason Bybel, Engineer Of Record (EOR) Representative, MWH Constructors Representative
EC Team Representatives: Chuck Lesniak, Thais Perkins, David Johns (geology, groundwater, JPS), Ed Peacock (engineering, biology), Willy Conrad (BCP)

Other staff and/or consultants will be brought in as needed.

Process (Fig. 1)
1. Monitoring – The EC Team will be responsible for environmental impact monitoring and perform some BMP monitoring during site visits. There will be several types of monitoring; environmental impact monitoring, site condition monitoring, and BMP monitoring. Environmental impact monitoring will include the monitoring of groundwater (wells), surface water (spring discharge, stream quality and quantity, etc.), and Jollyville Plateau Salamander. Details are described in the draft Environmental Monitoring Plan.

   The Project Team will be responsible for monitoring site conditions such as: geology, groundwater inflow, and BMP monitoring.

   The Project Team will also be responsible for BMP monitoring including discharges of tunnel/shaft water to the sanitary and storm sewer systems and vibration monitoring during blasting operations.

   An FTP site will be created where monitoring information can be posted for access by the A.M. Team. Tunnel inflow data will be posted each day during tunnel construction. Environmental data received in real time (most likely groundwater elev. data) will be posted weekly at a minimum, and daily if possible. Other EC monitoring data will be posted as soon as possible after receipt of the data.

2. Changed Conditions - Unexpected changes in environmental conditions, site conditions, or BMP performance that relate to achievement of EC goals and objectives will be brought to attention of the AM Team as soon as possible.

For some environmental resources there may not be specific threshold values that define a "changed condition". Data will be compared to baseline data or background monitoring sites to determine whether a change is a natural phenomenon or potentially project related. For example, a change in groundwater levels or spring flow will be compared to sites that are not in areas where they could be affected by the project and compared to historical data, rather than being compared to specific numeric values.

3. Evaluate Data Against EC Goals/Objectives (G/O's) – When a changed condition is identified, the information will be reviewed against established EC G/O's with three possible outcomes:
    a. EC G/O's are being met;
    b. EC G/O's are not being met; or,
    c. It is unclear whether EC G/O's are being met.

    Although described as a specific step, evaluation of site conditions and other information against established goals is a continual process by all parties involved in construction and monitoring.

4. No action needed because EC G/O's are being met - For example, a change in area groundwater elevations was determined to be due to climatic conditions and a review of related BMPs and tunnel inflow indicate everything is operating as expected.

    No action is indicated, but this is an opportunity for identifying possible project improvements. If so, implement as appropriate. Continue monitoring as normal.

5. Review BMP's because:
    - EC G/O's are not being met - For example, a change in area groundwater elevations is seen, but is not related to climatic conditions based on reference well elevations. Go to step 6.

      or

    - Unclear whether EC G/O's are being met - For example, a change in groundwater elevations is seen and the data indicates that it could be related to climate, but the reference well elevations didn't change as much as those in project area wells. Go to step 6.

6. Determine if BMP's are operating as intended or if expected site conditions have changed.
    a. BMPs are not operating properly - Repair failed BMPs as needed. Consider whether any new BMPs would provide benefit. **Note: In the event that significant environmental impact occurs or is determined to be imminent, work stoppage may be required to implement corrective action.** Go to step 7.
    b. BMPs are operating properly - Consider whether BMPs are inadequate or site conditions are different than expected. Upgrade or develop new solutions to achieve EC G/O's. Depending on environmental significance of changed condition, no action with continued monitoring may be the appropriate course of action. Changes in monitoring protocols (media, frequency, parameters, etc.) may also be considered. Go to step 7.

7. Implement selected action and continue monitoring (step 1).

Communication and Documentation

The status of key environmental indicators and conditions on the construction site will be provided to the EC Team by the Project Team during regular, weekly construction progress meetings, by posting on an FTP site or other means of communication (e-mail, fax, etc.). Key environmental indicators and

construction conditions include tunnel groundwater inflow (particularly relative to trigger levels), large voids, tunnel discharge quantity/quality, and environmental BMP function/condition (E/S controls, groundwater protection measures, etc.). Significant changes in key indicators, site conditions, or changes to BMPs (i.e. failures, changes in use or location, etc.) should be brought to the attention of the EC Coordinator as soon as possible.

The status of monitored, off-site environmental receptors will be provided to the Project Team by the EC Coordinator during regular, weekly construction progress meetings. Significant changes in critical receptors (spring quality/quantity, groundwater level, etc.) will be communicated to the Project Environmental Compliance Manager as soon as possible, but within 24 hours.

The adaptive management process will be documented by the EC Team to create a record of data, evaluation, and documentation of changes in the project design and/or BMPs. At a minimum, this will consist of phone logs, e-mails, and memoranda. Consideration of decisions of particular project or environmental significance should be distributed within the Project and EC Teams with sufficient time to allow input. This information will later be incorporated into the final EC report that will document construction phase Environmental Commissioning activities and project achievement of EC G/O's.

Figure 1: Adaptive Management Process Flow Chart