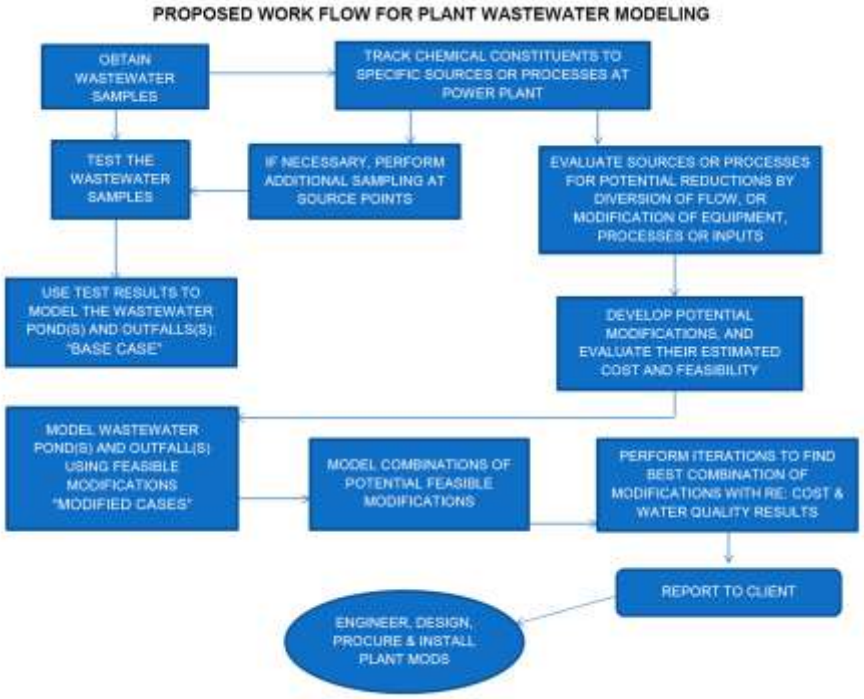
Power Plant Process & Waste Streams Characterization

Confidential Power Plant, Ohio



Description of Project

This project was completed by URS which became part of the AECOM family of companies in October 2014.

URS developed a dynamic mass and water balance model for a Midwest power plant in order to track chemical constituents as they moved through the power plant. The focus of the study was to:

- Develop a dynamic water/mass balance model for the entire site
- Verify the model against actual operating data
- Train end users on using the model
- Develop user interface instructions/manuals.

The model URS developed provided a high-fidelity, predictive, dynamic model of all water and wastewater processes specific to the plant. The model was modularized and customized to allow exploration of treatment options and beneficial reuse of water streams. The modularization and customization allowed the model blocks to be re-used for other plants in the fleet. The model software URS created also predicted removal rates of species such as mercury and selenium.

The site-wide probabilistic water/mass balance model for the power plant was built using the existing conditions, although it allowed for future

operating modifications. During the first phase of the study, URS collected historical data, such as the water level in the existing ponds and flow meter records through the entire system, which were used for model calibration of key input parameters. Other components of the model included:

- River make-up water
- Surface runoff from the contributing drainage areas
- Groundwater supply
- All ponds
- The plant
- Outflow system to an adjacent River
- Seepage
- Evaporation

URS created the water/mass balance model using the multi-purpose probabilistic modeling platform, GoldsimTM Contaminant Transport Model, which is a user-friendly, powerful, and flexible modeling platform that has been used widely in a variety of industries for modeling dynamic systems. In this case, the water and mass balance at the power plant are controlled by both probabilistic variables (such as precipitation, evaporation, seepage, etc.) as well as deterministic variables (like pumping rates, pumping rules, and reservoir storage). The platform allows the user to evaluate hydrologic, hydraulic, and stochastic relationships and the dynamic model allows users to ask "what-if" types of questions. The constructed model was then validated using operating data from the power plant.

URS also used a geochemical model developed by the U.S. Geological Survey called the PHREEQC I as an external model for chemical reaction modeling. PHREEQC I models chemical reactions of major and trace constituents due to mixing, adsorption, complexation, and precipitation/dissolution.

URS also developed a module that acted as a dynamic link between the water/mass balance and the geochemical models so there was seamless communication when evaluating the waste water flows.

Once the models were constructed and calibrated with historic data, URS conducted a workshop to train the utility on how to use the model as well as to gather feedback on the model, for improvements or enhancements, prior to finalizing the model. A user's manual was also developed which discusses the key input parameters.