Comprehensive Performance Evaluation Program

Initial Scope

Kuwahee, Fourth Creek, and Loves Creek Wastewater Treatment Plants

Submitted to EPA April 5, 2005

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D. Wayne Loveday

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4.5.05

Date

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I. Introduction

In accordance with the Consent Decree (CD), Knoxville Utilities Board (KUB) is required to implement several work elements related to its wastewater treatment plants (WWTPs). The following three related work elements apply to the Kuwahee, Fourth Creek, and Loves Creek WWTPs.

1. Comprehensive Performance Evaluation Program (CPE) - For each WWTP, KUB must complete a comprehensive performance evaluation using flow modeling and other appropriate evaluation techniques to determine capacity and ability to meet permits. To the extent applicable, the CPE shall be consistent with Environmental Protection Agency (EPA) publications "Improving POTW Performance Using the Composite Correction Approach" - EPA CERI, October 1984, and "Retrofitting POTWs" - EPA CERI, July 1989. The CPE is a thorough, structured review of a WWTP's process performance capabilities and associated administrative, operational, and maintenance practices. The objectives are to identify potential improvements in process performance that can be achieved without significant capital improvements, and to identify process components that will require capital improvements to achieve permit compliance. [Ref. CD Section VII.D.1.(a).(iv)]

2. Composite Correction Plan (CCP) - The CCP is the performance improvement phase that follows the CPE. It is a systematic approach to implementing administrative, operation, and maintenance improvements as well as rehabilitation and/or upgrades to the WWTPs to address the problems identified in the CPE. The CCP shall be consistent with the EPA publications "Improving POTW Performance Using the Composite Correction Approach" - EPA CERI, October 1984 and "Retrofitting POTWs" - EPA CERI, July 1989; and the "Tennessee Design Criteria". The CCP shall: (A) address all factors which limit or which could limit the WWTP's operating efficiency or the ability to achieve NPDES Permit compliance; (B) address the peak flow handling procedures and peak flow capacity of the WWTP; and (C) identify specific actions and schedules to correct each limiting factor, including capital improvements to the existing WWTP where appropriate. The CCP shall evaluate all appropriate alternatives and provide schedules for achieving permit compliance. [Ref. CD Section VII.D.1.(a).(v)]

3. Process Controls Program (PCP) for WWTPs - For each WWTP, KUB must establish standard operating procedures (SOPs) for wet weather flow conditions to optimize

treatment using existing facilities. Each SOP must establish criteria such as plant flow, mixed liquor suspended solids (MLSS), blanket levels, etc., to initiate process control changes. Development of specific procedures for when to initiate and conclude Diversions (i.e. blending) in accordance with 1994 NPDES Permit requirements are the primary goals of this program. [Ref. CD Section VII.D.2.(b)]

The CD specifically requires KUB to complete the CPE and CCP (Engineering Program Components of the Management Program required by the CD), to the extent applicable, consistent with the EPA publications referenced above (the 1989 publication is an expanded update of the 1984 publication).

This CPE Plan has been developed for review and approval by EPA prior to initiating the CPE. The PCP and CCP will be separate deliverables, each subject to EPA review and approval.

II. Peak Wet Weather Flow Issues

A key issue to be addressed in the CPE is diversion of flows during peak wet weather flow conditions. The CD requires compliance with the 1994 NPDES Permit Diversion provisions until new permits become effective. Draft permits, which are currently under appeal, do not contain the Diversion language contained in the 1994 permits.

Diversion and Bypass language from the 1994 and current draft permits are provided below:

1994 NPDES Permit Language

Bypass

"a. 'Bypass' means the discharge of wastes from any portion of the collection or treatment system other than through permitted outfalls. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass is prohibited unless the following three (3) conditions are met:

i. The bypass is unavoidable to prevent loss of life, personal injury, or severe property damage;

ii. There are not feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment down-time or preventative maintenance;

iii. The permittee submits notice of an unanticipated bypass to the appropriate field office of the Division of Water Pollution Control within 24 hours of becoming aware of the bypass (if this information is provided orally, a written submission must be provided within five days). When the need for the bypass

is foreseeable, prior notification shall be submitted to the Director, if possible, at least ten (10) days before the date of the bypass.

c. The permittee shall operate the collection system so as to avoid bypassing. The permittee shall actively pursue the goal of eliminating bypasses through its Collection System Inspection and Rehabilitation Program as outlined in Exhibit A.

Diversion

a. 'Diversion' is the intentional rerouting of wastewater within a treatment facility away from a biological portion of the treatment facility.

b. A diversion is permissible only when necessary to protect the active biomass from a wash-out due to peak flow events and when this action does not cause effluent limitations to be exceeded".

The definition of "Washout" in both permits is as follows:

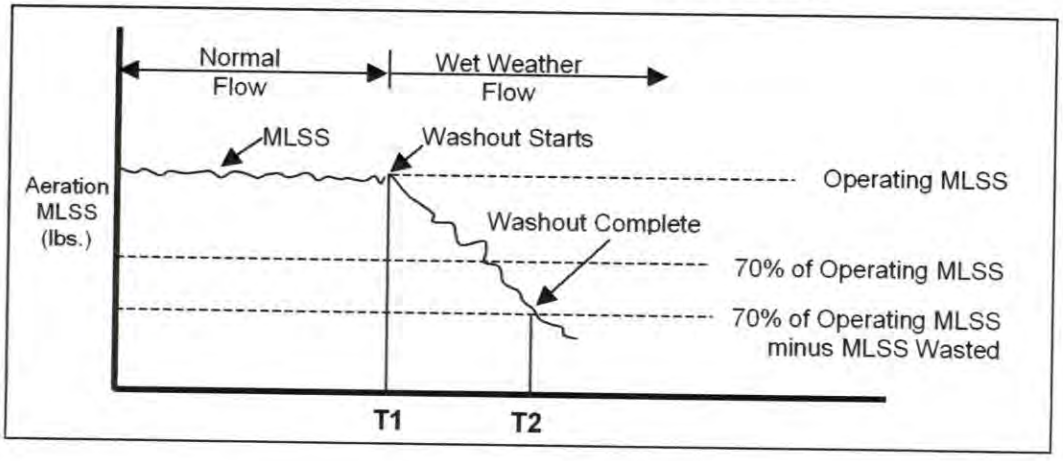
"For domestic wastewater plants only, a "washout" shall be defined as loss of Mixed Liquor Suspended Solids (MLSS) of 30% or more. This refers to the MLSS in the aeration basin(s) only. This does not include MLSS decrease due to solids wasting to the sludge disposal system. A washout can be caused by improper operation or from peak flows due to infiltration and inflow.

A washout is prohibited. If a washout occurs, the permittee must report the incident to the appropriate field office within 24 hours by telephone. A written submission must be provided within five (5) days. The washout must be noted on the discharge monitoring report. Each day of a washout is a separate violation."

The CPE will focus on meeting the 1994 permit requirements, which are consistent with the approved design of the plants. However, the CPE will also determine unit process capacities under expected operating conditions for each plant to support Diversions and/or additional treatment capacity that may be required.

Diversions, under the 1994 permit provisions, can be made only when necessary to protect the active biomass from a washout and when this action does not cause effluent limitations to be exceeded. A washout is specifically defined to mean a specific result (loss of 30 percent of MLSS in aeration basins only), as illustrated in Figure 1. Note that the definition of "Washout" contained in the permits refers to loss of biomass from the aeration basins, not from the plant, and is exclusive of MLSS decrease due to solids wasting to the sludge disposal system.

Figure 1: Aeration MLSS and Washout



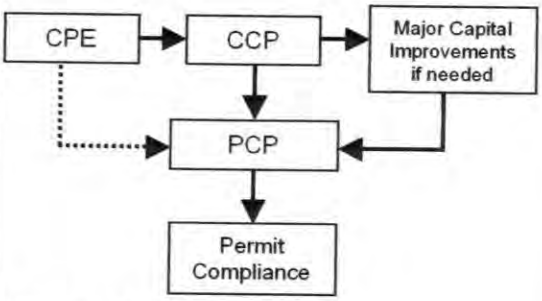
The measurement of aeration basin MLSS (as a concentration) to monitor the occurrence of washout conditions is more difficult for plug flow basins (i.e. Kuwahee WWTP) than for complete mix basins (i.e. Fourth Creek and Loves Creek WWTPs), since MLSS concentration will vary from front to back of a plug flow basin. This issue will have to be considered in the development of a monitoring/testing program for each plant.

The effluent limits imposed by the 1994 NPDES permits for the treatment plants are as shown in **Table 1**.

Table 1. 1994 NPDES Permit Limits for Fourth Creek, Kuwahee and Loves Creek Wastewater Treatment Plants

Parameter	Value for Fourth Creek	Value for Kuwahee	Value for Loves Creek
BOD (mg/L)			
Monthly	30		
Weekly	40		
Daily	45		
CBOD (mg/L)			
Monthly		25	25
Weekly		35	35
Daily		40	40
Minimum BOD removal (%)			
Daily	40%	40%	40%
Monthly	85%	85%	85%
Suspended solids (mg/L)			
Monthly	30	30	30
Weekly	40	40	40
Daily	45	45	45
Minimum suspended-solids removal (%)			
Daily	40%	40%	40%
Monthly	85%	85%	85%
Ammonia nitrogen—May through September (mg/L)			
Monthly		5	5
Weekly		7.5	7.5
Daily		10	10
Ammonia nitrogen—October through April (mg/L)			
Monthly		15	15
Weekly		20	20
Daily		25	25
Settleable solids (ml/L)			
Daily	1	1	1
Dissolved oxygen (mg/L)			
Daily minimum	1.0		
Instantaneous minimum		1.0	1.0
Fecal coliform (number/100 ml)			
Monthly (geometric mean)	200	200	200
Daily	1,000	1,000	1,000
pH			
Daily minimum	6	6	6
Daily maximum	9	9	9

The table shows that effluent standards for the Kuwahee and Loves Creek plants are more stringent than standards for the Fourth Creek plant. The Kuwahee and Loves Creek plants require nitrification, but the Fourth Creek plant does not. The difference will have some impact on the assessment of the plants.



According to the CD:

"The purpose of the CPE is to identify flow and/or loading rate restricted treatment process unit(s) at each WWTP."

The limits under the new permits are the same as is in the 1994 permits. All of the plants have stringent maximum day effluent concentration limits, and minimum daily removal efficiencies for CBOD (or BOD) and suspended solids.

III. CPE Overview

The CPE process is a detailed, systematic process for identifying current WWTP performance limiting factors that impact current NPDES Permit compliance. The process features several classification processes for rating plants based on major unit processes and for prioritizing performance-limiting factors (typically operations, maintenance, or administration factors). These are summarized below:

Evaluation of Major Unit Processes

Type 1 WWTP – CPE indicates performance problems are not a result of unit process capacities, but are related to operation, maintenance, administration, or to facility problems that can be corrected with minor modifications.

Type 2 WWTP – CPE indicates performance problems may be related to marginal capacity of one or more major unit processes; major facility modifications are likely required.

Type 3 WWTP – CPE indicates one or more major unit processes does not have sufficient capacity; major modifications or facility replacement may be required.

Prioritization of Performance Limiting Factors

A Rating – CPE indicates major performance effect on long-term, repetitive basis

B Rating – CPE indicates minimum performance effect on routine basis, or major effect on a periodic basis

C Rating – CPE indicates minor performance effect

There is also a points allocation system for rating individual unit process capabilities (aeration, final clarifiers, and sludge handling). The process supports subsequent CCP activities and ultimately, any required major capital improvements. The process also supports the PCP, which will likely require revisions to wet weather operational practices as improvements are made.

Given the stated purpose of the CPE, the unique characteristics of the WWTPs (i.e. designed for Diversions, nitrification requirements, etc.), and KUB's administration model (i.e. shared staff among plants, etc.), some aspects of the prescribed CPE process are not relevant.

A summary of CPE elements and KUB's approach to implementation is provided in **Table 2**.

Table 2: Summary of CPE Elements and Proposed KUB Implementation Approach

CPE Element	Comment	Proposed KUB Implementation Approach
1. Data Collection A. Kick-off Meeting B. Plant Tour C. Detailed Data Gathering	Will be completed generally in accordance with CPE guidelines	- Existing data, including record drawings, SOPs, recent flow and loading data, projected flows and loadings, and process performance data will be reviewed and evaluated - Interviews will be used to gather information on perceived plant performance issues and constraints
2. Evaluation of Major Unit Processes Influent Pumping Screening Grit Removal Primary Clarifiers Intermediate Pumping (if applicable) Biological Treatment Disinfection Residuals Management	Point scoring system for aeration, final clarifiers, and sludge handling will be supplemented with process modeling	- Establish current and planning period flows and loadings - Compare flow and loading design criteria to TDEC standards and other relevant design criteria - Conduct process modeling to establish capacity constraints and evaluate modifications and/or expansion alternatives for secondary treatment - Pilot testing may be required - Stress testing may be required *Note: Information from previous studies will be used to the extent possible.*
3. Prioritization of Performance–Limiting Factors	Will be limited to design and operations issues with focus on wet weather performance The forms in the CPE manual will not be used	- Administrative factors will only be addressed to extent necessary to address identified operations (and/or maintenance) factors that adversely impact performance, and to address implementation of recommendations if necessary - Design factors will include hydraulic capacity, process controls, level of automation, flow and measurement capabilities, and reliability criteria (per EPA guidelines) - Operations factors will include staffing level, operator training, SOPs, laboratory analysis procedures (including QA/QC) and data management - Sludge accountability evaluation to be completed

IV. Submittal Schedule

The CD requires the CPE to be completed in accordance with the following schedule:

Item	Review Level	Delivery
Submit CPE Plan for EPA Approval	1	60 days from Date of Entry (of CD)
Submit CPE for EPA Approval	1	300 days from CPE Plan approval (by EPA)

V. Scope of Study

To meet the CD requirements, the work will be accomplished in the following series of tasks:

Task Series	Description
100	Kickoff Meeting(s)
200	WWTP Tours
300	Data Collection and Assessment
400	Evaluation of Major Unit Processes
500	Evaluation of Performance Limiting Factors
600	CPE Memoranda and Reports
700	Process Controls Program Development (not included in this CPE Plan)

Task Series 100—Kickoff Meeting(s)

A project-planning workshop called a Project Quality Management (PQM) session will be held with key Camp, Dresser & McKee (CDM) team members and KUB staff. PQM is a one- to two-day workshop to develop consensus among all project stakeholders (KUB and CDM) on what must be done for the project to be successful and who is responsible for specific activities. Included in the PQM is development of a clear understanding of the project mission, identifying the critical success factors that the team must accomplish to achieve that mission, and developing a list of what has to be done so that the team can meet its critical success factors. Findings of the PQM will be integrated into the Work Plan to facilitate the implementation PQM mechanisms throughout the project duration. Because of the important nature of this process, it is essential that KUB staff participate in the workshop. Information obtained will be summarized and presented in a memorandum.

Task Series 200—WWTP Tours

The project team will tour each WWTP to familiarize themselves with facilities, site constraints, process controls, facility condition, and other features before conducting the PQM workshop. The tours will include KUB operations and maintenance staff who will be interviewed as part of the tours to gain additional insight on plant operation and performance issues.

Task Series 300—Data Collection and Assessment

The purpose of this task is to obtain relevant information to assess the performance of the treatment plants.

Subtask 301—Data Collection

KUB staff will provide data required for assessment. The data will include, but not be limited to, the following:

- Plans and specifications
- Operation and maintenance (O&M) manuals and SOPs
- Studies and reports
- Influent water quality data for past three years
- Plant operations data for past three years
- Discharge Monitoring Reports for past three years
- Permit violations for past three years
- Daily operating reports for past three years (in electronic format)
- Typical wet weather flow hydrographs
- Listing of units in operation and flow distribution
- Information on use of power, fuels, and chemicals for past three years
- Information on anticipated changes in waste streams (i.e., disposal of septage and grease-trap wastes, significant industrial dischargers, wet weather flows, etc.)
- Dissolved-oxygen concentrations in all aeration tanks.

Subtask 302—Assessment of Data

This subtask consists of preparing spreadsheets, graphs, and mass balances to help understand loadings and operational performance of the treatment plants. Material developed will include, but not be limited to, the following:

- Current and projected flows and mass balances
- Averages and percentiles of critical criteria
- Plots (daily and moving averages, as appropriate) of:
  - Flow and rainfall
  - Temperature
  - Influent concentrations and loads
  - Concentrations and loads in primary effluent
  - Concentrations and loads in secondary effluent (prior to blending)
  - Solids retention time
  - Sludge volume index.

Wet weather influent characteristics and process performance will be analyzed separately from dry weather conditions. Preliminary Corrective Action Plan/Engineering Report (CAP/ER) results will be used to estimate wet weather flows and loadings.

Subtask 303—Wet Weather Flow and Loading Analyses

Wet weather flow analyses will be performed to evaluate the impacts of different combinations of treatment and storage capacity on the frequency and volume of wet weather flows and loadings that reach each WWTP. These analyses will be conducted using the Storage Treatment, Overflow, and Runoff Model (STORM).

The STORM analysis is an effective planning tool for evaluating wet weather flow frequency statistics, and for determining the most cost-effective combination of collection system rehabilitation, system storage, and treatment capacity. The results will also be used to develop

statistics for annual average excess flow events (i.e. flow in excess of available reliable treatment capacity and/or hydraulic conveyance capacity of a plant) to determine the appropriate level of additional capacity required.

Subtask 304—Identification of Need for Additional Data

The initial assessment of data will likely reveal gaps in information. If available data are inadequate, data needed and a program for collection will be detailed. Information that might not be available now could include flows and concentrations of sidestreams, diurnal flow and loading characteristics, and analytical data described in Subtask 301.

Task Series 400—Evaluation of Major Unit Processes

For analysis of unit process performance capabilities and alternatives, the project team will use a variety of methods, depending on the specific task. As appropriate, we will use calculations on spreadsheets and simulation models using available plant data supplemented by additional analyses and tests. In addition, pilot testing of new processes and/or stress testing of existing processes may be required.

The activated sludge process for each plant will be evaluated using the BioWIN dynamic simulation model. The model will be used to evaluate existing facilities (i.e., determine existing capacities with and without Diversions) and alternative modifications, with and without potential blending scenarios.

Subtask 401—Evaluations Based on Industry Standards

Evaluation of some unit processes can best be carried out by comparing loading rates or performance on industry and/or TDEC standards, as well as EPA reliability criteria. Processes for which comparison of loading rates and performance can appropriately be based on standards include the following:

- Screens
- Grit chambers
- Primary clarifiers
- Disinfection
- Thickening (Kuwahee WWTP only)
- Digestion (Kuwahee WWTP only)
- Dewatering (Kuwahee WWTP only).

Firm capacity of existing facilities will be determined. In addition, feasible process improvements or modifications (such as chemical feed to primary clarifiers) will be evaluated as appropriate. The need for additional capacity will also be determined and a preliminary assessment of feasible alternatives will be completed.

Subtask 402—Evaluation of Activated Sludge System for the Fourth Creek WWTP

The permit level for the Fourth Creek WWTP does not include requirements for nitrogen; the permit focuses on removal of biological oxygen demand (BOD) and total suspended solids (TSS). The capacity of a plant with these requirements can be accurately determined with the use of a dynamic model such as BioWIN.

The simulation will require developing kinetic and stoichiometric parameters appropriate to the treatment plant. The simulation is set up with actual plant operating parameters (including

number of tanks and geometry, influent flows and concentrations, wasting rates, return rates, and other variables) and the simulation is run to predict effluent quality. The anticipated work includes use of solids flux analysis to determine the MLSS concentration at which the capacity of the aeration tanks for BOD removal matches the capacity of the secondary clarifiers. Relevant data and assumptions needed for this analysis included flow rates and peaking factors, BOD loads and peaking factors, yield, required solids retention time, and sludge volume index. The analysis is relatively straightforward, but engineering judgment is required to select appropriate process parameters. Shifting of solids from aeration tanks to secondary clarifiers during short-term high flows can also be incorporated into the analysis.

The simulation program will be used to simulate other operating conditions and to determine plant capacity. For these WWTPs, multiple simulations will be run to identify bottlenecks and potential corrective actions. The flow that can be sustained without Bypass or Diversion will be identified. In addition, the capacity of the existing plants with Diversions will be determined. Alternative process improvements, modifications and additions will be evaluated as appropriate.

Oxygen requirements must also be assessed. For this, existing data on oxygen use will be reviewed and spreadsheet calculations will be used to determine the adequacy of aeration equipment.

The flow that can be sustained without Bypass or Diversion will be identified from this analysis. In addition, the capacity of the existing plants with Diversions will be determined. Feasible process improvements or modifications (such as conversion to step feed aeration) will be evaluated as appropriate. The need for additional capacity will be determined, and a preliminary assessment of feasible alternatives will be completed.

Subtask 403—Evaluation of Activated Sludge System for the Kuwahee and Loves Creek WWTPs

The effluent requirements for the Kuwahee and Loves Creek WWTPs are more stringent than those for the Fourth Creek WWTP. In addition to setting effluent requirements for BOD and total suspended solids (TSS), the permit also limits concentrations of ammonia. The capacity of a plant with these requirements can be accurately determined with the use of a dynamic model such as BioWIN.

The simulation will require developing kinetic and stoichiometric parameters appropriate to the treatment plant. The simulation is set up with actual plant operating parameters (including number of tanks and geometry, influent flows and concentrations, wasting rates, return rates, and other variables) and the simulation is run to predict effluent quality.

The anticipated work includes use of solids flux analysis to determine the MLSS concentration at which the capacity of the aeration tanks for BOD removal matches the capacity of the secondary clarifiers. Relevant data and assumptions needed for this analysis included flow rates and peaking factors, BOD loads and peaking factors, yield, required solids retention time, and sludge volume index. The analysis is relatively straightforward, but engineering judgment is required to select appropriate process parameters. Shifting of solids from aeration tanks to secondary clarifiers during short-term high flows can also be incorporated into the analysis.

An important parameter for evaluation of a treatment plant that provides nitrification is the maximum specific growth rate of nitrifying organisms. To improve the estimate of the specific growth rate laboratory testing will be conducted, following the procedures developed in the Water Environment Research Foundation report *Methods for Wastewater Characterization in Activated Sludge Modeling.*

The simulation program will be used to simulate other operating conditions and to determine plant capacity. For these WWTPs, multiple simulations will be run to identify bottlenecks and potential corrective actions. The flow that can be sustained without Bypass or Diversion will be identified. In addition, the capacity of the existing plants with Diversions will be determined. Alternative process improvements, modifications and additions will be evaluated as appropriate.

Oxygen requirements must also be assessed. For this, existing data on oxygen use will be reviewed and spreadsheet calculations will be used to determine the adequacy of aeration equipment.

The flow that can be sustained without Bypass or Diversion will be identified from this analysis. In addition, the capacity of the existing plants with Diversions will be determined. Feasible process improvements or modifications (such as conversion to step feed aeration) will be evaluated as appropriate. The need for additional capacity will be determined, and a preliminary assessment of feasible alternatives will be completed.

Subtask 404—Stress and/or Pilot Testing

Stress testing of existing facilities and/or pilot testing of process modifications (e.g. chemical addition) or supplemental processes (e.g. ballasted flocculation) will be conducted if necessary. It is anticipated that stress testing (and pilot testing if final effluent quality may be affected) will require regulatory approval. A technical memorandum will be prepared summarizing our recommendations.

Task Series 500—Evaluation of Performance Limiting Factors

The evaluation of major unit processes focuses on potential treatment capacity and performance based on physical facility parameters (tank volume, surface area, etc.) and operational parameters for the primary and secondary treatment components (e.g. TSS removals, sludge volume index (SVI), yield, MLSS, etc.). This series of tasks will evaluate performance-limiting factors that may impact optimum, reliable performance of existing facilities. These factors include the following:

- Unit Process Design Capacity – current and optimized capacity of each unit process
- Plant Hydraulics – the capability to reliably pass peak flows without adverse process impacts
- Process Controls – the capability to control processes in response to variations in flows and loadings to optimize performance
- Process Measurements – the capability to measure flows and the use of flows and process parameters to make operational decisions and account for solids production, including the availability of appropriate automation and decision support systems

- Plant Operations Practices – the applicability of standard operating procedures, including but not limited to initial Process Controls Program results, to optimize plant performance, and comply with NPDES Permit requirements

- Plant Operations Capacity – the availability of well-trained staff to operate the facility at all times

- System Reliability – the condition of plant facilities and potential impacts on performance and reliability, including evaluation of facilities with respect to appropriate EPA reliability criteria.

Subtask 501— Evaluation of Unit Process Design Capacity
For each WWTP, the results of Task Series 400 will be used to develop performance potential graphs to identify unit processes that potentially limit total plant capacity. Consideration will be given to normal operations (full primary and secondary treatment of all flows) and Diversion mode operations.

Subtask 502—Evaluation of Hydraulic Capacity
Under this subtask, hydraulic capacity of each process unit and of pumping systems, closed conduits, and channels connecting process units will be reviewed, to determine potential bottlenecks. Hydraulic profiles will be developed for peak flows, using spreadsheets or a hydraulic model such as MIKE SWMM for analysis. Field measurements of water surface elevations may be required for confirmation. Based on the results of initial hydraulic evaluations, the need for more sophisticated analyses using computational fluid dynamics (CFD) software to evaluate specific process or hydraulic control structure performance will be evaluated.

Subtask 503—Evaluation of Process Controls
For each WWTP, process controls will be evaluated to assess their adequacy to control variable flows and process loadings to optimize performance. Process controls to be evaluated include, but are not limited to, flow measurement, flow distribution to multiple process units, sludge wasting, dissolved oxygen control, chemical feed controls, and diversion controls. In addition, existing process automation and opportunities to enhance process control through additional automation will be evaluated.

Subtask 504—Evaluation of Process Measurements
For each WWTP, process measurements including influent, intermediate and final flows and loads, as well as process performance indicators such as SVI, MLSS, settleable solids, dissolved oxygen will be evaluated. The evaluation will consider the availability of data, the timelines and accuracy of the available data, and the way data are used to make process decisions and develop performance reports. In addition, a sludge accountability evaluation will be conducted for each WWTP to verify data accuracy and adequacy.

Subtask 505—Evaluation of Operations Practices
For each WWTP, O & M Manuals and SOPs along with operations record-keeping and data analysis procedures will be evaluated relative to results of the major unit process evaluations, and previous subtasks involving hydraulics, process controls, and process measurements.

Subtask 506—Evaluation of Plant Operations Capacity
KUB's plant operations staff levels, shifts and training will be evaluated relative to current and potential future operations requirements.

Subtask 507—Evaluation of System Reliability
For each WWTP, the condition of existing facilities will be evaluated to determine if they are capable of reliable performance, particularly under wet weather conditions. In addition, the facilities will be evaluated with respect to appropriate EPA reliability criteria.

Task Series 600—CPE Memoranda and Reports

The project will require preparation of technical memoranda and reports. Technical memoranda will be prepared to document recommendations and decisions by the project team, and, more important, the basis for the recommendations and decisions. In general, the memoranda will be prepared in draft form, for review by KUB. After receiving KUB's comments, the memoranda will be prepared in final form and distributed. The technical memoranda will be numbered and catalogued.

The CPE Report covering all three WWTPs likewise will be developed in draft and final draft forms prior to submission to EPA, with review by KUB between draft and final draft forms. The report will include text, tables, and graphics in detail sufficient to explain all aspects of the study and its recommendations. An executive summary, table of contents, and lists of tables and figures will be provided. The CPE Report will serve as the basis for development of the Composite Correction Plan for the three WWTPs.

It is anticipated that the memoranda will provide source material for the CPE Report; however, they will be adapted for use specifically in the report and not merely inserted into the report. The draft report will be made available for public review and comments. Public and EPA comments on the draft will be reviewed and addressed prior to finalizing the report.

Task Series 700—Process Controls Program Development

The PCP is an Operations Program component of the Management Program required by the CD, and therefore requires development of separate documents for approval by EPA. However, the PCPs are closely related to the results of the CPE, and ultimately the CCPs. It is envisioned that the initial PCPs will be modified on completion of the CPEs, and again as CCP elements are implemented; however, these updates are not included in this scope of study. Development of the PCP is not addressed in this plan.

VI. Project Schedule

The CD requires KUB to submit a CPE Report to EPA for review and approval within 300 days of approval of this CPE Plan. **Figure 2** provides a preliminary project schedule that will enable KUB to comply with this requirement. The CCP will be initiated upon EPA's approval of the CPE.

The schedule for the PCP is included in the schedule because although a stand-alone program, it must be coordinated with the CPE.

Figure 2
Preliminary CPE/PCP Completion Schedule