

# Scope of Services

## Hap Cremean Water Plant

### *Disinfection By-Products (DBP) and Treatment Improvements Master Plan*

#### **Purpose and Goal**

The purpose of the *Hap Cremean Water Plant Disinfection By-Products (DBP) and Treatment Improvements Master Plan* is the selection of a *single treatment solution* that is preferred by the Division of Power and Water (DOPW). This preferred solution must position DOPW to continue producing finished water from the Hap Cremean Water Plant (HCWP) that will meet both current and anticipated applicable drinking water regulations. The primary goal is to select from the *universe of technologies* the treatment solution that is *right* for DOPW for minimizing both regulated disinfection by-products and atrazine in the Hap Cremean water distribution system.

Schedule is understood to be critical. As such, up to three treatment alternatives must be demonstrated in a one-year, pilot-scale study; and the right treatment solution must be selected, designed, approved by the Ohio Environmental Protection Agency (Ohio EPA), and placed in operation by April 1, 2012. Therefore, the Master Plan will be completed and ready for implementation by April 1, 2009.

The preferred treatment solution selected for implementation at the HCWP will:

- Effectively address disinfection by-products (DBPs), atrazine, and taste and odor issues; as well as other applicable current and future regulations (e.g., total coliform rule, lead & copper, etc.).
- Be cost effective (capital and operation) to implement.
- Maximize the use of existing treatment facilities.
- Involve affected stakeholders in the treatment process selected.
- Be readily defensible.

Four workshops will be held to achieve the project goals through review and analysis of the *universe of technologies*. The outcome of these workshops will be:

- Workshop I: The selection of a set of feasible treatment alternatives
- Workshop II: The selection of up to three alternatives that will be pilot-scale demonstrated for one year
- Workshop III: Refinement of pilot-scale protocol
- Workshop IV: Determination of the preferred alternative that is the right solution for the DOPW HCWP.

In order to gain consensus throughout this project, we will at times include use of *Criterion Decision Plus* software to facilitate group discussions and decision making.

Following is the outline of the Scope of Services for the Master Plan of Improvements to DOPW Hap Cremean Water Plant.

## 1. Project Management.

This task includes management and monitoring to ensure that the project is completed both on time and within budget. This task includes:

- a. Setup of project control files and procedures
- b. Coordination of sub-consultants
- c. Maintaining and monitoring the MBE and WBE participation
- d. Implementing a Quality Assurance/Quality Control (QA/QC) program
- e. Preparing monthly reports and invoices
- f. Reporting schedule compliance
- g. Preparation and distribution of minutes to DOPW for all meetings held with the DOPW, Ohio EPA, and/or related organizations.

## 2. Workshop I

The purpose of this task is to explore the *universe of technologies* and choose feasible alternatives for further evaluation. This task will be accomplished in three phases.

### Phase 1

Phase 1 is the preparation of a document that summarizes and categorizes the *universe of technologies*. This preliminary list will be based on the project objectives, experience with similar projects, and DOPW's issues and concerns at the HCWP. The document will discuss the ability of the various technologies to address:

- a. Disinfection by-products
- b. Atrazine
- c. Taste and odor
- d. Endocrine disruptors
- e. Pharmaceuticals
- f. Current and future regulations, e.g., disinfection by-products, enhanced surface water treatment rule, total coliform rule, lead & copper, etc.

This document will be distributed at least one week prior to Workshop I to stakeholders who will attend the workshop.

### Phase 2

Phase 2 is a ½-day tour of HCWP by key members of the B&N Team, led by senior DOPW staff. This tour is to be preceded by a conference room discussion of the treatment schemes and strategies of the HCWP.

### Phase 3

Phase 3 is a one-day workshop that will result in key Columbus stakeholders establishing the screening criteria for alternative technologies and choosing feasible alternatives for further evaluation. These feasible alternatives will be chosen from the *universe of technologies* utilizing Step 1, Concept Level, of a three-step process that includes:

- Step 1      Concept Level (pass/fail)
- Step 2      Planning Level (screening matrix)
- Step 3 (a)   Refinement Level: Refinement of the pilot-scale protocol for up to three chosen treatment alternatives
- Step 3 (b)   Refinement Level: Final design decisions for the selected (i.e., preferred) solution (refinement).

The remaining steps in this process will be used in subsequent workshops and described in detail at the appropriate points in this Scope of Services.

### **Step 1: Concept Level (Pass/Fail)**

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In Step 1, a combined group of DOPW staff and the B&N Team will brainstorm possible solutions, combine these possible solutions into categories (e.g., coagulation, adsorption, membrane filtration, etc.), and evaluate these possible solutions using a preliminary screening approach known as *concept level screening*.

The purpose of the concept level screening, which uses pass/fail terminology, is to eliminate concept-level alternatives that do not meet fundamental criteria, such as technical feasibility. Concept-level criteria may be considered equivalent to basic planning assumptions or project constraints. If an alternative cannot meet these fundamental tests, it is eliminated from further consideration.

Many alternatives will be suggested and identified as part of the planning process; however, only those that meet these fundamental criteria will be carried forward to Step 2. There may be instances, however, where an eliminated alternative may be revisited as part of reformulation or phasing of alternatives of the preferred project if they can be revised to meet the basic project criteria.

The outcome of this initial, one-day facilitated workshop will be a shortlist of five to ten feasible alternatives, which will then proceed to the next level of screening known as *planning level screening* for further evaluation.

### **3. Preliminary Engineering Report.**

The purpose of this task is to investigate optimization of existing DOPW operations at HCWP and to further evaluate the feasible alternatives chosen by DOPW at Workshop I. Optimization will include a ½-day meeting at HCWP with key operations staff; review of previous studies completed by DOPW; analysis of two years of historical data available for HCWP; bench-scale testing (if needed); and assistance with full-scale, short-term testing,

Further evaluation of feasible alternatives will include preparation of schematics and sketches, preparation of estimated capital and operational costs, additional bench-scale testing (if needed), and related issues. An optimization/evaluation report of the feasible alternatives will be prepared and submitted to key stakeholders (DOPW and B&N Team) two weeks prior to the second workshop. At Workshop II, the feasible alternatives will be screened further;

resulting in the choice of up to three alternatives to be further evaluated through one-year, pilot-scale demonstration studies.

The screening process will be facilitated using *Criterion Decision Plus* software and will involve key City stakeholders in developing rating criteria, and choosing the treatment alternatives to be evaluated at the pilot scale.

During Workshop II, up to three treatment alternatives to be demonstrated at the pilot scale will be chosen from the feasible alternatives utilizing Step 2, Planning Level, of the three-step process noted above in Phase 3 of Workshop I.

### **Step 2: Planning Level (Screening Matrix)**

As part of Workshop II, a screening matrix will be developed to compare feasible alternatives (that pass Step 1) against evaluation criteria. These evaluation criteria, and their corresponding weights, will be finalized using a consensus approach developed through interaction with potential stakeholders. The criteria will be more detailed than the fundamental pass/fail criteria. The screening matrix criteria may also be divided into subcriteria for further detail and differentiation.

A metric will also be defined for use in determining how well each alternative meets the criteria or subcriteria. The question to be asked in considering the alternatives relative to these criteria is: "How well does the alternative meet this criterion in solving the treatment issues consistent with the project objectives?" The metrics will be established by consensus, with engineering to be performed outside the facilitated workshop.

*Criterion Decision Plus* will be used as the tool to support Step 2 of the decision-analysis process due to its:

- Ability to readily utilize a variety of metrics for screening criteria
- Ability to rapidly complete sensitivity analyses
- Depth of data analysis available for identifying key differentiation between alternatives
- User friendly and interactive utility for meetings and presentations to stakeholders, public, or other groups
- Well-supported software with extensive use on prior projects.

The outcome of this second, one-day facilitated workshop will be the selection of up to three treatment alternatives to be evaluated in a one-year, pilot-scale demonstration study.

Following completion of Workshop II, a site visit will be arranged for up to four DOPW staff and conducted at up to three full-scale treatment plants to view and evaluate the technologies being considered for pilot-scale demonstration.

#### **4. Pilot Study and Report.**

The purpose of this task is to prepare a pilot-scale demonstration protocol, conduct the pilot-scale demonstration studies, analyze data generated from the studies and develop a report for each of the treatment alternatives evaluated at the pilot scale. Key elements of this task include:

- a. Surveying the HCWP to locate facilities and appropriate areas for conducting the pilot-scale studies of the chosen alternatives. This activity will include reviewing key locations at the HCWP considered for pilot-scale demonstration and collecting critical data needed for the pilot-scale facilities; such as available power, location of water source, discharge locations, size of area, ease of access, etc.
- b. Determining the final goals and objectives of DOPW for conducting the pilot-scale studies.
- c. Preparing a draft pilot-scale demonstration protocol for each of the treatment alternatives.
- d. Meeting and reviewing with key DOPW staff the draft pilot-scale demonstration protocol and obtaining any comments or suggested changes.
- e. Meeting and reviewing with Ohio EPA the draft pilot-scale demonstration protocol and obtaining any comments or suggested changes.
- f. Preparing and submitting the final pilot-scale demonstration protocol to Ohio EPA for approval.
- g. Obtaining approval for the pilot-scale demonstration protocol from the Ohio EPA.
- h. Procuring and installing the pilot-scale demonstration equipment at the HCWP.
- i. Providing up to two weeks of training to pilot-scale operation's staff (i.e., B&N Team operations personnel) on the operation and maintenance of the pilot-scale demonstration equipment.
- j. Operating and maintaining pilot-scale demonstration equipment for a period of one year. This will include the analysis and tabulation of water samples collected on a daily basis and summarized weekly, as outlined in the approved protocol; staffing the pilot-scale equipment with operation and maintenance personnel; performing routine maintenance and repair; and coordinating operation of the pilot-scale equipment with key HCWP personnel. This task includes performing the necessary laboratory analysis of collected samples.
- k. Conducting Workshop III, approximately two months after beginning the one-year, pilot-scale demonstration period to evaluate preliminary results of the pilot-scale studies. This task is necessary to determine adequacy of the pilot-scale treatment alternatives and to identify any course correction of the pilot-scale protocol that might be required, including potentially changing any of the up to three treatment alternatives being evaluated.

*Criterion Decision Plus* software will again be used during Workshop III, utilizing Step 3(a), Refinement Level, of the three-step process noted above in Phase 3 of Workshop I.

### **Step 3(a): Refinement Level: Refinement of Pilot-scale Demonstration Protocol**

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Once the screening in Step 2 is complete, up to three treatment alternatives are chosen for pilot-scale demonstration, and two months of data have been generated at the pilot scale - the Step 2 approach will be used to refine the protocol for the treatment alternative(s) to determine any course corrections for the pilot-scale demonstration study. If a course correction is determined to be needed, modification of the pilot-scale protocol, revisiting Ohio EPA approval, and installation of any additional pilot-scale equipment will be provided.

- l. Preparing a Draft Demonstration Study Report after completion of the one-year, pilot-scale demonstration study(s). This report will outline the purpose of the demonstration study(s), tabulated results of operation of each alternative technology, cost estimates (operation and capital), schematics, and related details.
- m. Submitting a copy of the draft Demonstration Study Report to the Technical Review Committee and appropriate DOPW staff for review and comments. Updating the draft Demonstration Study Report based on comments received from the Technical Review Committee.
- n. Conducting Workshop IV with key stakeholders. The purpose of this workshop will be to review results outlined in the draft Demonstration Study Report, and to select the preferred, single treatment solution for the HCWP. *Criterion Decision Plus* will again be used in this fourth, one-day workshop to assist the affected stakeholders in selecting the preferred treatment solution that is most appropriate and right for DOPW at the HCWP. Workshop IV will use Step 3(b), Refinement Level, of the three-step process noted above in Phase 3 of Workshop I.

### **Step 3(b): Final design decisions for the selected (i.e., preferred) solution (refinement)**

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Once the refinement in Step 3 (a) is complete and one year of pilot-scale data has been analyzed, a preferred alternative will be selected. The Step 2 approach will again be used – this time to refine the preferred alternative and derive the most efficient and optimized solution, i.e., the *right* solution.

- o. Preparing a draft Final Demonstration Study Report based on the results of Workshop IV.
- p. Submitting a copy of the draft Final Demonstration Study Report to the appropriate DOPW staff for review and comments. Updating the Final Demonstration Study Report based on comments received from DOPW.
- q. Submitting the Final Demonstration Study Report to the Ohio EPA. Meeting with Ohio EPA and reviewing the report.

## **5. Master Plan.**

This task consists of preparing the Master Plan for treatment improvements at the HCWP. Key elements for this task include:

- a. Developing means of compliance on an interim basis prior to implementation of the preferred alternative.
- b. Developing a basis-of-design for each component of the HCWP to identify the components for which the approved capacity would have to be increased to obtain an overall approved capacity of 125 MGD.
- c. Preparing a draft Master Plan. This will include interim compliance strategies, detailed design data, preliminary drawings of improvements, equipment quotes, a preliminary opinion of probable construction costs, and an implementation schedule.
- d. Submit a copy of the draft Master Plan to the Technical Review Committee for review and comments. Update the draft Master Plan based on comments received from the Technical Review Committee.
- e. Submit and review the updated draft Master Plan to DOPW for comments, additions, and corrections.
- f. Prepare the Final Master Plan based on comments received from DOPW.