RECEIVED
FEB 26 2010
PUBLIC SERVICE COMMISSION

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF NORTHERN KENTUCKY WATER DISTRICT FOR APPROVAL OF THE MEMORIAL PARKWAY TREATMENT PLANT ADVANCED TREATMENT FACILITY PHASE II, AND ISSUANCE OF A CERTIFICATE OF CONVENIENCE AND NECESSITY	) CASE NO. 2010-00093

APPLICATION FOR APPROVAL OF CONSTRUCTION

Northern Kentucky Water District (NKWD), by counsel, petitions for an order approving the new construction to the Memorial Parkway Treatment Plant pursuant to KRS 278.020. This is the second phase of construction at the treatment plant. The other portion of this project is pending in Case No. 2010-00038 filed January 28, 2010.

In support of the application, the following information is provided:

1. NKWD's office address is 2835 Crescent Spring Rd., Erlanger, KY 41018-0640. Its principal officers are listed in its current Annual Report on page 6, which is filed with the Commission as are its prior years Reports;

2. NKWD is a non-profit water district organized under Chapter 74 and has no separate articles of incorporation;

3. A description of NKWD's water system and its property stated at original cost by accounts is contained in its Annual Report, which is attached as Exhibit E.

4. NKWD serves retail customers in Kenton, Boone and Campbell Counties and sells water at wholesale to non-affiliated water distribution systems in Kenton, Boone,

Pendleton and Campbell Counties.

5. NKWD proposes to construct new facilities at the existing treatment plant as described in Exhibit A. The project involves the construction of a new concrete and masonry brick building, which will house eight granular activated carbon contactors with twelve feet of carbon media; a low lift pumping station with six vertical turbine pumps and variable speed drives plus two smaller vertical turbine pumps to provide slurry water for carbon loading and unloading; three medium pressure ultraviolet disinfection reactors; a diesel driven standby power generator; and ancillary facilities including control through the existing SCADA system, mechanical HVAC and plumbing systems, and electrical systems.

One paper copy of the Maps, Plans, Specifications and Bid Documents is provided as a separate bound document. A disk with the plans and specifications is included with Exhibit A of the application. The estimated cost is $30,000,000.00. The District proposes to finance the project with $821,966 from the 2007 BAN and $1,945,034 from the 2009 BAN for a total of $2,767,000 for engineering and design services. The remaining $27,233,000 will be taken from the 2010 BAN.

6. The construction is in the public interest and is required to allow NKWD to continue to provide adequate service to its customers. The project, its cost, need and other details are contained in Exhibit A.

7. The total financing for which approval is sought is approximately $30,000,000.00. See Exhibits C and D. The District has received all approvals from the DOW for the Plans and Specifications and funding for these improvements.

8. Easements and rights of way are not required, see Exhibit B.

9. This service will not compete with any other utility in the area.

10. The proposed construction project, identified in Exhibit A, is scheduled to begin construction in upon PSC approval and substantially completed in 24 months with an additional two months to final completion. Board approval of the project was given on

February 19, 2010, attached as Exhibit C. Bid information is included with Exhibit C. Bids expire on April 10, 2010. **Because of the extremely favorable bids and the mandatory deadline to have the facilities on line by April, 2012, NKWD requests expedited review and approval of this application and Case No. 2010-00038 to assure that the project is completed on time. With a 24 month estimated construction period, there is little room for delay.**

11. No new franchises are required. A copy of the DOW letter approving the Plans and Specifications for the proposed improvements is attached as Exhibit B.

12. Construction descriptions are in Exhibit A and Bid Documents. Facts relied on to justify the public need are included in the project descriptions in Exhibit A.

13. Maps of the area showing location of the proposed facilities are in Exhibit A.

14. The construction costs will be funded by the issuance of approximately $30M of BANS.

15. Estimated operating costs for operation and maintenance, depreciation and debt service after construction are shown in Exhibit D.

16. A description of the facilities and operation of the system are in Exhibit A.

17. A full description of the route, location of the project, description of construction and related information is in Exhibit A.

18. The start date for construction; proposed in-service date; and total estimated cost of construction at completion are included in Exhibits A and B.

19. CWIP at end of test year is listed in Exhibit E.

20. Plant retirements are listed in Exhibit B and E. No salvage values are included as booked.

21. The use of the funds and need for the facilities is justified based on a the engineering report included as Exhibit A

22. No rate adjustment is being proposed.

23. The following information is provided in response to 807 KAR 5:001 (8):

a. Articles of Incorporation – None. NKWD is a statutorily created water district under KRS Chapter 74;

24. The following information is supplied pursuant to 807 KAR 5:001(9):

a. Facts relied upon to show that the application is in the public interest: See Exhibit A.

25. The following information is provided as required by 807 KAR 5:001 (11):

a. A general description of the property is contained in the Annual Report, Exhibit E.

b. No stock is to be issued; No bonds are to be issued in this case;

c. There is no refunding or refinancing;

d. The proceeds of the financing are to construct the property described in Exhibit A

e. The par value, expenses, use of proceeds, interest rates and other information is not applicable because no bonds are being issued at this time.

26. The following exhibits are provided pursuant to 807 KAR 5:001 (11)(2):

a. There are no trust deeds. All notes, indebtedness and mortgages are included in Exhibits E and F.

b. Property is to be constructed is described in Exhibit A.

27. The following information is provided pursuant to 807 KAR 5:001(6):

a. No stock is authorized.

b. No stock is issued.

c. There are no stock preferences.

d. Mortgages are listed in Exhibit F.

e. Bonds are listed in Exhibit F.

f. Notes are listed in Exhibit F.

g. Other indebtedness is listed in Exhibit F.

h. No dividends have been paid.

i. Current balance sheet; income statement and debt schedule are attached as Exhibits F and G.

28. USoA plant accounts are included in exhibit D.

29. Depreciation cost and debt service are in exhibit D.

For these reasons, the District requests issuance of an order granting authority to construct the facilities and for any other authorization that may be necessary.

SUBMITTED BY:

John N. Hughes
124 W. Todd St.
Frankfort, KY 40601

Attorney for Northern
Kentucky Water District

Section 8(1)	Full name and post office address of applicant and a reference to the particular provision of law requiring Commission approval.	Application
Section 8(2)	The original and 10 copies of the application with an additional copy for any party named therein as an interested party.	yes
Section 8(3)	If applicant is a corporation, a certified copy of the Articles of Incorporation and all amendments thereto <u>or</u> if the articles were filed with the PSC in a prior proceeding, a reference to the style and case number of the prior proceeding.	n/a
Section 9(2)	(a) The facts relied upon to show that the proposed new construction is or will be required by public convenience or necessity.	Exhibit A
	(b) Copies of franchises or permits, if any, from the proper public authority for the proposed new construction or extension, if not previously filed with the commission.	Exhibit B
	(c) A full description of the proposed location, route, or routes of the new construction or extension, including a description of the manner in which same will be constructed, and also the names of all public utilities, corporations, or persons with whom the proposed new construction or extension is likely to compete.	Exhibit A
	(d) Three (3) maps to suitable scale (preferably not more than two (2) miles per inch) showing the location or route of the proposed new construction or extension, as well as the location to scale of any like facilities owned by others located anywhere within the map area with adequate identification as to the ownership of	Exhibit A

	such other facilities.	
	(e) The manner, in detail, in which it is proposed to finance the new construction or extension.	Exhibits A, D
	(f) An estimated cost of operation after the proposed facilities are completed.	Exhibit D
KRS 322.340	Engineering plans, specifications, plats and report for the proposed construction. The engineering documents prepared by a registered engineer, requires that they be signed, sealed, and dated by an engineer registered in Kentucky.	Exhibit A
Section 8(1)	Full name and post office address of applicant and a reference to the particular provision of law requiring Commission approval.	Application
Section 8(2)	The original and 10 copies of the application with an additional copy for any party named therein as an interested party.	yes
Section 8(3)	If applicant is a corporation, a certified copy of the Articles of Incorporation and all amendments thereto <u>or</u> if the articles were filed with the PSC in a prior proceeding, a reference to the style and case number of the prior proceeding.	n/a
KRS 278.300(2)	Every financing application shall be made under oath, and shall be signed and filed on behalf of the utility by its president, or by a vice president, auditor, comptroller or other executive officer having knowledge of the matters set forth and duly designated by the utility.	Application
807 KAR 5:001: Section 11(1)(a)	Description of applicant's property.	
	Statement of original cost of applicant's property and the cost to the applicant, if different.	Exhibit E
Section	If stock is to be issued: and kinds to be issued.	none

11(1)(b)	--Description of amount and kinds to be issued.	
	--If preferred stock, a description of the preferences.	none
	If Bonds or Notes or Other Indebtedness is proposed: --Description of the amount(s)	Exhibits E, F
	--Full description of all terms	
	--Interest rates(s)	
	--Whether the debt is to be secured and if so a description of how it's secured.	
Section 11(1)(c)	Statement of how proceeds are to be used. Should show amounts for each type of use (i.e., property, debt refunding, etc.)	Exhibit A
807 KAR 5:001:		
Section 11(1)(d)	If proceeds are for property acquisition, give a full description thereof. Supply any contracts.	n/a
Section 11(1)(e)	If proceeds are to refund outstanding obligations, give:	n/a
	--Par value	
	--Amount for which actually sold	
	--Expenses and application of proceeds	
	--Date of obligations	
	--Total amount	
	--Time held	
	--Interest rate	
	--Payee	
Section 11(2)(a)	Financial Exhibit (see below)	

Section 11(2)(b)	Copies of all trust deeds or mortgages. If previously filed, state case number.	Exhibit E
Section 11(2)(c)	If Property to be acquired: --Maps and plans of property.	Exhibit A
Section 11(2)(c)	--Detailed estimates by USOA account number.	Exhibit D

ALL INFORMATION BELOW IN SECTIONS 6(1) THROUGH 6(9) SHOULD COVER THE PERIOD ENDING NOT MORE THAN 90 DAYS PRIOR TO DATE ON WHICH APPLICATION WAS FILED:

807 KAR 5:001		
Section 6(1)	Amount and types of stock authorized.	None
Section 6(2)	Amount and types of stock issued and outstanding.	None
Section 6(3)	Detail of preference terms of preferred stock.	None
Section 6(4)	Mortgages: --Date of Execution	Exhibit E,F
	--Name of Mortgagor	
	--Name of Mortgagee or Trustee	
	--Amount of Indebtedness Secured	
	--Sinking Fund Provisions	
Section 6(5)	Bonds	Exhibit E,F
	--Amount Authorized	
	--Amount Issued	
	--Name of Utility Who Issued	
	--Description of Each Class Issued	
	--Date of Issue	
	--Date of Maturity	
	--How Secured	

	--Interest Paid in Last Fiscal Year	
Section 6(6)	Notes Outstanding:	Exhibit E,F
	--Date of Issue	
	--Amount	
	--Maturity Date	
	--Rate of Interest	
	--In Whose Favor	
	--Interest Paid in Last Fiscal Year	
Section 6(7)	Other Indebtedness:	
	--Description of Each Class	
	--How Secured	
	--Description of Any Assumption of Indebtedness by Outside Party (i.e., any transfer)	
	--Interest Paid in Last Fiscal Yr.	none
Section 6(8)	Rate and amount of dividends paid during the five (5) previous fiscal years and the amount of capital stock on which dividends were paid each year.	None
Section 6(9)	Detailed income statement and balance sheet.	Exhibits F G

AFFIDAVIT
Fort Thomas Treatment Plant Advanced Treatment Project

Affiant, Jack Bragg, Jr., being the first duly sworn, deposes and says that he is the Vice President of Finance of the Northern Kentucky Water District, which he is the Applicant in the proceeding styled above; that he has read the foregoing "Fort Thomas Treatment Plant Advanced Treatment Project" Application and knows the contents thereof, and that the same is true of his own knowledge, except as to matters which are therein stated on information or belief, and that is to those matters he believes them to be true.

Jack Bragg, Jr.
Vice President - Finance
Northern Ky. Water District

Subscribed and sworn to before me in said County to be his act and deed by Jack Bragg, Jr., Vice President of Finance of the Northern Kentucky Water District, this 22nD day of February 2010.

NOTARY PUBLIC
Kenton County, Kentucky
My commission expires 5-9-2011

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

Fort Thomas Treatment Plant
Advanced Treatment Project

Project 184-447

ProjectDescription:

The project involves the construction of a new concrete and masonry brick building. The new building will house 8 granular activated carbon contactors with 12 feet of carbon media; a low lift pumping station with 6 vertical turbine pumps and variable speed drives plus 2 smaller vertical turbine pumps to provide slurry water for carbon loading and unloading; and 3 medium pressure ultraviolet disinfection reactors; a diesel driven standby power generator; and ancillary facilities including control through the existing SCADA system, mechanical HVAC and plumbing systems, and electrical systems.

The bids were opened January 21, 2010 and are subject to acceptance for 90 days. Therefore, the bids will expire April 20, 2010. The project is scheduled to take 24 months to substantial completion and another 2 months to reach final completion.

The estimated cost of the total project with engineering, construction, and contingencies is $30,000,000.

NORTHERN KENTUCKY WATER DISTRICT
Fort Thomas Treatment Plant Advanced Treatment Facility
184-447

TABLE OF CONTENTS

Case No. 2010-____
Exhibit _____A_____

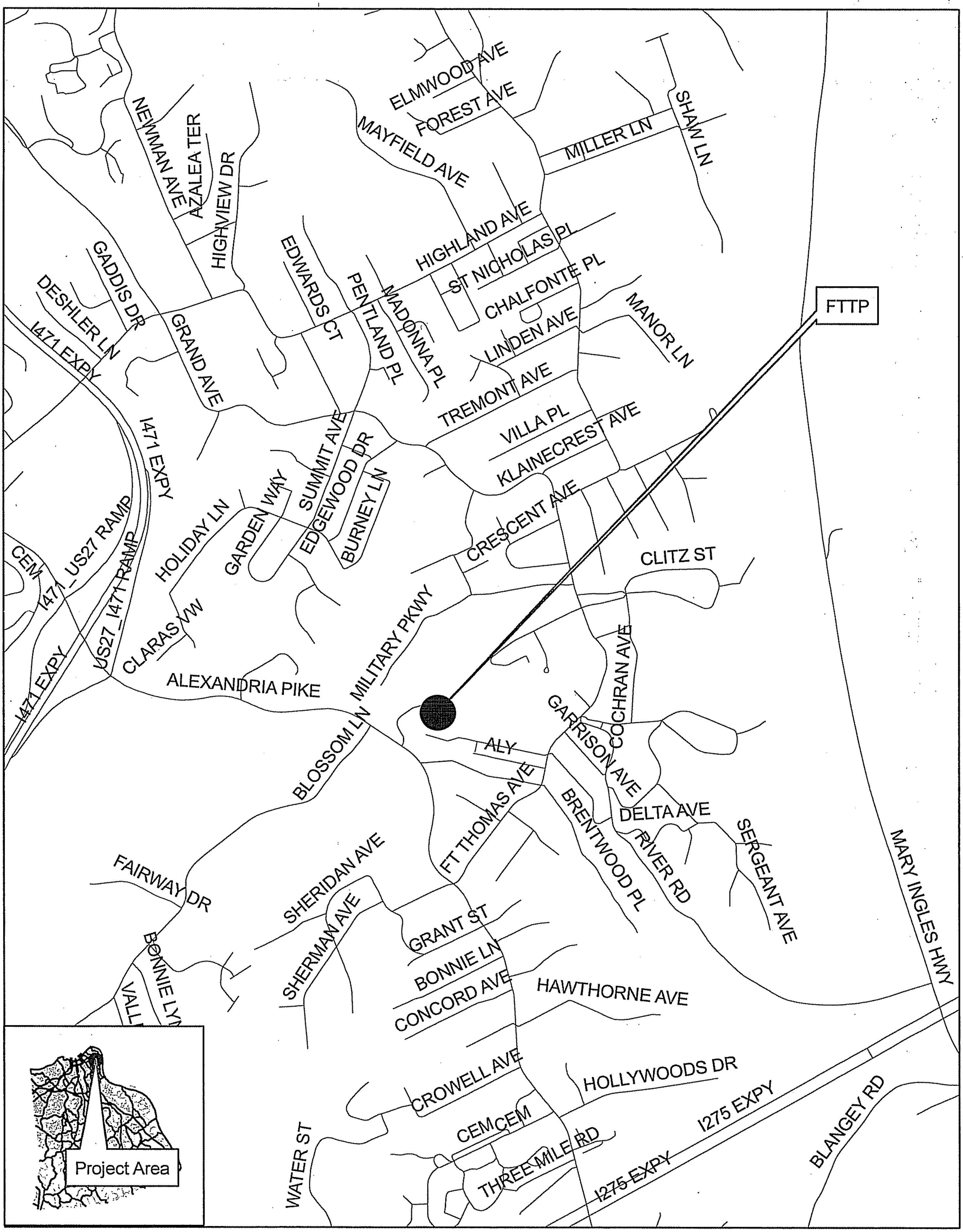
NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

Project Map

Site Map


FTTP
ELMWOOD AVE
FOREST AVE
MAYFIELD AVE
MILLER LN
SHAW LN
NEWMAN AVE
AZALEA TER
HIGHVIEW DR
HIGHLAND AVE
ST NICHOLAS PL
CHALFONTE PL
EDWARDS CT
PENTLAND PL
MADONNA PL
GADDIS DR
DESHLER LN
I471 EXPY
GRAND AVE
LINDEN AVE
MANOR LN
TREMONT AVE
VILLA PL
KLAINECREST AVE
I471 EXPY
SUMMIT AVE
EDGEWOOD DR
BURNEY LN
GARDEN WAY
HOLIDAY LN
CRESCENT AVE
CLITZ ST
CEM
I471_US27 RAMP
US27_I471 RAMP
CLARAS VW
MILITARY PKWY
ALEXANDRIA PIKE
I471 EXPY
COCHRAN AVE
GARRISON AVE
ALY
BLOSSOM LN
FT THOMAS AVE
BRENTWOOD PL
DELTA AVE
RIVER RD
SERGEANT AVE
MARY INGLES HWY
FAIRWAY DR
SHERIDAN AVE
SHERMAN AVE
GRANT ST
BONNIE LN
BONNIE LYN
CONCORD AVE
HAWTHORNE AVE
CROWELL AVE
HOLLYWOODS DR
I275 EXPY
BLANGEY RD
CEM
CEM
THREE MILE RD
I275 EXPY
WATER ST
Project Area

Case No. 2010-____
Exhibit ____A____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant Advanced Treatment Facility

Campbell County
184-0447

Basis of Design Report

BASIS OF DESIGN REPORT

FOR

FORT THOMAS TREATMENT PLANT | MEMORIAL PARKWAY TREATMENT PLANT ADVANCED TREATMENT

Owner

Northern Kentucky Water District
2835 Crescent Springs Road
Erlanger, KY 41018

STATE OF KENTUCKY
18916
REGISTERED
PROFESSIONAL ENGINEER

CH2MHILL

CH2M HILL

300 E-Business Way, Suite 400
Cincinnati, Ohio 45241

HDR

HDR/Quest

2517 Sir Barton Way
Lexington, Kentucky 40509

January 2009

Contents

Section **Page**

Appendices (Located on Sharepoint Site)

Exhibits

Exhibits

Exhibits

Exhibits

SECTION 1

Introduction

1.1 Basis of Design

This report presents the basis of design for adding Advanced Treatment (AT) to the Fort Thomas Water Plant (FTTP) and Memorial Parkway Treatment Plant (MPTP) owned and operated by Northern Kentucky Water District (NKWD). The major components of advanced treatment include post-filtration granular activated carbon (GAC) adsorption followed by ultraviolet light (UV) treatment. These components were selected and preliminary design criteria were established in a report titled Preliminary Design of GAC Systems by Malcolm Pirnie/GRW, (PD Report, March 2008). The PD Report, March 2008, focused on establishing the process standards for GAC at the NKWD plants and selected the location of the proposed building to house the GAC and UV facilities at each plant.

The materials presented in this report were developed during the conduct of the Preliminary Engineering study by CH2M HILL, HDR and Thelen and Associates with the purpose of further defining the GAC and UV processes, identifying and defining support systems, and investigating and identifying means of integrating the facilities into the existing water treatment plant sites. A similar preliminary engineering study is being conducted by Malcolm Pirnie and GRW for the NWKD Taylor Mill Treatment Plant (TMTP) and coordination of the efforts for the studies was also a focus of the preliminary design. Cost estimates for the construction of the improvements were refined and operations and maintenance cost estimates were prepared for the proposed new facilities.

1.2 Project Goals

The primary overall goal of the NKWD Advanced Treatment initiative is to achieve compliance with the Stage 2 Disinfectants and Disinfection Byproducts (D/DBP) Rule through the implementation of GAC at all of the water treatment plants. Another goal is to provide a multiple barrier treatment approach for disinfection, particularly to address Cryptosporidium and Giardia through the addition of UV in conjunction with the existing chlorination system. Finally the GAC treatment also provides additional removal of organics including contaminants of emerging concern (CEC).

Implementation of Advanced Treatment therefore addresses current and future water quality concerns and enables NKWD to provide superior quality drinking water to the customers.

A project chartering meeting was held on September 30, 2008 attended by representatives of the Advanced Treatment teams for all the plants. The group adopted the following goals for the projects.

- Compliance with the Stage 2 Disinfectants and Disinfection Byproducts (D/DBP) Rule – GAC at FTTP is the single driver to achieving regulatory compliance. Meet schedule - FTTP must be completed by July 2011. Any delay during design puts more pressure on the construction schedule to meet the July 2011 deadline.
- Cost reduction/cost control – Minimize construction and operation costs.
- Minimize disruption of operations during construction – Strike a balance with the outages that can be tolerated and maintaining operability.
- Adopt the same look and feel to how the equipment is laid out and controlled at the three plants.
- Standardize maintenance features.
- Size buildings with enough space for maintaining equipment.
- Minimize contractors' risk and change orders.
- Have less organic demand in the distribution system.
- Carrying chlorine residual longer in the distribution system.

Discussion was held at the meeting regarding sustainability of the AT facilities and the following sustainability definition and approach was prepared and adopted.

Sustainability—shaping the built environment to maintain and enhance the natural environment—is a powerful concept that inspires innovative problem-solving.

Sustainable solutions create value to the owner and innovation from economically viable, environmentally sensitive, and socially responsible approaches:

- Reduce life cycle costs:
  - Reduce energy, water, and material consumption.
  - Reduce waste in all forms, including emissions and heat.
- Favor long-term, systems-oriented, high-value problem-solving.
- Engage owner's employees and stakeholders positively.
- Apply principles to planning, design, construction, and operations.
- Protect natural resources for use by future generations.

The sustainability approach therefore encompasses design, construction, and operations and maintenance activities and concepts. Implementation of these approaches has been fostered by the involvement of members of each group in the Preliminary Engineering study and sets the stage for continued involvement throughout the final design, construction and start-up phases of the project.

1.3 Proposed Improvements

Treatment process related improvements for both plants were identified in the Preliminary Design study and refined and expanded to include supporting facilities in the Preliminary Engineering study. At both plants the AT facilities will be incorporated into the existing process trains between the sand filters and the clearwells. This process location necessitates the addition of low head pumping to lift the filter effluent to the top of the GAC contactors and provide sufficient head to drive the water through the contactors and UV system before discharge into the existing clearwells. A full description of facilities and design criteria for each is provided in this report. Summaries of the proposed improvements at each plant are provided here.

1.3.1 Fort Thomas Treatment Plant

The following process facilities are proposed for FTTP:

- 8 GAC contactor beds.
- 3 GAC feed pumps with variable speed motors and controls.
- 1 GAC backwash pump with variable speed motor and controls, also serves as backup filter backwash pump.
- 1 Filter backwash pump with variable speed motor and controls, also serves as backup GAC backwash pump.
- GAC/Backwash tank supplying the feed and backwash pumps.
- Equalization tank to capture GAC backwash waste, GAC to waste and miscellaneous waste streams requiring no additional treatment before being pumped back to the raw water reservoirs.
- 2 Equalization basin return pumps.
- 2 Slurry water pumps for use in transporting GAC into and out of the contactors.
- 1 Air blower for air scour backwash of the GAC contactors.
- Sodium bisulfite de-chlorination system for the filter effluent consisting of a bulk tank, 2 transfer pumps, a day tank and 3 feed pumps.
- 3 Medium Pressure High Output UV reactors.

Non-process facilities include the GAC building housing all the previously mentioned improvements and meeting/conference room facilities. The building will be constructed separately from existing facilities but will include a covered breezeway to the existing laboratory. An electrical power supply system includes an engine-generator to provide backup power for the existing liquid treatment processes serving the plant downstream of the raw water reservoirs and the proposed AT facilities and an uninterruptible power supply (UPS) for the UV system.

1.3.2 Memorial Parkway Treatment

The following process facilities are proposed for MPTP:

- 6 GAC contactor beds, with 5 fully functional and 1 empty for future expansion.
- 4 GAC feed pumps with variable speed motors and controls.
- 2 Backwash pumps with variable speed motors and controls serving both the GAC contactors and the existing sand filters.
- GAC/Backwash tank supplying the feed and backwash pumps.
- 2 Slurry water pumps for use in transporting GAC into and out of the contactors.
- 1 Air blower for air scour backwash of the GAC contactors.
- 2 Medium Pressure High Output UV reactors.

Non-process facilities include a new building housing most of the previously mentioned improvements. The building will be constructed primarily within the footprint of existing abandoned flocculation basin and rectangular clarifiers although the pump station structure will expand beyond the existing walls. The backwash pumps will be installed in the existing backwash pump station and replace the existing filter backwash pumps. A sodium bisulfite dechlorination system will not be installed initially as NKWD will evaluate the need by comparing operation of the GAC system at FTTP with dechlorination to the operation at MPTP without. If need the system can be added in an existing chemical building that includes a spare chemical room equipped with a 5,000 gallon bulk tank. An electrical power supply system includes an engine-generator to provide backup power for the existing liquid treatment processes and the proposed AT facilities and a UPS for the UV system.

SECTION 2

Characterization of Water Quality and Flows

2.1 Introduction

The Stage 2 Disinfectant/Disinfection Byproduct (D/DBP) Rule will require compliance with locational running annual averages (LRAA) for total trihalomethanes (TTHM) and five haloacetic acids (HAA5) at each sampling location in the distribution system by April 1, 2012. The MCLs for TTHMs and HAA5 are 0.080 mg/L and 0.060 mg/L, respectively.

Plant operating and water quality records between September 2003 and August 2008 were reviewed to confirm the GAC and UV design criteria presented in the PD Report, March 2008. Information reviewed included the following:

- Diurnal flow records for one summer and winter month showing the variation in production rate over the course of a day.
- Maximum and average day flow.
- Alkalinity.
- Hardness.
- Iron.
- Manganese.
- Turbidity.
- Dissolved Organic Carbon (DOC)/Total Organic Carbon (TOC).
- Ultraviolet Absorbance (UVA)/Ultraviolet Transmittance (UVT).

2.2 Fort Thomas Treatment Plant

The Fort Thomas Treatment Plant (FTTP) is rated for a maximum flow of 44 mgd from the Ohio River using conventional coagulation, settling and filtration processes. The plant operates 24 hours a day, 7 days a week. Characterizations of the raw and finished water quality as well as the flow conditions are presented in the following sections.

2.2.1 Water Quality

The water quality data for FTTP are summarized in Exhibit 2-1.

EXHIBIT 2-1
FTTP Water Quality Data (September 2003 – August 2008)

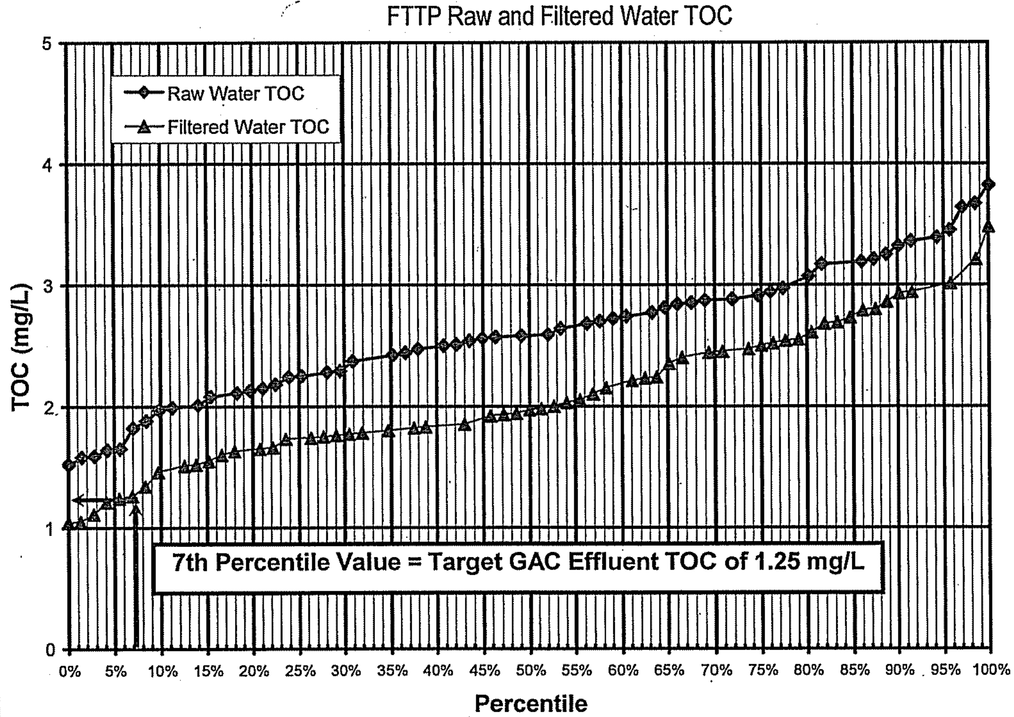
Constituent	Average	Range	Data Points	Standard Deviation	90th Percentile
Total Organic Carbon (TOC), mg/L					
Raw	2.54	1.33 – 4.40	163	0.57	3.27
Filtered	2.08	1.04 – 3.48	73	0.56	2.92
Dissolved Organic Carbon (DOC), mg/L					
Raw	2.46	0.47 – 3.69	201	0.56	3.14
Filtered	1.96	0.76 – 3.92	115	0.64	2.84
Turbidity, mg/L					
Raw	27.8	1.0 – 245.0	1,827	24.7	59.1
Settled	1.43	0.6 – 6.0	1,827	0.62	2.2
Finished*	0.07	0.03 – 0.21	1,827	0.02	0.10
Alkalinity, mg/L as CaCO3					
Raw	67	32 – 107	1,827	10	80
Finished	61	29 – 101	1,827	10	74
Hardness, mg/L as CaCO3					
Raw	128	76 – 184	1,826	18	154
Finished	124	75 – 183	1,827	19	151
Iron, mg/L					
Raw	208.9	0.0 – 5,888.7	102	823.1	5.8
Old Clearwell	0.5	0.005 – 5.4	23	1.5	0.1
New Clearwell	2.0	0.003 – 48.8	35	8.4	3.9
Manganese, mg/L					
Raw	22.2	0.032 – 510.8	103	74.7	60.5
Old Clearwell	0.6	0.001 – 7.5	82	1.7	2.7
New Clearwell	0.3	0.001 – 1.3	18	0.6	1.2
UV Absorbance (UVA254), cm-1					
Raw	0.069	0.024 – 0.300	203	0.033	0.095
Old Clearwell	0.025	0.000 – 0.095	209	0.012	0.040
New Clearwell	0.026	0.000 – 0.095	187	0.012	0.040
UV Transmittance (UVT254), %					
Raw	85.5	50.1 – 94.6	203	5.9	91.2
Old Clearwell	94.4	80.4 – 100.0	209	2.6	97.3
New Clearwell	94.3	80.4 – 100.0	187	2.6	97.1

EXHIBIT 2-1
FTTP Water Quality Data (September 2003 – August 2008)

Constituent	Average	Range	Data Points	Standard Deviation	90th Percentile
SUVA					
Raw	2.9	0.9 – 13.4	201	1.6	4.1
Old Clearwell	1.6	0.8 – 5.3	116	0.5	2.0
New Clearwell	1.5	0.9 – 3.0	115	0.3	1.9
Water Temperature, °F	62	36 - 88	1,827	15	82
*Based on combined filter effluent daily averages at 4-hour intervals.					

Filtered water TOC ranged between 1.04 mg/L and 3.48 mg/L, as shown on Exhibit 2-2. Based on conservative assumptions for the distribution system (water age) and treatment (pH, chlorine residual concentration and water temperature), the PD Report, March 2008 predicted TTHM formation would occur at a concentration of 0.064 mg/L if the target GAC effluent TOC concentration is 1.25 mg/L. Exhibit 2-2 shows that roughly 7 percent of the filtered water TOC data evaluated is less than or equal to the target GAC effluent TOC concentration. Based on current TOC levels and disinfection practices, TTHMS and HAA5 will form at concentrations in excess of the Stage 2 D/DBP MCLs of 0.080 mg/L and 0.060 mg/L, respectively. Therefore, TOC removal will be required for regulatory compliance.

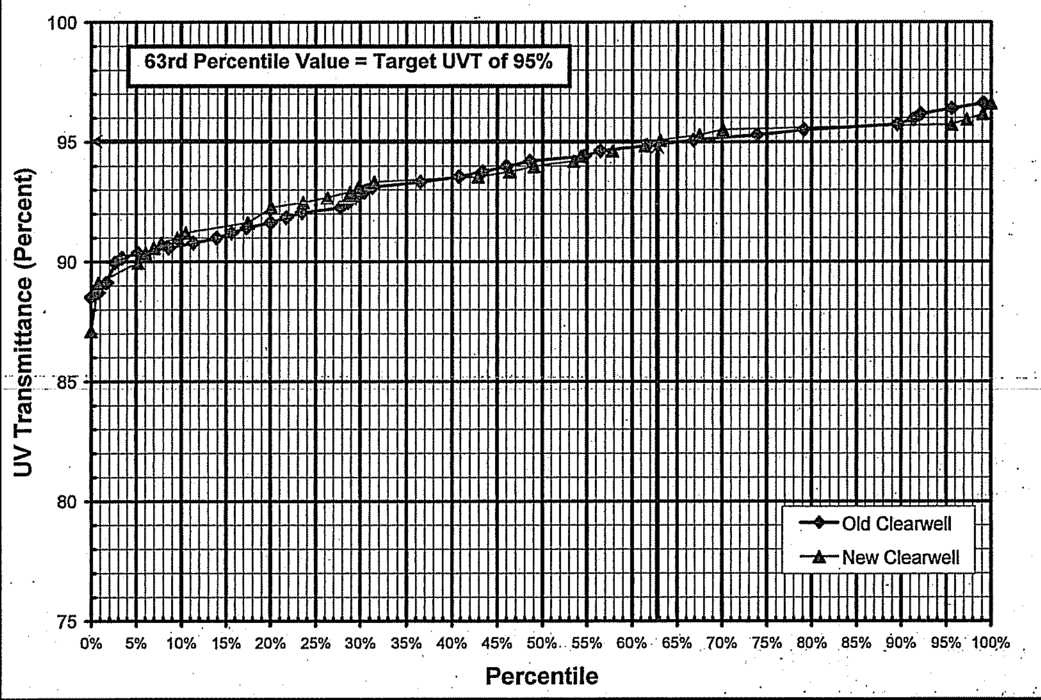
EXHIBIT 2-2
FTTP Raw and Filtered Water TOC



The UV transmittance (UVT) of water is an important parameter used in the design of UV disinfection systems. An influent UVT of 95 percent is proposed based on a review of historical plant data and a comparison with plant performance data from the Greater Cincinnati Water Works' (GCWW) Richard Miller WTP.

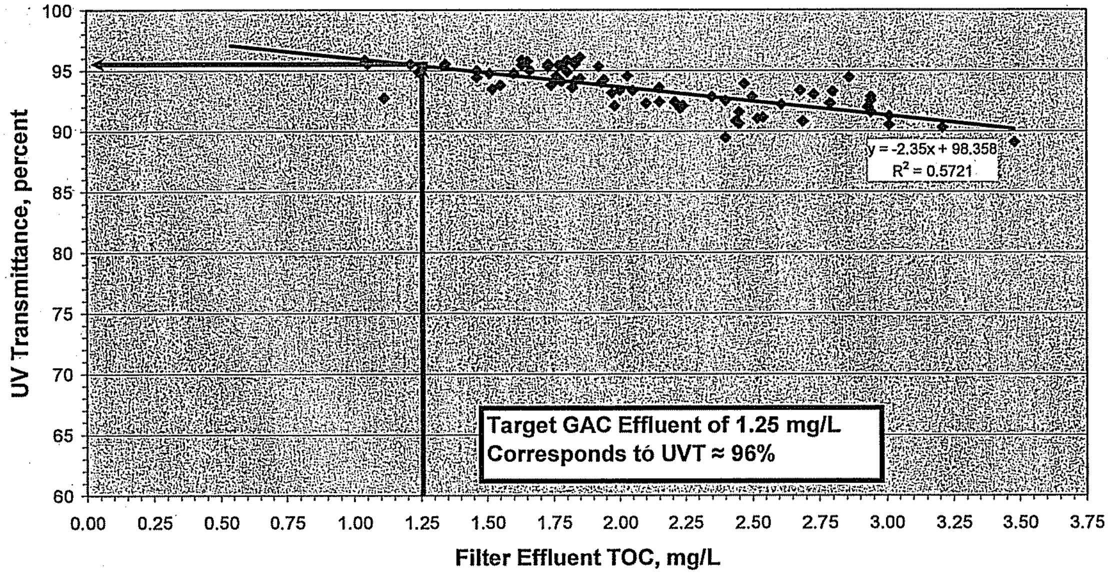
Finished water UVT for the old and new clearwells ranged from 80 percent to 100 percent, as shown on Exhibit 2-3. A frequency analysis of the UVT data indicated that 63 percent of the UVT data between September 1999 and August 2008 is less than or equal to the target UV system influent UVT of 95 percent. The GAC facilities will remove the natural organic matter, resulting in a decrease of TOC and an increase in the UVT of the water entering the UV reactors.

EXHIBIT 2-3
FTTP Finished Water UV Transmittance



A linear relationship was formed between TOC and UVT in order to determine what effluent UVT value may correspond with the target GAC effluent TOC goal of 1.25 mg/L. The relationship between filter effluent TOC and finished water UVT at FTTP is presented in Exhibit2-4. The resultant effluent UVT level corresponding to a GAC effluent TOC of 1.25 mg/L is about 96 percent. The best fit linear regression is shown and the correlation coefficient (R2 value) shows a fairly good correlation.

EXHIBIT 2-4
FTTP Finished Water UVT vs. Filter Effluent TOC



2.2.2 Current Flows

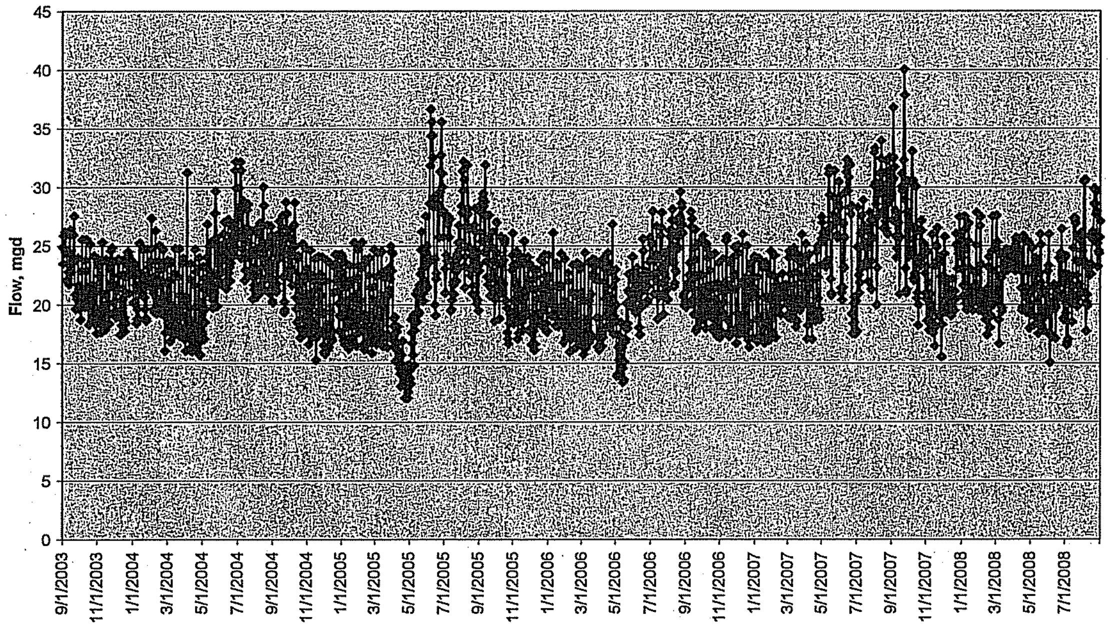
The daily average flow data for FTTP is summarized in Exhibit 2-5 and presented in Exhibits 2-6 through 2-9.

EXHIBIT 2-5
FTTP Flow Data (September 2003 – August 2008)

Parameter	Average	Range
Flow, mgd	22.0	12.0 – 40.0

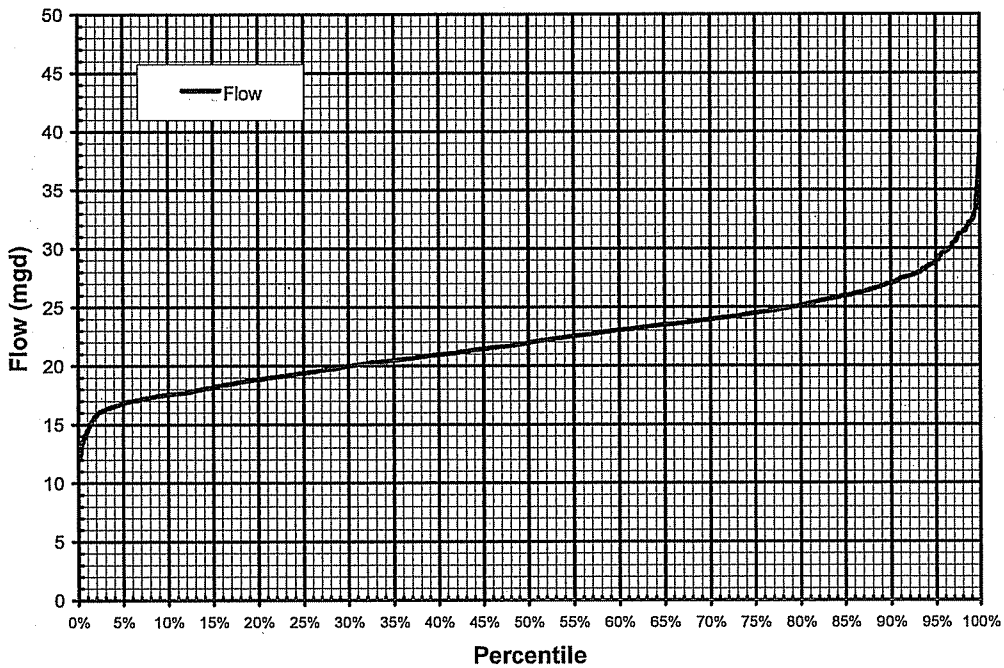
The daily average flow is presented in Exhibit 2-6.

EXHIBIT 2-6
FTTP Flow



A frequency analysis of the daily average flow is presented in Exhibit 2-7. About 48 percent of the time, flow between September 2003 and August 2008 was less than or equal to the average day flow of 22 mgd. The plot also shows that 99 percent of the time, the FTTP flow did not exceed 40 mgd.

EXHIBIT 2-7
FTTP Flow Data



Diurnal flow records for one winter and one summer month showing the variations in the production rate over the course of a day are shown on Exhibits 2-8 and 2-9, respectively. The diurnals show that:

- Minimum flow fell below 12 mgd (to about 9 mgd) overnight in November 2007.
- Variation is significant over the course of a day.
- In August 2008, instantaneous flows exceeded 40 mgd and dropped to about 12 mgd within days of each other.
- Most severe impacts of rapid flow changes are anticipated for clarification, chemical dosing, and filtration. Impacts on GAC and UV are not expected to be significant.

EXHIBIT 2-8
FTTP Diurnal Flow
November 2007

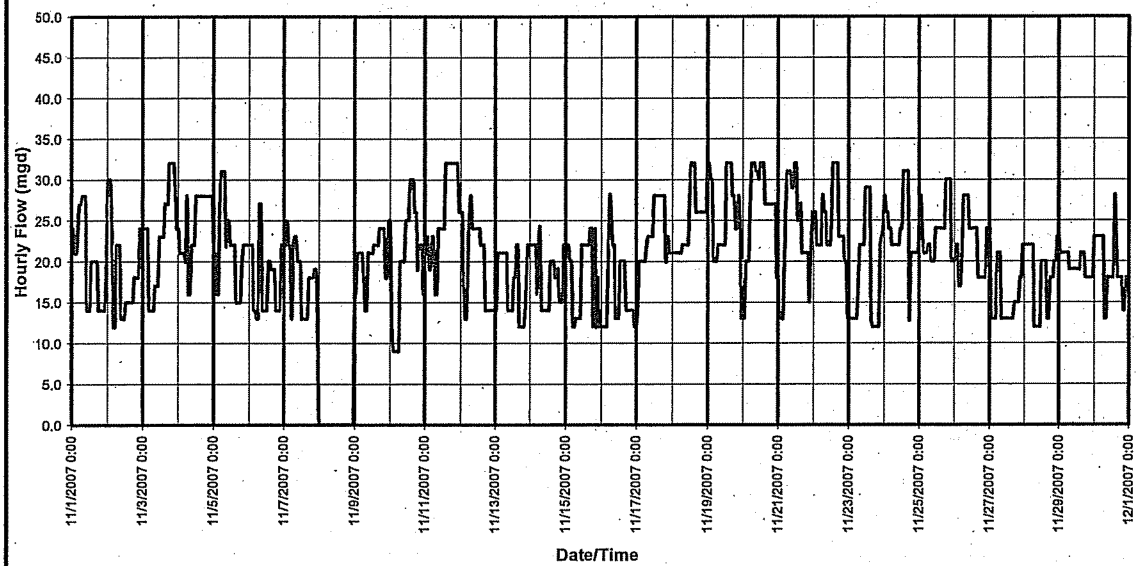
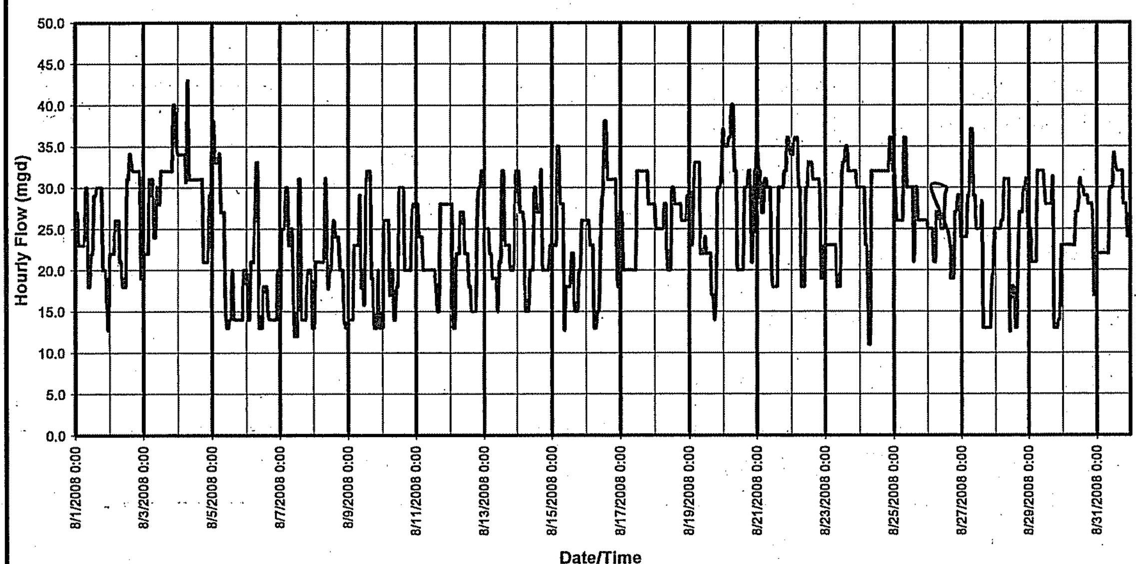


EXHIBIT 2-9
FTTP Diurnal Flow
August 2008



2.2.3 Flow Projections

The projected average day flow developed and provided by NKWD for FTTP for Year 2006 through 2030 is listed in Exhibit 2-10. The average day demands are based on the assumption that MPTP is expanded to 15 mgd in 2020 and that a major portion of the Covington area is supplied by MPTP in lieu of FTTP. The new facilities proposed for MPTP will provide treatment capacity in the advanced treatment facilities of 15 mgd; however, the plant can be expanded to at least 20 mgd in the long term. The advanced treatment facilities will have a hydraulic capacity of 20 mgd to accommodate future plant expansion. It is assumed that TMTP will supply 6 mgd through 2030 under average day conditions.

EXHIBIT 2-10
FTTP Flow Projections

Year	Average Day, mgd
2006	19.88
2007	20.32
2008	20.76
2009	21.21
2010	21.65
2011	22.09
2012	22.53
2013	22.97
2014	23.42
2015	23.86
2016	24.31
2017	24.75
2018	25.19
2019	25.64
2020	21.72
2021	22.17
2022	22.62
2023	23.07
2024	23.52
2025	23.97
2026	24.43
2027	24.88
2028	25.33
2029	25.78
2030	26.23

2.3 Memorial Parkway Treatment Plant

The Memorial Park Treatment Plant (MPTP) currently treats up to 10 mgd from the Ohio River using coagulation, high-rate ballasted flocculation (Actiflo®) and filtration processes. The plant operates 16 hours a day, 7 days a week. A characterization of the raw and finished water quality as well as the flow conditions is presented in the following sections.

2.3.1 Raw Water Quality

The water quality data for MPTP is summarized in Exhibit 2-11.

EXHIBIT 2-11
MPTP Water Quality Data (September 2003 – August 2008)

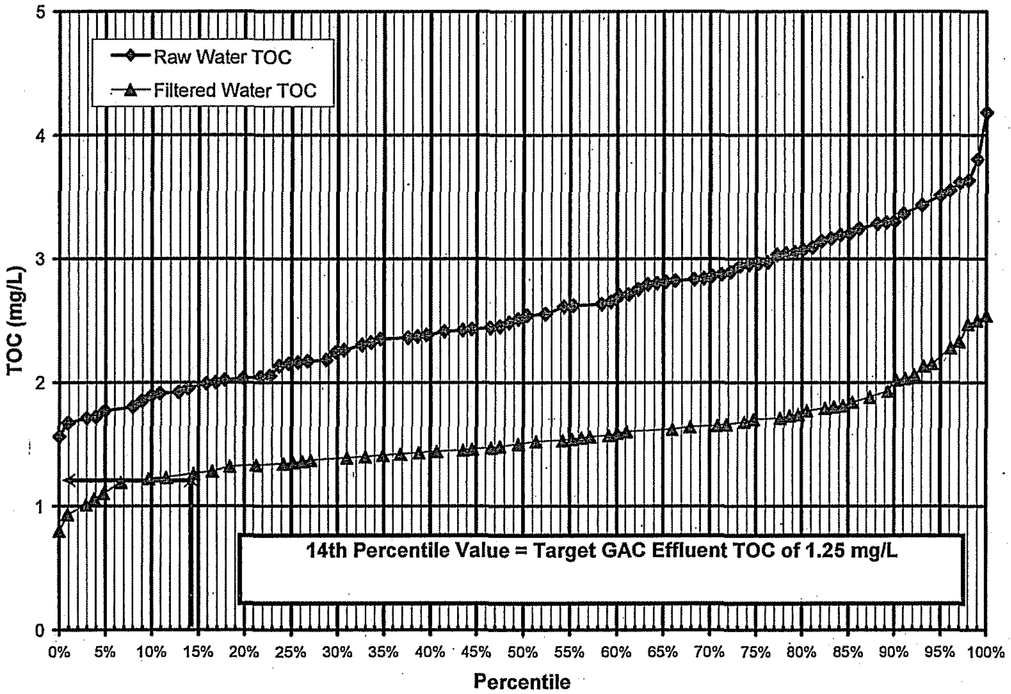
Constituent	Average	Range	Data Points	Standard Deviation	90th Percentile
Total Organic Carbon (TOC), mg/L					
Raw	2.57	1.56 – 4.18	102	0.56	3.30
Filtered	1.55	0.80 – 2.54	104	0.33	1.99
Dissolved Organic Carbon (DOC), mg/L					
Raw	2.56	1.23 – 3.85	129	0.51	3.25
Finished	1.64	0.94 – 2.74	136	0.32	2.01
Turbidity, mg/L					
Raw	12.2	1.0 – 94.1	1,695	12.1	29.0
Settled	1.18	0.5 – 3.9	1,695	0.44	1.8
Finished*	0.08	0.02 – 0.21	1,719	0.02	0.10
Alkalinity, mg/L as CaCO3					
Raw	65	44 – 110	1,719	8.8	78
Finished	56	38 – 94	1,725	7.9	66
Hardness, mg/L as CaCO3					
Raw	129	90 – 188	1,717	18	156
Finished	127	86 – 180	1,725	18	154
Iron, mg/L					
Raw	208.9	0.0 – 523.8	50	92.8	0.8
Finished	0.6	0.009 – 12.4	50	2.5	0.04
Manganese, mg/L					
Raw	3.9	0.003 – 135.2	50	20.5	0.2
Finished	0.002	0.001 – 0.004	20	0.001	0.003

EXHIBIT 2-11
MPTP Water Quality Data (September 2003 – August 2008)

Constituent	Average	Range	Data Points	Standard Deviation	90th Percentile
UV Absorbance (UVA254), cm-1					
Raw	0.069	0.010 – 0.240	128	0.029	0.095
Finished	0.021	0.000 – 0.070	138	0.011	0.030
UV Transmittance (UVT254), %					
Raw	85.6	57.5 – 97.7	128	5.3	91.2
Finished	95.3	85.1 – 100.0	138	2.3	97.7
SUVA					
Raw	2.7	0.0 – 11.6	129	1.3	3.6
Finished	1.5	0.7 – 4.1	109	0.4	1.9
Water Temperature, °F	63	37 - 86	1,724	14	81
*Based on combined filter effluent daily averages at 4-hour intervals.					

Filtered water TOC ranged between 0.80 mg/L and 2.54 mg/L, as shown on Exhibit 2-12. Based on conservative assumptions for the distribution system (water age) and treatment (pH, chlorine residual concentration and water temperature), the PD Report, March 2008 predicted TTHM formation would occur at a concentration of 0.064 mg/L if the target GAC effluent TOC concentration is 1.25 mg/L. Exhibit 2-12 shows that roughly 14 percent of the filtered water TOC data evaluated is less than or equal to the target GAC effluent TOC concentration. Based on current TOC levels and disinfection practices, TTHMS and HAA5 will form at concentrations in excess of the Stage 2 D/DBP MCLs of 0.080 mg/L and 0.060 mg/L, respectively. Therefore, TOC removal will be required for regulatory compliance.

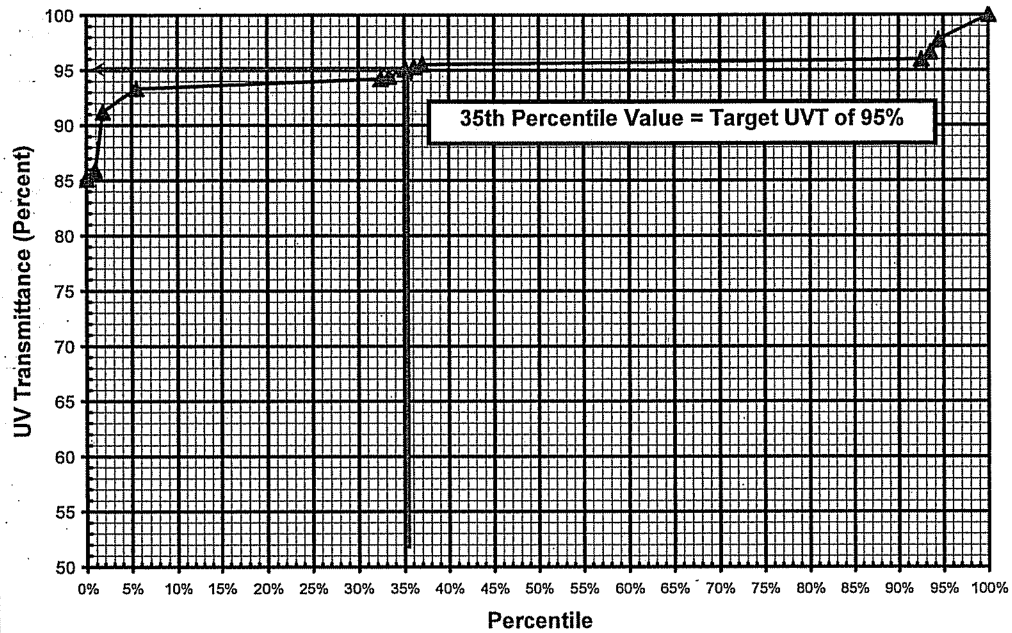
EXHIBIT 2-12
MPTP Raw and Filtered Water TOC



The UV transmittance (UVT) of water is a major parameter used in the design of UV disinfection systems. An influent UVT of 95 percent is proposed based on a review of historical plant data and a comparison with plant performance data from the Greater Cincinnati Water Works' (GCWW) Richard Miller WTP.

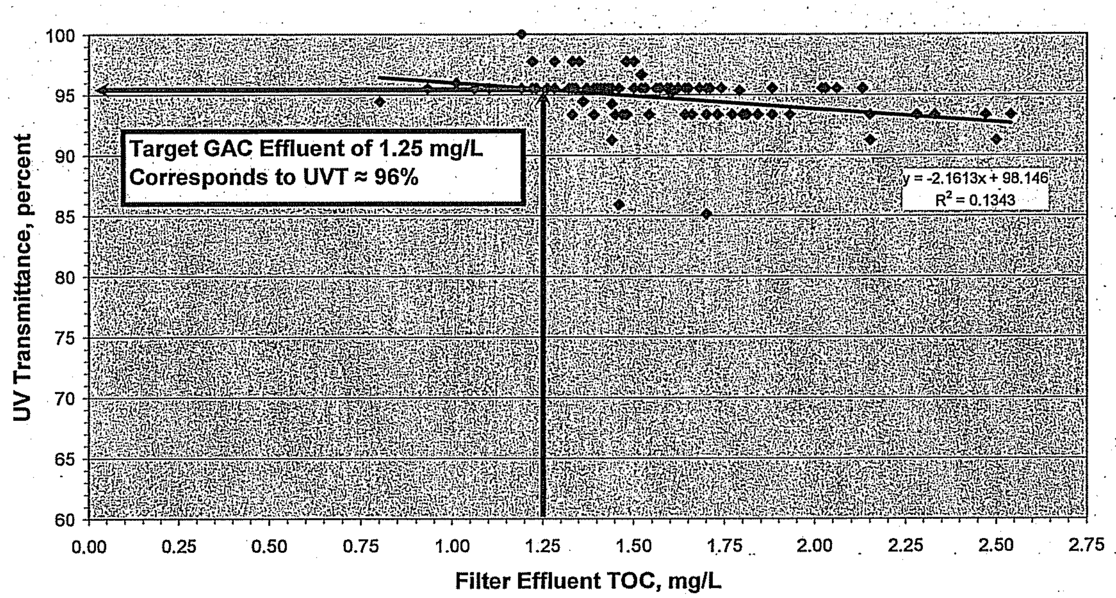
MPTP finished water UVT ranged from 85 percent to 100 percent, as shown on Exhibit 2-13. A frequency analysis of the UVT data indicated that 35 percent of the UVT data between September 1999 and August 2008 is less than or equal to the target UV system influent UVT of 95 percent. The GAC facilities will remove the natural organic matter, resulting in a decrease of TOC and an increase in the UVT of the water entering the UV reactors.

EXHIBIT 2-13
MPTP Finished Water UV Transmittance



A linear relationship was formed between TOC and UVT in order to determine what effluent UVT value may correspond with the target GAC effluent TOC goal of 1.25 mg/L. The relationship between filter effluent TOC and finished water UVT at MPTP is presented in Exhibit 2-14. The resultant effluent UVT level corresponding to a GAC effluent TOC of 1.25 mg/L is about 96 percent. The best fit linear regression is shown. The correlation coefficient (R2 value) shows scatter and not as good of a correlation as that for FTTP.

EXHIBIT 2-14
MPTP Finished Water UVT vs. Filter Effluent TOC



2.3.2 FTTP and MPTP Finished Water Quality Differences

It is interesting to note that while both plants use the same source water (Ohio River) and use conventional treatment processes, there are slight differences between the plants' finished water qualities. The differences can be attributed to the Actiflo® clarification process used at MPTP. Exhibit 2-15 presents the constituents with the most significant differences in concentrations.

EXHIBIT 2-15
Finished Water Quality Comparison (September 2003 – August 2008)

Constituent	FTTP		MPTP	
	Average	Range	Average	Range
TOC, mg/L Filtered	2.08	1.04 – 3.48	1.55	0.80 – 2.54
Alkalinity, mg/L Finished	61	29 - 101	56	38 - 94
Iron, mg/L Finished	2.0	0.003 – 48.8	0.6	0.009 – 12.4
Manganese, mg/L Finished	0.6	0.001 – 7.5	0.002	0.001 – 0.004
UV Absorbance (UVA254), cm-1 Finished	0.025	0.00 – 0.095	0.021	0.00 – 0.070

EXHIBIT 2-15
Finished Water Quality Comparison (September 2003 – August 2008)

Constituent	FTTP		MPTP	
	Average	Range	Average	Range
UV Transmittance (UVT254), % Finished	94.4	80.4 – 100.0	95.3	85.1 – 100.0
SUVA Finished	1.6	0.8 – 5.3	1.5	0.7 – 4.1

These results demonstrate that Actiflo® at MPTP does a better job at organics removal than conventional clarification at FTTP. This effectiveness will be beneficial in terms of operating costs for both post-filter GAC adsorption and for UV disinfection. Any improvements that NKWD can achieve at FTTP will be similarly advantageous.

2.3.3 Current Flows

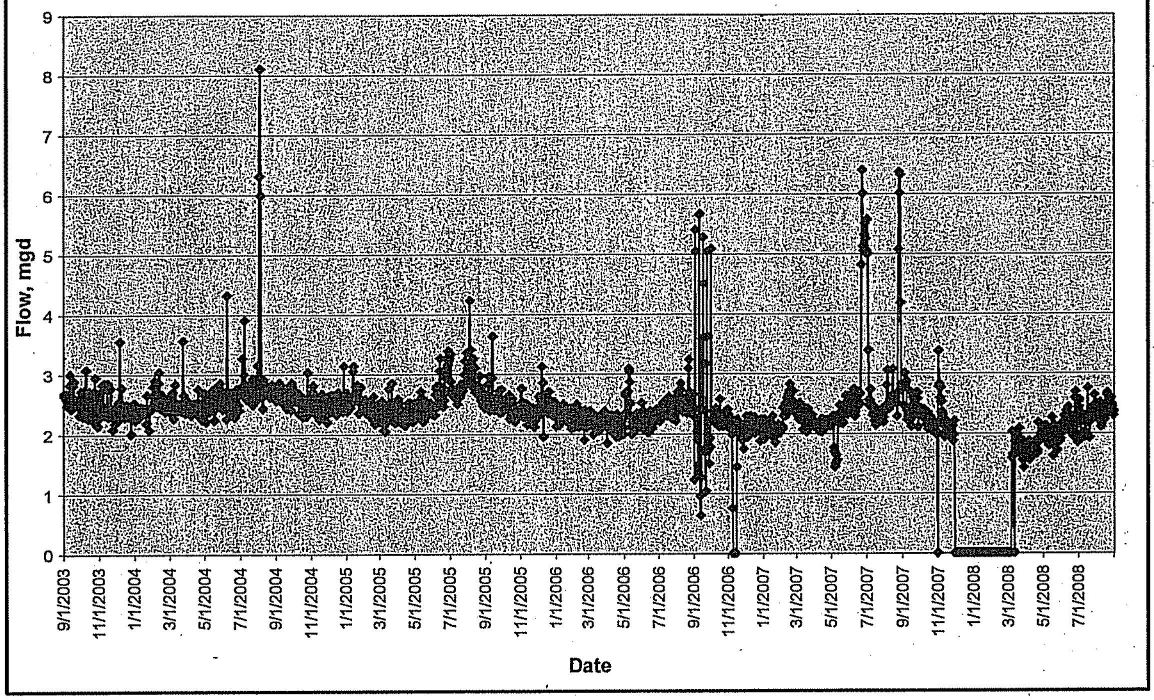
The daily average flow data for MPTP is summarized in Exhibit 2-16 and presented in Exhibit 2-17 through 2-20. The MPTP operates two shifts, 7 days per week. MPTP does not operate 3rd shift. The daily base flow is typically around 4.5 mgd; however, the average flow over 24 hours is 2.3 mgd.

EXHIBIT 2-16
MPTP Flow Data (September 2003 – August 2008)

Parameter	Average	Range
Flow, mgd	2.3	0.0 – 8.1

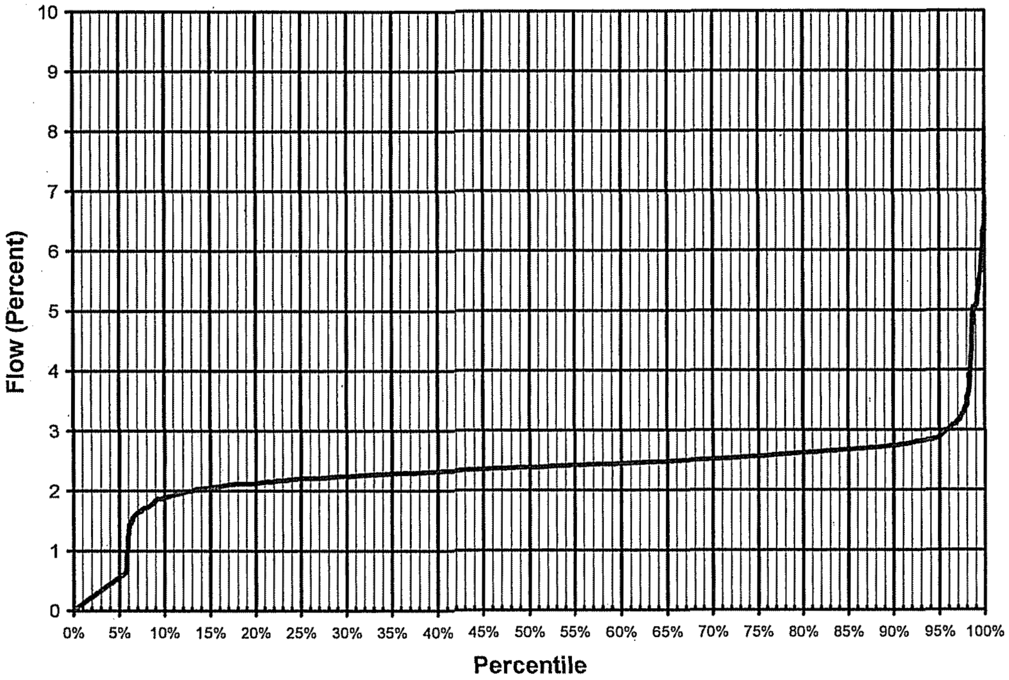
The daily average flow is presented in Exhibit 2-17.

EXHIBIT 2-17
MPTP Flow



A frequency analysis of the daily average flow is presented in Exhibit 2-18. About 39 percent of the flow data between September 2003 and August 2008 is less than or equal to the average day flow of 2.3 mgd. The plot also shows that 100 percent of the flow data has not exceeded 10 mgd.

EXHIBIT 2-18
MPTP Flow



Diurnal flow records for one winter and one summer month showing the variations in the production rate over the course of a day are shown on Exhibits 2-19 and 2-20, respectively. The diurnals show that the plant has not treated flow above 10 mgd.

EXHIBIT 2-19
MPTP Diurnal Flow
November 2007

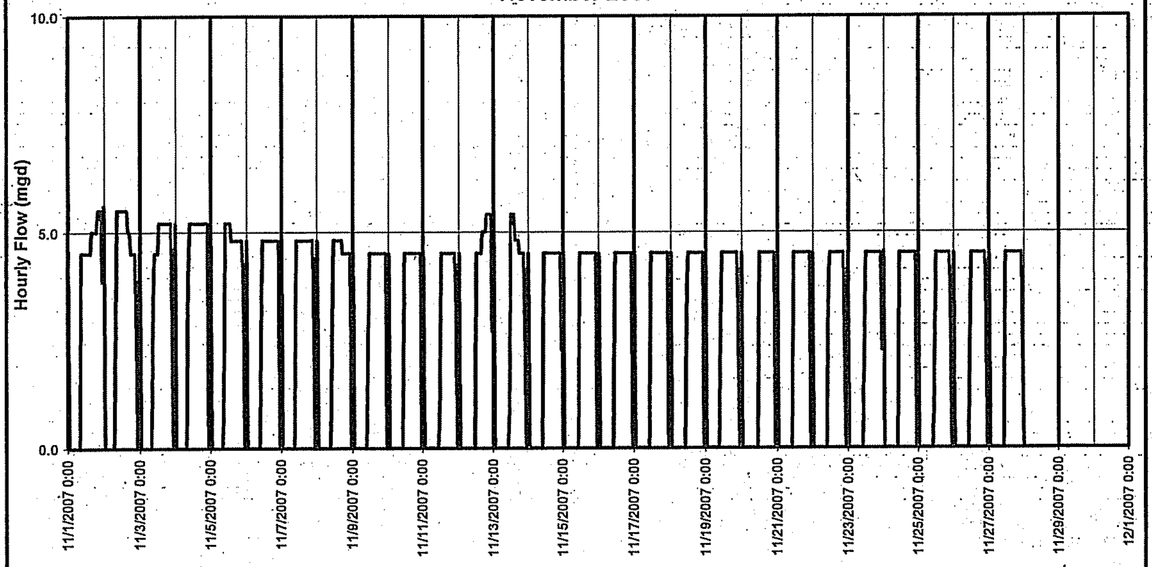
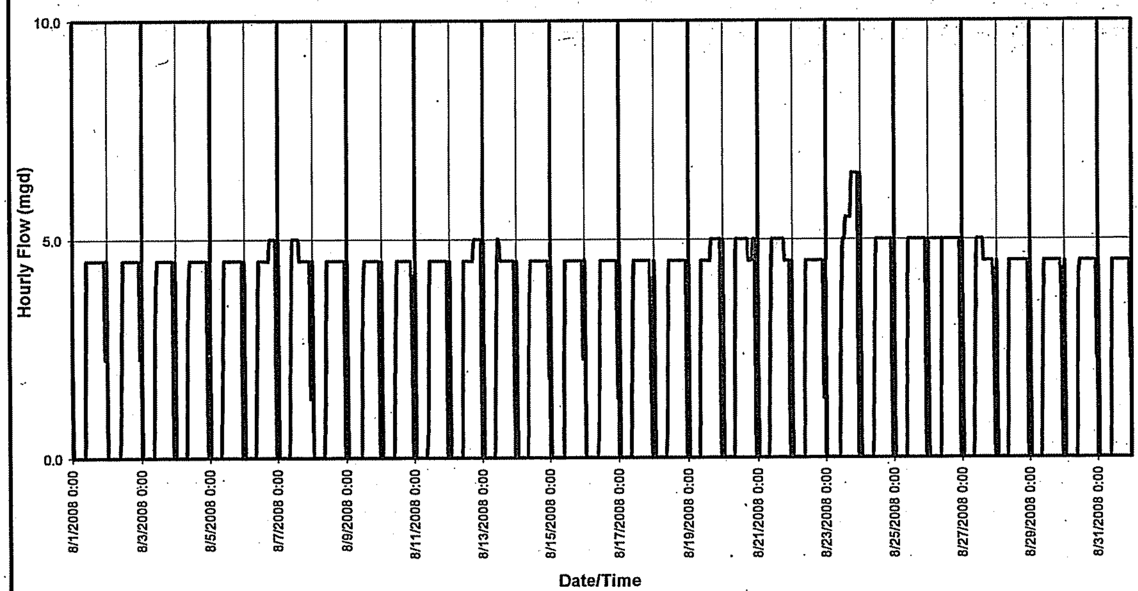


EXHIBIT 2-20
MPTP Diurnal Flow - August 2008



2.3.4 Flow Projections

The projected average day flow developed and provided by NKWD for MPTP for Year 2006 through 2030 is listed in Exhibit 2-21. The average day demands are based on the assumption that MPTP is expanded to 15 mgd in 2020 and that a major portion of the Covington area is supplied by MPTP in lieu of FTTP. The new facilities proposed for MPTP will allow the plant to be rated at 15 mgd; however, the plant can be expanded to at least 20 mgd in the long term. It is assumed that TMTP will supply 6 mgd through 2030 under average day conditions.

EXHIBIT 2-21
MPTP Flow Projections

Year	Average Day, mgd
2006	2.70
2007	2.83
2008	2.96
2009	3.08
2010	3.21
2011	3.34
2012	3.47
2013	3.60
2014	3.72
2015	3.85
2016	3.98
2017	4.11
2018	4.24
2019	4.37
2020	8.87
2021	8.90
2022	8.94
2023	8.97
2024	9.01
2025	9.04
2026	9.07
2027	9.11
2028	9.14
2029	9.18
2030	9.21

Review of Preliminary Design Report

In January 2006, the United States Environmental Protection Agency (USEPA) published the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and the Stage 2 Disinfectants and Disinfection By-Product (DBP) Rule. Both regulations will take effect in mid-2012 for the NKWD. To comply with the Stage 2 DBP Rule, NKWD will need to reduce concentrations of DBPs, particularly in warm weather months at points in the water distribution system. Monitoring of DBPs is ongoing by NKWD and levels exceeding the future standards have been identified at locations in the service area of both the FTTP and MPTP.

The Northern Kentucky Water District (NKWD), Malcolm Pirnie, and GRW, Inc., completed a preliminary design report, "Preliminary Design of GAC Systems," in March 2008. This document is referred to as the "PD Report, March 2008". The PD Report, March, 2008, summarized a review of treatment options for NKWD to comply with these new regulations, and then recommended specific compliance strategies (treatment technologies) for implementation. Available site options were reviewed for each treatment technology at each of the NKWD's three treatment plants, and specific site locations were recommended for the new facilities. The PD Report, March 2008 also included an opinion of probable project costs for each NKWD treatment plant.

One of the initial tasks for the current project, Advanced Treatment at FTTP and MPTP, was to review the key recommendations of the PD Report, March 2008. The objective was to make the preliminary engineering as efficient as possible by building on the prior recommendations. In the following sections, the key recommendations of the PD Report, March 2008 are reviewed, and the specific recommendations that were carried forward for the Advanced Treatment at FTTP and MPTP project are identified.

3.1 Processes

Based on the PD Report, March 2008, the NKWD is proceeding with implementing two new treatment technologies, post-filter GAC adsorption and UV disinfection, at the FTTP and at the MPTP. These treatment technologies are feasible approaches to meet the NKWD treatment objectives, as described in the following sections.

3.1.1 GAC Adsorption

GAC adsorption is being implemented to reduce the concentration of organics that serve as the precursors to the formation of DBPs, specifically total trihalomethanes (TTHMs) and haloacetic acids (HAAs), which are regulated under the Stage 2 DBP Rule. Based on bench-scale testing completed by the NKWD, an effluent total organic carbon (TOC) target concentration of 1.25 mg/L was established as the treatment goal for GAC adsorption. Based on the testing completed and the specific characteristics of the NKWD treatment facilities and distribution system, if TOC is removed to this concentration through upstream treatment and GAC adsorption, the NKWD anticipates compliance with the Stage 2 DBP Rule. It is recommended that NKWD review the target after the Advanced Treatment facilities are operational to determine whether seasonal or overall adjustments can be made.

The design concept for GAC adsorption was based on rapid small-scale column tests (RSSCTs) performed on several occasions by researchers under contract to NKWD. These tests, combined with simulated distribution system (SDS) tests of DBP formation, identified the treatment target noted previously. In addition, the PD Report, March 2008 included analyses that recommended the post-filter GAC adsorption process be designed with a 20-minute empty bed contact time (EBCT). This EBCT was found to provide a balance between capital cost, GAC bed life, and Operation and Maintenance cost.

Additional key assumptions and/or recommendations noted in the PD Report, March 2008 include the following:

- Operating modes were evaluated, and a staggered operation approach was recommended. With this approach, GAC media is changed in one contactor at a time, utilizing blending and the shape of the GAC exhaustion curve to reduce GAC replacement frequency and costs.
- As noted in Table 4-2 of the PD Report, March, 2008, the estimated replacement frequency for GAC was every 200 days at the FTTP and, per Table 5-2, every 240 to 260 days at the MPTP. These replacement frequencies are based on maximum design flow rates at each plant. With 8 contactors at the FTTP, a 200-day replacement frequency, and a staggered operation mode, replacement of the GAC in an individual contactor would be as frequently as every 200 days divided by 8 contactors, or every 25 days.
- The proposed design from the PD Report, March 2008 provides a 20-minute EBCT at the FTTP with all contactors in service. At the MPTP, the design EBCT is 19.8 minutes with all contactors in service.

From the preliminary design, the number of contactors, EBCT, and operation mode are feasible design criteria, consistent with standards of the industry, and these elements of the project have been incorporated into the detailed design.

Based on review of the PD Report, March 2008 by CH2M HILL/HDR, the following points are noted for consideration:

- GAC media life will be extended, with less frequent required media replacement, with EBCTs exceeding 20 minutes. All contactors should be in service at all times when available. For operation at anticipated average flowrates at each treatment plant, the GAC is expected to last more than 200 days before replacement is necessary to meet the finished water TOC target.

- GAC media life will be extended, with less frequent required media replacement, with better TOC removal through conventional treatment. The more TOC removed prior to GAC, the more bed volumes GAC will be able to treat. The bench-scale RSSCTs were conducted with 2.4 to 2.7 mg/L of TOC in the GAC influent. Optimizing coagulation and conventional treatment may allow the NKWD to further reduce GAC replacement frequency and operating costs.
- The Advanced Treatment at FTTP and MPTP project will include further evaluation of operating strategies and operations planning as the project progresses. These evaluations should include developing a plan to get into staggered operation mode. This may consist of operating fewer than all contactors during initial operation.
- The evaluation of operating modes should also address development of a plan for scheduling media unloading and new media deliveries with the GAC supplier. With varying flowrates and varying TOC loading to the post-filter GAC contactors, the initial schedule may require forecasts and conservatism to meet water quality targets.

3.1.2 UV Disinfection

The PD Report, March 2008 also included "contingencies for including a UV disinfection facility at each treatment plant" in the event NKWD desires to add an additional microbial barrier to the WTP process. The PD Report, March 2008 includes preliminary planning for UV disinfection at each facility, and a UV facility is included in the opinion of probable project costs for each NKWD treatment plant.

For the Advanced Treatment at FTTP and MPTP project, the design of UV disinfection facilities was included in the scope of work. Although Cryptosporidium sampling of the NKWD source waters does not indicate a regulatory need to provide UV disinfection, the NKWD has identified the water quality improvement and public health benefit of UV disinfection as meriting the inclusion of UV facilities in the project. This element of the project has been included in the detailed design.

3.2 Facilities

In the following sections, the new facilities are described separately for each treatment plant.

3.2.1 Fort Thomas Treatment Plant

At the FTTP, available space at the existing site is extremely limited. The PD Report, March 2008 included an evaluation of available locations for GAC facilities, and "Option 3," with the new facilities located at the south end of the plant site, east of the existing Water Quality Laboratory, was identified as the recommended location. This location does involve some key constraints, specifically constructing the building along a steep hillside with minimal room for modification to the building dimensions estimated in the PD Report, March 2008. This approach requires constructing three walls of the GAC building as retaining walls, with significant rock excavation required for construction.

To fit the GAC contactors on the selected site location, it is necessary to design and construct the contactors in a linear arrangement. CH2M HILL's preferred filter (or contactor) arrangement involves a center filter piping gallery, with the longer dimension of the filters parallel to the gallery wall to provide plenty of spacing, lay lengths for pipe and components, and access for operations. At the FTTP, the restrictive site constraints dictate the layout of the GAC contactors. This linear arrangement is feasible, and will be designed to maximize spacing and access within the available footprint.

Flow to the GAC facility will be pumped, with a new booster pump station and wetwell shown as a separate, adjacent facility. Backwash supply flows were assumed to be pumped from either the same booster pump station wetwell or from the existing finished water clearwell. The PD Report, March 2008 assumed that backwash waste and contactor-to-waste flows from GAC would be routed to an equalization basin located beneath the GAC facility.

The UV disinfection facility was assumed to be located in a separate building, adjacent to the GAC facility. As described later in this document, for economic and space planning reasons, the design has been modified to make the UV disinfection facility part of a common building with the GAC facility.

Based on review of the site constraints and the potential locations, the site location selected represents a feasible location for the new facilities.

3.2.2 Memorial Parkway Treatment Plant

The MPTP is also restrictive in terms of options for a new GAC facility. The PD Report, March 2008 reviewed two site options, and it was recommended that the GAC contactors be installed in the footprint of existing Sedimentation Basins No. 5 and No. 6. These two basins were removed from service in 1997 when the Actiflo process was installed for clarification. Similar to the FTTP, this retrofit location assumes the contactors are constructed in a linear arrangement (Configuration C of the PD Report, March 2008).

Flow to the GAC facility will be pumped, with a new booster pump station and wetwell shown as a separate, adjacent facility. Backwash supply flows were assumed to be pumped from the same booster pump station wetwell. The PD Report, March 2008 assumed that backwash waste and contactor-to-waste flows from GAC would be routed directly by gravity to the existing North Reservoir.

The UV disinfection facility was assumed to be located in a separate room on the footprint of the abandoned flocculation basins, adjacent to the GAC facility.

Based on review of the site constraints and the potential locations, the site location selected represents a feasible location for the new facilities.

3.2.3 Common Elements of Both Facilities

There are a number of elements that both the FTTP and MPTP have in common, and that will be incorporated in final design of the GAC facilities. These elements include the following:

- Access along the full gallery length, with truck access on the gallery side of the contactors.
- Dedicated GAC truck transfer station for each contactor.
- GAC contactor-to-waste piping.
- Differential pressure transmitters for each contactor to allow headloss measurement.

There are also certain, specific elements of the PD Report, March 2008 recommendations that have not been carried forward as development of the project concepts for final design has progressed. These elements, which include the type of underdrain, the inclusion of air scour, the need for dechlorination facilities, the backwash supply location, and the specific flows to be accommodated at the backwash waste equalization basin, are addressed in the following sections of this document.

SECTION 4

Site Visits

4.1 Introduction

Tours of operational GAC facilities were taken by NKWD, CH2M HILL, and HDR staff during October 2008 for the purpose of gaining insights into the design and operation of GAC contactors. The facilities included a wastewater treatment plant with both pressure and gravity contactors and a regeneration system and three water treatment plants with post-filter GAC contactors. A tour of the Greater Cincinnati Water Works' (GCWW) Richard Miller WTP to supplement the information gained on the prior trips is planned to occur during the final detailed design period. The plants were selected based on plant capacity and features of interest to the District to be incorporated at FTTP and MPTP. The following sections summarize the lessons learned; site specific GAC system components; operation and maintenance observations; and design recommendations from the tours.

4.2 Lessons Learned

The key lessons learned from the site visits include the following:

- The GAC market is very fluid as a result of increasing activated carbon use at water plants and electrical power plants and the introduction of foreign produced GAC. It is very difficult to project future costs for virgin and regenerated carbon due to the volatility in both the carbon and energy markets.
- Foreign produced carbon is increasingly available but historically the carbon has tended to break down into fines more readily than domestic carbon due to a different production method used for GAC formation.
- GAC delivery scheduling is critical when establishing a new account for initial bed fill. The supply is tight and vendors indicate a potential 8-month lead time for virgin, domestic carbon.
- Once an account is established vendors have honored supply schedules but the delivery window is on the order of weeks, not days as is the case with other treatment chemicals.
- Vendors are resistant to long-term (> 1 year) contracts with utilities.
- Vendors are increasingly interested in offering regeneration of GAC from a plant but regeneration is affected by seasonal swings in natural gas prices.

- Flexibility and simplicity are important for GAC deliveries. Most of the sites had one delivery approach in mind for GAC delivery (bulk or SuperSacks) and made modifications to the installed system later. Deliveries are dictated by how the suppliers can best deliver the GAC in the region.
- Simplify the GAC piping. Most of the sites installed more piping than they actually use. Provisions are needed to minimize plugging and ease cleaning of pipes. Suppliers tend to use their own hoses, eductors, and hoppers or cyclones for delivery or removal of GAC.
- Vendors provide crews for removing spent carbon and replacing new or regenerated carbon and the cost is included in the contract including the cost of replacing carbon lost as fines.
- All of the underdrains used at the tour sites were stainless steel. There was mixed success with the Johnson Screens. The Glendale, Arizona Oasis plant experienced trouble with the Triton (half circle) underdrains. Any underdrain, regardless of material of construction, can plug if the GAC is not placed properly; therefore, a good placement and defining plan is required.
- Considerable release of fines occurs when loading new or regenerated carbon in contactors. GAC should be specified by volume or tank level and not by mass. GAC also should be loaded in lifts with backwashes in between the lifts followed by contactor to waste operation for final de-fining.
- When GAC is loaded into a basin in the slurry form the GAC should be submerged and allowed to soak up water for several hours before backwashing and when placed in dry form the resting period should be considerably longer
- A robust supply of slurry water is needed for carbon transport for loading and unloading basins. At least 110 psi and 100 gpm are needed.
- Air scour is preferred by the plants that have it.
- The level of effort to operate the GAC facilities is similar to that for conventional sand filters.
- Instrumentation such as TOC analyzers, turbidity analyzers can provide valuable operating information but due to the extended carbon delivery window and the variations in carbon life, monitoring of contactor performance parameters on a daily or weekly basis is normally adequate for operations.

4.3 UOSA

The UOSA Millard Robbins Water Reclamation Plant, located in Centerville, Virginia, was toured on October 7, 2008.

Tour Hosts:

- Bob Angelloti – Director of Technical Services
- Matt Brooks – Operations Process Control

- Jack Sellman – Operations Supervisor
- Bill Kulik – Controls System Engineer

Attendees:

- Amy Kramer/NKWD
- Richard Harrison/NKWD
- Bill Wulfeck/NKWD
- John Schmiade/NKWD
- Brent Tippey/HDR-Quest
- Paul Swaim/CH2M HILL
- Nick Winnike/CH2M HILL

Key observations from the visit are presented in the following sections.

- Design Capacity 54 mgd.
- Average Day Flow 30 mgd.
- GAC system follows sand filters.

4.3.1 GAC System Components

- 32 upflow/downflow pressure contactors (1 MGD capacity each).
- Each pressure vessel holds 80,000 lbs of carbon.
- Eight upflow/downflow 2-cell gravity contactors, 10ft media depth, flat bottom with 1,200 plastic US Filter nozzles per cell.
- Two 500 cu ft blow down tanks for transferring carbon from gravity contactors.
- Two 5,000 cu ft carbon storage/transfer tanks, capacity equal to 1 cell of a gravity contactor.
- Multiple hearth regeneration furnace (6 hearths).
- Two defining tanks.
- Dewatering bin at top of incinerator holds 500 cu ft (12,000 lbs) of carbon.
- 10 million gallon ballast pond upstream of contactors.

4.3.2 Operation and Maintenance Observations

- Contactors operated in biological mode, remove COD and prolong carbon life.
- CBOD removal of 3 mg/l from biofilm on GAC.
- UOSA does not chlorinate backwash water because it can kill biomass.
- Filter effluent turbidity 0.15-0.25 NTU.
- GAC Contactor effluent 0.5 NTU.
- GAC Influent TOC around 5 mg/L.

- GAC Effluent TOC 1.5 to 2.0 mg/L up to 3.5 mg/L.
- Organics are mostly dissolved.
- F300 Calgon used based on pilot testing of different sizes. UOSA doesn't have to go out for bid for procurement because of performance study.
- Evaluated Chinese carbon in study, but was 30% to 35% less effective than domestic.
- UOSA will purchase single reactivated carbon but not later generation; this saves about 25% of purchase cost, but delivery can take several months depending on availability.
- UOSA rarely does a "wholesale" replacement of carbon.
- UOSA doesn't require acid wash of regenerated carbon in purchase specification.
- Calcium on the carbon catalyzes reaction during regeneration and its removal with acid wash is not wanted.
- 4-5 days of contactor to waste to wash out fines after regeneration or new carbon.
- 4-5 million gallons of contactor to waste flow required to remove fines from 80,000 lbs of regenerated or new carbon.
- Pressure vessels regenerated about 1/3-2/3 of carbon at a time.
- Defining process to remove fines prior to filling pressure vessels.
- More fines in virgins than regenerated carbon.
- Add water to wet carbon for better fines control when unloading.
- Water tight trucks used for spent carbon hauling.
- Use vactor truck with screen for removing water from spent carbon while loading onto truck.
- 4 hours to unload new carbon, some drivers took twice that long when not observed by plant staff.
- 4-5 hours to load spent carbon in truck.
- GAC building does not have dehumidification.
- Keep lights off to keep algae growth down.
- Well screens over backwash troughs.
- Keep pH under 8 to reduce calcium scaling on carbon.
- Regenerate pressure vessels every 6 months, gravity contactors every 3 months.
- 10 percent carbon loss at regeneration.
- Regeneration furnace runs 10-12 weeks, twice a year late fall and early spring.

- UOSA calculation concluded cheaper to regenerate on-site than to buy new carbon.
- Storing carbon outside made it more friable.
- Plant control system set GAC contacted water flow target and let flows upstream fluctuate to match.
- Gravity contactors have flat bottom and leave last 20 percent of carbon (2 ft) in tanks because of difficulty removing below this level.
- For gravity contactors, the old carbon is placed in the upflow cell followed by the regenerated carbon in the downflow cell.
- If both gravity cells have old carbon, both cells are operated in the downflow mode.
- Takes less than a day to remove carbon from a gravity contactor (all but bottom two feet).
- Pressure vessel coating should be factory inspected.
- Use SCADA to accumulate total flow through each contactor after regeneration.
- Match influent slurry water flow with drain flow for pressure vessels as moving carbon into vessel.
- Stagger exhaustion of vessels whether pressure or gravity.
- Each operator has own approach to removing spent carbon, some use eductor but others just slurry and pump.
- UOSA does not maintain entire carbon content of any vessel at same age, replace only part at a time.
- Wire brushing well screens required in pressure vessels.
- Apparent bulk density metric used to determine completion of regeneration.
- Staffing requirements comparable to operating filters for normal operation of GAC.
- 50 psi water supply used to push carbon from pressure vessels.
- 110 psi eductor water supply used for unloading trucks.
- Can put booster pumps on eductor effluent for moving carbon from truck to facility, head needs will dictate need.
- Backwash of gravity contactors based on headloss.
- Contactor backwash duration is manually controlled based on color of water.
- Backwash water sent to retention ponds that return flow to the head of treatment plant. UOSA has less than one day of storage at 45 MG each.
- Backwash by gravity; no pumps.

- Only one retention pond is lined. Ponds have shale bottoms. UOSA scrapes the bottom of ponds annually.
- Operators have to manually operate valves for pressure vessels to get full capacity.
- Pressure vessels were modified to reduce media depth from original 20 feet and went to downflow instead of upflow configuration. UOSA still has the ability to go upflow, if desired.
- Post filters are not used anymore in the downflow mode after pressure vessels. Screens were getting clogged by fines in upflow mode, but don't have a problem in the downflow mode.
- Only one other US Filter upflow installation has plastic nozzles and they failed too. UOSA provides small, 1 1/2 inch hose and water to spray into truck hopper to prevent bridging when unloading truck.

4.3.3 Design Recommendations

- Gate valves on carbon lines should be installed in the vertical position upside down at a 45 degree angle to prevent the GAC from compacting under the gate.
- Air supply not needed for unloading open top carbon trucks.
- Initially had fixed nozzle spray system in contactors to assist in carbon removal but were not effective.
- Properly insulate dissimilar metals to prevent corrosion.
- Floor drains plug with carbon, suggest cleanable pit with overflow.
- Carbon steel piping abraded within 15 years especially at bends.
- Sight glass (Ernst, Farmingdale, NJ) at frequent locations in carbon transport piping.
- Cleanouts at all low spots in vertical piping and every 30 ft in horizontal runs of carbon transport piping.
- Plastic nozzles eroded in upflow mode and had to be replaced after 6 months.
- Plastic nozzles not a problem in downflow mode.
- Stainless steel nozzles are available as custom order.
- Made slits in nozzles 2 times bigger to avoid biological plugging.
- Don't use iodine or molasses number.
- 10 MG of ballast pond capacity for feeding GAC, need a minimum of 3 MG, recommend 10 percent of forward flow minimum.

4.4 Twin Oaks Valley Water Treatment Plant

The Twin Oaks Valley WTP, located in San Diego, California, was toured on October 27, 2008.

Tour Host:

- Brian McDonald – CH2M HILL/OMI Project Manager Operations

Attendees:

- Amy Kramer/NKWD
- Ron Lovan/NKWD
- Mike Greer/NKWD
- Matt Piccirillo/NKWD
- Amy Matracia/NKWD
- Laura Talarek/NKWD
- Kevin Owen/NKWD
- Larry Anderson/HDR
- Brent Tippey/HDR-Quest
- Paul Swaim/CH2M HILL
- Nick Winnike/CH2M HILL

Key observations from the visit are presented in the following sections.

- Design Capacity 100 mgd.
- Average Day Flow 85 mgd.
- GAC system follows membranes and ozone contactor.
- Surface water treatment drawing supply from either Colorado River system or California Delta water system, Regional water consortium controls supply.
- Began operation June 2008.

4.4.1 GAC System Components

- 10 downflow gravity contactors, 6 ft media depth, flat bottom with AWI underdrains and air scour system.
- Each contactor contains about 161,000 lbs of GAC.
- Contactors are open to air, not within a building.
- GAC stored in supersacks outdoors.
- 2 150,000 equalization tanks for membrane permeate, GAC backwash, and centrifuge centrate.

4.4.2 Operation and Maintenance Observations

- Contactors operated in biological mode, stabilize AOC after ozone.

- Backwash water supply is not chlorinated but chlorine is added in summer to control algae and midge flies.
- Membrane effluent turbidity 0.02-0.03 NTU.
- GAC Contactor effluent 0.05-0.08 NTU.
- GAC Influent TOC is not measured because it is not a factor of performance and compliance.
- GAC Effluent TOC is not measured because it is not a factor of performance and compliance.
- BDOC is checked on occasion for contract compliance.
- 1.2 mm GAC used, larger than for absorbers, provides medium for biological stabilization.
- Selected Chinese carbon based on price and plan for infrequent replacement.
- Carbon replacement not intended with biological operation, carbon added only to replace attrition.
- Filled basins with GAC by lifting supersacks over basin and dry drop into bed.
- After carbon fill, ramp up flow to contactors to minimize carbon loss.
- Losing carbon in bed where air supply for air scour appears to be at highest pressure, tracking down causes.
- During a demonstration backwash carbon loss was also observed through holes in wall to backwash trough. Holes intended to drop water level before starting air scour and are intended to have screens to prevent carbon loss.
- Uneven carbon surface was evident with highest level on trough side and lowest level on other side.
- Air scour is beneficial but no testing backwash water savings from air scour has been undertaken.
- Water flows by gravity from ozone contactor through GAC system, flow control valves provide for uniform flow through all contactors.
- Gravity contactors have flat bottom, filled beds to full depth before backwash.
- Backwash frequency, once per day, to date has been determined primarily by need to control midge flies.
- GAC is not hauled in bulk. Supersacks are used and GAC is placed with a crane.
- Intend to backwash of contactors based on headloss.
- Weekly HPC analysis conducted to determine need for chlorination of backwash for algae control.
- Basins are backwashed before being idled and again before coming on line.

- Backwash by gravity from tank on hill above basins; no pumps.
- Backwash water sent to equalization tanks with membrane concentrate then treated with plate settlers and return to the head of treatment plant.
- Mixing pumps in EQ basin experienced seal failure after defining carbon from initial bed fill.
- Plant has requirement of zero discharge of liquid streams and draws supply from existing concrete reservoir, therefore contactor to waste capability was not provided.
- In spite of carbon loss, GAC has not been detected in downstream water reservoir.
- Not confident in accuracy of on-line Hach analyzer, tends to vary from lab tests.
- Original operations plan was to bring contactors on line up to full design capacity and run as many contactors as needed to satisfy production demands. Have found that operating all contactors at the same rate produces better finished water turbidity.

4.4.3 Design Recommendations

- Contactor to waste should be provided if not precluded by other operational restrictions.
- Air scour recommended as it aids in removal of biology and fines.
- 304 stainless steel in plate settler starting to stain just a few months after startup, recommend 316 stainless.

4.5 Chaparral Water Treatment Plant

The Chaparral WTP, located in Scottsdale, Arizona, was toured on October 28, 2008.

Tour Hosts:

- Art Nunez- Water and Wastewater Treatment Director
- Don Henderson – Senior Water Treatment Plant Operator
- Binga Talabi – Laboratory Manager

Attendees:

- Amy Kramer/NKWD
- Mike Greer/NKWD
- Matt Piccirillo/NKWD
- Amy Matracia/NKWD
- Laura Talarek/NKWD
- Kevin Owen/NKWD
- Larry Anderson/HDR
- Brent Tippey/HDR-Quest

- Paul Swaim/CH2M HILL
- Nick Winnike/CH2M HILL

Key observations from the visit are presented in the following sections.

- Design Capacity 30 mgd.
- Average Day Flow 14 mgd.
- GAC system follows membranes.
- Surface water treatment drawing supply from SRP canal system, Regional water consortium controls supply from one of 3 rivers.
- Began operation March 2006.

4.5.1 GAC System Components

- 10 downflow gravity contactors, 8 ft media depth, and 16.6 EBCT design rate.
- sloped bottom with Johnson Screen underdrains.
- Each contactor contains 140,000 lbs of GAC.
- GAC stored in supersacks outdoors.

4.5.2 Operation and Maintenance Observations

- Scottsdale has been running the Chaparral plant since 2006 but are starting up a larger GAC plant at this time.
- Contactors operated for absorption have noted that sometimes TOC goes down but THMs increase.
- Backwash water supply is from finished water reservoir and is dechlorinated using sodium bisulfite.
- Backwash based on headloss and occurs about 30-day intervals.
- Membrane effluent turbidity 0.03 NTU.
- GAC Contactor effluent 0.05 NTU.
- GAC Effluent TOC 1.6 mg/L.
- 12x40 mesh GAC used at the new plant.
- Initially used Calgon, Norit and Jacobi (Chinese) carbon and found Jacobi to be inferior with more fines.
- Have removed all original carbon and landfilled all Jacobi.
- Have been told but did not verify that Chinese carbon production leaves out a step in the particle production which saves cost but results in more fines.

- Have contract with Calgon to remove, regenerate and replace GAC.
- Carbon is hauled to Midwest for regeneration.
- Their first generation reactivated GAC performs as good or better than the virgin carbon.
- Calgon contract is 1 year term, nothing longer offered by vendor without tying to cost indexes for inflation.
- Supersacks don't last more than 3 months outside.
- Calgon filling hopper is 6 ft x 6 ft x 13 ft tall and cyclone for removing carbon is 12 ft x 12 ft x 15 ft tall.
- Floor slope in contactors is not adequate to provide benefit in removing carbon.
- Backwash laterals cause carbon to dam up behind it.
- Have stainless steel Johnson Screen underdrains which are expensive but wanted the best. Not sure if the extra cost was justified.
- Remove carbon using eductor and hose system and no problem getting carbon completely removed.
- Have staggered replacement schedule for carbon. It took years to achieve.
- Have sample ports at 3 depths in the contactors but have not used them.
- Put water in bed then backwash in stages during GAC loading after each 1/2 bed lift and again after filling. Backwash for 30 minutes each time then contactor to waste 90 minutes.
- Backwash at a lower rate for fluffing about once a month did not provide any benefit.
- Run full design flow rate of 3 mgd of contactor to waste flow for a total volume of about 140,000 gal to remove fines after GAC replacement.
- Initially filled basins with GAC by lifting SuperSacks over basin and dry drop into bed.
- Takes about 1 ½ days to remove spent carbon and 2 days to place new carbon. Place in two lifts and let sit overnight after first lift.
- 100 psi and 200 gpm water supply used for educting carbon, have to run pumps in series to provide the necessary pressure.
- Vendors originally proposed regenerated GAC prices to be about half of virgin prices but in the recent round of bidding the vendors offered less than 10 % discount for regenerated GAC.
- Have not had any problems taking a bed out of service for a period of hours or days and putting it back in service.

- Backwash water sent to wash water recovery basing with membrane concentrate then treated with plate settlers and return to the head of treatment plant.
- Submersible pump used in EQ basin.
- After plant startup the flow to individual contactors was adjusted to exhaust the carbon at different times to accomplish a staggered replacement schedule.
- Still optimizing GAC operation but believe that pre-chlorinating the membrane effluent before introducing to GAC may aid in precursor removal in beds.
- Operators run contacted water samples through lab filter to check for carbon fines after backwash or loading contactors.
- S-Can monitor used for SUVA and has performed well but is expensive at $30,000.

4.5.3 Design Recommendations

- Carbon bid specification should quantify volume not weight and include backwash at least twice during fill to ensure full intended EBCT.
- 3 or 4 inch eductor should be used for carbon loading and unloading.
- A single eductor with hoses for connection to truck and basin is adequate, don't need individual eductors.
- Provide at least 110psi and 100 gpm motive water system.
- Provide flexible unloading system as vendors planned bulk delivery and then changed to SuperSacks after design.
- Obtain test columns or other features desired to operate and optimize contactors as obtaining budget for such features later is difficult.
- Provide TOC analyzer (Sievers) but put it in the lab.
- Provide wash water recovery basin size to accommodate both GAC backwash and other discharges that may result from turbidity spikes in raw water supply.
- Provide containment for water that escapes during loading and unloading operations outside building.

4.6 Oasis Water Treatment Plant

The Oasis WTP, located in Glendale, Arizona, was toured on October 28, 2008.

Tour Host:

- Dawn Slauter – Utilities Supervisor Oasis Water Campus

Attendees:

- Amy Kramer/NKWD
- Mike Greer/NKWD

- Matt Piccirillo/NKWD
- Amy Matracia/NKWD
- Laura Talarek/NKWD
- Kevin Owen/NKWD
- Larry Anderson/HDR
- Brent Tippey/HDR-Quest
- Paul Swaim/CH2M HILL
- Nick Winnike/CH2M HILL

Key observations from the visit are presented in the following sections.

- Design Capacity 10 mgd.
- Average Day Flow 7 mgd.
- GAC system follows sedimentation basins and operates as filtration process.
- Contactor beds are open air with no building above.
- Surface water treatment drawing supply from SRP canal system, Regional water consortium controls supply from one of 3 rivers.
- Began operation October 2007.

4.6.1 GAC System Components

- 5 downflow gravity contactors, 6 ft media depth.
- Flat bottom with Johnson Triton (semi circle) underdrains.
- Each contactor contains 81 sacks (about 80,000 lbs) of GAC.
- GAC stored in SuperSacks outdoors.

4.6.2 Operation and Maintenance Observations

- Plant has been in operation for a year and the carbon has been changed out at least once in each contactor.
- Contactors operated as filters and typically run about 96 hours between backwashes.
- Minimal biology in filters.
- Raw water turbidity to plant ranges from 2 -1,000 NTU.
- Use S-CAN for raw and finished water analysis.
- GAC Effluent TOC target is 2 mg/L.
- 8 x 20 mesh (1.0 to 1.2 mm) GAC used.
- Initially installed Calgon carbon and have replacement contract with Calgon which was the only bidder to offer regeneration of Oasis carbon. Satisfied with performance of regenerated carbon.

- Flat floor in contactors but grade tolerance in specification was ¼ inch and this has contributed to problems with the underdrain.
- Johnson Triton underdrains provided with air scour. Both air and water pipes run beneath basin and enter underdrain laterals from below.
- Underdrain laterals are held down only by angle iron supports at 3 locations across basin. When air is activated the underdrains vibrate which has caused the seal on the air penetration into the bottom of the laterals to fail resulting in carbon loss into air headers.
- Procured underdrains on direct purchase contract and are working with Johnson to resolve the problem but this is a new product and Johnson is struggling with determining a fix.
- Initial installation of carbon was by dry drop from SuperSacks into beds.
- Remove and replace carbon using eductor and hose system with SuperSacks. No installed carbon loading pipes, just run hoses over wall of basin.
- The removal and replacement process can be completed in 2 days.
- Carbon is hauled to Midwest for regeneration.
- No problem removing carbon from basins.
- Backwash 3-4 times (~ 150,000 gallons) to remove fines.
- Air scour helps remove fines.
- Operate contactors to achieve a staggered carbon replacement schedule.
- Stated preference for Leopold type flat underdrain system.
- Backwash on head loss, turbidity or time.
- Backwash water sent to 500,000 gallon equalization basin then onto a clarifier before being returned to the raw water pump station.
- Submersible pumps serve the equalization basin.
- Backwash water is supplied from a 230,000 gallon backwash pump station at the front end of a finished water reservoir before chlorine is added.
- Use turbidimeters, particle counters and Sievers TOC analyzer (in lab) and like all instruments.

4.6.3 Design Recommendations

- Flat floor and flat underdrain system with air scour.
- Provide simple carbon loading and unloading system as vendors have their own equipment.

4.7 Richard Miller Water Treatment Plant

A tour of the Greater Cincinnati Water Works' (GCWW) Richard Miller WTP has not been scheduled at this time.

- 240 mgd post-filter GAC contactors.
- Carbon loading.
- Regeneration.

Design Standards

5.1 UV and Advanced Oxidation

This section presents the preliminary design recommendations for the installation of UV disinfection at the Fort Thomas Treatment Plant and Memorial Parkway Treatment Plant. The design objective of 2.5 log inactivation of Cryptosporidium was used to compare various types of UV disinfection technologies on the basis of footprint and lifecycle costs. After reviewing several UV disinfection products that met the design criteria, the decision was made to proceed with a procurement strategy for the installation of medium pressure UV equipment at both treatment plants. Building layouts that will accommodate three UV reactor trains at FTTP and two UV reactor trains at MPTP were found to be the most cost-effective.

5.1.1 UV System Design Criteria

The UV systems will be designed and operated to provide 2.5 log inactivation of Cryptosporidium per the requirements in the EPA UV Disinfection Guidance Manual (UVDGM). This will also provide at least 2.5 log inactivation of Giardia. Viruses will be inactivated using the existing chlorine dosing and contacting system. To achieve 2.5 log inactivation of Cryptosporidium, the UVDGM requires a UV dose of 8.5 mJ/cm2 that must be demonstrated through manufacturer validation testing and application of a validation factor to account for uncertainties in the validation. Manufacturers must provide documentation supporting that their equipment recommendations have been validated in accordance with the UVDGM. In addition to the UV dose requirements, UV system designs are developed based on the following:

- Peak design flow.
- Influent water quality (UV transmittance).
- UV output over the course of the lamp lifecycle.
- Fouling potential.
- Redundancy requirements (one unit out of service at peak design flow).
- Headloss considerations.

The design criteria in Exhibit 5-1 are proposed for the UV disinfection systems at FTTP and MPTP. Data analysis supporting the selection of a 95% UV transmittance (UVT) for both plants is summarized in Section 2.

EXHIBIT 5-1
UV System Design Criteria

Design Criteria	Value
Peak Design Flow (mgd) FTTP MPTP	 44 20
Average Design Flow (2009 - 2028) (mgd) FTTP MPTP	 23.5 6.1
Design Dose Log Inactivation - Cryptosporidium Delivered UV Dose (mJ/cm2)	 2.5 8.5
Minimum UVT	95%
End-of-Life Lamp Output (EOLL)	70%
Allowance for Fouling	90%
Maximum Head Loss through UV reactors (in)	24 inches
Redundancy Requirement	One standby unit out-of-service

5.1.2 UV Disinfection Technology Review

There are two types of UV disinfection technology that are under consideration for MPTP and FTTP: 1) low pressure – high output (LH) and 2) medium pressure – high output (MP). Equipment manufacturers for LH systems include Wedeco and potentially Trojan. Several manufacturers of medium pressure equipment include Trojan, Calgon, Aquionics, and Ozonia. Wedeco, Trojan, and Calgon offer reactors that have been validated in the 20 mgd flow range. In general, LH UV systems typically require more space and may have higher equipment costs because more lamps are used to provide the same dose as medium pressure lamps. However, LH UV systems typically use less energy to meet UV dose requirements, potentially resulting in lower lifecycle operating costs. LH and MP manufacturers also differ in the number of UV sensors that are included in a reactor: Wedeco provides one sensor per operable set of lamps; that may be one sensor per reactor (e.g., model BX3200) or one sensor per row (e.g., model K143). MP manufacturers typically provide one sensor for each lamp. LH and MP UV systems are compared for footprint, number of lamps, energy consumption, and lamp and ballast replacement costs in Exhibit 5-2.

EXHIBIT 5-2
Comparison of Medium Pressure and Low High UV Equipment

	LH	MP
Footprint	2x	1x
Number of Lamps	10x	1x
Power Consumption	1x	2x
Lamp Replacement Cost	3x	1x
Ballast Replacement Cost	1x	2x

Technologies used among manufacturers typically vary in the reactor design, lamp wattage, and the ability to turn down lamps to adjust for different flows or water quality. Manufacturers of LH and MP equipment were asked to provide their recommendations for UV equipment at FTTP and MPTP based on the design and operating criteria provided in Exhibit 5-1. In addition, preference was expressed for the use of the same or similar reactor equipment/technology at both plants when feasible. Manufacturer offerings are compared in Exhibit 5-3 and 5-4 below.

EXHIBIT 5-3
Comparison of UV Equipment Recommendations for FTTP

	Wedeco	Trojan	Aquionics	Calgon
Number of Trains	3	3	5	3
UV Technology Type	LH	MP	MP	MP
Reactor Model	K143	2L24	InLine 12000+	Sentinel 3x10 kW
Number of Duty Reactors	2	2	4	2
Number of Standby Reactors	1	1	1	1
Reactor Flow (mgd)	22	22	11	22
Reactor flange diameter (in)	30	24	20	36
Number of lamps – per reactor – total	36 108	2 6	6 30	3 9
Lamp Power (kW/lamp)	0.36	9.8	5	10
Max Reactor Power (kW)	13	19.6	30	30
Installed Power Load (kW) (excludes standby)	26	36.4	120	68
Power Load @ Avg Flow (kW)	11.9	23.8	60	14.7
Estimated Headloss at peak flow (in)	20	11.1		6

EXHIBIT 5-4
Comparison of UV Equipment Recommendations for MPTP

	Wedeco	Trojan	Aquionics	Calgon
Number of Trains	2	2	3	2
UV Technology Type	LH	MP	MP	MP
Reactor Model	K143	2L24	InLine 12000+	Sentinel 2x10 kW
Number of Duty Reactors	1	1	2	1
Number of Standby Reactors	1	1	1	1
Reactor Flow (mgd)	20	20	10	20
Reactor flange diameter (in)	30	24	20	24
Number of lamps – per reactor – total	24 48	2 4	6 18	2 4

EXHIBIT 5-4
Comparison of UV Equipment Recommendations for MPTP

	Wedeco	Trojan	Aquionics	Calgon
Lamp Power (kW/lamp)	0.36	9.8	5	10
Max Reactor Power (kW)	8.64	18.2	30	22
Installed Power Load (kW) (excludes standby)	8.64	18.2	60	22
Power Load @ Avg Flow (kW)	8.64	9	30	9.6
Estimated Headloss at peak flow (in)	20	9.5		14

Wedeco, Trojan, and Calgon provided equipment recommendations that were based on the same number of reactor trains (3 at FTTP and 2 and MPTP). As Aquionics does not have a reactor validated in the same flow range, their product recommendations required 2 additional treatment trains at each plant. In addition, Wedeco, Trojan, and Calgon have significantly lower peak and average power requirements in proposals for both plants compared with Aquionics.

5.1.3 Potential Site Layouts

After collecting equipment recommendations from several UV manufacturers, four preliminary facility layouts were developed for the purposes of estimating footprint and building costs:

- FTTP Medium Pressure (Exhibit 5-5 located at the end of this Section).
- FTTP Low Pressure – High Output (Exhibit 5-6 located at the end of this Section).
- MPTP Medium Pressure (Exhibit 5-7 located at the end of this Section).
- MPTP Low Pressure – High Output (Exhibit 5-8 located at the end of this Section).

The layouts were created based on reactor and control panel dimensions provided by Wedeco (LH) and Trojan (MP). Three feet of spacing was provided between MP reactors per manufacturers' recommendations for maintenance and electrical code requirements. In LH layouts, 12 feet center-to-center spacing between reactors was provided to allow for maintenance platforms, which are recommended due to the height of the reactors. Estimates of building footprints for the four manufacturers evaluated are provided in Exhibit 5-9. In general, building footprints for LH UV systems were estimated to be 1.8 times the area required for MP systems that accommodate Trojan and Calgon equipment.

EXHIBIT 5-9
Comparison of UV Disinfection Building Footprints

UV System Type (Mfrs. accommodated)	FTTP	MPTP
LH (Wedeco)	3,150	2,280
MP (Trojan, Calgon)	1,710	1,250
MP (Aquionics)	2,400	1,620

5.1.4 Preliminary Evaluation of UV System Costs

5.1.4.1 UV Disinfection Equipment Costs

UV equipment manufacturers were asked to provide budgetary cost proposals for equipment and operating costs using the design criteria presented in Exhibit 5-1. Equipment costs from LH and MP manufacturers are compared in Exhibit 5-10. Cost proposals submitted by the four manufacturers evaluated are included in Appendix E. As shown in Exhibit 5-10, the quotes submitted for LH equipment are substantially more than for the MP equipment.

EXHIBIT 5-10
Comparison of UV Equipment Costs for FTTP and MPTP

Manufacturer	Equipment Cost*	
	FTTP	MPTP
Wedeco	$ 810,000	$ 540,000
Trojan	$ 440,000	$ 293,500
Calgon	$ 332,000	$ 183,000
Aquionics	$ 891,900	$ 542,600
*Includes reactors, lamps, and control panels		

5.1.4.2 Annual Operation and Maintenance Cost Estimates

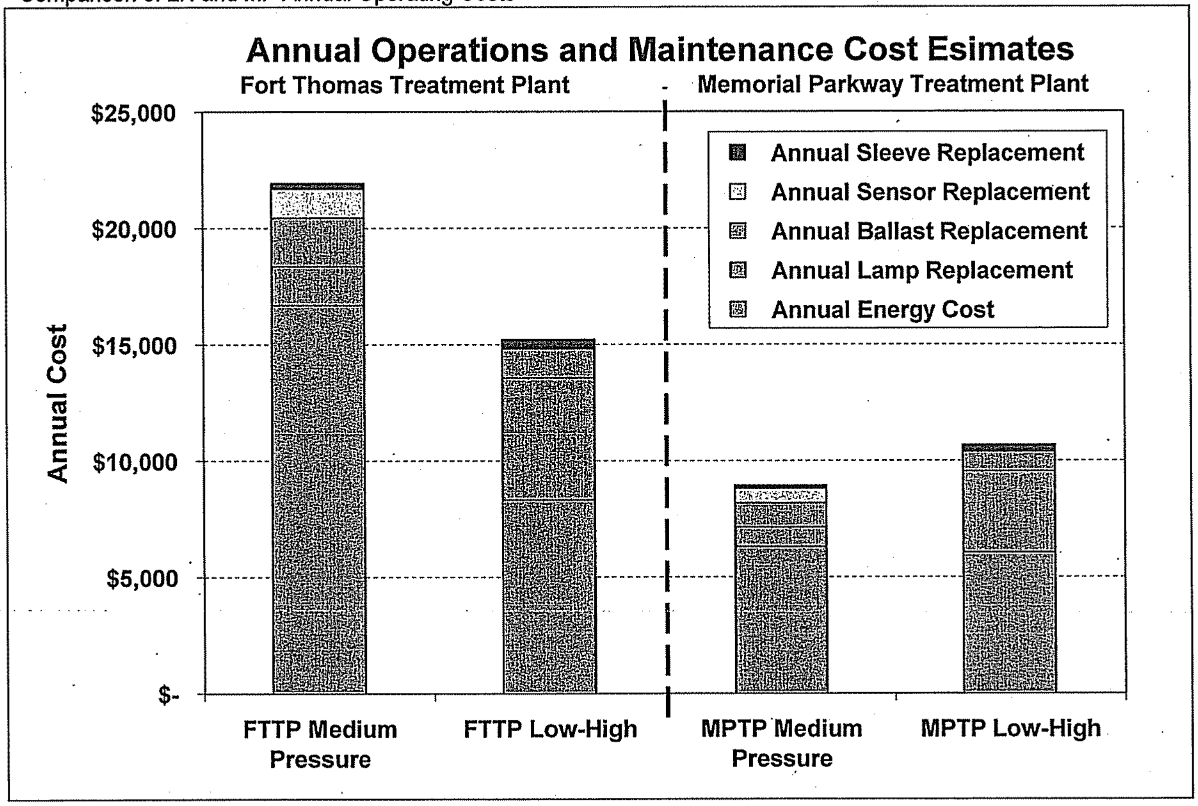
In general, energy consumption comprises the greatest portion of annual operations and maintenance (O&M) costs for UV disinfection systems. Other O&M costs are from the replacement of lamps, ballasts, sensors, and sleeves over the course of the UV system's lifecycle. Replacement lives and costs for these items provided by Wedeco and Trojan are shown in Exhibit 5-11.

EXHIBIT 5-11
Replacement Life and Costs for UV System Components

	Warranteed Replacement Life		Replacement Cost	
	Trojan	Wedeco	Trojan	Wedeco
Lamps	9,000 hrs	12,000 hrs	$ 429	$ 199
Ballasts	120 mths	60 mths	$ 5,200	$ 350
Sensors	5 yrs	10 yrs	$ 1,559	$ 684
Sleeves	5 yrs	20 yrs	$ 299	$ 180

Using information shown in Exhibit 5-11 and calculations of annual energy costs based on the design average flows for FTTP and MPTP, the annual O&M costs were determined (Exhibit 5-12). These estimates do not include the labor cost for the replacement of parts or other routine system maintenance activities.

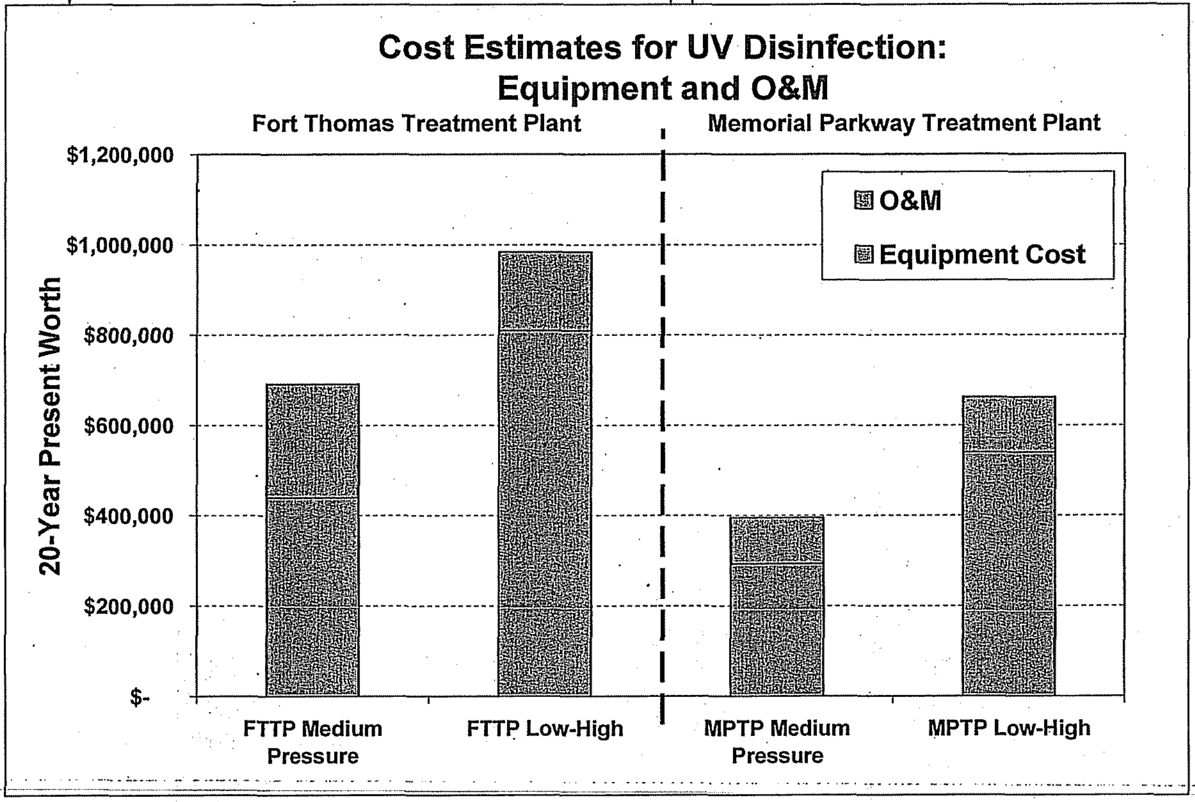
EXHIBIT 5-12
Comparison of LH and MP Annual Operating Costs



5.1.4.3 Net Present Value Equipment Cost Estimates

Exhibit 5-13 compares the net present value (NPV) of the LH and MP UV disinfection systems, including equipment costs and the NPV of the O&M costs. Although O&M costs are less, the LH system is estimated to have a higher net present value cost due to higher equipment costs from the manufacturer quotation.

EXHIBIT 5-13
Comparison of LH and MP 20-Year Present Value Estimates for Equipment and O&M



5.1.4.4 Power Quality Equipment

Power quality equipment costs were considered as part of the cost comparison of MP and LH UV equipment. Power quality equipment includes a standby engine generator and UPS. In general, MP systems have higher installed and average operating power requirements compared with LH systems, resulting in higher power quality costs for MP systems (Exhibits 5-3 and 5-4).

The UV systems at FTTP and MPTP will include standby power provided by diesel engine generators. The diesel engine generators will also serve loads for the associated GAC facilities. A UPS system will be needed to provide clean, reliable power to the UV system while the generator is starting to prevent the lamps from losing their arc and having to re-start. The re-start times for LPHO and MP type UV lamps may take up to 10 minutes, and may be required by voltage sags of 10% or power interruptions as short as 1/2 cycle (0.0085 seconds).

The recommended duration of the UPS is 5 minutes to ride through all voltage sags/interruptions and to allow the standby generator adequate time to start and carry the load. The UPS will also allow the UV system to ride through intermittent voltage sags or momentary power interruptions in the regional or local power system, or intermittent power disturbances caused within the plant. Based on a brief review, a battery type (static) UPS should be used rather than a flywheel (rotary) type based on cost. The flywheel type UPS had the advantage of not requiring energy storage batteries, but the smallest units that are currently available have a rating of 130kW and an installed cost of approximately $110,000. The rating of a battery type UPS can be sized to more closely match the power requirements of the installed UV system, and has approximately half the installed cost of the flywheel type UPS systems.

5.1.4.5 Relative Present Value Cost Estimates

20-year present value relative cost estimates were developed for LH and MP UV disinfection options for the following categories:

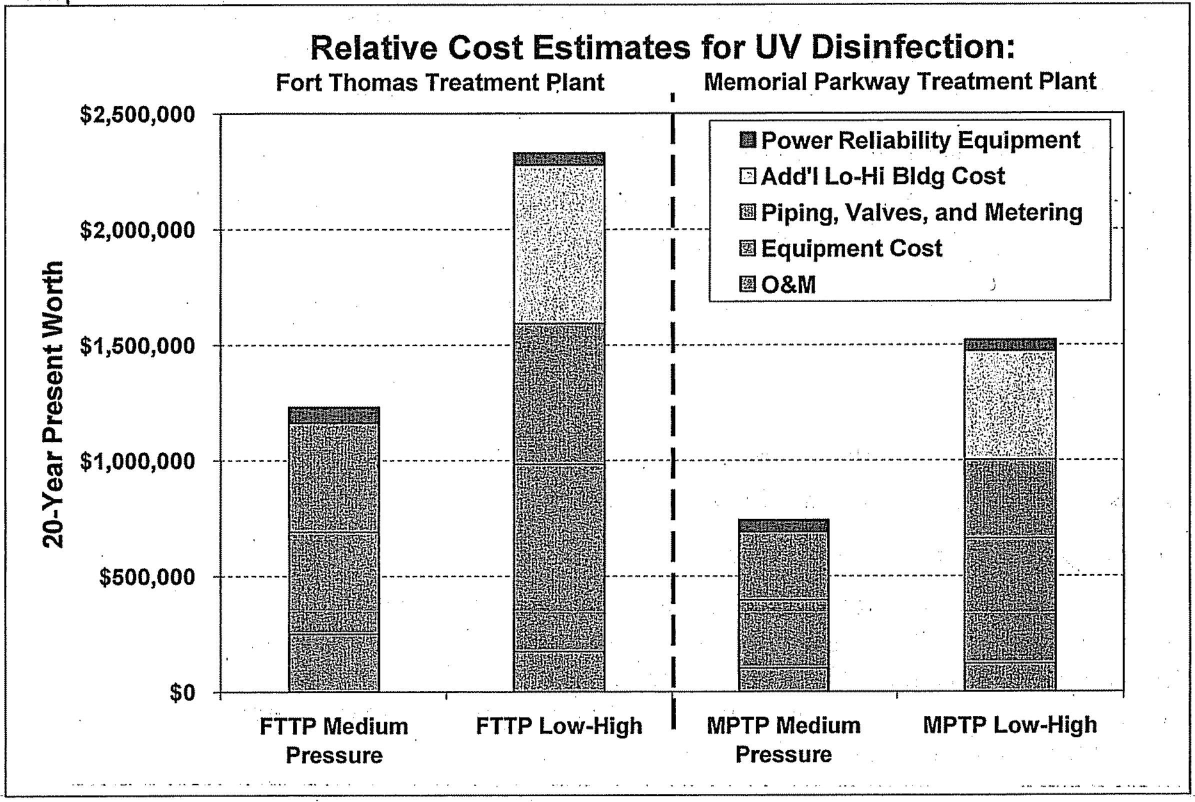
- O&M (include energy costs and lamp, ballast, sleeve, and sensor replacement costs).
- UV equipment.
- Piping, valves, and metering.
- Cost for LH building space in excess of MP building space required.
- Power reliability/quality equipment.

Using information provided by Wedeco and Trojan, relative costs for LH and MP UV system options for FTTP and MPTP are compared in Exhibit 5-14. Figures contained within Appendix F compare these costs to those estimated for an Aquionics system to evaluate the cost for a medium pressure option that requires a greater number of reactor trains and has higher energy requirements.

The relative cost estimates include estimates for construction, other markups, and a 30% contingency. However, they only include the difference in generic building space requirements between LH and MP systems and are not intended be an opinion of probable construction cost for the finished facility. Opinions of probable construction cost are presented in Section 9.

In general, comparison of the relative costs suggests that using low pressure – high output UV equipment would be significantly more expensive than medium pressure equipment, when including the extra building space required. The higher cost for a LH system is largely due to its higher equipment cost and larger footprint requirements. Including the 20-year present worth cost estimate for O&M does not result in a more attractive lifecycle cost for LH UV equipment.

EXHIBIT 5-14
Comparison of LH and MP 20-Year Present Worth Estimates



5.1.5 Recommendations and Procurement Strategy

UV disinfection system costs and technology comparisons for LH and MP equipment were presented in a meeting with NKWD staff on November 7, 2008. Due to the significantly higher present value costs and larger footprints for a low pressure – high output system compared with a medium pressure system, the decision was made to proceed with a procurement strategy that would specify MP equipment in the construction bidding documents.

The procurement approach will consist of the following:

- Specification of medium pressure UV reactor equipment in construction bidding documents.
- Design based on 3 reactor trains at FTTP and 2 reactor trains at MPTP.
- Procurement specification based on lifecycle cost and other criteria that account for O&M differences between different types of UV equipment, i.e., it will include price for equipment supply and installation as well as O&M costs (energy costs, replacement costs for lamp, ballasts, and other parts, and labor costs from maintenance).

- Procurement approach will include mandatory alternative bid prices for Calgon and Trojan reactors to allow opportunity for selection of the same brand at both plants if NKWD procurement regulations permit such selection.

This procurement approach offers several benefits:

- Reducing the need to accommodate multiple types of UV equipment streamlines the design process, decreasing the risk of change orders during construction.
- Bidding based on lifecycle cost considers both equipment installation and purchase cost as well as O&M costs, which can vary significantly between UV manufacturers and technologies and can comprise a substantial portion of the system's 20-year net present worth.
- The use of the same brand of UV equipment at both plants will result in greater efficiencies in plant operation as training, inventory management, and operations and maintenance functions and expertise can be shared between the two plants.

5.1.6 UV Advanced Oxidation Process (UV AOP)

Following the widespread implementation of ultraviolet (UV) disinfection, many utilities have begun to consider the potential use of UV light at much higher doses, together with upstream hydrogen peroxide feed, as an advanced oxidation process (AOP). UV AOP has been evaluated on a handful of drinking water treatment projects with high water quality goals, and for sources of supply that are affected by typical point-source and non-point source influences. UV AOP systems have been implemented for municipal use by the Orange County (CA) Water District (70 mgd) and designed for the Aurora (CO) Reservoir Water Purification Facility (50 mgd), so UV AOP represents a viable technology for treatment plants in the same size range as NKWD's FTTP and MPTP.

UV AOP is a chemical oxidation process used to oxidize complex organic constituents that are difficult to degrade biologically into simpler end products. In this process, hydrogen peroxide (H2O2) is dosed upstream of the UV reactors and when the UV photons are absorbed by the dissolved H2O2, hydroxyl radicals are formed. Hydroxyl radicals are highly reactive chemical species that react unselectively with organic molecules present in water. The initiation of this advanced-oxidation process enables the destruction of contaminants through the process of oxidation. At the same time, many contaminants are destroyed directly by UV light photolysis. Concurrently, disinfection also occurs. The contaminants that can be reduced by UV/AOP include:

- Bacteria, viruses, Giardia, Cryptosporidium, and other pathogens.
- Many endocrine disrupting compounds (EDCs).
- Many pharmaceutical and personal care products (PPCPs).
- Some disinfection by-products (e.g., NDMA and other nitrosamines).
- Many synthetic organic chemicals (SOCs), pesticides, herbicides, volatile organic chemicals (VOCs), and solvents.

Drinking water utilities have evaluated UV AOP for seasonal use for taste and odor control or for year-round use as a barrier against emerging contaminants. UV AOP typically uses much higher UV doses than are necessary for UV disinfection. A typical UV dose for UV AOP is greater than 500 mJ/cm2, which is more than an order of magnitude higher than a typical UV disinfection dose. In addition, only a fraction of the hydrogen peroxide is consumed by the process, so the residual peroxide must be quenched. Quenching is typically accomplished by chlorine, although other chemicals such as sodium bisulfite are also feasible.

5.1.6.1 Potential Application to NKWD

For the NKWD, the potential application of UV AOP would be as: 1) primary disinfection for Cryptosporidium, and 2) a general barrier for "emerging contaminants," including EDCs, PPCPs, and other contaminants associated with anthropogenic activity. For drinking water UV AOP installations, the typical drivers for implementing UV AOP have been taste and odor control or destruction of NDMA. The NKWD already plans to implement GAC adsorption, an effective barrier for taste and odor control and for most emerging contaminants. NDMA is not well removed by GAC or by the other treatment processes used by the NKWD, but the NKWD has sampled for NDMA on a few occasions, and NDMA has not been detected in the raw water.

Two options were considered for UV AOP for the NKWD: 1) design UV AOP to provide 1-log (90 percent) destruction of the hormones, Estradiol and Ethinylestradiol, or 2) 2-log (99 percent) destruction of the hormones, Estradiol and Ethinylestradiol. The hormones, Estradiol and Ethinylestradiol, were identified as a potential design target because they are indicative of anthropogenic discharges in a watershed, and they are also indicative of treatment effectiveness (e.g., not the easiest, nor the most difficult, compound to destroy). System characteristics for each option are shown in Exhibit 5-15.

EXHIBIT 5-15
UV AOP System Options for NKWD

Item	Option 1	Option 2
Performance Target	1-log Estradiol & 1-log Ethinylestradiol	2-log Estradiol & 2-log Ethinylestradiol
Performance for NDMA	50 percent	90 percent
Performance for Atrazine	50 percent	90 percent
Reactor Type*	Trojan SWIFT 16L30*	Trojan SWIFT 16L30*
Lamps per Reactor	16	16
Number of Reactors per Trains	2	3
Number of Trains	2	3
Hydrogen Peroxide Dose, mg/L	6 mg/L	6 mg/L
Total Connected Electrical Load, kW	798 kW	1,795 kW
UV Equipment Cost	$2.1 Million	$4.3 Million
Annual Power Cost	$280,000 per year	$629,000 per year
Annual Hydrogen Peroxide and Chlorine Quenching Chemical Cost	$880,000 per year	$880,000 per year

EXHIBIT 5-15
UV AOP System Options for NKWD

Item	Option 1	Option 2
Performance Target	1-log Estradiol & 1-log Ethinylestradiol	2-log Estradiol & 2-log Ethinylestradiol
Performance for NDMA	50 percent	90 percent
Performance for Atrazine	50 percent	90 percent
Reactor Type*	Trojan SWIFT 16L30*	Trojan SWIFT 16L30*
Note: * Reactor type shown is a medium-pressure reactor from one UV manufacturer. There are other equipment options available, but this was selected as an example.		

As shown, UV AOP would require more UV reactors compared to UV disinfection, and the construction costs and O&M costs would increase significantly. Of the two options, Option 1 is less costly, but treatment performance is marginal with only 50 percent destruction of NDMA and atrazine. Option 2 provides 1-log removal of NDMA and atrazine, but at higher construction and O&M cost. Based on the performance of other treatment barriers, the sampling results for NDMA, and the additional cost for UV AOP, the NKWD decided not to include UV AOP in this project.

5.1.6.2 Future Conversion to UV AOP

In the future, the NKWD may elect to consider expansion and conversion of the planned UV disinfection system to UV AOP. This would require the addition of UV reactors in series, and possibly conversion to larger UV reactors. For example, for UV disinfection at the FTTP, Trojan would supply three trains, with one 24-inch diameter UV reactor per train. To convert to UV AOP Option 2, each train would need to be increased to 30-inch diameter piping, and three reactors would be required in series for each train. The current UV disinfection design assumes 24-inch diameter reactors from Trojan, with 5 upstream and 3 downstream diameters of straight-run piping, for a total straight run of approximately 20 feet of length. For UV AOP using the larger reactors and three reactors in series per train, three reactors could be installed flange-to-flange-flange in the existing building space, with 1-ft spool pieces between reactors. Additional chemical storage and feed equipment and additional electrical service capacity would be required. Thus, conversion to UV AOP would require expansion of chlorine facilities, installation of new hydrogen peroxide facilities, expansion of pumping capacity to overcome additional headloss, replacement of UV train piping, and additional power feed, but it appears that the UV reactors could be incorporated in the planned building space. During detailed design, means of increasing pumping capacity at the GAC influent pump station will be evaluated to accommodate the potential future implementation of UV AOP.

At some time in the future, if the NKWD elects to further consider a new treatment technology for destruction of emerging contaminants, it is recommended that ozone and UV AOP both be considered further. Ozone is a viable alternative to UV AOP, and ozone is typically more economical than UV AOP as a general barrier for the treatment of emerging contaminants. Although ozone is not effective for NDMA destruction, it is equally effective or more effective than UV AOP for many contaminants. For the NKWD, ozone would most likely be best implemented after clarification, and GAC would provide biological stabilization prior to water distribution.

5.2 GAC

In the following sections, the major components of the GAC facilities are addressed.

5.2.1 GAC Media Type

The March 2008 PDR summarized RSSCT results and noted that tests were conducted with two bituminous-coal based GAC products, and one lignite-coal based carbon (Norit HYDRODARCO® 4000). The results demonstrated that the lignite based carbon performed significantly worse than the two bituminous carbon products in terms of adsorption of TOC. Consequently, the lignite based carbon was not recommended for use in the GAC facility. The use of GAC from different source materials (e.g., wood-based GAC) other than those specifically demonstrated through RSSCTs is not recommended.

For drinking water applications, bituminous coal is the typical raw material for activated carbons. GAC from bituminous coal has properties including high adsorption capacity, good abrasion resistance, and low ash levels. Two sizes of bituminous GAC were considered for the NKWD, as shown in Exhibit 5-16.

EXHIBIT 5-16
GAC Media Sizes Considered for NKWD

Parameter	12 x 40 Mesh (e.g., FS400)	8 x 30 Mesh (e.g., FS 300)
Type of Carbon	Virgin bituminous	Virgin bituminous
Effective Size	0.55 – 0.75 mm	0.8 – 1.0 mm
Uniformity Coefficient	1.9	2.1
Iodine Number	1000 mg/g	900 mg/g
Clean Bed Headloss (at 5 degrees C, 4.4 gpm/sf and 12 ft media depth)	5.5 ft	2.7 ft
Backwash Flowrate for 30% Bed Expansion	11.8 gpm/sf	18 gpm/sf
GCWW Media?	Yes	No
Basis for RSSCT Results?	Yes	No
Available From More Than One Vendor?	Yes	Yes

NKWD's RSSCTs assumed the use of 12 x 40 mesh GAC media, with an effective size of 0.55 to 0.75 mm. This specific GAC media size is consistent with the GAC used successfully in post-filter contactors by Greater Cincinnati Water Works (GCWW) at the Richard Miller WTP, which also treats Ohio River water. For a different GAC size, the RSSCT results would need to be re-evaluated, with calculations revised based on the other media sizes under consideration.

The 12 x 40 mesh size GAC offers high adsorptive capacity, as indicated by an iodine number of 1,000 mg/g. This size GAC is on the small side of the spectrum of GAC used at WTPs, but filtration will remove particulate matter upstream of GAC contactors. Thus, post-filter GAC contactors can use smaller media, with better adsorptive capacity, because headloss accumulation from particle retention in the media will be minimal. For these reasons, 12x40 mesh GAC media was adopted for the project.

For 12x40 mesh GAC, there are multiple potential suppliers. GAC suppliers of this size media are shown in Exhibit 5-17. This specific media size is equivalent to "Filtrasorb 400" from the Calgon Carbon Corporation and to Norit Americas' "Norit GAC 1240."

EXHIBIT 5-17
Potential GAC Suppliers for NKWD

	CALGON	NORIT	SIEMENS WESTATES	CARBOCHEM
	FILTRASORB F400	NORIT GAC 1240	AQUACARB 1240	LQ-1240
IODINE NUMBER mg/g (Min)	1000	1020	1000	950
moisture wt % (Max%)	2	2		
abrasion # (Min)	75	75	80	92
Effective size mm	.55 to .75	0.65	.55-.75	
UC (max)	1.9	1.6	1.9	
Ash, weight % (Max)	9			
Apparent density, g/cc (Min)	0.44	0.5	.46-.54	0.5
Mesh Size (US Sieve			12 x 40	

5.2.2 Procurement of GAC Media

It is recommended that the NKWD procure virgin GAC as part of the construction project for Advanced Treatment at the FTTP & MPTP. Among virgin, bituminous-coal based activated carbon products, differences in raw materials and activation methods influence the final properties of the carbon. Thermal activation of GAC can be accomplished through either direct activation or re-agglomeration. According to the Calgon Carbon Corporation, both products result in an activated carbon with similar iodine number values, re-agglomeration adds pore structure into the carbon granule, which results in a more uniform activation. Direct activation often results in granules that are over-activated along the outer edge of the granule and under-activated at the core. From field testing reported by the Calgon Carbon Corporation, and by others including GCWW and the City of Scottsdale, performance has been shown to be superior with re-agglomerated GAC. Thus, re-agglomerated GAC is recommended for the NKWD.

The Twin Oaks Valley Water Treatment Plant (TOVWTP) near San Diego, California, procured GAC manufactured in Asia. In this application, GAC is used solely to facilitate biological activity for reduction of biodegradable organic carbon (BDOC). From the project experience at the TOVWTP, GAC manufactured in Asia was more economical than GAC manufactured in the United States. The Calgon Carbon Corporation reports that GAC manufactured in Asia is direct activated, rather than re-agglomerated. Thus, the recommendation for re-agglomerated GAC, and GAC manufactured in Asia is not likely to comply with the GAC media specification.

5.2.3 Carbon Specification

There are various concepts for removal and replacement of GAC media in gravity contactors (i.e., GAC change-outs). The overall concept for the supply and removal of GAC media for the NKWD is to contract out media change-out operations to a company able to provide, or manage, all materials and services required for media exchange. The general scope of these services may include providing virgin GAC media, new media installation, spent media removal, and media regeneration and/or disposal. These services can be procured on a single change-out, annual, or multi-year services agreement. However, an agreement established for a longer duration commitment may have the advantage of fixed price and may even offer a lower unit cost due to economies of scale. Observations by representatives of the utilities at the plants that were toured indicated that vendors may be resistant to offering long term contracts without the provision for escalation clauses related to fuel or other prices.

Exhibit 5-18 includes the draft technical specification section for procurement of GAC media and is located at the end of this Section. The specification section is written for the FTTP, but the media characteristics will be the same for the MPTP as well. It is anticipated that a single contract for GAC media for all plants will be held by NKWD.

For the initial installation of GAC in the construction project, virgin GAC will be required for the contactors at each treatment plant, and the GAC supply will be bid as part of the general construction contract. During construction, a separate specification for GAC removal and replacement will be developed for the first year or more of facility operation. For plant operations in the future, custom regeneration of NKWD's GAC will likely be more economical than purchase of new batches of virgin GAC for media replacement. For custom GAC regeneration, options include:

1. Obtain bid pricing from GAC suppliers for custom GAC regeneration, including media removal at NKWD's treatment plants, transport to regeneration facilities, regeneration, GAC makeup, return transportation and placement in the contactors.
2. Develop an agreement with Greater Cincinnati Water Works (GCWW) for regeneration of NKWD media at GCWW's regeneration facilities.
3. Construct regeneration facilities at NKWD facilities and arrange GAC transport capabilities for internal (NKWD) transfer.

For Option 1, as described in the site visit notes, Scottsdale's bids included slightly lower unit costs for custom GAC regeneration by the GAC supplier versus virgin GAC purchase. From discussions with the Calgon Carbon Corporation, they regenerate GAC for drinking water treatment plants at a facility in Columbus, Ohio. Thus, it is anticipated that transport costs would be less compared to a more distant location such as Scottsdale (AZ), and consequently, custom GAC regeneration may be more favorable economically compared to virgin GAC for the NKWD.

Any decision to further evaluate Options 2 and 3 will need to consider cost, permitting, political ramifications, and other factors. These options also require identifying an approach to GAC media loading, unloading, and transport. A contract would be required with a GAC supplier to provide make-up carbon for the quantity lost as fines in the routine operation of the system and in the removal, regeneration and replacement process.

The use of virgin GAC or custom regenerated GAC is recommended over additional options, such as purchasing regenerated carbon from a common pool, because of the NKWD's objectives of effective DBP precursor removal and overall public health protection.

NKWD prefers to keep an option open to investigate alternate carbon sources in the future such as no bituminous based products. To support such investigations NKWD requests that space be provided in the AT Building at FTTP sufficient for installation of a future pilot GAC column system. RSSCT testing could also provide useful data in evaluating alternative GAC supplies with a considerably shorter test duration. Therefore multiple options will exist for testing at such time as NKWD chooses to do so.

5.2.4 Underdrains

The PD Report, March 2008 recommended a sloping floor in the GAC contactors, with stainless steel, wedge-wire style underdrains. The PD Report, March 2008 also noted that A-frame style underdrains have also been used successfully for GAC contactors. From CH2M HILL experience, plastic block lateral underdrains also represent a feasible option.

The construction of a sloped floor in the contactor significantly impacts the potential options for the contactor underdrains. After consideration of a sloped floor for NKWD, it was determined that the sloped floor would unnecessarily add to the depth of construction without significant benefit in terms of GAC empty bed contact time or added efficiency for GAC media removal. Therefore, a flat floor contactor design was selected.

The underdrain selection is also influenced by the type of backwash desired (i.e., water only or air/water), and the size of media used. For NKWD, small GAC media will be used, and air scour will be included (as described in the following section). The three types of underdrains generally used for new construction are:

- Block systems.
- False floor and nozzle systems.
- Stainless steel underdrains.

For the NKWD facilities, block systems and stainless steel underdrains represent the most feasible approaches. False floor and nozzle systems were not considered further because of the additional depth (at least 18 inches additional depth of contactors) required for construction.

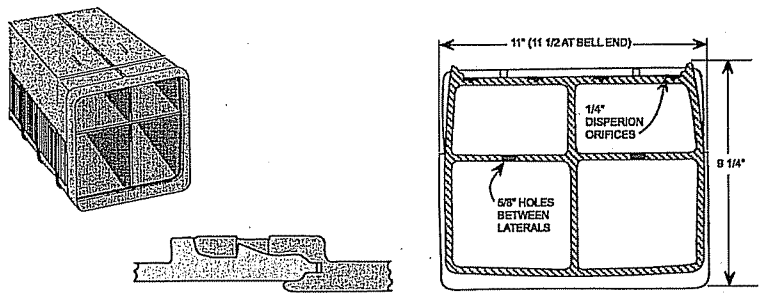
5.2.4.1 Block Systems

Significant advances in underdrain block system technology have occurred and been delivered to the market in the last 15 years. In the past blocks were made of vitrified clay and capable of water-only backwash, they are now made of high-density polyethylene and are capable of air-water backwash. The plastic blocks are lighter, easier to install, and are more forgiving of hydraulic shock. Plastic block systems are currently manufactured by F.B. Leopold Company (Type S ® and Type SL) and Infilco Degremont Technologies (TetraTM U Block and LP Block). Other manufacturers that have developed this technology include USFilter/Siemens (MULTIBLOCK®), and Roberts Filter Group (TrilateralTM).

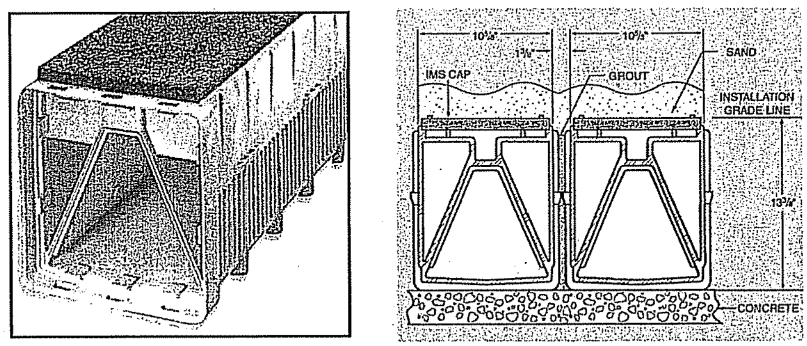
Typical plastic underdrain blocks are shown in Exhibit 5-19. These systems can utilize an integral media support cap (Leopold's IMS® cap or Infilco Degremont's Savage Plate®) to replace the traditional gravel support layers. Note that Infilco Degremont's Savage Plate comes in three different types: B plate, S plate, and T plate. Plate selection is based on the application, where the S plate is used when the media effective size is greater than 0.45 mm. This cap is made of sintered plastic beads and is bolted to the top of the underdrain.

The Leopold block system with IMS caps has a nominal pore size of approximately 0.35 mm for the IMS. With the small GAC size recommended for NKWD, the size difference between the GAC and the IMS cap is less than most projects. To reduce potential that plugging problems with IMS caps are minimized, a 4-inch deep layer of large diameter sand is recommended between the GAC and the underdrain. This sand layer is recommended regardless of the block system selected.

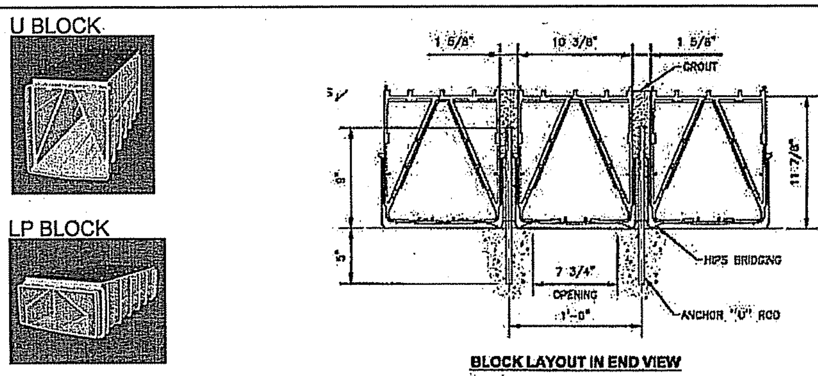
EXHIBIT 5-19
Block Underdrains



A. Dual Parallel Lateral (F.B. Leopold Co.)



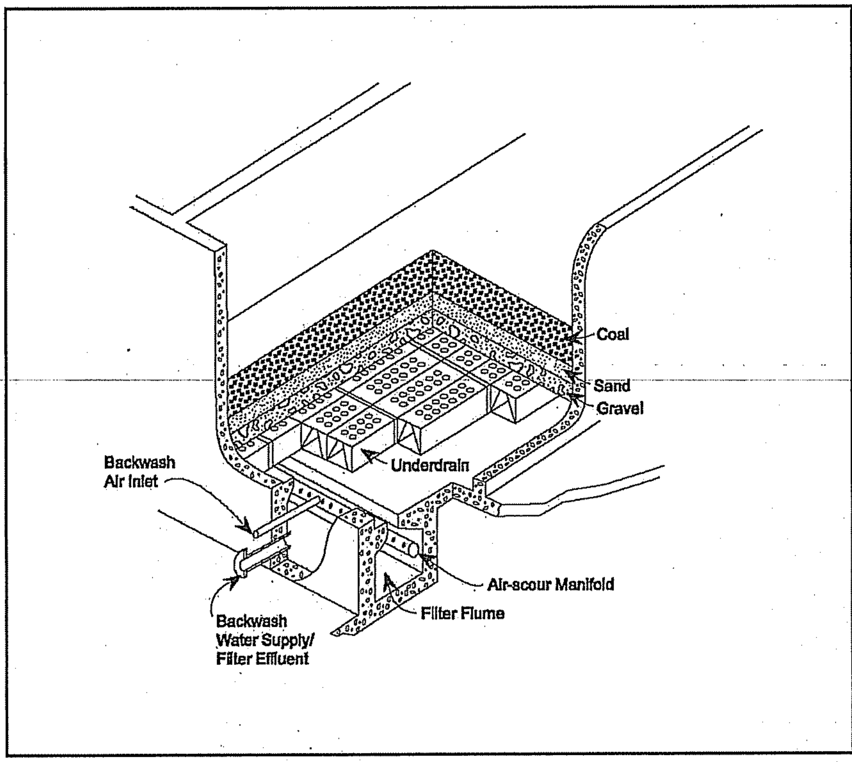
B. Universal Type S Underdrain with IMS Cap (F.B. Leopold Co.)



C. Tetra Block with S Plate (Infilco Defragment)

A typical plastic block underdrain system with air/water backwash is shown in Exhibit 5-20. The blocks are grouted to the filter (or contactor) floor and anchored with steel rods. Note that either a front or a center flume design can be used to accommodate the desired filter box length-to-width ratio while maintaining the maximum allowable lateral length. Different manufacturers have different requirements for the flume geometry and lateral lengths, so the proposed manufacturers will be contacted during detailed design. Fluid velocities in the flume should not exceed 6 feet per second (lower velocities are recommended). In general, a larger flume cross section provides lower fluid velocities but is more demanding of the underdrain blocks to maintain structural integrity.

EXHIBIT 5-20
Block Underdrain System with Air/Water Backwash



The dimension across the laterals is constrained to a multiple of the installed lateral width, including grout between laterals. The installed width varies between manufacturers with Leopold's Type S laterals having a nominal width of 11-inches and nominal height of 12 inches (without the IMS cap). Infilco Degremont's TETRA U Block laterals have a total height of 11-7/8 inches and width of 10-3/8 inches, so the same box dimensions may not be applicable to both lateral types. Leopold and Infilco Degremont both offer a low-profile block underdrain, but this underdrain was not considered for NKWD because the lateral length is limited significantly. For example, the Leopold Type S lateral has maximum length of 48 feet, whereas the Type SL (low-profile underdrain) is limited to 16 feet of length.

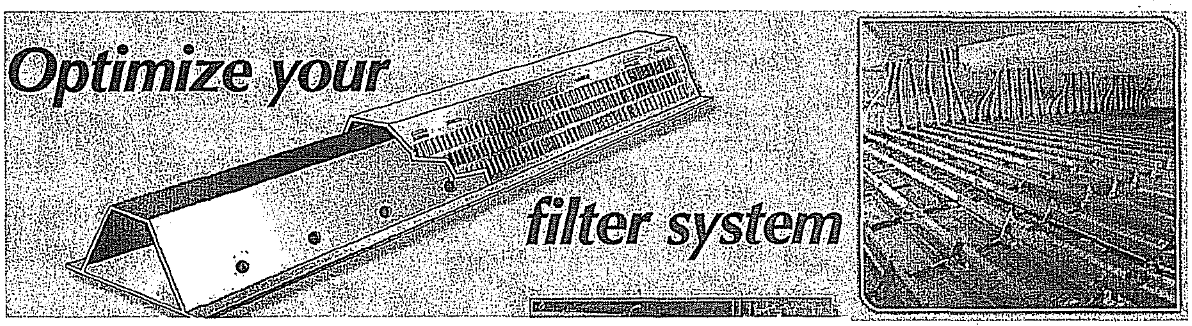
The dimension along the laterals (lateral length) is limited by the ability of the laterals to convey backwash flows without introducing unacceptable maldistribution along their length. As per CH2M HILL specifications the manufacturer should guarantee that the maldistribution will be less than 5 percent in the field over the length of the lateral. If tests are performed in a hydraulic laboratory to demonstrate meeting this requirements, then the maldistribution under laboratory conditions should be less than 3 percent.

5.2.4.2 Stainless Steel Underdrains

Stainless steel underdrains, such as the Johnson Triton product, were investigated on the site visits documented in Section 4. From the project experiences noted during the site visits, this type of underdrain did not perform well in combination with air scour. As a result, this type of underdrain was not considered further. The Johnson header lateral was also ruled out, since this underdrain cannot accommodate air scour.

AWI manufactures low profile stainless steel underdrains and underdrain panels for new installations and retrofits. The stainless steel underdrains are custom-designed for orifice sizing to match the design conditions of filtration and backwashing. Illustrations of the AWI underdrains are shown in Exhibit 5-21. CH2M HILL has installed these underdrains at several large new water treatment plants with success. However, the cost of the underdrain itself is typically higher than the standard block underdrain due to the materials of construction. In addition, there is a strong likelihood of a single bidder. For these reasons, the NKWD elected to use plastic block underdrains at the FTTP and the MPTP.

EXHIBIT 5-21
Stainless Steel Underdrain, Including Application With Air/Water Backwash (Right)



5.2.5 Air Scour

Air scour provides some agitation and cleaning of filter media throughout its depth and can reduce the water requirements for backwashing. Simultaneous air plus subfluidization water wash (upflow water wash with air scour) provides the most effective agitation and cleaning of the filter media throughout its depth. Upflow water wash with air scour is CH2M HILL's preference, particularly for installations with deep bed (≥4 feet of media) filters or contactors.

For the FTTP and MPTP post-filter GAC contactors, media depth will be 12 feet (FTTP) and 10 feet (MPTP). With this depth of media, air scour offers more effective backwashing of the deep beds. Air scour will also enhance the ability to remove fines by backwashing. With air scour, it will be easier to remove fines by backwashing, and better fines removal through backwashing will mean less fines removal through underdrains. In addition, more efficient fines removal will minimizes downtime and water use for fines removal.

A concern by NKWD was raised concerning an increase in GAC particle breakup due to the increased turbulence associated with air scour. Based on discussion with Professor Vern Snoeyink, GAC particle breakup and mass transfer zone disturbances are not anticipated. In fact, the use of air scour was recommended by Professor Snoeyink based on extensive use in Europe with deep beds. The air scour cleaning is often followed by a water only backwash step to re-stratify the media and the garnet layer.

Typical air flow rates are:

$$\text{Air} = 2\ \text{scfm/ft}^2 \text{ with simultaneous water} = 3 \text{ to } 6\ \text{gpm/ft}^2$$

Positive displacement blowers are typically used because of their ability to maintain a relatively constant air flow rate against changing discharge pressure conditions. A separate room is typically provided for the blowers to minimize noise. Air piping is generally type 304 stainless steel, with adequate provision for thermal expansion of the piping. Carbon steel and ductile iron may also be used for air scour piping, but require additional maintenance due to temperature and moisture conditions. Air temperature at the discharge of positive displacement blowers approaches or exceeds 200 degrees F, therefore any piping within 8 feet of the finished floor will be insulated for health and safety reasons.

When the blowers are located at a lower elevation than the filter high water level, care must be taken to avoid the potential for water to siphon down the air piping to the blowers. For this project, a high loop will be incorporated into the air piping to allow for the decrease in air volume as it cools to ambient conditions from the blower discharge pressure.

A new air scour blower system will be added at each plant. FTTP currently does not have an air scour system for the sand filters but the design of a new air scour system is underway by others. The new blower at FTTP is planned to be placed on the north side of the existing Filter Building which is a considerable distance from the Advanced Treatment Building. An air scour system is in place for the existing filters at MPTP which may be able to serve as a back-up to the new blower to be provided in the project. It may not be necessary to include air scour in every backwash event and therefore a single new blower will be provided at each location. Information on the blowers is as follows:

FTTP

- Number of blowers : 1
- Capacity:1760 scfm.
- Blower Discharge Pressure: 9.1psi, final value to be determined in final design.
- Blower Type: Positive Displacement.
- Horsepower: 100 HP, final value to be determined in final design.

MPTP:

- Number of blowers : 1
- Capacity: 1,224 scfm.
- Blower Discharge Pressure: 7.4psi, final value to be determined in final design.
- Blower Type: Positive Displacement.
- Horsepower: 50 HP, final value to be determined in final design.

5.2.6 GAC Loading and Unloading Systems

GAC media is often supplied in bulk truckloads of approximately 20,000 or 40,000 pounds. Partial truckloads will increase the cost per unit weight of GAC. Other delivery options include flat-bed trucks with GAC super sacks (e.g., 1,000-lb or 2,000 lb sacks) and tanker trucks. From discussions with GAC suppliers, tanker trucks are most expensive to use, and consequently, they are typically only used with pressurized GAC vessels.

Exhibit 5-22 lists the design criteria pertaining to GAC procurement for the FTTP. Note that the physical elements that will be designed at each treatment plant to accommodate GAC loading and unloading are shown on Exhibits presented in Section 8.

EXHIBIT 5-22
GAC Contactor Design Criteria for FTTP

Total number of contactors	8
Individual contactor area, sq ft	880
GAC media depth, feet	12.0
Each contactor media volume, cu ft	10,560
Apparent Density of GAC (dry), lb/cu ft	32.5
Dry GAC media per contactor, lbs	343,200
Number of 40,000 lb truckloads per contactor	9 (results in 360,000 lbs of GAC)
Number of 1,000 lb super sacks per contactor	344

Exhibit 5-23 lists the design criteria pertaining to GAC procurement for the MPTP.

EXHIBIT 5-23
GAC Contactor Design Criteria for MPTP

Total number of contactors, initial construction	5
Individual contactor area, sq ft	612
GAC media depth, feet	10.0
Each contactor media volume, cu ft	6,120
Apparent Density of GAC (dry), lb/cu ft	32.5
Dry GAC media per contactor, lbs	198,900
Number of 40,000 lb truckloads per contactor	5 (results in 200,000 lbs of GAC)
Number of 1,000 lb super sacks per contactor	199

5.2.6.1 GAC Loading Procedures

There are various methods used to move virgin GAC to an empty contactor. The method used to load media often depends on the supplier's preference, although specific requirements (e.g., such as those imposed by plant physical constraints) can be defined in the GAC specification. From discussions with the GAC media suppliers, they view any method involving loading the GAC to contactors as a slurry as similar. Their identification of exactly which method to use will be based on the specification requirements and their own economic considerations at the time of delivery to the project site.

GAC loading methods are described in Exhibit 5-24, and the corresponding physical requirements for each method are listed in Exhibit 5-25. Media loading by eduction of GAC from an open-bed truck is illustrated in Exhibit 5-26. Loading from super sacks is illustrated in Exhibit 5-27.

The number of supersacks required for the NKWD facilities is significant. It is estimated that 199 1,000-lb super sacks would be required to load a single contactor at MPTP, and approximately 344 1,000-lb super sacks would be required to load each contactor at FTTP. Given the site limitations at the FTTP, it is recommended that GAC suppliers be encouraged to deliver media from open-bed trucks (Method 4 as outlined in Exhibit 5-24). However a prohibition of super-sacks may slightly increase the cost for GAC media. The facility design will be able to accommodate either approach, although delivery from open-bed trucks is preferred.

EXHIBIT 5-24
Summary of GAC Loading Procedures

Method	Description	Process Description
1	Empty GAC super sacks directly into contactor	GAC would be delivered to the site in super sacks using flatbed trucks. Super sacks, about one cubic yard (3 ft x 3 ft x 3 ft) and typically ½ ton (1,000 lbs) by weight, would be stored on-site until installation. A small crane would be mobilized and used to pick and drop the super sacks into the contactor where the GAC is released from its bag. A water depth 2 ft above the media will be maintained for dust control.
2	Slurry GAC from hopper and super sacks	Similar to above, GAC would be delivered and stored on the site in super sacks. In this case, GAC would be released into a hopper apparatus provided by the GAC supplier using a forklift. Using service water as the motive fluid, GAC would slurry into the contactor bed through portable hoses.
3	Slurry GAC from tanker trucks	Water is added to a self-contained tanker truck to saturate the GAC and form a GAC slurry. Compressed air is then used to pressurize the truck and facilitate GAC transfer to the contactor through a flexible hose. The excess water transferred from the truck to a contactor is removed by backwashing or via contactor to waste. This is the method used for GAC loading to pressurized vessels.
4	Slurry GAC from open bed dump trucks	Dump trucks are emptied into a hopper apparatus or by using an eductor wand with service water as the motive fluid. The GAC slurry is transferred from the eductor system to the contactor through portable hoses.

EXHIBIT 5-25
GAC Loading Requirements

Description	Method	Value
Slurry Water Supply Flow, gpm	2, 3, 4	100-200
Slurry Water Pressure, psi	2, 3, 4	90-110
Compressed Air Supply, scfm	3	14
Compressed Air Pressure, psi	3	13-14
Delivery Truck Capacity, lbs	1, 2, 3, 4	40,000
Approximate total duration to load GAC in 1 contactor including backwashes, hrs	1, 2, 3, 4	24-40
Approximate service water used to load GAC in 1 contactor, gal	2, 3, 4	30,000 to 60,000 per truckload
Approximate backwash waste volume generated following loading GAC in 1 contactor, gal	1, 2, 3, 4	FTTP: 540,000 to 1,000,000 MPTP: 375,000 to 800,000

EXHIBIT 5-26
Media Installation by Eduction from Open-Bed Truck (Provided by Calgon Carbon Corporation)

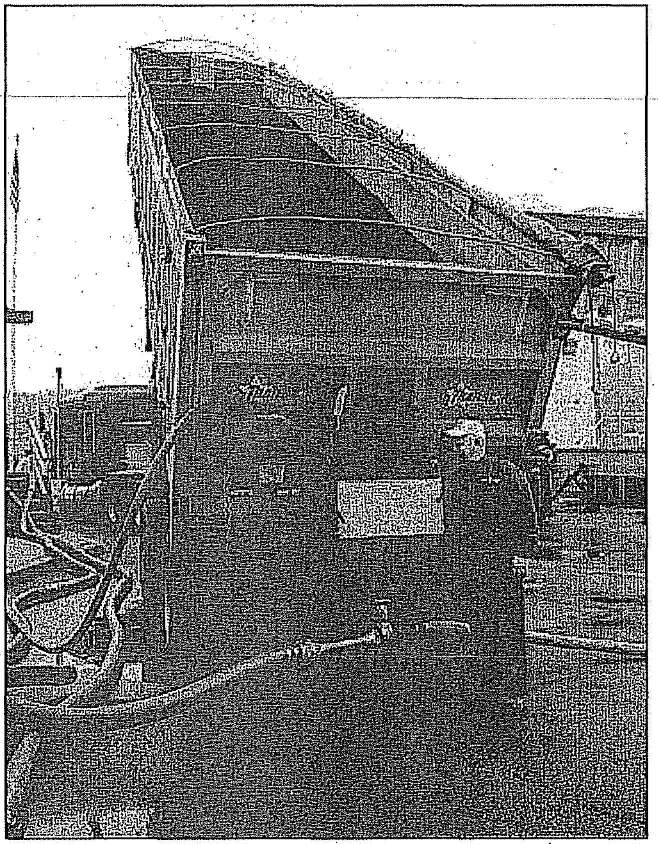


EXHIBIT 5-27
Media Installation by Eduction from Super Sacks (Provided by Calgon Carbon Corporation

5.2.6.2 GAC Removal Procedures

There are two main procedures for media removal from the NKWD contactors: 1) eduction with high pressure water (either to an open trailer or super sacks), or a 2) vacuum system. A summary of these GAC removal options is provided in Exhibit 5-28.

EXHIBIT 5-28
Summary of GAC Removal Procedures

Method	Description	Process
1A	Eduction of GAC Slurry to Truck	GAC slurry (media + water) is conveyed from the contactor using an eductor (wand or fixed) connected to a motive water supply. The GAC slurry is conveyed to an open bed or tanker truck. Excess water is continuously drained from truck from a single drain point and sometimes aided by the use of a vactor truck with screening to remove water at a high rate but exclude media loss. Drain water would be routed by temporary piping to empty in the backwash waste equalization basin.
1B	Eduction of GAC Slurry to Super Sacks	Same procedure as above, except the GAC slurry is conveyed to a holding container where the excess water is drained. The drain water would be routed to the backwash waste equalization basin. GAC is then loaded into super sacks for storage at the site and further draining. Once GAC is relatively dry, GAC will be transported to custom regeneration facility or disposal.
2	Vactor Truck	GAC slurry (media + water) is vacuumed from contactor using a vactor truck. Vactor trucks are significantly smaller than open trailers (500-2,000 gallons) so the vactor truck would transfer the media into an open trailer truck.

Media removal by eduction of the GAC slurry (method 1A) to an open bed truck is illustrated in Exhibit 5-29. It should be noted that, even after a period of draining, the spent (i.e., wet) GAC weighs approximately twice the amount of dry GAC. Therefore, twice the number of trucks are needed to haul the same volume of spent GAC away as to deliver dry GAC. Drying spent GAC through permeable super sacks allows a contractor to haul away similar quantities per truck as that delivered. From discussions with the Calgon Carbon Corporation, they have patented a method to drain the spent GAC prior to putting it in super sacks. Media removal by eduction of the GAC slurry to super sacks by this proprietary method is shown in Exhibit 5-30.

EXHIBIT 5-29
Media Removal by Eduction to Open-Bed Truck (Provided by Calgon Carbon Corporation)

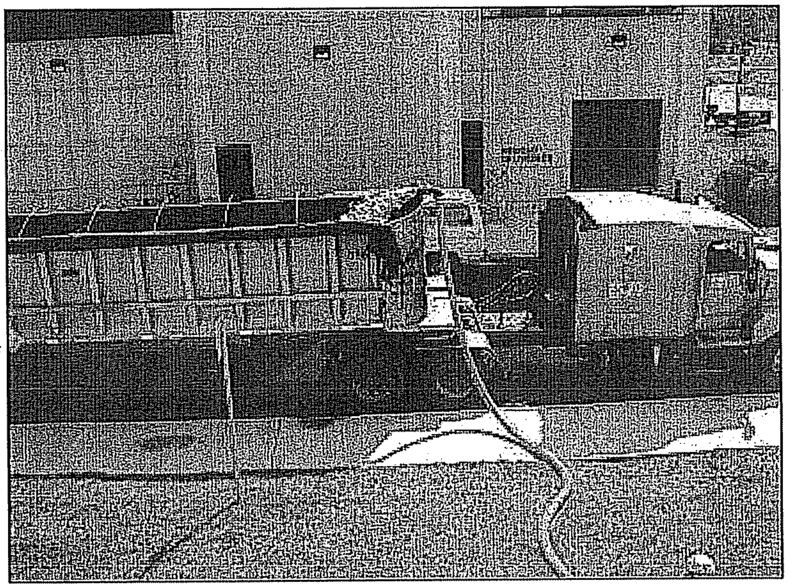


EXHIBIT 5-30
Media Removal by Eduction to Super Sacks (Provided by Calgon Carbon Corporation)

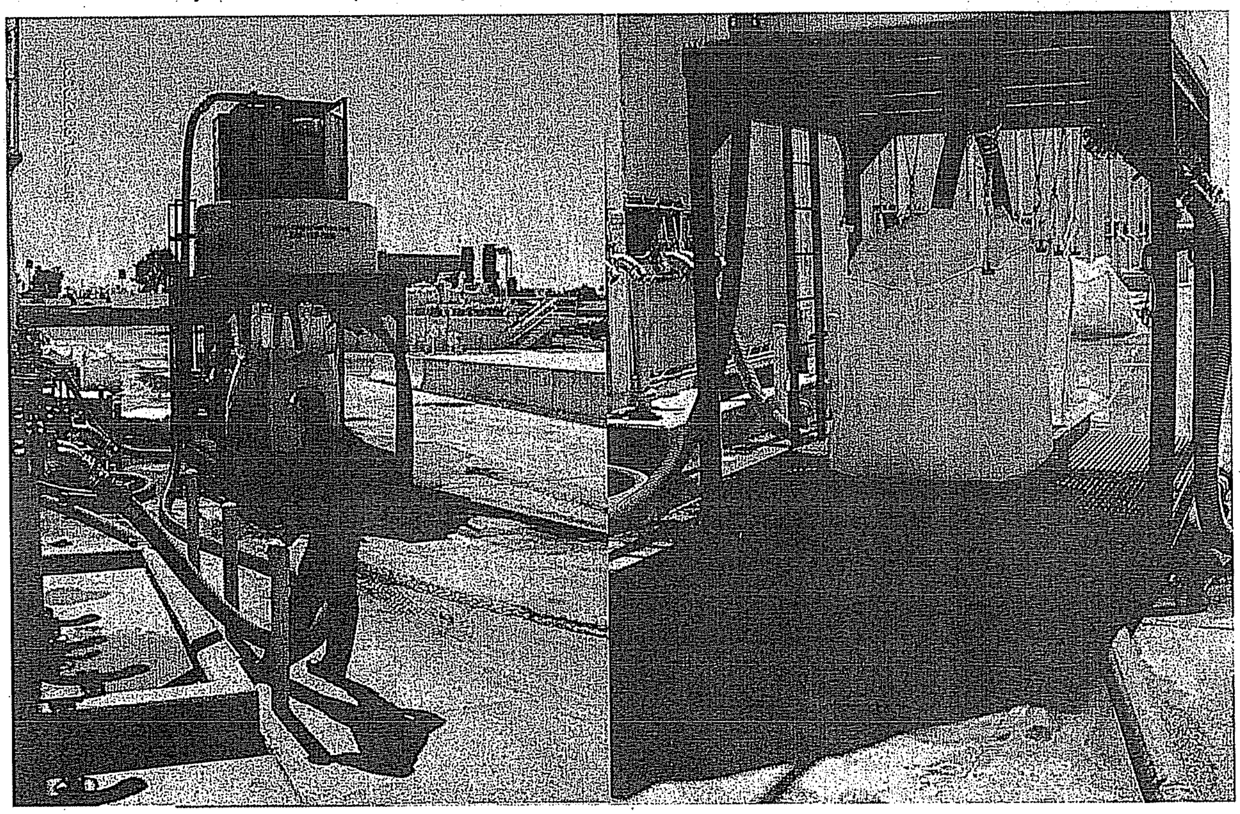


Exhibit 5-31 lists the GAC media removal requirements. The GAC specification section for the purchase order of GAC will specify constraints that the NKWD may elect to impose on media removal methods. The use of Method 1A is expected to have the least impacts on the FTTP site, although Method 1B can also be accommodated.

EXHIBIT 5-31
GAC Removal Requirements

Description	Method	Value
Slurry Water Supply Flow, gpm	1A, 1B, 2	100
Slurry Water Pressure, psi	1A, 1B, 2	90-110
Approximate total time duration to remove GAC from 1 contactor, hrs	1A, 1B, 2	16-40
Approximate drain water used to remove GAC from 1 contactor, gal	1A, 1B, 2	100,000-400,000

5.2.7 On-Site GAC Storage

The PD Report, March 2008, did not include any on-site storage for GAC. The provision of on-site GAC storage would offer a buffer for issues associated with GAC availability or transportation restrictions/issues, and would provide flexibility at each treatment plant. However, providing GAC storage would also take up limited space at each site, potentially increase construction cost, and GAC storage time would need to be carefully managed to ensure that no deterioration of carbon occurred.

Three options were identified to provide GAC storage, as follows:

1. Storage Tanks or Silos:

    Provide storage for 10,560 cu ft (1 contactor) minimum for Fort Thomas.

2. Increase Size of Contactors:

    Increase contactor size to provide 20 min. EBCT with 7 Contactors @ 44 mgd.

    Add approximately 1,005 cu ft of additional contactor area (at 44 mgd).

    Increase building length by 24 ft or width by 6 ft.

3. Super Sack Storage:

    Provide inside storage for 344 +/- super sacks.

    Based upon stacking super sacks 4 high, approximately 1500 cu ft required.

    UOSA used 2000-lb Super Sacks, so approximately 162 per contactor.

After considering these options, the NKWD elected to consider the 8th contactor as GAC storage. This will result in no change in system operation, but because the daily average flowrate has not exceeded 40 mgd, effectively there is system storage available. If it becomes necessary to leave a contactor full of exhausted GAC in place for some period of time, the FTTP can operate with 7 contactors in use, and the EBCT will still be 20 minutes or longer for flowrates of 38.5 mgd or less. Similarly, the capacity at the MPTP facilitates this same approach to GAC storage on-site.

5.2.8 Backwash Supply

The best criteria for backwash effectiveness are the quality of the filtered water and the long-term absence of dirty media and mud ball formation. Typical fluidized bed expansions are 20 to 30 percent, and fluidization also provides water flow to stratify the bed. Since temperature affects viscosity of water, flow rates for water-only backwash have to be adjusted for significant variations of summer and winter temperatures. Each degree Celsius increase in water temperature requires approximately a 2 percent increase in wash rate. Typical backwash rates for silica sand, anthracite coal, and dual media are 15 to 23 gpm/sq ft, but lower rates are required for deep bed monomedia GAC filters. Discussions with GAC suppliers indicate that a 30% bed expansion is adequate to backwash even without air scour. A range of 6 to 12 gpm/sq ft is recommended for the design of the GAC contactors.

The anticipated volume of each GAC contactor backwash at the FTTP is approximately 180,000 gallons. The anticipated volume of each GAC contactor backwash at the MPTP is approximately 125,000 gallons. These volumes were determined based on 30 percent bed expansion, at maximum water temperature (minimum viscosity), and based on contactor sizing at each facility.

At FTTP the backwash supply for the GAC contactors (and for the existing filters) will be pumped from the GAC influent pump station wet well, located beneath the GAC Building. Thus, the backwash supply will consist of filtered water. Because the NKWD pre-chlorinates, a chlorine residual concentration of 0.2 to 0.5 mg/L is typically present in the filtered water. It is recommended that NKWD evaluate pre-chlorination needs and applied doses as a means of reducing disinfection by-products, sodium bisulfite use and possibly GAC replacement frequency.

At MPTP, the backwash pumps draw supply from the finished water clearwell. The chlorine residual at that location is typically in the range of 1.9 to 2.2 mg/l.

5.2.9 Backwash Waste

For each treatment plant, backwash equalization and waste disposal facilities will be provided. At the FTTP, backwash waste equalization will be provided beneath the GAC contactors. Backwash waste will be collected and pumped to the South Reservoir. At the MPTP, backwash waste from the contactors will flow by gravity to the North Reservoir.

The backwash waste handling facilities have been sized to accommodate backwash waste from GAC loading, installation, and unloading. In addition, the equalization basin will accommodate the anticipated volume of each GAC contactor backwash (approximately 180,000 gallons at the FTTP and approximately 125,000 gallons at the MPTP). In addition, the backwash waste facilities were also sized to accommodate

15 minutes of contactor-to-waste flows. NKWD currently adds powdered activated carbon to the reservoirs for taste and odor control so it was concluded that returning carbon fines from backwash and filter to waste operations would provide some beneficial reuse of the carbon fines.

5.2.10 Analytical Requirements

Each GAC contactor will be equipped with an effluent flowmeter, and a flowmeter will also be provided for backwash supply. Each GAC contactor will be equipped with differential pressure sensors to allow monitoring of headloss accumulation. A level indicator will be provided at each contactor as well.

At each treatment plant, one turbidimeter will be provided on the combined GAC effluent. Each GAC contactor will be piped and spare controls wiring run so that an individual turbidimeter can be added in the future. The NKWD has contacted KDOW about turbidity reporting requirements, and relevant findings will be incorporated into project detailed design. The NKWD plans to continue to use turbidity monitoring on individual conventional filters as the turbidity point of compliance. This practice is consistent with many facilities with operating post-filter GAC contactors. Particle counters will not be installed for the GAC contactors.

To monitor organic concentrations in the GAC effluent, the NKWD will implement grab sampling for total organic carbon (TOC) in the GAC influent and effluent, including the effluent from each contactor. UV absorbance at 254 nm (and UV transmittance at 254 nm, which can be calculated from UV absorbance and vice versa) also provide key information on organic levels that are present. UV absorbance typically correlates well with TOC. Additional grab sampling to monitor UV absorbance is also recommended.

For on-line TOC analyzers, the NKWD checked into Hach, Sievers/GE and S::CAN at the AWWA Water Quality Technical Conference exhibition held in Cincinnati in November, 2008. Based on observations from NKWD staff, the Hach analyzer requires a high degree of maintenance, whereas the Sievers/GE analyzer is reported to work better. The NKWD was impressed with the S::CAN analyzer because of minimal maintenance requirements and simple calibration. The S::CAN TOC analyzer is expected to cost about $1,300. In the coming months, the NKWD plans to demo a few online TOC analyzers. Thus, the detailed design will leave space and provisions (plumbing, power, and controls) for future TOC analyzers to be located on the combined GAC effluent, not on individual contactors, at each facility.

At each facility, the UV absorbance in the combined effluent will be measured as part of the UV disinfection process. Each UV disinfection equipment system will be equipped with a UV transmittance (UVT) analyzer. If not currently available, a bench-top UVT analyzer will need to be provided to the laboratory at both plants for calibration purposes. The on-line UVT analyzer for UV disinfection will require weekly calibration checks versus the bench-top unit at each facility.

At each treatment plant, sample piping from the GAC influent, each individual contactor, and the combined GAC effluent will be routed to a central area with a sample sink.

Based on the site visits, and project discussion at workshops, additional analytical requirements include the following:

- Fines analysis by a 0.45-micron grab sample filter test upon installation of new GAC.
- SCADA will be programmed to compile bed volumes per contactor based on flowrate per contactor and contactor on/off time.

The UV disinfection systems will include the following analytical elements:

- UV intensity sensors – 1 per lamp for medium-pressure UV systems. Note that the UV intensity sensors will require monthly calibration checks versus reference intensity sensors.
- Flowmeter and flow control valve per UV "train".
- Other equipment provided by UV manufacturer, including:
  - Level Sensors.
  - Temperature Sensors.

5.3 Storage and Pumping

5.3.1 Fort Thomas Treatment Plant (FTTP)

Additional pumping facilities will be installed to support the addition of Advanced Treatment facilities within the existing gravity flow configuration of the plant. A GAC Pump Station will be added to lift the water to the GAC contactors and provide sufficient head to drive the flow through the GAC and UV systems. Pump systems will also be constructed to provide backwash water for the contactors, slurry water for conveying clean and spent GAC from the contactors, and for pumping the residuals streams from Advanced Treatment back to the raw water reservoirs.

5.3.1.1 GAC Pump Station

The GAC Feed pumps will be sized to feed the GAC Contactors and match the production rate for the water treatment plant. These pumps will take suction from the proposed GAC Pump Well and discharge into the contactor influent channel. The pumps will be provided with variable frequency drives to control the flows.

Three pumps will be provided, each with a maximum rate capacity of 22 mgd to provide a firm capacity of 44 mgd. Each pump will be sized to develop an approximate TDH of 60 feet.

The PD Report, March 2008 identified both submersible and vertical turbine pumps as appropriate for this application. The NKWD personnel are familiar with the operation and maintenance of the vertical turbine pumps, but do not currently have large submersible pumps in the system. These pumps will operate continuously and are critical to the operation of the Advanced Treatment facility. Based upon the experience of NKWD personnel with operations and maintenance of vertical turbine pumps, the superior operational efficiency available, and accessibility of the pumps for O&M functions, vertical turbine pumps are recommended for this application.

The GAC feed pumps will therefore be as follows:

- Number of pumps: 3, 2 duty, 1 standby.
- Capacity: 22 mgd, each.
- Head: 60 ft, TDH, final value to be determined in final design.
- Drive: Variable speed.
- Pump Type: Vertical Turbine.
- Horsepower: 250 HP (approximate, final value to be determined.

5.3.1.2 GAC Contactor Backwash Pump

The GAC Contactor Backwash Pumps will be sized to provide the flow required to develop a 30% bed expansion. The maximum flow identified by the PD Report, March 2008 was 13,200 gpm based upon a backwash rate of 15 gpm per square foot at an approximate TDH of 65 feet. Discussions with suppliers for the selected GAC indicate that, at a temperature of 85 degrees F, a backwash rate of 11.8 gpm per square foot of contactor bed area will provide 30% bed expansion. On this basis, the contactor backwash pump will be designed to provide a rate of 12 gpm/sf or a total flow rate of 10,560 gpm at an approximate TDH of 65 feet. The PD Report, March 2008 identified both submersible and vertical turbine pumps as appropriate for this application. The GAC Backwash Pump will not operate on a continuous basis, but will take suction from the pump well and be located in the GAC Pump Station adjacent to the GAC Feed Pumps. Based upon the use of vertical turbine pumps for the GAC Feed Pumps, the facility layout, hydraulics and consistency, it is recommended that vertical turbine pumps be utilized for the backwash pumps.

The GAC backwash pumps will therefore be as follows

- Number of pumps: 1, with backup provided by Filter Backwash Pump.
- Capacity: 15.2 mgd. 10,555 gpm
- Head : 65 ft, TDH, final value to be determined in final design.
- Drive: Variable Speed Pump.
- Type: Vertical Turbine.
- Horsepower: 250 HP (approximate).

5.3.1.3 Filter Backwash Pumps

The existing sand filters are currently backwashed taking supply from a buried, 200,000 gallon backwash tank located in the hillside above the plant near the south reservoir. This tank is filled with drinking water taken from a distribution system main supplied by the Route 27 Pump Station. Before the finished water supply line was installed, the tank was filled by drawing water from the clearwells. The original backwash pumps for filling this tank are located in the basement of the filter building and have not been used for several years due to excessive vibration in the entire building and a power dip that occurred whenever the pumps were started.

Replacement of the original backwash pumps was included in the scope of the Advanced Treatment project. The existing sand filters are currently scheduled for rehabilitation including, at a minimum, the replacement of the existing media. The filter improvement project is in design by another engineering firm and bidding of the project will be completed before the Advance Treatment bidding. The filter media replacement will likely require additional backwash flow which cannot be easily provided by the existing backwash tank system. This need for additional flow and replacement of the backwash pumps when combined with the condition of the existing backwash tank (scheduled for rehabilitation in separate capital project) support the installation of a backwash pump system which can be utilized to backwash the sand filters directly (i.e., without use of the backwash tank). The backwash rate for the new filters has not been determined. In accordance with the latest version of Ten State Standards, the rate should be a minimum of 20 gpm per square foot.

The preliminary sizing analysis provided in this report was completed to determine whether the pump capacity requirement for backwashing the GAC contactors would likely equal or exceed that needed for the sand filters. This preliminary analysis has reached that conclusion. The final capacity and head of the filter backwash pumps should be selected based on the characteristics of the filter media and underdrain system. CH2M HILL requests that NKWD provide this information.

The initial sizing of this pump will provide 20 gpm per square foot to the filters. Based upon the 560 square feet area of the existing filters, the total flow rate will be 11,200 gpm at an approximate TDH of 70 feet will be required. The Filter Backwash Pump will be located in the GAC Pump Station adjacent to the GAC Feed Pumps and the GAC Backwash Pump. Similar to the GAC Feed Pumps and GAC Backwash Pumps, vertical turbine pumps will be utilized for this application.

The flow and head characteristics for the GAC Backwash Pumps and Filter Backwash Pumps are similar enough that the pumps will be utilized as backup pumps for the other application. The pumps will be provided with variable frequency drives, flow meters, and flow control valves sufficient to control the flows and heads for the two applications.

The filter backwash pumps will therefore be as follows

- Number of pumps: 1, with backup provided by GAC Backwash Pump.
- Capacity: 16.1 mgd. 11,181 gpm
- Head: 70 ft, TDH, final value to be determined in final design.
- Drive: Variable speed.
- Pump Type: Vertical Turbine.
- Horsepower: 250 HP (approximate).

5.3.1.4 Slurry Water Pump System

A slurry water supply system is needed to support the installation and removal of the GAC from the contactors. This slurry water stream requires flow of at least 100 gpm per contactor feed line and a head of at least 100psi. Site visits by the project team confirmed that a slurry stream of this capacity and pressure is required to efficiently install and remove the GAC. Contacts with carbon vendors revealed that the ability to operate 2 eductor driven GAC supply/removal lines concurrently would be a valuable asset for exchanging carbon in the beds.

The PD Report, March 2008 determined that the slurry water system would be provided with a hydropneumatic tank to stabilize pressures in the system. Discussions with manufacturers indicate that a large tank (1,000 gallons minimum) would be required for this application and that the relatively infrequent use of the system at full capacity (only during GAC replacement) would result in operational problems. In lieu of the hydropneumatic tank system, a system of vertical pumps with variable frequency drives will be provided. This system will provide additional operational flexibility, reduce maintenance, and avoid the stagnant water that would result from the use of the hydropneumatic tanks. The system will consist of two large pumps capable of providing the flows and pressures required for GAC transfer operations and a smaller, vertical pump with variable frequency drive for routine daily washdown in the facility. The system will be designed to allow operation of both of the large pumps if the GAC replacement contractor needs the additional flow for multiple trucks or removal from multiple contactors concurrently.

The slurry water pumps will therefore be as follows

- Number of pumps: 2.
- Capacity: 100 gpm, each.
- Head: 110 ft, TDH, final value to be determined in final design.
- Drive: Variable speed.
- Pump Type: Vertical Turbine.
- Horsepower: 15 HP (approximate).

5.3.1.5 GAC Pump Well

The operation of the GAC and Filter Backwash Pumps requires a well to avoid system drawdown and significant operational problems. Discussions with NKWD personnel confirmed that the existing clearwells are not adequate for this use. This GAC Pump well will serve as the source for several discharges including the following:

- GAC Feed (Pump to GAC Contactors).
- GAC Backwash Supply.
- Filter Backwash Supply.
- Slurry Water Supply.

The GAC Feed will be a continuous flow and will match the water treatment plant flow in most instances. As such, only minor storage capacity is required for this application, primarily during pump startup.

The remainder of the flows will occur on a periodic basis with the Filter Backwash being the most frequent. In order to minimize the size of the pump well, the NKWD has determined that the filters and the contactors will not be backwashed concurrently. The well was sized to backwash all of the filters in a single day or to backwash two (2) contactors and four (4) filters in a single day. The tank was sized to provide sufficient storage to allow either of the backwash pump systems to operate through a full backwash cycle without increasing the raw water flow to the plant or decrease the GAC Feed rate to the active contactors. This operational flexibility allows the NKWD to complete the required backwash and replenish the storage at the most appropriate time. On this basis, the minimum size required is 371,000 gallons of usable storage. A storage tank of 400,000 gallons is recommended.

The pump well will be divided into two, relatively equal parts to allow for inspection, maintenance, and cleaning without interrupting operation of the system. The interior tank walls will be connected using slide gates which will normally be in the open position. The pump well will be provided with an overflow which will be routed to the EQ Basin. When a tank compartment is to be isolated for maintenance activities the water level can be drawn down by the GAC feed pumps. Each of the two tank sections will also be outfitted with a submersible sump pump to facilitate dewatering of the tanks section.

The sump pumps will therefore be as follows:

- Number of pumps: 3.
- Capacity: 100 gpm, each.
- Head: 25 ft, TDH, final value to be determined in final design.
- Drive : constant speed.
- Pump Type: submersible.

5.3.1.6 Equalization (EQ) Basin

5.3.1.6.1 EQ Basin Size

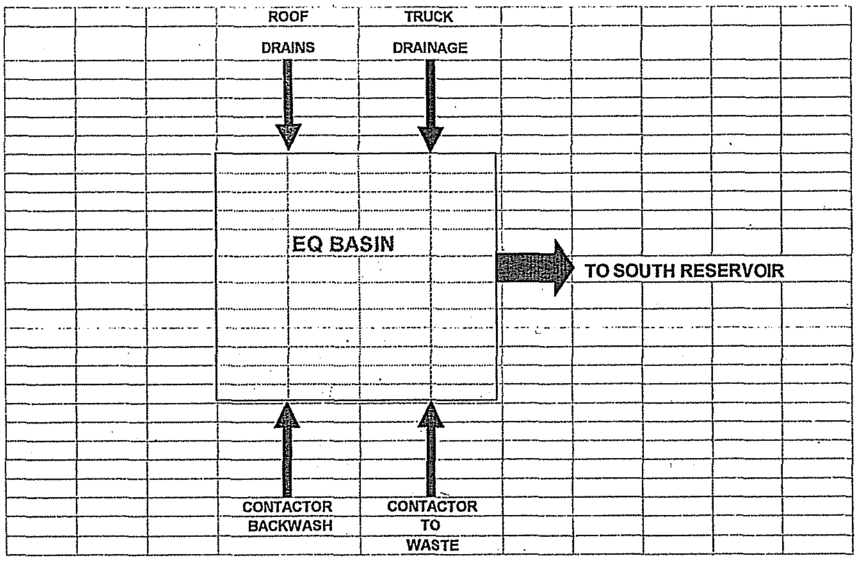
Backwashing the GAC Contactors produces a large volume of waste water which requires disposal. The PD Report, March 2008 identified the total volume of backwash water as 400,000 gallons based upon a backwash period of 30 minutes at a rate of 15 gpm per square foot. This volume does not include the contactor to waste flow proposed after the contactor backwash. The Kentucky Division of Water verified that disposal of the Contactor Backwash water will not be considered recycle flows as regulated by the Filter Backwash Recycle Rule. Therefore the backwash and contactor to waste water will be of suitable quality to be pumped to the South reservoir for disposal at a rate that optimizes the sizing of the tank and pumps.

In addition, the removal of the spent GAC from the contactors and installation of new GAC in the contactors will require the use of slurry water for transport and will require wasting and disposal of these flows. The waste slurry water will contain varying amounts of GAC fines and must be contained and disposed of properly. The facility will include provisions for containing this water and routing it to the EQ Basin for disposal. NKWD currently adds powdered activated carbon to the raw water reservoirs at times for taste and odor control; therefore returning the carbon fines to the reservoirs may be beneficial.

The roof structure for the Advanced Treatment building is intended to include a vegetated green roof over the contactor basins and a pitched metal roof over the pump station and UV room. The storm water from the metal roof will be routed to the EQ Basin for pumping to the south reservoir. The Kentucky Division of Water has agreed to this disposal method provided certain conditions are met (see Section 10).

Exhibit 5-32 summarizes the flows to the EQ Basin. The original analyses and tank sizing included the filter to waste flows from the existing sand filters. It was determined that separating these flows from other backwash to waste flows and routing these flows to the new EQ Basin by gravity would be extremely difficult, if possible, and involve significant construction costs relative to the flows involved. It was determined that the filter to waste flows would continue to be treated in the existing system at this time. In addition, overflows from the GAC Pump Well and the contactor influent channel will be routed to the EQ Basin.

EXHIBIT 5-32
EQ Basin Flows



The size of the EQ Basin is controlled by the total volume of water routed to the basin, the pumping rate from the basin to the South reservoir and the operation of the facility. Three (3) options were evaluated to determine the optimum size of the EQ Basin including the following:

- Pump Rate = 0 gpm.
- Pump Rate = 3,300 gpm.
- Pump Rate = 6,600 gpm.

The tanks sizes for these options ranged from 210,000 gallons for the largest pump rate to over 515,000 gallons for option with no pumping during the tank filling cycle. A review of the lifecycle costs for the three options indicated that a pump rate of 3,300 gpm and a storage tank size of 333,000 gallons resulted in the lowest cost option by approximately 10% of the total costs. On this basis, it is recommended that an EQ Basin with a total volume of approximately 350,000 gallons and a pump station with a firm capacity of 3,300 gpm be constructed.

The EQ Basin will be divided into two, relatively equal parts to allow for inspection, maintenance, and cleaning. The tank sections will be connected using slide gates which will normally be in the open position. When a tank compartment is to be isolated for maintenance activities the water level can be drawn down by the EQ basin pumps. Each of the two tank sections will also be outfitted with a submersible sump pump with capacity sufficient to empty the tank and handle wash down water. During detailed design, consideration will be given to sloping the basin floors and/or filleting the basin corners as a means of enhancing removal of GAC fines.

The sump pumps will therefore be as follows

- Number of pumps: 2, 1 per compartment.
- Capacity: 0.14 mgd, each.
- Head: 25 ft, TDH, final value to be determined in final design.
- Drive: Constant speed.
- Pump Type: Submersible.

5.3.1.6.2 EQ Pump

The PD Report, March 2008 identified submersible pumps or vertical turbine pumps for use in this application. These pumps will be operated primarily when the GAC Contactors are backwashed and for shorter periods of time during other operations. The pumps will be required to pump significant GAC fines after each GAC replacement event with the potential for some GAC fines during each backwash. Submersible pumps have greater solids handling capability and have broader tolerances in the bowl area making them less subject to abrasion from handling carbon fines. It is intended that the tank be emptied after each backwash or contactor to waste event. The use of vertical turbine pumps in this location would require the construction of deeper well in the area of the pumps to maintain submergence at all times whereas submersible pumps require only minimal submergence. On the basis of the intended use and the frequency of use it is recommended that the submersible pumps be utilized for this application. Each pump will be provided with a means for removal from the well for maintenance and removal from the building for servicing. NKWD expressed a concern with inaccessibility of the pumps for routine inspection and maintenance and has requested that highest quality submersible pumps be provided.

The EQ pumps will therefore be as follows:

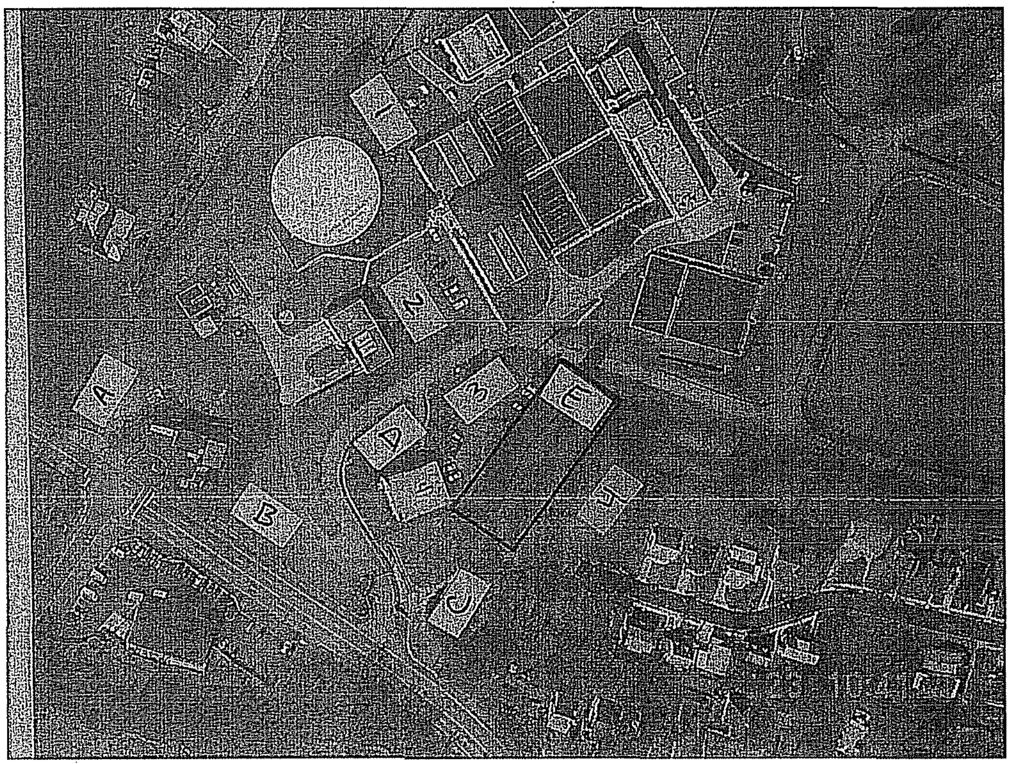
- Number of pumps: 2, 1 per compartment.
- Capacity: 4.75 mgd, each.
- Head: 70 ft, TDH, final value to be determined in final design.
- Drive: Constant speed.
- Pump Type: Submersible.
- Horsepower: 100 HP (approximate).

5.3.1.6.3 Location of Facilities

The FTTP site is extremely limited in space and, accordingly, the location of the proposed EQ Basin and GAC Pump Well with the associated pumping facilities on the site is critical. Numerous factors, both economic and non economic, have a significant impact on the final locations.

NKWD selected four (4) potential locations for each of the tanks/pumping facilities as shown in Exhibit 5-33. The letters show potential locations for the EQ Basins and numbers indicate potential GAC Pump Well locations. In addition, based upon the initial evaluations and discussions with the project team, the potential of locating the tanks at a common location was also evaluated and sites E and 2 selected as the most appropriate sites for combined tanks.

EXHIBIT 5-33
Potential Tank Locations



The evaluation of the alternative locations consisted of a review of the potential construction advantages and disadvantages, discussions related to operational advantages and disadvantages, comparative constructions cost analyses, and a review of non-economic factors. Exhibits 5-34 and 5-35 include the construction review and Exhibit 5-35 includes a summary of the non-economic factors.

EXHIBIT 5-34
EQ Basin Site Construction Evaluation

EQ BASIN	1	2	3	4
SITE OPTIONS			**OUT**	**OUT**
			USE E	**LOC/ROCK**
Site access and operations	No impact	Sheeting for Road	Sheeting–minor	No impact
Laboratory operations	No impact	No impact	Access limited Blasting	No impact
Existing piping	Some relocation	Some relocation	Minor	Minor
Proposed piping	Long discharge route	Shortest–influent		Deep, rock, long influent
Access for O & M				
Operations costs				
Sheeting/shoring/Bracing	Protect Filter/pipe/elec/ pipe/electrical/hypo **Design Critical**	Protect Solids Bldg. Road and Parking **Design Critical**		Min–rock
Rock excavation	4-12 ft unweathered	Least		Major–hard
Foundation requirements	On rock	Drilled Shafts plus rock		Rock
Risk to other buildings	Solids	Solids/Park/Road/ Tunnel		Blast near Lab Blast near BW
Risk to adjacent property				Blast near houses
Geotechnical investigation	Addn'l Borings req'd	Addn'l Borings req'd		Add'l borings req'd
Future Site use	Filter Bldg Exp	Restricts Solids Bldg		Future BW Tank?
Positives		>Min rock & blast	**USE E INSTEAD**	
		>Access	>No advan to separat	
		>Impact on Ops	>Combine sheeting	
Negatives				
		>Tight Const		>Rock exc
		>Rock Varies		>BW tank
		>10' below solids		>Houses
		>Shore 4 sides		>Depth for Pipe
		>Future solids		
		>Foundation		

EXHIBIT 5-35
GAC Pump Well Site Construction Evaluation

PUMP WELL	A	B	C	D	E
SITE OPTIONS	OUT			OUT	
	USE B		OUT-ROCK	SPACE/ROCK	
Site access and operations	No impact	No impact	Close to entrance–	Close to road	Close to road to
			work area, hold hill		Residential-alt. access avalble
Laboratory operations	No impact	No impact	Access	Access/blast	Blasting
Existing piping	Pipe tunnel/exist	Minor	Minor	Minor	Minor
	station				
Proposed piping	Longest required–in	Longest required–	Long Run		
	& out	Influent & Outlet	Influent & Outlet		
Access for O & M			Access difficult	Drive on tank	with GAC
Operations costs	Highest pump head	Highest pump head			
Sheeting/shoring/Bracing	Critical to Protect				
	adjacent				
Rock excavation	Partial	Partial	Major	Major	Above 765-Weathered
					Below 765-hard!
Foundation requirements	Drilled Shafts + Rock	Drilled Shafts + Rock	On rock	On rock	On rock
Risk to other buildings					Blast near lab
					Blast near BW tank
Risk to adjacent property	Prop Line–close				Blast near houses
	Rt 27	Rt 27			
Geotechnical investigation	Addn'l Borings req'd	Addn'l Borings req'd			
Future Site use	No impact	No impact			
Positives		**Better than A-**			Combine sheeting w/
		>No property line problems			GAC bldg const
		>No buildings to protect			
		>No demo			
Negatives					
	Demo Exist Station	Rt 27	50 ft of cut	No space for 50x100	To 765–weather rock
	Property Line	Foundation	Approach el. 800	20-32 ft of cut	< 765–rock
	Reduce size to sheet		35 ft Weathered Rk	Lower than 1st Floor of Lab	
	Rt. 27		15 ft hard rock		

EXHIBIT 5-36
Non-Economic Tank Location Factors

	Site Access	Lab Access & Operations	Exist Pipe & Duct	Proposed Pipe	Risk to Adj Prop & Bldg	Future Site Use	Future Bldg Expansion	Community Acceptance	
EQ SITE B	⇨	⇧	⇩	⇩	⇧	⇧	⇩	⇩	
EQ SITE E	⇧	⇩	⇧	⇧	⇩	⇧	⇩	⇩	
PUMP SITE 1	⇧	⇧	⇩	⇨	⇩	⇩	⇩	⇨	
PUMP SITE 2	⇨	⇧	⇩	⇨	⇩	⇩	⇧	⇧	
COMBINED SITE 2	⇨	⇧	⇩	⇨	⇩	⇩	⇧	⇧	
COMBINED SITE E	⇧	⇩	⇨	⇧	⇩	⇧	⇩	⇩	

On the basis of the site construction evaluation for each of the alternatives, the following sites were selected for further evaluation.

- GAC Pump Well----Sites 1 and 2.
- EQ Basin----Sites B and E.
- Combined Tanks----Site 2 or E.

A comparative construction cost estimate was completed for each of the alternatives. On the basis of these estimates, the following was identified:

- Pump Well----Site 2 more economical (25%).
- EQ Basin----Site E more economical (8%).
- Either Combined Site~ 20% more economical than separate sites.
- Combined Sites---Site E more economical (2%).

On the basis of the evaluations and the potential future expansions of the site, it was determined that Site E would be utilized for a combined tank site, under the GAC building.

The EQ Basin will be provided with an overflow which will be routed to the existing backwash holding tank.

5.3.2 Memorial Parkway Treatment Plant (MPTP)

5.3.2.1 Purpose

The installation of granular activated carbon contactors and ultraviolet (UV) disinfection at MPTP will require the addition of pumping and storage facilities for proper operation. At MPTP, these facilities will be installed after filtration and prior to post-chlorination and clearwell storage. The facilities include a GAC influent pumping station, GAC Contactors, and UV reactors together with related piping and valves. In addition, the installation of GAC and UV at MPTP will require modifications to existing piping and facilities. The primary purpose of this section is to identify the pumping and storage facilities that are required and the design criteria associated with them.

5.3.2.2 Design Criteria

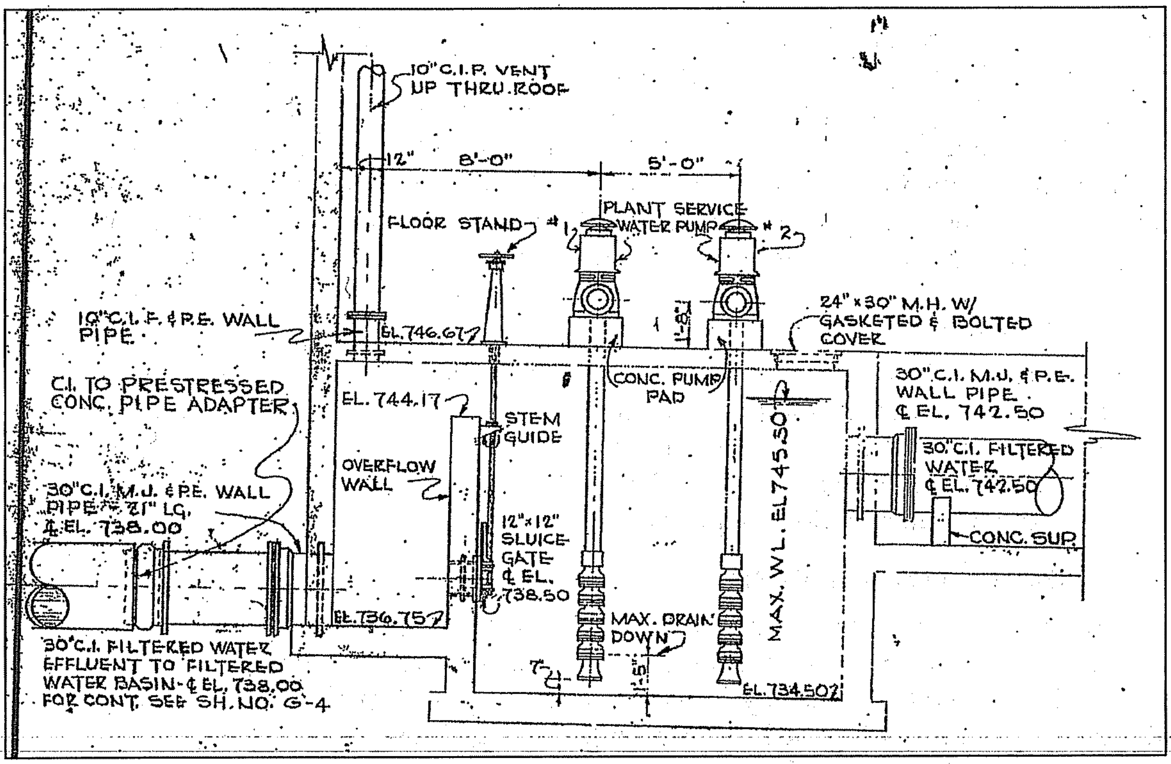
The installation of the GAC contactors at MPTP will be a retrofit and will require a pumping station to provide influent flow to the contactors. The pump station will lift the water to the GAC contactors and provide sufficient head to drive the flow through the GAC and UV systems. The preliminary design details associated with each element of the GAC influent pump station are provided below.

5.3.2.2.1 GAC Pump Station Wet Well

The GAC pump station wetwell at MPTP will be located adjacent to the existing filter building near the lower access door as shown on the Site Plan presented in Section 8. The flow from the filters presently is routed to a 3,000 gallon "pit" as shown below in Exhibit 5-37 prior to exiting the Filter Building. This "pit" has previously served as a supply pump station for a hydro-pneumatic system that supplied service water to the WTP. This pump station is no longer in service but the "pit" has a control weir on the entrance that serves as a seal weir for the filters. The entire pit will be removed and the combined filter effluent pipe will be extended to the GAC influent pump station. The weir will not be needed as the high level in the GAC influent pump station will be equal to the water surface elevation in the conventional gravity filters. Additional details of the GAC influent pump station include the following:

- Operating Floor Elevation – 760.0.
- Bottom of Wetwell Elevation – 735.0.
- Wall Thickness – 18" minimum.
- An existing drain line runs under proposed pump station location. This line will be placed in a trench through the bottom of the pump station which has an impact on available volume.

EXHIBIT 5-37
Pit Layout



The usable volume has been determined based on a review of the expected loss of head through the gravity filters, piping and appurtenances. Those estimated values are provided below:

- 8.0' max LOH (NKWD trigger for backwashing filter).
- 0.5' effluent valve loss at open position.
- 1.0' minor losses for piping.

Based on this information, the terminal head loss through the existing filters is approximately 9.5 ft. Therefore, if the water surface elevation is maintained at approximately 758.0, the level in the GAC influent pump well should be around 748.5. This results in a usable wet well volume of about 75,000 gallons with about 13 ft of water depth. This volume will provide a buffer for the pumps during start-up or change of flow events as well as during media handling periods while the filter rate-of-flow controllers are responding to the change. The pumps will have variable frequency drives (VFDs) to help slow the instantaneous demands associated with a change of flow event. The pump station will be fitted with an overflow pipe discharging to the North Reservoir to prevent the water from backing up in the filters in the event of a pump failure.

The wet well will be divided into two, relatively equal parts to allow for inspection, maintenance, and cleaning without interrupting operation of the system. The interior tank walls will be connected using slide gates which will normally be in the open position. When a tank compartment is to be isolated for maintenance activities the water level can be drawn down by the GAC feed pumps. Each of the two tank sections will also be outfitted with either a submersible sump pump or a valved gravity drain assembly to facilitate removal of sediment and fluid from the tank section prior to a maintenance event.

5.3.2.2.2 GAC Influent Pumps

The GAC pump station will include 4 influent pumps, check valves, isolation valves along a single flowmeter and related appurtenances. All of the proposed pumps are to be vertical turbine and will be provided with VFDs to accommodate the wide flow ranges seen at MPTP. Additional details for the pumps are provided below in Exhibit 5-38.

EXHIBIT 5-38
MPTP GAC Influent Pump Details
NKWD Advanced Treatment Project

Item	Pump 1	Pump 2	Pump 3	Pump 4
Flow (GPM)	3,500	3,500	7,000	7,000
Total Discharge Head (Feet)	50	50	55	55
Minimum Efficiency	78%	78%	78%	78%
Horsepower	75	75	125	125
Maximum Speed (RPM)	1800	1800	1200	1200
Pump Control	VFD	VFD	VFD	VFD
Minimum Floor Clearance	14"	14"	16"	16"
Minimum Submergence	48"	48"	60"	60"

The pumps are sized to provide for efficient operations at the current typical flow rate of 5 mgd as well as projected future flows of 10 - 15 mgd.

5.3.2.2.3 Slurry Water Pumps

In addition to the GAC influent pumps, two vertical turbine slurry water pumps will be included in the GAC pump station. The purpose of these pumps is to provide motive water for the delivery and removal of the GAC media from the contactors. The materials handling will be done with eductors which require high pressure water to produce a vacuum. The vacuum will enable the GAC to be removed or installed in a wet slurry. Some of the details associated with the slurry pumps are provided below in Exhibit 5-39.

EXHIBIT 5-39
MPTP Slurry Pump Details
NKWD Advanced Treatment Project

Item	Pump 1	Pump 2
Flow (GPM)	100	100
Total Discharge Head (Feet)	250	250
Minimum Efficiency	75%	75%
Horsepower	15	15
Maximum Speed (RPM)	3600	3600
Pump Control	Constant Speed	Constant Speed
Minimum Floor Clearance	14"	14"
Minimum Submergence	48"	48"

5.3.2.2.4 Backwash Pumps

A replacement of the existing backwash pumps at MPTP is expected. MPTP currently has two backwash pumps that supply the existing filters. Fortunately, the size and expected backwash rate of the existing filters is comparable with the new GAC contactors. As such, the existing backwash facilities are of acceptable size and capacity to supply the GAC contactors as well. Therefore, the existing backwash pumps will be replaced with new pumps and VFDs added to assure smooth operations between the two facilities. The design criteria for the replacement backwash pumps is provided below in Exhibit 5-40.

EXHIBIT 5-40
MPTP Replacement Backwash Pumps
NKWD Advanced Treatment Project

Item	Pump 1	Pump 2
Flow (GPM)	11,000	11,000
Total Discharge Head (Feet)	65	65
Minimum Efficiency	80%	80%
Horsepower	250	250
Maximum Speed (RPM)	1800	1800
Pump Control	VFD	VFD
Pump Type	Vertical Turbine	Vertical Turbine

5.4 Ancillary Systems

5.4.1 Dechlorination

The RSSCTs conducted for NKWD were all conducted with chlorine feed to filters turned off. There is a limited amount of data available on the impacts of chlorinated influent to GAC contactors. Anecdotal information suggests chlorinated influent may result in a decrease in adsorptive performance (leading to more rapid carbon exhaustion and more frequent replacement), as well as potential negative impacts on GAC media characteristics over time. For these reasons, the NKWD plans to dechlorinate the GAC influent.

The potential concerns associated with a chlorinated backwash supply were carefully considered. The potential negative effects of a chlorinated backwash supply that were identified include damage to any established biology in the GAC contactors, potential reduction in adsorption efficiency, and increased carbon friability. On the other hand, the benefits of a chlorinated backwash supply include the availability on site and the provision of a disinfectant residual for storage.

There have been mixed findings regarding the impacts of free chlorine applied to the GAC media as backwash supply water. One study by Liu et al.1 demonstrated that a concentration of 0.5 mg/L free chlorine in the backwash water had essentially no effect on the GAC's biological activity. CH2M HILL has evaluated this issue at both pilot-scale and full-scale treatment facilities, and empirical findings from the majority of these evaluations indicate that backwash supply water with a free chlorine residual concentration of 0.5 to 1.0 mg/L is not expected to negatively impact biological filtration performance.

Consultation with Professor Vern Snoeyink of the University of Illinois indicated that a key parameter to consider with respect to chlorinated backwash supply is the mass of free chlorine per gram of GAC carbon. Based on backwash volumes, and an average free chlorine concentration leaving the filters of approximately 0.5 mg/L, the total chlorine loading is approximately 1 mg chlorine per gram of GAC, or less than 0.1 percent. Professor Snoeyink, one of the world's foremost experts on activated carbon, indicated in discussion that this chlorine loading from filter backwashing is not likely to have a detrimental effect on GAC performance in terms of biological activity or adsorption performance.

It is recommended that the NKWD collect empirical data during the initial period of plant operations. As described in a later section, dechlorination facilities are planned for the treatment plants. It is recommended that a dedicated dechlorination chemical feed pump and feed piping also be provided for the backwash supply in the event the NKWD determines that it is beneficial to dechlorinate the backwash supply. Once the system is in operation, it is recommended that NKWD review operation of the pre-chlorination and dechorination systems to assess benefits versus costs.

5.4.1.1 Dechlorination Options

Currently, sulfur-based chemicals including sodium bisulfite, sodium metabisulfite, and sodium thiosulfate are most frequently used by water utilities for dechlorination. Other options include hydrogen peroxide, sodium thiosulfate, calcium thiosulfate, ascorbic

□

[1] Liu, X., et. al., 2001, "Factors Affecting Drinking Water Biofiltration," *Journal American Water Works Association*, Vol. 93, No. 12, pp. 90-101

acid, and sodium ascorbate. The choice of a particular dechlorination chemical depends on site-specific issues such as chemical preferences, strength of chlorine or chloramines, and site constraints.

Sodium bisulfite is used by many utilities due to its lower cost and higher rate of dechlorination. Sodium thiosulfate is also used for dechlorination since it is less hazardous and consumes less oxygen than sodium bisulfite. Ascorbic acid and sodium ascorbate are used because they do not impact dissolved oxygen concentrations.

Sodium bisulfite is available as a white powder, granule or clear liquid solution. It is highly soluble in water and generally purchased as a solution in strengths of approximately 40 percent. Currently, many industries and wastewater utilities use sodium bisulfite solution for dechlorination. It is usually metered as a dechlorinating agent by diaphragm-type pumps.

Sodium bisulfite reacts very rapidly with residual chlorine, both free and combined forms, and contact times are very short. Dechlorination control is very simple because it is specific to chlorine and has a very low environmental and toxicity impact. Careful dosage control is necessary because any excess over that required for residual chlorine will deplete dissolved oxygen in water and could have a negative impact on chlorine residual in the clearwell. Sodium bisulfite undergoes the following reaction with chlorine:

$$\underset{\text{Sodium Bisulfite}}{NaHSO_3} + \underset{\text{Hypochlorous acid}}{HOCl} + H_2O \rightarrow \underset{\text{Sodium bisulfate}}{NaHSO_4} + \underset{\text{Hydrochloric acid}}{HCl}$$

On a weight-to-weight basis, approximately 1.45 parts of sodium bisulfite are required to dechlorinate 1 part of chlorine. Many facilities overfeed slightly (e.g., 1.6:1 ratio of sodium bisulfite to residual chlorine on a weight basis). The usual solution strength is 40 percent, which has a specific gravity of 1.3. Thus, the bulk density of active chemical is 4.34 lbs per gallon. For each part chlorine removed, 1.38 parts of alkalinity as CaCO3 will be consumed.

Sodium bisulfite can cause skin, eye and respiratory tract irritation. It is highly corrosive and must be stored in a containment area. It can be handled wet in stainless steel, PVC, or fiberglass tanks. Because it may crystallize at room temperatures, a heating system will be necessary.

For the NKWD, sodium bisulfite systems have been designed to dechlorinate, as follows:

GAC Influent:

- 44 mgd maximum flow at FTTP.
- 20 mgd maximum flow at MPTP.
- Minimum sodium bisulfite dose of 0.32 mg/L (for chlorine residual of 0.2 mg/L).
- Average sodium bisulfite dose of 0.80 mg/L (for chlorine residual of 0.5 mg/L).
- Maximum sodium bisulfite dose of 3.2 mg/L (for chlorine residual of 1.0 mg/L).

Backwash Supply:

- Sized for maximum backwash supply flow rate (15 gpm/sf for one contactor).
- Minimum, average, and maximum sodium bisulfite doses as noted above.

A storage tank with capacity of approximately 6,000-gallons will be provided to provide capacity for a full tanker truck delivery and to provide more than 30 days storage at average flow and dose conditions. A total of three feed pumps will also be provided, with dedicated feed pumps for: 1) GAC influent dechlorination, 2) backwash supply dechlorination, and 3) a shared standby pump.

NKWD has elected to defer installation of dechlorination facilities at MPTP. The impact of dechlorination at FTTP will be observed during the early period of operation and the discussion of whether to add dechlorination at MPTP will be made based on the observations.

5.4.2 General Equipment and Systems

Standards for mechanical, electrical and controls equipment and systems have been developed using insights gained during the plant tours, from prior experience of the designers and from the experience of NKWD with vendors and types of equipment. GAC is transported to and from the contact beds in a slurry form through hoses and pipes. Consistent feedback was provided that an ample volumetric flow rate and pressure of the slurry water is essential and that even with a good slurry water supply, plugging of conveyance piping will sometimes occur. Durable 316 stainless steel pipe is recommended for carbon slurry and cleanouts are to be provided at all bends and frequently in long runs of pipe.

Graphite (carbon) is nearly at the top (Cathodic end) of the Galvanic Series of Metals and can cause galvanic corrosion of most metals. In addition, GAC granules and the fines that are created when the granules break down are gritty products that tend to erode surfaces through which they pass. Therefore careful selection of materials and equipment types is required for piping and pumping systems that handle GAC slurry, spent backwash water, and contactor to waste flows.

Exhibit 5-41 located at the end of this Section provides a summary of the standards to be used in selecting and specifying equipment and systems to be used on the Advanced Treatment projects. The standards are intended as a guide for the selection of cost effective components in the detailed design process. The cost effectiveness goal includes selection of durable materials suitable for long term service in the service environment and also identification, where possible of items that are available through multiple sources so as to promote competitive bidding on the projects.

5.5 Electrical System

The purpose of evaluating the electrical system for FTTP and MPTP in the Basis of Design report is five fold:

- Develop design standards to be implemented at each plant.
- Provide an assessment of the condition and capacity of the existing electrical distribution system at each plant to determine if it is suitable to support the proposed improvements related to the additional facilities for Advanced Treatment.
- Develop alternatives to upgrade or replace the existing electrical distribution system to ensure long-term operational reliability for Advanced Treatment at each facility.
- Develop alternatives for adequate back-up power to keep each facility operational during a power outage. Review the existing backup power capabilities at both facilities to determine their capacity for additional loads.
- Recommend specific improvements to be implemented.

5.5.1 Design Standards

The objective of the design is to provide a safe, reliable and maintainable electrical distribution system. In general, the following basic criteria shall apply:

- All electrical components, including transformers, conductors, and overcurrent devices will be sized for the existing, new and known future loads per NEC.
- The fault current will be calculated at any specific point on the system and equipment will be rated for that fault current.
- Reliability is the ability of equipment to perform its function for its service life. For electrical equipment, reliability is established by several factors, including surrounding conditions, maintenance, and operating the equipment within its ratings.
- Maintenance and operation will be considered during design. This includes standardizing the type of equipment specified to ease operations, minimize maintenance time, and minimize maintenance parts; providing equipment and design that is safe, operable, and easily maintainable; and minimizing capital, operations, and maintenance costs.
- The applicable standards and codes include the following:
  - National Electric Code (NEC).
  - Kentucky Building Code (KBC).
  - Life Safety Code (NFPA 101).
  - National Electrical Safety Code (NESC).
  - National Fire Protection Association (NFPA).
  - Insulated Cable Engineers Association (ICEA).
  - National Electrical Manufacturers Association (NEMA).

- Institute of Electrical and Electronic Engineers (IEEE).
- American National Standards Institute (ANSI).
- The Occupational Safety and Health Act (OSHA).
- American Society for Testing and Materials (ASTM).
- Underwriters Laboratory (UL).

- Exposed conduit in chemical areas will be PVC Schedule 80. Other areas including exterior locations will be aluminum. Underground conduit shall be PVC Schedule 40, concrete encased. Final connections to motors, valves and vibrating equipment will be with flexible conduit.
- Provide spare conduits where appropriate for future use.
- Conductors will be NEC Type THHN/THWN for sizes #14 through #1 AWG; NEC Type XHHN for sizes #2 and larger.
- System voltage will be 208Y/120 volt, three-phase for lighting and miscellaneous small loads; 480Y/277 volt, three-phase for motors and feeder circuits.
- NEMA 1, gasketed enclosures will be used in locations where the area is relatively dry and clean; NEMA 4X stainless steel or plastic enclosures for electrical equipment outside and in corrosive areas; NEMA 7/9 enclosures for any hazardous areas.
- Surge/Lightning protection will be provided at main switchgears, loadcenters, VFDs and MCCs. For control and power distribution panels, follow the principle of "single point grounding" within each enclosure.
- Motors will be energy efficient type. For motors used with variable frequency drives, inverter duty motors in accordance with NEMA MG 1, Part 31 will be utilized.
- In any space within the building, adequate lighting levels will be maintained. The footcandle level for maintained illumination will be as recommended by IES, Lighting.
- Provide night lighting that stays on continuously in corridors, stairways and critical areas.
- Provide emergency lighting and exit lights in areas required by the current KBC.
- Lightning protection systems shall be provided for each building. Each system shall comply with the latest version of Lightning Protection Institute (LIP) and HFPA.

5.5.2 FTTP

5.5.2.1 Existing System

Currently the facilities at FTTP have four separate services from Duke Power:

- The main feed to the plant which includes the Administration/Filter Building, Sludge Building, Belt Press Building, Sodium Hypo Building and Chemical Building.
- Lab.
- US 27 Pump Station.
- Pretreatment Building and Carbon Silo.

The focus of this report will be on the main feeder at the plant.

FTTP receives power at 12,470 volt from a Duke overhead, three-phase circuit that runs along Military Parkway on the north side of the plant. The supply runs from the overhead circuit underground on the plant property to an outdoor metal-clad enclosure containing a 15 kV draw-out main breaker. The main breaker feeds outdoor, pad-mounted 15 kV switchgear with three sub-feed disconnect switches:

- Switch No. 1 feeds a 225 kVA step down transformer to 480 volt which serves a main switchboard SB-1 at the Sodium Hypo facility. SB-1 also has a sub-feed for the Chemical Building.
- Switch No. 2 feeds three pad mounted transformers:
  - 500 kVA step down transformer to 480 volt which serves MCC-C in the Administration/Filter Building.
  - 225 kVA step down transformer to 480 volt which serves MCC-A in the Sludge Building Pump Room.
  - 225 kVA step down transformer to 480 volt which serves the Belt Press Building.
- Switch No. 3 is spare.

The 15 kV main breaker also functions as a tie-breaker with the generator breaker. In the event of a power failure, the automatic transfer controller will start the generator, open the main breaker and then close the generator breaker to provide back-up power to the facilities.

A 175 kW diesel generator set in an outdoor enclosure located adjacent to the main breaker provides power in the event of a power failure. Because the generator is not large enough for the entire plant, operations must be selective regarding what can run during an outage.

For additional information regarding the existing distribution system at FTTP, refer to the One-Line diagram on Exhibit5-42 located at the end of this Section.

5.5.2.2 Existing Loads

Each facility was evaluated based on the past 10 month demand history provided by Duke Energy as shown on Exhibit 5-43. This information is necessary in order to evaluate the existing capacity of the electrical service as well as the existing generator.

EXHIBIT 5-43
FTTP Demand

Month/Year	Demand (kW)	
	Actual	Billed
December 2007	198.0	198.0
January 2008	192.0	198.0
February 2008	186.0	186.0
March 2008	180.0	180.0
April 2008	162.0	168.3
May 2008	156.0	168.3
June 2008	168.0	168.3
July 2008	198.0	198.0
August 2008	180.0	180.0

Exhibit 5-44 summarizes the existing load and new loads for FTTP and provides an evaluation of potential generator sizes for the new loads and new/existing combined.

EXHIBIT 5-44
FTTP Load Data Summary

ITEM	Quantity	HP	FTTP (KW)
Existing Loads			
1. Existing Plant Peak Demand (Dec/07)			198.0
2. + 25%			49.5
Subtotal Existing Loads			247.5
New Loads			
1. GAC Pumps (2 Duty, 1 Standby)	3	250	400.0
2. Backwash Pump (1 Duty, 1 Standby)	2	250	200.0
3. EQ Pump (1 Duty, 1 Standby)	2	100	80.0
4. Blower	1	100	80.0
5. Misc Pumps		50	40.0
6. UV	3		90.0

EXHIBIT 5-44
FTTP Load Data Summary

ITEM	Quantity	HP	FTTP (KW)
7. Misc Bldg Loads			100.0
Subtotal New Loads			990.0
Generator Size Based New Loads Only			1250.0
TOTAL LOADS			1237.5
Generator Size Based on Total Loads			1500.0

5.5.2.3 Recommendations

After consideration of existing and projected demands along with items identified by NKWD as critical to plant operations, the following is recommended at FTTP:

- Provide a new 480 volt, three-phase, 1600 amp service for the Advanced Treatment facilities.
- Install a new primary 12,470 volt feeder from the existing pad mount switchgear to a new 1000 kVA pad mount transformer.
- Since the existing generator at 175 kVA is too small for anything at the plant except lighting and miscellaneous loads, it is recommended that it be removed and replaced with one large enough to service the existing facilities as well as new. The new generator will be 1500 kW.
- Provide a UPS for the UV System. For a detailed discussion on the UPS, refer to Section 5.1.4.4, Power Quality Equipment.

For additional information regarding the modified distribution system at FTTP, refer to the One-Line diagram on Exhibit 5-45 located at the end of this Section.

5.5.3 MPTP

5.5.3.1 Existing System

Currently the facilities at MPTP have three separate services from Duke Power:

- The main feeder to the plant which includes the Filter Building, New Chemical Building, Old Chemical Building, Wash Water Pump Station, Actiflo Facilities, and PAC.
- Raw Water Transfer Station (RWTS) and Solids Building.
- Water Works Road Pump Station.

The focus of this report will be on the main feeder at the plant.

MPTP receives power at 12,470 volt from a Duke overhead, three-phase circuit that runs along Water Works Road on the southeast side of the plant. The supply runs from the overhead circuit underground on the plant property to an outdoor metal-clad walk-in enclosure that contains two sub-feed draw-out breakers:

- Breaker No. 1 serves as a back-up feed to the RWTS. The feeder runs underground to a 300 kVA pad mounted transformer that steps the voltage down to 480 volt. The secondary of the transformer is tied to a manual transfer switch that can be utilized to provide an alternate source of power to RWTS.
- Breaker No. 2 feeds a 750 kVA step down transformer to 480 volt which feeds 1200 amp switchgear in the walk-in enclosure. The switchgear has seven sub-feed breakers that serve the following areas:
  - Breaker No. 1 is a 200 amp breaker that feeds the Filter Building. The feeder is connected to the generator via an automatic transfer switch.
  - Breaker No. 2 is 300 amp breaker that feeds the old Chemical Building.
  - Breaker No. 3 is a 600 amp breaker that feeds the Wash Water Pump Station.
  - Breaker No. 4 is a 450 amp breaker that feeds Actiflo.
  - Breaker No. 5 is a 250 amp breaker that feeds the blower.
  - Breaker No. 6 is a 60 amp breaker that feeds a 30 kVA step down transformer to 208Y/120 volt.
  - Breaker No. 7 is a 400 amp breaker that feeds the new Chemical Building and Carbon Silo. This feeder is connected to the generator via an automatic transfer switch.

A 250 kW diesel generator set in an outdoor enclosure provides limited power to the Filter Building, new Chemical Building and Powdered Activated Carbon Building.

For additional information regarding the existing distribution system at MPTP, refer to the One-Line diagram on Exhibit 5-46 located at the end of this Section.

5.5.3.2 Existing Load

MPTP was evaluated based on the past 10 month demand history provided by Duke Energy as shown in Exhibit 5-47.

EXHIBIT 5-47
MPTP/RWTS Demand

Month/Year	MPTP Demand (kW)			RWTS Demand (kW)	
	Actual			Actual	
	Peak	Off-Peak	Billed	Peak	Billed
December 2007	60.0	60.0	163.2	75.0	127.5
January 2008	54.0	54.0	163.2	21.0	127.5
February 2008	222.0	222.0	216.0	21.0	127.5
March 2008	240.0	240.0	210.0	66.0	127.5

EXHIBIT 5-47
MPTP/RWTS Demand

Month/Year	MPTP Demand (kW)			RWTS Demand (kW)	
	Actual			Actual	
	Peak	Off-Peak	Billed	Peak	Billed
April 2008	156.0	156.0	168.0	66.0	127.5
May 2008	162.0	162.0	162.0	66.0	127.5
June 2008	186.0	186.0	192.0	69.0	127.5
July 2008	168.0	168.0	186.0	66.0	124.95
August 2008	210.0	210.0	192.0	147.0	-
September 2008	186.0	186.0	168.0	84.0	124.95

Exhibit 5-48 summarizes the existing load and new loads for MPTP and provides an evaluation of potential generator sizes for the new loads and new/existing combined.

EXHIBIT 5-48
MPTP Load Data Summary

ITEM	Qty	HP	MPTP (KW)	RWTS (kW)	COMBINED
Existing Loads					
1. Existing Plant Peak Demand (Mar/08)			222.0		222.0
2. Raw Water Transfer Station (Aug/08)				147.0	147.0
3. + 25%			55.5	36.8	92.3
Subtotal Existing Loads			277.5	183.8	461.3
New Loads					
1. GAC Pumps (Large size)	2	125	200.0		200.0
2. GAC Pumps (Small size)	2	75	120.0		120.0
3. Backwash Pump	1	250	200.0		200.0
4. Blower	1	100	80.0		80.0
5. Misc Pumps		50	40.0		40.0
6. UV	2		20.0		20.0
7. Misc Bldg Loads			100.0		100.0
Subtotal New Loads			760.0		760.0
Generator Size Based New Loads Only			820.0		
TOTAL LOADS			1037.5	183.8	1221.3
Generator Size Based on Total Loads			1250.0	300.0	1500.0

5.5.3.3 Recommendations

After consideration of existing and projected demands along with items identified by NKWD as critical to plant operations, the following is recommended at MPTP:

- Provide a new 480 volt, three-phase, 1200 amp service for the Advanced Treatment facilities.
- Re-route the existing primary service through a new automatic transfer switch and primary switchgear. The new switchgear will have two feeder breakers. One breaker will feed the existing switchgear and the other will feed a new 750 kW pad mount transformer.
- Since the existing generator at 250 kW is too small for the loads considered critical, it is recommended that it be removed and replaced with one large enough to service the existing facilities as well as new. The new generator will be 1500 kW.
- Provide a UPS for the UV System. For a detailed discussion on the UPS, refer to Section 5.1.4.4, Power Quality Equipment.

For additional information regarding the modified distribution system at MPTP, refer to the One-Line diagram on Exhibit 5-49 located at the end of this Section.

5.6 Control Systems

The purpose of evaluating the control systems for FTTP and MPTP is:

- Develop design standards to be implemented at each plant.
- Provide a new control system that is compatible with the existing SCADA system at each plant.
- Develop alternatives to modify the existing SCADA system to connect the new Advanced Treatment facilities to the existing data network.
- Develop preliminary control strategies for each process that accommodates manual and automated system controls.
- Develop a basis of design for a new access control system that will interface with the existing system.
- Recommend SCADA and access control improvements at each facility.

5.6.1 Design Standards

5.6.1.1 Existing System Standards

Currently the SCADA system at both plants utilizes the following key components:

- Allen-Bradley Control Logix PLCs for the more recent upgrades at both plants. Some areas at FTTP still utilize Allen-Bradley PLC5 and SLC500 series PLCs while MPTP still uses Allen-Bradley SLC500 series PLCs for Filter 4-6 and Actiflo.
- Ethernet network and switches.
- Fiber optic cable network with patch panels and media converters.

- View nodes for operator/staff interface throughout the facilities.
- Wonderware HMI software.
- Radio communications to remote pumping stations and tank sites.

The existing access control system at each plant utilizes a proximity card and PIN codes for access inside each building. Each building is hard wired to a master controller. For additional information regarding the existing SCADA network at FTTP, refer to the Network Diagram on Exhibit 5-50 located at the end of this Section. For additional information regarding the existing SCADA network at MPTP, refer to the Network Diagram on Exhibit 5-51 located at the end of this Section.

The existing Wonderware HMI system for NKWD consists of the following:

- The current Wonderware software is Version 8.0 for FTTP, MPTP and TMTP. It was upgraded in 2005.
- Wonderware InTouch currently is licensed up to 60K tags for each plant. Capacity is not an issue.
- The current Wonderware ActiveFactory reporting software is Version8.5. NKWD is licensed for up to five concurrent users per server.
- The current Wonderware InSQL Server is Version 8.0 with 5000 tags.
- The tag count for each facility is:
    - FTTP: 6K tags.
    - MPTP: 3K tags.
    - TMTP: 4K tags.

NKWD has decided to upgrade the existing Wonderware Version 8.0 HMI software to Version 10.0 in a separate capital project. The transition will occur in 2009 and therefore, an analysis of a Wonderware upgrade will not be necessary in this report. The Advanced Treatment design documents will need only to indicate that the contract must include the cost of additional licenses for view nodes added in the project.

5.6.1.2 Proposed Standards - SCADA

The objective of the design is to provide a SCADA system that is fully compatible with the existing system at each facility. In general, the following basic design criteria shall apply to both plants:

- The new Advanced Treatment facility at each plant shall be equipped with an Allen-Bradley Control Logix PLC for interfacing with the new equipment. It is anticipated that any pump VFD will have a data connection between the VFD and PLC. All other components will have inputs/outputs hardwired to the PLC.
- The new PLC will communicate with the existing network via fiber optic cables. Spare or dark fibers will be included for future us.

- View nodes will be installed in the GAC Contactor area on the second floor for access during backwash. Laptop access ports will be provided in the electrical/control room and pipe gallery of each facility.
- Any new computers shall be Dell, IBM or HP.
- Provide empty conduits with pull wire for telephones. NKWD will contract separately to have telephone wire installed for connecting to each plant.
- SCADA tag names must be consistent with NKWD's existing system. Each tag must include a reference to each individual plant. Where appropriate, add tags for industrial SQL for the data base server.
- All data collection, programs and alarms would reside in the new PLC.
- New HMI screens will be developed for each process and some existing ones will need to be updated.
- Status/Alarms for such items as ambient temperature, flooding, fire, and unauthorized entry would be installed and brought to the PLC for SCADA access.
- Provide audio and visual alarms for chemical bulk tank fill stations to identify full tanks. Alarm to be common with high tank level. Include alarm in SCADA and do not provide a driver re-set.
- Provide temper water for all eyewash/shower facilities with a flow switch for SCADA alarm.
- All pumps shall be equipped with vibration monitoring equipment and shall include SCADA interface.
- The SCADA PLC will be sized to accommodate 25% spare I/O including two spare I/Os per contactor for future instrument/analyzer.

New equipment at each plant will have both manual and automated control options. Typical control strategies for pumps/motors will include:

- Local disconnect switch.
- Local HAND-OFF-REMOTE selector switch. In HAND the pump is energized. In OFF the pump cannot be started from anywhere including the MCC, VFD or SCADA. In REMOTE the pump is control from the MCC or VFD.
- MCC or VFD mounted HAND-OFF-REMOTE selector switch. This switch only controls the pump when the local HOR is in the REMOTE position. In HAND the pump is energized. In OFF the pump can only be started at the local HOR. In REMOTE the pump is controlled via SCADA.

New motor operated valves will have 480 volt, three-phase actuators. Each valve will have the following key control features:

- Integral mounted disconnect switch.

- Integral mounted LOCAL-REMOTE selector switch. In LOCAL the valve is operated via the integral mounted OPEN-STOP-CLOSE pushbuttons. In REMOTE the valve is controlled remotely via SCADA. The valve will have provisions for the following input/output signals with SCADA:
  - Valve in remote.
  - Valve open.
  - Valve closed.
  - Valve open command from SCADA.
  - Valve close command from SCADA.
  - Valve stop command from SCADA for valves requiring flow control.
- Valves that are designated as modulating shall have provisions for an additional analog input signal to SCADA for valve position.

5.6.1.3 Proposed Standards - Access Control System

The following access control standards will apply to both plants:

- All exterior doors shall have a keypad with proximity reader for building access.
- Access control will be provided for each new electrical/control room.
- Overhead doors that are not near a pedestrian door will be operated from the outside with keyed access similar to pedestrian door access.
- Panic hardware on the doors need to be push bar type and not paddle type or motion sensors.
- Provide spare conduits where appropriate for future use (CCTV).

5.6.2 FTTP

The modified SCADA network at FTTP is presented on the FTTP Network Diagram on Exhibit 5-52 located at the end of this Section. The process and instrumentation layouts for FTTP are presented in P&ID Exhibits 8-11 through 8-15. Exhibit 5-53 presents electrical design features for the major equipment items at FTTP.

5.6.3 MPTP

The modified SCADA network at MPTP can be found on the MPTP Network Diagram on Exhibit 5-54 located at the end of this Section and the process instrumentation layouts for MPTP are presented in P&ID Exhibits 8-24 through 8-28. Exhibit 5-55 presents electrical design features for the major equipment items at MPTP.

EXHIBIT 5-53
FTTP New Electrical Loads

New Electrical Loads										
Description	ID No.	Quantity	Horsepower/KVA	Volts	Current @ 460V	Ph.	Controller	Fed From	Control Features	Comments
FTTP										
GAC Influent Pumps	FT-GAC-P-1, 2, 3	3	*250 HP ea*	460	*312*	3	VFD	MDP-GAC	Local HOR selector switch. Keypad with LED readout in front of VFD. High discharge pressure, high pump/motor temperature or vibration will shutdown the pump and alarm SCADA.	Vertical Turbine Pumps - 2 Duty, 1 Standby. 18-Pulse, stand alone, NEMA 1G VFD. Generator load step as needed.
Contactor/Filter Backwash Pumps	FT-GAC-BW-1, 2	2	*250 HP ea*	460	*312*	3	VFD	MDP-GAC	Local HOR selector switch. Keypad with LED readout in front of VFD. Pump operates in conjunction with discharge control valve. High discharge pressure, high pump/motor temperature or vibration will shutdown the pump and alarm SCADA.	Vertical Turbine Pumps - 1 Duty, 1 Standby. 18-Pulse, stand alone, NEMA 1G VFD. Generator load step as needed.
Slurry Water Pumps	FT-SW-P-1, 2, 3	3	*15 HP ea*	460	*14*	3	VFD	MCC-GAC	Local HOR selector switch. Keypad with LED readout in front of VFD. Pump operates in conjunction with suction/discharge valves.	MCC mounted, 6-Pulse PWM VFD.
UV Reactors	FT-UV-1, 2, 3	3	*40 kVA total*	460	*48*	3		MDP-GAC		Custom control panel supplied with equipment.
Air Scour Blower	FT-GAC-B-1	1	100 HP	460	124	3	RVSS	MCC-GAC	Local HOR selector switch. HOA selector switch with pilot lights in front of starter.	MCC mounted, reduced-voltage, solid state starter.
EQ Pumps	FT-EQ-P-1, 2	2	*100 HP ea*	460	*124*	3	RVSS	MCC-GAC	Local HOR selector switch. HOA selector switch with pilot lights in front of starter.	MCC mounted, reduced-voltage, solid state starter.

EXHIBIT 5-55
MPTP New Electrical Loads

New Electrical Loads										
Description	ID No.	Quantity	Horsepower/KVA	Volts	Current @ 460V	Ph.	Controller	Fed From	Control Features	Comments
MPTP										
GAC Influent Pumps	MP-GAC-P-1, 2	2	*125 HP ea*	460	*312*	3	VFD	MDP-GAC	Local HOR selector switch. Keypad with LED readout in front of VFD. High discharge pressure, high pump/motor temperature or vibration will shutdown the pump and alarm SCADA.	Vertical Turbine Pumps - 18-Pulse, stand alone, NEMA 1G VFD. Generator load step as needed.
GAC Influent Pumps	MP-GAC-P-3, 4	2	*75 HP ea*	460	*96*	3	VFD	MDP-GAC	Local HOR selector switch. Keypad with LED readout in front of VFD. High discharge pressure, high pump/motor temperature or vibration will shutdown the pump and alarm SCADA.	Vertical Turbine Pumps - 18-Pulse, stand alone, NEMA 1G VFD. Generator load step as needed.
Contactor Backwash Pump	MP-GAC-BW-1, 2	2	*250 HP ea*	460	*312*	3	VFD	MDP-GAC	Local HOR selector switch. Keypad with LED readout in front of VFD. Pump operates in conjunction with discharge control valve. High discharge pressure, high pump/motor temperature or vibration will shutdown the pump and alarm SCADA.	Vertical Turbine Pump - 18-Pulse, stand alone, NEMA 1G VFD. Generator load step as needed.
Slurry Water Pumps	MP-SW-P-1, 2	2	*15 HP ea*	460	*14*	3	VFD	MCC-GAC	Local HOR selector switch. Keypad with LED readout in front of VFD. Pump operates in conjunction with suction/discharge valves.	MCC mounted, 6-Pulse PWM VFD.
UV Reactors	MP-UV-1, 2	2	*20 kVA total*	460	*24*	3		MDP-GAC		Custom control panel supplied with equipment.
Air Scour Blower	MP-GAC-B-1	1	100 HP	460	124	3	RVSS	MCC-GAC	Local HOR selector switch. HOA selector switch with pilot lights in front of starter.	MCC mounted, reduced-voltage, solid state starter.

5.7 Architectural

A new Advanced Treatment Building will be constructed at each plant. At FTTP the AT Building will be constructed into a hillside east of the existing Water Quality Laboratory with a connection to the laboratory only by a breezeway. At MPTP the AT Building will be constructed largely within an area occupied by abandoned Sedimentation Basins 5 and 6 and an abandoned flocculation basin. A pump station structure will be under separate roof and constructed adjacent to Sedimentation Basins 5 and 6.

New building structures for the NKWD will be designed to blend with existing facilities and be practical and functional with emphasis on long service life with minimum maintenance requirements.

5.7.1 Design Codes and Standards

Building design will comply with the latest edition of codes and industry standards referenced herein:

- Kentucky Building Code.
- National Fire Protection Association (NFPA) standards, including:
  - NFPA 101 Life Safety Code.
  - ADAAG 1999 Accessibility Code.
  - International Fire Code.

5.7.1.1 Building Code Classification

All facilities will be designed in accordance with applicable codes for life safety, fire protection, and occupational health and safety. Where applicable, facilities will be designed in accordance with Building Code requirements for accessibility by persons with disabilities.

Both AT buildings have been classified as Industrial Moderate Hazard F1. The classification is based on building use, building area, number of stories and building content. GAC has been classified as a combustible solid according to the MSDS (Material Safety Date Sheet). The International Fire Code (IFC) defines maximum allowable quantities within a building as 125cu ft. Areas exceeding the allowable amount should be classified as H3 High hazard. Both AT Buildings have a quantity of GAC in excess of 125cu ft, however under typical operating conditions the GAC will be fully submerged in water and will not create any fire hazard. Additionally the GAC is expected to be placed and removed from the basins using a slurry water system. Special procedures will have to be observed when GAC will be left exposed. The Operations and Maintenance manual will indicate the GAC should be left in a submerged condition whenever basins are out of service. This practice is recommended by GAC vendors.

Signage for the top floor of the AT building will also be considered. The Proposed building classification approach will require review by the local Authorities Having Jurisdiction.

Building structural components will be concrete walls and floor slabs with double Tee precast concrete roof slabs. These materials allow classification of the building construction according to IBC as Noncombustible Unprotected IIB or Noncombustible Protected IIA.

Combustible protected construction will require fire rating of structural elements, but in return allows larger building area and additional stories in building height. The Fort Thomas GAC building area is over the limit for IIB classification and therefore the construction type will be noncombustible protected. Given the nature of concrete construction, rating of structural elements can be achieved by maintaining proper concrete cover for steel reinforcement and additional concrete topping over the precast roof. The Memorial Parkway AT Building has smaller building area and could be classified as IIB (Noncombustible unprotected).

5.7.1.2 Exterior Treatment and Materials

Structure exteriors will be designed to be practical and functional with emphasis on long service life with minimum maintenance requirements and to blend with existing structures. Priority will be given to the use of local construction materials and techniques where practical and complementary to the existing structures.

5.7.1.3 Exterior Walls

Exterior-facing walls will be designed of face brick. Exterior materials will be selected to minimize maintenance requirements. Exterior wall assemblies will be designed to achieve an R =10 value.

5.7.1.4 Roofs

The design arrangements of roofs, canopies, fascias, parapets, overhangs, or other roof elements will be in harmony with the massing and materials of the structures and to control runoff and direct drainage away from equipment, doorways, sidewalks, ramps, or other occupied areas. Sloped roof with metal roofing system on pre engineered metal framing will be provided at MPTP and on the lower portion of the FTTP AT Building over the Pump Room and UV room. The portion of the FTTP roof over the GAC facilities will include a flat vegetated (green) roof. Runoff from the metal roofs will be directed to the gutters (sloped roofs) and drains (flat roofs). Access to the green roof will be provided by both the stairs and the elevator to provide for public viewing of the roof. As a surface runoff mitigation measure and sustainability approach, the runoff will be discharged to the EQ tank at FTTP and pumped back to the South Reservoir for reuse whereas at MPTP the roof drainage can flow by gravity to the North Reservoir. The Roof assemblies will be designed to achieve a minimum R =20 value.

5.7.1.5 Exterior Doors, Windows, and Louvers

Exterior doors, windows, and louvers will be designed of extruded aluminum sections with factory-applied protective coatings. Sills, thresholds, flashing, and trim will be provided to prevent water penetration to the interior of the building. All doors, windows, and louvers will be provided with corrosion-resistant hardware, accessories, fasteners, and operating mechanisms. Exterior window glazing will be tinted insulated glass. Exterior door glazing to be tinted insulated tempered glass.

The interior space of the operating floor of each AT Building where top of the GAC basins are exposed will be kept dimly lit except when required for a personnel access. This approach will limit growth of algae in the basins. Natural light will be limited and electric lights should be switched to be extinguished when GAC space is not occupied.

A curtain wall will be constructed on the operating floor of each AT building to contain the humid atmosphere but to allow sufficient space for personnel access with ladders into the GAC contactors for placing and removing the GAC media. The type of ladder access will be investigated during detailed design to identify a system that provides access to the bottom of the contactor while meeting safety code issues with landings, cage or cable system, etc. Besides isolating the moist atmosphere, the curtain wall will serve to block natural light from exterior windows from penetrating into the contactor area but allow the light to illuminate the walkways or conference rooms. At FTTP the curtain wall will also provide separation between the process area and the public area to allow conference activities and operations and maintenance activities to be conducted concurrently without disruption.

Door units and hardware will be designed for heavy-duty usage. Locksets, security system and keying arrangement acceptable to the Owner will be provided. Security access card readers will be provided on all exterior doors and any doors to the electrical rooms.

Where applicable, equipment and vehicle doors for motorized operation will be provided and controlled from an interior control panel. Doors with manual backup for emergency hand operation will be provided.

Louver assemblies will be designed complete with bird screens, filters, dampers, blank-off panels, acoustical treatment, or other required features. Louver assemblies will be designed to prevent infiltration of rain and provide positive drainage to the exterior.

5.7.1.6 Interior Treatment and Materials

Structure interiors will be designed to be practical and functional with emphasis on long service life with minimum maintenance requirements. Priority will be given to the use of local construction materials and techniques, where practical and final selection will be made during detailed design. Interior components and finishes will be designed of non-combustible materials with minimum flammability and smoke developed characteristics.

Interior walls in process areas will be designed of concrete masonry units or concrete. Conference room walls will have gypsum dry wall surface. Where required for fire separations, walls will be designed in accordance with recognized tested UL assemblies.

Floor and base materials designed for long service life with minimum maintenance requirements will be provided. Hard surface seamless flooring material will be provided for areas subject to splashes, spills, or wet exposure. Bases of suitable material and height to protect wall finishes will be provided. Floors, ramps, and steps will be designed with non-slip finishes and abrasive nosing inserts for safety.

Interior doors, frames, sidelights, transoms, and windows will be designed of steel or aluminum to the Owner's Standard and final selection will be made during detailed design. Where required for fire or smoke separations, steel doors and frames, window frames, and appropriately sized glass units with labels from appropriate testing agencies will be provided.

All doors will be designed with appropriate corrosion-resistant hardware. Locksets and keying system acceptable to the Owner will be provided. Clear tempered glazing will be provided for all interiors glazing not required to be labeled as a fire separation.

Ceilings will be designed to be integrated with the building services and lighting systems. Ceiling materials and finishes that enhance the acoustic properties of the spaces will be provided. Appropriate access will be provided to equipment concealed in the ceiling spaces.

Where practical, the design will include factory finishes of interior items. Field-applied finishes and protective coatings will be provided to all other building elements that are not supplied with factory-applied protective coatings. The use of factory- or field-applied coatings that provide long-term service use with minimum maintenance will be considered wherever possible.

Chemical resistant coating systems will be designed to provide a minimum of 48-hour immersion protection against spills or leaks of stored chemicals in secondary containment areas. Coating systems will include primer, fiberglass mat, saturant, and two trowel -applied coats of vinyl ester resin with silica filler. Non slip finish will be provided on all horizontal surfaces.

Public use spaces such as the conference room and entry foyer at FTTP will have durable finishes suitable for the industrial setting but also provide an attractive appearance.

Areas subject to elevated noise level will be provided with acoustical treatment.

5.7.2 FTTP

The proposed AT Building will house a pipe gallery, UV area and Pumping Station at lower level (769). The first floor will house a chemical storage room, blower and HVAC room and Wash and Janitor rooms, an Electrical Room and an elevated walkway over the UV and Pump Rooms. The second floor, termed the GAC operating floor will be placed at level 802 and will extend over the GAC contactors and adjacent areas but not over the UV or Pump Rooms. A conference room with kitchenette will be constructed on this floor level. Due to the existing site constrains and grade configurations, the eastern portion of the building will be recessed into existing hillside. This approach will partially screen the building and make it less intrusive to the adjacent residential neighborhood. All of the mentioned areas (GAC, UV, Pumping Station, Blower room and chemical storage area) will be considered as one building for the building code classification. Access to the building will be provided from North/West side through stair No 1 and Stair No 2. See Architectural Exhibits in Section 8.

The classification of the Fort Thomas AT building is outlined in the Exhibit 5-56.

EXHIBIT 5-56
Fort Thomas AT Building

Building Classified Under IBC 2006	
Construction Type:	Noncombustible protected -IIA
Occupancy Type:	Industrial Moderate Hazard F-1
Number of Stories:	3
Building Area:	21,812 SF(max allowed 25,000SF)
Building Height:	39 ft (max allowed 4 stories, 65 Feet)
Occupant Load:	Unoccupied
Fire Rated Separation Required Between Following Areas and the Remainder of the Building:	
1HR	Stairs
1HR	Vestibules
1HR	Electrical Room
1HR	Basement and Ground Floor
Fire Protection Requirements:	
Sprinklers (IBC Section 903.2.3):	Not Required
Fire Alarm System (IBC Section 907.2.4):	Not Required
Portable Fire Extinguishers (IBC) Section 906.1):	Required

5.7.3 MPTP

The new GAC facility will be located adjacent to the existing Filter Building at the Memorial Parkway Water Treatment Plant and constructed largely within existing abandoned process tankage and galleries. The proposed structure will house a Pipe Gallery at level 745.00 connecting on one side to lower level of existing Filter Building and also providing access to existing Service Tunnel on the South –East side. The UV area will be located at the lower level, adjacent to the existing Service Tunnel. The Pump

Station will be placed adjacent to existing Filter Building with Pump Room floor at level 760, which is the First Floor. Also at this level a walkway/loading area will be constructed for the full length of the building to allow for walking access between the Filter Building and the proposed UV room through the proposed AT Building. A GAC operating floor will be located at level 772.00. All of the mentioned areas (GAC, UV and Pumping Station) will be considered as one building for the building code classification. Access to the ground from all levels will be provided through stair No 1 and No 2. See Architectural Exhibits in Section 8.

The classification of the MPTP AT building is outlined in the Exhibit 5-57.

EXHIBIT 5-57
Memorial Parkway AT Building

Building Classified Under IBC 2006	
Construction Type:	Noncombustible unprotected -IIB
Occupancy Type:	Industrial Moderate Hazard F-1
Number of Stories:	3
Building Area:	11,030 SF (max allowed 15.500SF)
Building Height:	24 (max allowed 2 stories, 55 Feet)
Occupant Load:	Unoccupied
Fire Rated Separation Required Between Following Areas and the Remainder of the Building:	
1HR	Stairs
1HR	Vestibules
1HR	Electrical Room
1HR	Basement and Ground Floor
Fire Protection Requirements:	
Sprinklers (IBC Section 903.2.3):	Not Required
Fire Alarm System (IBC Section 907.2.4):	Not Required
Portable Fire Extinguishers (IBC) Section 906.1):	Required

5.8 Green Elements

The sustainability statement for the project that is included in Section 1 will be the guiding statement for sustainability/green project elements throughout the design, construction and startup. The statement goes beyond the initial construction to address the entire service life of the project. Accordingly the design will incorporate features such as SCADA controls that will enable NKWD operations staff to optimize operations of pumps and chemical feed equipment and provide for energy efficiency.

5.8.1 Sustainability Initiatives

A common measure of sustainability is the Leadership in Energy and Environmental Design (LEED) certification program. The program establishes standards that are primarily applicable to residential and commercial structures and provides for certification at various levels of energy efficiency and environmental stewardship. LEED certification is not intended to be sought for the Advanced Treatment facilities at FTTP and MPTP but the LEED sustainable initiatives will provide additional guidance to the AT teams in the execution of the design, construction and startup. The primary LEED initiatives are:

- Sustainable sites.
- Water efficiency.
- Energy and atmosphere.
- Materials and resources.
- Indoor environmental quality (IEQ).
- Innovation and design process.

Project elements that have been adopted to implement these initiatives are described herein.

5.8.1.1 Sustainable Sites

- Erosion and Sediment Control- site erosion, sediment control and air quality (dust) control plant will be integrated into the construction activities as prescribed in the bidding documents.
- Site Selection – Use of existing plant sites for the structures at both plants will minimize the disruption of the projects on surrounding neighborhoods.
- Reduced Site Disturbance – Constructing the AT Building at FTTP into the hillside with a covered breezeway to the laboratory and constructing the MPTP AT Building within the footprint of existing abandoned structures reduced disturbance to the existing plant sites and preserves space for future additions.
- Stormwater Management – The facilities are designed to return the residual water streams including much of the stormwater from the roofs to the raw water reservoirs and a green roof is proposed for FTTP. A green roof will also be investigated for MPTP. These measures counteract the effect of increasing the impermeable surfaces associated with expanding roadway and vehicle areas. The primary concerns with stormwater quality are GAC fines, chemical spills and vehicle fluid leaks and the AT Building aprons at both plants will include provisions for containment of these stormwater threats.

- Site Greening – The green roof on a majority of the AT Building and vegetative restoration of the surrounding hillside at FTTP will be compatible with the green features on the existing terraced hillside.
- Heat Island Effect – The high degree of incorporation of the facilities both at FTTP into the hillside and at MPTP into existing structures minimizes the increase in heat absorptive spaces. Additionally the use of a green roof and light colored, high-albedo masonry at FTTP will further reduce heat absorption.
- Light Pollution Reduction – Containing the access to the FTTP AT Building to the surface of the building facing inward towards the existing plant facilities will result in lighting the access areas in a manner that shields the neighborhood behind the building from additional lighting.

5.8.1.2 Water Efficiency

- Water Use Reduction- Returning the residual water streams to the raw water reservoir retains the beneficial use of the streams while minimizing offsite discharge of the water.
- Water Use Reduction-Use of low flow plumbing fixtures will minimize water use.

5.8.1.3 Energy and Atmosphere

- Minimum Energy Performance – Several provisions in equipment specifications will be made including NEMA "Premium Efficiency" Motors on process equipment and use of energy efficient lighting.
- Minimum Energy Performance – Constructing the FTTP AT Building into the hillside will provide natural insulation and moderate heating and cooling requirements for the building.
- Minimum Energy Performance – Providing air conditioning only in electrical/controls rooms and conference rooms will minimize cooling energy requirements.
- CFC Reduction in HVAC and R Equipment and Elimination of Halons- Use of ozone friendly refrigerants.
- Optimize Energy Performance-Variable frequency drives will be used on the largest motors and all equipment items where cost effective to minimize energy use.

5.8.1.4 Materials and Resources

- Building Reuce- The MPTP AT Building will be constructed with existing facilities using existing channel walls and galleries.

- Building Reuse- Several systems at MPTP including the sodium bisulfite system, the air scour blower, and the backwash pumps will be installed within existing buildings to replace aged equipment or take advantage of space allocations provided in prior construction.
- Durable Building- Emphasis will be placed on designing all of the structures using long lasting durable materials, prolonging the service life of the buildings.

5.8.1.5 Indoor Environmental Quality

- Minimum IAQ Performance- HVAC design will meet current ASHRAE Standards.
- Low-emitting Materials – Low VOC materials will be specified in bidding documents to meet or exceed VOC limits for adhesives, sealants, paints, and composite wood products.
- Indoor Chemical and Pollutant Source Control- Use of separate ventilation systems for chemical storage areas.
- Daylight and Views-Windows and glazing provided on galleries and conference spaces to provide natural light to these spaces. Curtain walls installed to shield GAC contactor surfaces from light.

5.8.1.6 Innovation and Design Process

- Lighting – Where applicable, lights will include motion detectors to automatically turn off lights on un-occupied spaces.
- Reuse of excavated material – Where possible, rock and soil excavated from the site will be used for fill or pavement subgrade to minimize off site hauling and import of fill materials.
- Integration of Operations and Maintenance Staff- The project team includes full participation by NKWD front line operations and maintenance personnel so as to promote user friendly design approaches and to stimulate development of sustainable approaches to long term operations and maintenance of the facilities.
- LEED Certified Design Staff – The lead project Architect, Barbara Kolis-Hupa is a LEED accredited professional.

5.8.2 Stormwater System

The impact of the new advanced treatment buildings on stormwater released from both the FTTP and MPTP sites has been considered in the overall effort to achieve a green design. Each site is uniquely different in the current approach to stormwater management and the impact from the different construction approaches (retrofit versus greenfield) will also differ between sites. Ultimately, review and approval of the design by Sanitation District No. 1 will be required, but the concept was to prevent any increase in the discharge volume from either site. This would be done through the construction of detention facilities or other measures. A brief summary of the proposed stormwater detention facilities or system modifications for each site is provided below.

- FTTP – An existing stormwater infrastructure exists at FTTP with a 30" main discharging storm flow into an unnamed tributary to the Licking River. This main will require a short relocation as part of the advanced treatment project. The construction of a new advanced treatment facility with a footprint of approximately 22,000 square feet into a hillside will have a stormwater management impact. This was an important part of the consideration of the green roof. The incorporation of the green roof reduces 100-year storm flows from 4.2 CFS to 1.2 CFS *when considering only the building footprint*. Stormwater from the metal roof portion of the building will be collected in the EQ basin beneath the building and pumped to the raw water reservoirs. Collecting and handling the stormwater in this manner keeps the water from the stormwater system and eliminates any system impacts. This results in a detention facility that is reduced by 62%. This is especially important at the FTTP site where space available for detention facilities is not easy to accommodate.
- MPTP – The construction within the footprint of the existing sedimentation and flocculation basins will enable the construction at MPTP to yield no net increase of stormwater from the building construction. The improved access roads and delivery area will increase surface runoff slightly but MPTP captures most of the surface run-off on the north side of the site in the north basin. Therefore, any increase will be detained on-site within a suitable structure. No stormwater improvements are anticipated at MPTP.

SECTION 6

Geotechnical Analysis

The deep excavations and the geotechnical conditions at both FTTP and MPTP will have a significant impact on the overall project cost. Thelen Associates is currently completing the borings and summary report for the advanced treatment project but a significant amount of information already exists that has helped form some conclusions about the geotechnical expectations at both sites. The expected conditions and areas of concern are detailed below.

- FTTP – Three areas exist which will likely require significant geotechnical consultation as part of the final design. Each of the areas identified below will be reviewed in detail with special measures noted either in the geotechnical report or in a subsequent meeting.
    - Hillside adjacent to the laboratory that will be excavated for the advanced treatment building.
    - Clearwell influent pipe corridor between the filter building and Sedimentation Basins 2 & 3.
    - North filter bank effluent pipe route around the northwest side of the building.
- MPTP – Subsurface data from under the existing is available from two previous projects. More data will be gathered as part of the advanced treatment project . The footprint under the new building is the primary area of interest at MPTP.

Based on the available information, it is expected that the new Advanced Treatment facilities at both sites will be founded on rock. In developing the preliminary opinion of probable construction cost, Thelen & Associates has been consulted and contacted local excavation contractors to verify unit costs associated with rock excavation, rock removal and other geotechnical costs.

The geotechnical reports for both plants are provided in Appendix A.

SECTION 7

Hydraulic Analysis

7.1 Introduction

Hydraulic analysis was necessary to establish allowable water surface levels and structural elevations of the Advanced Treatment facilities and the sizing of conveyance piping and channels at both plants. Currently filter effluent from both plants flows by gravity to the clearwells. The proposed configuration requires the introduction of piping and pumping to intercept the filter effluent and lift it to the top of the GAC contactors. The pumping lift must provide adequate head to drive the water through the GAC contactors, the downstream UV reactors, and conveyance facilities to discharge the AT effluent to the clearwells. The GAC pump wet well elevation is established to provide for discharge of the filter effluent into the well while allowing continued operation of the sand filters. These components are common to both FTTP and MPTP. At FTTP, the operating level of the existing and proposed treatment processes is below the level of the raw water reservoirs. Consequently, it is necessary to include an equalization tank and pumping system to return the recycle streams to the reservoirs. The MPTP raw water reservoirs are at a level below the treatment processes which allows the recycle streams from the AT processes to flow by gravity to the raw water reservoirs.

The hydraulic analysis was used to develop the maximum operating level of the GAC contactors at both plants and the maximum operating level of the GAC pump station wet wells. At FTTP an option of discharging the filter to waste flows from the sand filters to the EQ tank was also considered and used to establish the maximum operating level of the tank.

The hydraulic analyses were conducted using the CH2M HILL WINHYDRO (HYDRO) program and best practices. The program uses forms to input data and it provides formatted pages for textual output and a hydraulic profile as graphical output. The HYDRO program computes the energy grade line (EGL) and hydraulic grade line (HGL) elevations on the upstream and downstream sides of hydraulic elements that commonly occur in water treatment plants. It allows elements to be sequenced to simulate the entire plant. HYDRO is based on backwater calculations, i.e., analysis begins at the downstream end and precedes upstream, one element at a time. Hydraulic parameters on the downstream side of each element are equated to the upstream parameters of the downstream element.

7.2 Fort Thomas Treatment Plant

7.2.1 Assumptions

The following assumptions and allowances were made for the hydraulic analysis.

- 44 mgd peak flow.
- Minimum water temperature of 35 degrees F.
- 8 contactors in service.
- Mannings n value for piping = 0.013.
- High water level of 765.0 in the newest clearwell.
- Weir elevation at splitter box set at 774.00 for UV submergence.
- 48-inch pipe from UV discharge header to splitter box.
- 24-inch Trojan MP UV reactor (22 mgd per reactor and headloss of 11.1 inches).
- 24-inch piping for UV trains.
- 48-inch pipe from GAC contactors to UV influent header.
- One foot of headloss across 20-inch flow control valve on GAC effluent at 60% open.
- Leopold Universal Type S underdrains with IMS cap (6-inches of headloss at 4.5 gpm/sf).
- 4-inch sand layer between top of underdrain and GAC in contactors.
- 12 feet of Calgon Filtrasorb 400 GAC with allowance of 6.1 feet of clean bed headloss at 4.5 gpm/sf and 6 feet of headloss for dirty bed.
- 30 percent expansion of GAC media during backwash.
- 6 inches of space between expanded GAC level during backwash and bottom of trough.
- AT effluent passes through splitter box to divide flows equally to both existing clearwells. Splitter box serves to provide for full submergence of UV reactors and functions as a seal weir for the GAC contactors.

Maximum water levels for existing structures were obtained from the Asset Management Program (Black & Veatch, May, 2004). Both Trojan and Calgon are expected to compete for provision of the medium pressure UV reactors. In the 22 mgd capacity range, Trojan would provide a 24 inch reactor while Calgon would provide a 30 inch reactor. Therefore the hydraulic analysis was based on the higher head loss situation of the smaller Trojan reactors to allow adequate head for either reactor to be used. It is not anticipated that Calgon will offer a 24 inch reactor for this flow range.

7.2.2 Hydraulic Profile

The hydraulic profile for the Advanced Treatment facilities FTTP is shown on Exhibit 7-1 at the end of this Chapter. The output file from WINHYDRO provided in Appendix B.

7.2.3 Conclusions

The conclusions of the hydraulic analysis are listed below.

- Operating water elevation of 798.7 in GAC contactors to accommodate full range of flow and temperature, multiple UV and GAC options, and to allow flow by gravity to the existing New Clearwell.
- Maximum water level in EQ tank is 764.0 to allow gravity flow of filter to waste to the tank. Design considerations for the AT Building may require a lower operating level in the tank.
- Maximum water level in GAC wetwell is 762.0 to allow gravity flow and prevent back-up of filter effluent.
- Design considerations for the AT Building may require a lower operating level in the tank.
- GAC contactor-to-waste pipe size permits gravity flow to EQ basin.
- GAC backwash waste channel size permits gravity flow to EQ basin.
- Operating level of EQ basin allows gravity discharge of sand filter FTW to EQ basin.
- A maximum flow of 35 mgd can be delivered through the new 36-inch pipe from splitter box to New Clearwell when the operated at highest operating level.

The hydraulic analysis is in general concurrence with the operating level estimates for the GAC contactors presented in the Preliminary Design report. The hydraulic analysis conducted for this phase of the project are preliminary and will be refined as the full details of the equipment, piping and fittings are developed in the detailed design phase.

7.3 Memorial Parkway Treatment Plant

7.3.1 Assumptions

The following assumptions were made for the hydraulic analysis.

- 20 mgd peak future plant flow.
- Minimum water temperature of 35 degrees F.
- 6 contactors in service at 20 mgd and 5 in service at 15 mgd.
- Mannings n value for piping = 0.013.
- Clearwell high water level of 742.0.

- 36-inch piping between UV discharge header and clearwell.
- Open/close butterfly valves on UV influent and effluent.
- 24-inch gooseneck for UV submergence.
- 24-inch Calgon MP UV reactor (20 mgd per reactor and headloss of 14 inches).
- 24-inch piping for UV trains.
- 36-inch piping between GAC and UV.
- One foot of headloss across 18-inch flow control valve on GAC effluent at 60% open.
- Leopold Universal Type S underdrains with IMS cap (6-inches of headloss at 4.5 gpm/sf).
- 4-inch sand layer.
- 10 feet of Calgon Filtrasorb 400 GAC with allowance of 5.1 feet of clean bed headloss at 4.5 gpm/sf and 5 feet of headloss for dirty bed.
- 30 percent expansion of GAC media during backwash.
- 6 inches of space between expanded GAC level during backwash and bottom of trough.
- 24-inch piping between GAC pump station and GAC contactors.

Maximum water levels for existing structures were obtained from the Asset Management Program (Black & Veatch, May, 2004) A contactor media depth of 10 feet was selected for MPTP because adequate space was available to provide for larger shallower basins which allowed for reducing the height of the contactors and the AT building. The lower profile building fits better into the aesthetic of the plant facilities. Both Trojan and Calgon are expected to compete for provision of the medium pressure UV reactors. In the 20 mgd capacity range, both manufacturers have validated 24 inch reactors. The Calgon unit has more headloss so the hydraulic analysis was based on Calgon reactors to allow adequate head for either reactor to be used.

7.3.2 Hydraulic Profile

The hydraulic profile for MPTP is shown on Exhibit 7-2 at the end of this Chapter. The output file from WINHYDRO is provided in Appendix B.

7.3.3 Conclusions

The conclusions of the hydraulic analysis are listed below.

- Water elevation of 768.7 in GAC contactors to accommodate full range of flow and temperature, multiple UV and GAC options, and contactor to allow flow by gravity to clearwell.

- A maximum water surface of 748.5 in the GAC feed pump wet well can accommodate existing filter operating levels. Design considerations for the AT Building may require a lower operating level in the tank.
- Backwash waste and contactor-to-waste pipes and channels are adequately sized to permit gravity flow to the North Reservoir.

SECTION 8

Schematic Design

This section presents the schematic design which conveys how the systems described in prior chapters will be implemented at FTTP and MPTP. The section addresses implementation issues such as yard piping and site work, constructability and sequencing, project schedule, and estimated drawing lists for the bidding documents at each plant. A combined specific list is provided as the specification sections for each plant are expected to be very similar but the numbers, sizes and quantities of items at MPTP will be less than at FTTP.

The following drawings are presented at the end of this Section:

FTTP:

8-1 Site Plan
8-2 Not Used
8-3 AT Facility Section
8-4 AT Facility West Elevation – Proposal 1
8-5 AT Facility West Elevation – Proposal 2
8-6 AT Facility Lower Basement Plan at EL 769.00
8-7 AT Facility Basement Plan at EL 769.00
8-8 AT Facility First Floor Plan at EL 784.00
8-9 AT Facility Second Floor Plan – Proposal 1 at EL 802.00
8-10 AT Facility Second Floor Plan – Proposal 2 at EL 802.00
8-11 AT Facility GAC Pump Station P&ID
8-12 AT Facility GAC Contactor Overview P&ID
8-13 AT Facility Typical GAC Contactor P&ID
8-14 AT Facility UV P&ID
8-15 AT Facility Air Scour Blower P&ID
8-16 AT Facility Waste (EQ) Basin P&ID

NKWD reviewed the 2 proposals for the west face of the AT Building at FTTP and selected Proposal 1 for implementation.

MPTP:

8-17 Site Plan
8-18 AT Facility Northwest and Southwest Elevation
8-19 AT Facility Lower Level Floor Plan at EL 743.50
8-20 AT Facility Operating Level Floor Plan at EL 760.0
8-21 AT Facility Upper Level Floor Plan at EL 772.0
8-22 AT Facility Sections
8-23 AT Facility Section
8-24 AT Facility GAC Pump Station P&ID

8.1 Fort Thomas Treatment Plant

8.1.1 Sitework

The installation of GAC contactors and UV disinfection facilities at FTTP will require extensive sitework. This will be challenging considering that the FTTP site is already nearly built out. The GAC contactors, GAC and backwash pump station and UV facilities are all proposed to be built in a single building. The proposed location of the building is within the terraced hillside northeast of the laboratory and adjacent to the parking area. The placement of the building in this location will require extensive excavation (over 40′ deep in some areas) and a significant restoration effort will be required. In addition, the existing access roads and utility lines will need to be modified or relocated to accommodate the building. Details of this work will be provided in the following items and a site plan reflecting the proposed work is provided in Exhibit 8-1.

8.1.2 Access Road

The current access roadways will be impacted by the construction of the new Advanced Treatment Building. The main road will experience higher frequency and heavier than normal loads from construction traffic. In addition, excavation from the work is expected to impact portions of the existing roads due to the deep excavations that will be required. The key design considerations for the access roads are detailed below.

- The main access road into FTTP is expected to experience modest damage from construction traffic. It is expected that subbase repair along with new binder and surfaces courses of pavement will be required from the entrance through the driveway area north of Flocculator #4.
- The parking area in front of the filter building will be significantly impacted from the installation of 36-inch GAC influent pipe and will require sub-base and pavement restoration.
- The northeast laboratory parking area will be temporarily destroyed during excavation of the GAC facilities. This area will be re-constructed with concrete pavement as a GAC delivery/parking area. Concrete pavement is proposed in lieu of asphalt because extensive truck traffic flow and parking will occur when GAC is delivered and removed so an especially durable surface is needed.
- The access road from the lower plant site to the dam will be temporarily closed during construction as excavation will be present in this area. It will be relocated northeast by approximately 50 feet and re-opened later in the project.

- Larger concrete pavement aprons and driveway areas will be added between the filter building and advanced treatment building to improve truck access. This area is identified on the site plan in Exhibit 8-2.

8.1.3 Yard Piping

As detailed on the site plan provided in Exhibit 8-3, there are several significant runs and tie-ins of yard piping that are required for the advanced treatment project. Each of these are described below.

- Two GAC influent lines are required based on the current filter piping arrangement. The 12 gravity filters at FTTP are divided into the north and south filter banks. Each bank has a designated combined filter effluent (CFE)channel beneath the floor of the gallery. In order to accommodate the routes proposed below, some existing utilities may be required to be relocated. Selected potholing (or daylighting) of existing lines has been performed by NKWD to determine the extent of the relocation requirements.
  - The north filter bank 36" CFE is directed out the north wall of the building into the yard where it is routeded to the 3.5 MG cylindrical clearwell known as the new clearwell. This line will be intercepted with a 36" tee (2 valves) in the yard north of the filter building. A new 36" GAC Influent line will be installed from this point around the northwest corner of the filter building, across the front parking area to the Advanced Treatment Building.
  - The south bank CFE discharges into the collection/weir box in the basement of FTTP. This box is the entrance point to the old clearwell under the FTTP filter building. In order to access the filter effluent from the south bank, two new 30" connections will be made with the effluent channels that run under the filter building floor on either side of the gallery. From there, the twin 30" pipes will be combined into a 36" CFE that will exit the south wall of the filter building in a similar manner to the north bank. Once outside the filter building, the new 36" line will be routed southwesterly across the main access road to the advanced treatment facility.

8.1.4 List of Drawings

Based on the preliminary design concept, a preliminary list of expected drawings for the installation of advanced treatment at FTTP is provided in Exhibit 8-29. The drawing list has expanded from prior estimates primarily because of the additional sheets associated with the installation of 3 floors, an elevator, conference rooms and the green roof for the Advanced Treatment Building.

8.1.5 List of Specifications

A preliminary list of specifications for the installation of advanced treatment be found in Exhibit 8-30. This list applies to both the FTTP and MPTP AT projects and includes all disciplines including civil, process, mechanical, architectural, structural, electrical and instrumentation.

8.1.6 Project Schedule

The anticipated project schedule is as follows:

Value Engineering Review:	January 12, 2009 – February 2, 2009
Commence Final Design:	February 9, 2009
50% Review:	March 30, 2009
90% Review(includes constructability review and submittal to KDOW):	June 22, 2009
Submission to NKWD for Final Review:	July 15, 2009
Advertisement for Bids:	August 17, 2009
Bid Opening:	October 5, 2009
Award Construction Contract:	January 4, 2010
Construction Substantial Completion:	June 6, 2011

8.1.7 Construction Sequencing

The FTTP is the largest and most critical production facility owned and operated by NKWD and as a result it is essential that the plant remain in service continuously during the period of construction. Only short duration outages of less than a few hours can be incorporated into the construction plan. A feature of the plant that accommodates construction sequencing is the dual flow path through the filters and clearwells. It is possible to isolate half of the filters and either clearwell while leaving the remaining units in service. Some of the isolation activities and their impacts on yard piping design have been presented previously in this chapter. As the project progresses, it will be beneficial to identify allowable durations of plant shutdowns to accommodate specific construction activities that cannot be handled by isolation of a portion of the plant.

The proposed work associated with the installation of advanced treatment at MPTP will occur entirely within an existing plant site. The new GAC contactors and UV reactors will be constructed within a new building on an unoccupied portion of the site. This will allow construction of the building to occur with minimal disturbance of plant operations. Deep excavation including removal of durable unweathered rock near the Water Quality Laboratory will have an impact on the accessibility of the lab for delivery of materials and will need to be taken into account as the construction plan and schedule are developed.

The construction activities that will require the most consideration for sequencing and coordination will be the tie ins to the filter effluent piping in and around the filter building as described previously. It will be necessary to limit the contractor to working on the piping for only the north or south half of the filters and only one clearwell at any time. Consideration should also be given to the seasonal variation of flows at FTTP as longer outages for tie ins can be accommodated more readily in the cold weather months when the production rate is down.

Besides the piping and structural tie-ins it will be necessary to construct temporary access roadways during construction to provide for the continued delivery of materials and chemicals to the existing chemical and sodium hypochlorite buildings. It will be essential to identify maximum allowable durations of road outages to accommodate chemical delivery traffic as needed. To this end it will be beneficial for the contractor to complete the major excavation for the proposed Advanced Treatment Building before May 1 of 2010 so as to take advantage of reduced chemical delivery during the winter and spring period.

8.2 Memorial Parkway Treatment Plant

The concept for the installation of GAC contactors and UV facilities at MPTP is to intercept the combined filter effluent line in the existing filter building and re-direct the flow to the proposed Advanced Treatment Building. The new contactors fit within the footprint currently occupied by Sedimentation Basins 5 and 6. Additionally, the UV facility will be housed in the existing north flocculation basin. Upon the completion of the additional treatment steps, the finished water will be routed to the finished water piping to the existing clearwell.

The installation of GAC and UV require some supplemental components to be installed. These include a GAC influent pump station, replacement backwash pumps to serve both the filters and the GAC Contactors, and chemical facilities for dechlorination.

8.2.1 Sitework

The installation of GAC contactors and UV disinfection facilities at MPTP will require a significant amount of sitework. However, the location of the proposed facilities are all adjacent to each other so the length of piping runs will be modest. Like FTTP, the contactors, influent pumping station and UV building are all proposed to be built in a single building. The proposed location of the building is within the footprint of existing sedimentation basins 5 and 6 and the existing north flocculator. These structures will be modified or demolished as part of the project. The building in this location will require significant excavation below existing foundation levels and shoring and bracing will be important. In addition, existing access roads and utility piping will need to be modified or relocated to accommodate the building. Details of this work will be provided in the following items and a site plan reflecting the proposed work is provided in Exhibit 8-17.

8.2.2 Access Road

The existing main access roadway (north side of plant) will be significantly impacted by the construction of the new advanced treatment building. MPTP has 2 alternate entrances which can be utilized during the construction phase. The restoration of the main access road will include the re-grade of a portion of the area to create a loading/removal area for the GAC. This will require most of the ground surrounding the advanced treatment building to be re-graded to approximate elevation 757.0 and paved with concrete. This will eliminate the lower level "back door" entry to the filter gallery.

8.2.3 Yard Piping

As detailed on the site plan provided in Exhibit 8-17 there are several significant runs and tie-ins of yard piping that are required for the Advanced Treatment project. Each of these are described below.

- The GAC pump station will be served by the existing 30" combined filter effluent line. This line is currently located within the pump station footprint. Valving and tees will be added to the portion of the line that remains in service while the remainder is cut and abandoned.
- The 36" combined contactor effluent line will be routed outside the footprint of the advanced treatment building for a short distance in order to prevent a piping conflict.
- The 36" UV effluent line is routed outside the building and re-connects to the existing 30"clearwell influent piping.
- The GAC delivery area will have drains to collect any surface water. These drains will be routed to the north reservoir.

8.2.4 List of Drawings

Based on the preliminary design concept, a preliminary list of expected drawings for the installation of advanced treatment at MPTP. This list is found in Exhibit 8-31 and is a composite look at drawings from all disciplines including civil, process, mechanical, architectural, structural, electrical and instrumentation.

8.2.5 List of Specifications

A preliminary list of specifications for the installation of advanced treatment at MPTP can be found in Exhibit 8-32. This list is consistent with the specifications found in the FTTP project and will include all disciplines including civil, process, mechanical, architectural, structural, electrical and instrumentation.

8.2.6 Project Schedule

The anticipated project schedule is as follows:

Commence Final Design:	January 12, 2009
50% Review:	March 30, 2009
90% Review(includes constructability review and submittal to KDOW):	June 22, 2009
Submission to NKWD for Final Review:	July 15, 2009
Advertisement for Bids:	August 17, 2009
Bid Opening:	October 5, 2009
Award Construction Contract:	January 4, 2010
Construction Substantial Completion:	June 6, 2011

8.2.7 Construction Sequencing

A key constructability asset of the MPTP is that at present and for the entire construction period it will be possible to take the plant off line for extended periods of time. Presently the plant is operated only 16 hours a day 7 days a week. Allowing the plant to be taken off line rather than requiring pump around or making hot taps into pipes offers significant cost advantages. As the project progresses, it will be beneficial to identify allowable durations of plant shutdowns to accommodate specific construction activities.

The proposed work associated with the installation of advanced treatment at MPTP will occur entirely within an existing plant site. As previously described, the new GAC contactors and UV reactors will be constructed within the footprint of existing basins which were abandoned when the Actiflo system was installed. As such, the work will need to be coordinated and sequenced in order to minimize the downtime of the facility. Key elements of that sequencing are provided below.

- MPTP does not utilize the sedimentation basins under current operations. Therefore, the demolition of these facilities may occur early in the project without impact on the availability or capacity of the plant.
- The relocation of the drain line from the existing filters must occur early in the project prior to constructing the GAC pump station.
- The demolition of the "pit" area and the associated piping modifications should be performed prior to the construction of the GAC influent pump station.

Aside from these specific elements, the construction of the GAC and UV facilities is expected to occur largely without significant impact on the operations at MPTP. In addition to the specific items listed above, shutdowns may be required for shoring of existing structures to create suitable temporary support. Otherwise, it is expected that chemical delivery traffic through the new Memorial Parkway delivery entrance can be maintained and that normal operations of the Actiflo, filters, clearwell and chemical feed facilities is possible during much of the construction period.

SECTION 9

Cost Estimates

Estimates of the construction cost and annual operations costs have been prepared for the Advanced Treatment systems at FTTP and MPTP. The estimates were prepared using the CH2M HILL Parametric Cost Estimating System (CPES) conceptual cost estimating tool. Inputs to the tool include the facilities and equipment standards presented in Section 5 and the layouts and structure dimensions presented in the drawing exhibits in Section 8. Costs for many of the largest equipment items were input to CPES based on quotes received from equipment vendors. The CPES tool provides allowances for ancillary equipment and systems such as building mechanical, electrical and SCADA based on process design criteria, equipment cost information, where available, and historic construction project data. CPES also generates the operations and maintenance estimates from the same process inputs and unit rates for labor, materials and energy applicable to the local area.

The construction cost estimates presented in this Basis of Design Report are "order-of-magnitude" estimates, as defined by the American National Standards Institute (ANSI) and The Association for the Advancement of Cost Engineering International (AACE International) as "approximate estimates made without detailed engineering data. It is normally expected that estimates of this type will be accurate within plus 50 percent or minus 30 percent." This range implies that there is a high probability that the final project cost will fall within the range.

A 30% contingency has been included in these cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where previous experience has shown that unforeseeable events that will increase costs are likely to occur. The contingency is used as a means to reduce the risk of possible cost overruns. The contingency in these estimates consists of two components: Bid Contingency and Scope Contingency. Bid Contingency covers the unknown costs associated with constructing a given project scope, such as adverse weather conditions, strikes by material suppliers, geotechnical unknowns, and unfavorable market conditions for a particular project scope. Scope Contingency covers scope changes that invariably occur during final design and implementation.

The cost estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimates. The final cost for the project will depend on such criteria as actual labor and material costs, competitive market conditions, actual site conditions, final project scope, and other variables. As a result, the final project cost will vary from this estimate. The proximity to actual costs will depend on how close the assumptions of this estimate match final project conditions. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help assure proper project evaluation and adequate funding.

One of the largest components of the construction cost and the overwhelming largest operations expenditure is the acquisition of GAC. A uniform message from the GAC facilities that were toured by the project team and from GAC suppliers is that the prices of virgin and regenerated GAC are unstable to the point that purchase contracts with a term exceeding one year are not available. Longer term projections were also not available from suppliers. Many market conditions are in flux including the availability of foreign supplies, energy prices, and demands for water treatment and electrical power plants. A current 2008 price of $1.30 per pound of carbon delivered and placed in the bed by the supplier was used in the cost analysis.

The cost estimates were developed using unit cost information for other materials such as concrete, steel, etc. referenced to January 2008. Then the costs were escalated to the mid point of construction at the end of the 3rd quarter of 2010. The *Engineering News Record* recently posted the regional construction cost index (CCI) for January 2009 and the index exhibited a 5.7 percent increase over the January 2008 index. Accordingly a 6 percent annual escalation factor was applied to the construction estimates to develop the values for the November 2010 mid point of construction.

9.1 FTTP

The cost estimates for FTTP were developed based on facility types as defined in the CPES tool. The major facility types are filtration/contactors, chemical feed systems (sodium bisulfite), UV disinfection, flow splitting structures, and user defined facilities which apply to the engine generator and yard piping. The major pump systems are included in the GAC facility cost.

9.1.1 Construction Cost Estimate

The construction cost estimate is presented in Exhibit 9-1 and the details of each item in the table are presented in Appendix C.

EXHIBIT 9-1
FTTP Construction Cost Estimate

Component	2008 Cost Estimate	Nov 2010 Estimate
GAC Building • Contactors • Air Scour System • GAC Feed Tank & Pumps • EQ Basin Tank & Pumps • Backwash Pumps • Slurry Water Pumps • Conference Room • Green Roof	$ 22,240,734	$ 26,110,600

EXHIBIT 9-1
FTTP Construction Cost Estimate

Component	2008 Cost Estimate	Nov 2010 Estimate
Sodium Bisulfite System	$ 193,953	$ 227,700
UV Disinfection	$ 1,882,864	$ 2,210,500
Flow Splitting Structure	$ 284,355	$ 333,800
Engine Generator	$ 688,681	$ 808,500
Yard Piping	$ 2,659,152	$ 3,121,800
Allowances • Sitework • SCADA • Electrical	$3,353,970	$ 3,937,600
Contractor Markups	$6,659,865	$7,818,700
Contingency	$11,389,073	$13,370,800
Total	$49,352,647	$57,940,000

Excavation of weathered and durable rock and sheeting of the excavation are significant factors in the cost of the Advanced Treatment Building. Thelen and Associates contacted local excavation contractors to assess unit pricing for the work and provided input for the cost analysis. The input resulted in reduction of the unit pricing from rates used in other locations.

9.1.2 Operations and Maintenance Estimate

The CPES model development of operations and maintenance costs includes provisions for long term maintenance and repair of facilities and structures as well as routine operations. As such the estimates include not only purchase of GAC, sodium bisulfite, and electricity and routine maintenance of pumps but also resurfacing of pavement, repainting walls, and replacement of SCADA hardware and other longer term ownership and maintenance items. Annual costs are developed for the current year, then escalated to the first year of operations and each subsequent year in the period of analysis (20 year planning period), and then an annualize net present value for the entire period is calculated as shown in Exhibit 9-2. The O&M costs include a 20 percent contingency. The detailed estimates are presented in Appendix C.

EXHIBIT 9-2
FTTP Operations and Maintenance Cost Estimate

Component	2008 Cost Estimate	20 Year Annual Net Present Value
GAC Building • Contactors • Air Scour System • GAC Feed Tank & Pumps • EQ Basin Tank & Pumps • Backwash Pumps • Slurry Water Pumps • Conference Room • Green Roof	$ 6,086,277	$ 9,215,849
Sodium Bisulfite System	$ 56,964	$ 86,256
UV Disinfection	$ 213,138	$ 320,627
Flow Splitting Structure	$ 9,219	$ 13,960
Engine Generator	$ 9,427	$ 14,275
Yard Piping	$ 0	$ 0
Allowances Items • Sitework • SCADA • Electrical	$201,099	$ 304,504
Staffing – 1 position	$ 67,392	$ 102,046
Total	$ 6,643,516	$ 10,057,517

The estimate assigns equal long term O&M costs over each year of the planning period so that allowances for repainting and pavement resurfacing are included in both the year 1 and year 20 estimates. In reality such long term cost will be incurred toward the back end of the planning period. This method of estimation allows the owner to plan for such costs and regulates annual funding allocations to a uniform level.

The O&M estimate includes budget for a staff position at FTTP which is an allowance to cover the added labor associated with the operations, maintenance, laboratory, management and other activities necessary for ownership and operations of the GAC, pumping, and UV systems. The allowance is not a recommendation to add a single labor position at the plant. The specific staffing needs will be explored in more detail by NKWD based on their current staff size and capabilities.

9.2 MPTP

The cost estimates for MTTP were developed based on facility types as defined in the CPES tool. The major facility types are filtration/contactors, chemical feed systems (sodium bisulfite), UV disinfection, and user defined facilities which apply to the engine generator and yard piping. The major pump systems are included in the GAC cost, however the washwater pumps will be installed in the existing pump station.

9.2.1 Construction Cost Estimate

The construction cost estimate is presented in Exhibit 9-3 and the details of each item in the table are presented in Appendix C.

EXHIBIT 9-3
MPTP Construction Cost Estimate

Component	2008 Cost Estimate	Nov 2010 Estimate
GAC Building • Contactors • Air Scour System • GAC Feed Tank & Pumps • Backwash Pumps • Slurry Water Pumps	$ 9,342,505	$ 10,968,100
Sodium Bisulfite System	$ 160,977	$ 189,000
UV Disinfection	$ 1,004,773	$ 1,179,600
Engine Generator	$ 688,681	$ 808,500
Yard Piping	$ 165,392	$ 194,200
Allowances • Sitework • SCADA • Electrical	$ 1,363,481	$ 1,600,800
Contractor Markups	$ 2,707,417	$ 3,178,500
Contingency	$ 4,629,968	$ 5,435,600
Total	$ 20,063,194	$ 23,554,300

The estimate includes considerably less GAC and excavation than the Fort Thomas estimate but includes costs for demolition of existing facilities in the sedimentation flocculation basin. The allowances, contractor markups and contingency values are based on the same percentages as at FTTP.

At the time of preparation of this Basis of Design Report, there are some cost items that have not yet been finally resolved at MPTP including the potential for a green roof, adding an air scour blower for the GAC system, and the elimination of the sodium bisulfite system. As a result the cost estimate has not been changed from the submittal that was made with the draft report which includes the cost of the sodium bisulfite system but not a green roof of an additional air scour blower. The combined additive and deductive impacts of the potential changes are expected to amount to less than 1 percent of the total construction cost.

9.2.2 Operations and Maintenance Estimate

The development of the O&M costs for MPTP parallels that for FTTP and the estimate is presented in Exhibit 9-4. The detailed estimates are presented in Appendix C.

EXHIBIT 9-4
MPTP Construction Cost Estimate

Component	2008 Cost Estimate	20 Year Annual Net Present Value
GAC Building • Contactors • Air Scour System • GAC Feed Tank & Pumps • Backwash Pumps • Slurry Water Pumps	$ 1,316,037	$ 1,992,745
Sodium Bisulfite System	$ 19,926	$ 30,173
UV Disinfection	$ 92,118	$ 139,486
Engine Generator	$ 9,427	$ 14,275
Yard Piping	$ 0	$ 0
Allowances Items • Sitework • SCADA • Electrical	$ 81,752	$ 123,790
Staffing – 1 position	$ 67,392	$ 102,046
Total	$ 1,586,652	$ 2,402,515

The MPTP O&M estimate also includes an allowance for a staff position for the new facilities. As is the case with FTTP, this allowance is intended to aid in the budgeting process NKWD will complete an assessment of specific staffing needs.

SECTION 10

Kentucky Division of Water Coordination

An important element of the preliminary engineering phase was to establish regular communication with the Kentucky Division of Water in relation to the advanced treatment project at both FTTP and MPTP. This has been accomplished with conference calls and correspondence exchange with key KDOW staff on a variety of subjects related to the project including the following.

- Requested clarification on need for supplementary detention basin after the Actiflo process. This basin (existing Sedimentation Basin #4) will need to have one wall modified as part of the project. Based on Actiflo performance and a previous determination, KDOW will not require the continued use of the basin so this will not create an impact on plant operations.
- Discussed the capture of roof run-off by routing drains to equalization basin to reduce stormwater impact of large new GAC building at FTTP. KDOW was substantially in agreement with this if diversion capabilities were included to account for contaminants during maintenance periods, etc. The KDOW response letter is provided in Appendix D.
- Gained approval of recycling carbon backwash waste water, GAC contactor to waste and carbon motive (slurry) water to the raw water reservoirs at both plants.
- Gained approval of including a bypass around the entire Advanced Treatment system at both plants rather than around GAC and UV processes individually.
- The use of the procedures established in the United States Environmental Protection Agency Guidance Manual for UV Disinfection for establishing a UV dose that achieves the inactivation targets over varying water quality and flow conditions while minimizing energy consumption.
- Discussion on maintaining the turbidity compliance point as the sand filter effluent rather than the GAC contactor effluent. Electronic correspondence has been exchanged with KDOW with no final response as of December 31, 2008.

Case No. 2010-____
Exhibit ____A____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

Engineer's Opinion Of Probable Construction Cost

CH2MHILL

FACILITY DETAIL 4 (CSI) Unallocated
PROJECT: Fort Thomas WTP
DESIGN STAGE:
PROJECT No.:

ESTIMATOR: David Roby
ESTIMATE No.:
REV No./DATE: /

Facility	CSI	Proc/System	Description	Takeoff Quantity		Total Unit Price		Total Amount	Grand Total
W990			**Final Fort Thomas WTP**						
	02000		**SITEWORK**						
		Plumbing DR Trench	**Trench Drains**						
			18" Wide trench drain with heavy duty grating	270.00	lf	170.00	/lf	45,900	69,439
			Plumbing DR Trench Trench Drains				**/lnft**	**45,900**	**69,439**
		Sidewalk	**Sidewalk**						
			Sidewalks, driveways, and patios, sidewalk, concrete, cast-in-place with 6 x 6 - W1.4 x W1.4 mesh, broomed finish, 3000 psi, 6" thick, excludes base	650.00	sf	4.87	/sf	3,167	4,778
			Sidewalk Sidewalk				**/sqft**	**3,167**	**4,778**
		Site Asphalt	**Site Asphalt Paving**						
			Base course drainage layers,aggregate base course for roadways and large paved areas,crushed stone base,compacted,crushed 1-1/2"stone base,12"deep	350.00	sy	21.02	/sy	7,358	11,274
			Bituminous-stabilized Base courses, for roadways and large paved areas, prime and seal,cuPrime Coat	25.00	gal	5.51	/gal	138	211
			Plant-mix asphalt paving, for highways and large paved areas, binder course, 2" thick	350.00	sy	6.59	/sy	2,308	3,527
			Plant-mix asphalt paving, for highways and large paved areas, wearing course, 2" thick	350.00	sy	7.39	/sy	2,587	3,955
			Site Asphalt Site Asphalt Paving				**/sqft**	**12,390**	**18,967**
		Site Concret	**Concrete Paving - Site**						
			Base course drainage layers,aggregate base course for roadways and large paved areas,crushed stone base,compacted,crushed 1-1/2"stone base,8"deep	6,300.00	sy	21.02	/sy	132,436	202,937
			12" Compacted subgrade	6,300.00	sy	10.58	/sy	66,653	100,836
			Concrete Paving 9"	6,300.00	sy	40.99	/sy	258,236	396,036
			Concrete Curb & Gutter 12"	470.00	lf	8.08	/lf	3,796	5,781
			Site Concret Concrete Paving - Site				**/sqft**	**461,122**	**705,590**
		Site Demo	**Site And General Demolition**						
			Demolish, remove pavement, remove existing and temporary bituminous pavement, 4" to 6" thick, excludes hauling and disposal fees	5,500.00	sy	7.71	/sy	42,381	62,590
			Remove 2 Filter backwash pumps, existing filter building	5.00	day	3,503.18	/day	17,516	25,868
			Load haul and remove debris	1.00	ls	45,003.18	/ls	45,003	66,462
			Excavate for pipe removal	1,200.00	lf	43.18	/lf	51,819	76,528
			Remove 2 Filter backwash pumps, existing filter building	5.00	day	3,503.18	/day	17,516	25,868
			Remove chemical feed lines from inlet box, existing filter building	1.00	day	3,503.18	/day	3,503	5,174
			Demo fiberglass cover, weir box and slide gate, existing filter building	1.00	day	3,503.18	/day	3,503	5,174
			Relocate wooden stairs, new wooden landing, wooden railing, existing filter building	2.00	day	3,503.18	/day	7,006	10,347
			Remove miscellaneous small conduit, storage racks, etc., existing filter building	2.00	day	3,503.18	/day	7,006	10,347

Facility	CSI	Proc/System	Description	Takeoff Quantity		Total Unit Price		Total Amount	Grand Total
		Site Demo	**Site And General Demolition**						
			Relocate filter-to-waste piping, existing filter building	2.00	day	3,503.18	/day	7,006	10,347
			Electrical demolition, existing filter building	2.00	day	3,503.18	/day	7,006	10,347
			Minor site demolition, remove existing catch basin or manhole, masonry, excludes hauling	9.00	ea	330.85	/ea	2,978	4,397
			Minor site demolition, hydrants, fire, remove and reset, excludes hauling	1.00	ea	1,350.88	/ea	1,351	1,995
			Site demolition, pipe, sewer/water, 12" diameter, remove, excludes excavation, hauling	252.00	lf	7.56	/lf	1,906	2,814
			Site demolition, pipe, sewer/water, 15" to 18" diameter, remove, excludes excavation, hauling	510.00	lf	8.82	/lf	4,500	6,645
			Site demolition, pipe, sewer/water, 21" to 24" diameter, remove, excludes excavation, hauling	200.00	lf	11.03	/lf	2,206	3,257
			Site demolition, pipe, sewer/water, 27" to 36" diameter, remove, excludes excavation, hauling	210.00	lf	14.71	/lf	3,088	4,560
			Miscellaneous concrete site demolition	2,300.00	cf	38.68	/cf	88,957	131,373
			Concrete sidewalk demolition	6.00	sy	8.00	/sy	48	71
			Site Demo Site And General Demolition					**314,299**	**464,164**
		Site Erosion	**Site Erosion Control**						
			Erosion Control	1.00	ls	50,000.00	/ls	50,000	75,641
			Site Erosion Site Erosion Control				**/lnft**	**50,000**	**75,641**
		Site Excavate Struct	**Site Structural Excavation**						
			General Pavement Repair	1.00	ls	50,000.00	/ls	50,000	97,002
			Excavate Unweathered Rock	11,180.00	ls	70.00	/ls	782,600	1,155,762
			Excavate Weathered Rock	16,000.00	ls	40.00	/ls	640,000	945,167
			Excavate General	11,000.00	ls	18.00	/ls	198,000	384,130
			Backfill With Imported Select Fill & Compact	4,534.00	ls	17.42	/ls	78,982	120,179
			Haul Excess Excavated Rock Offsite	27,187.00	ls	15.00	/ls	407,805	602,256
			Site Excavate Struct Site Structural Excavation				**/cuyd**	**2,157,387**	**3,304,498**
		Site Fence	**Site Fencing**						
			Fence, chain link industrial, aluminized steel	600.00	lf	35.68	/lf	21,409	32,733
			Fence, chain link industrial, overhead slide gate, cantilever type	18.00	lf	113.93	/lf	2,051	3,107
			Fence, misc metal, snow fence	355.00	lf	4.86	/lf	1,723	2,603
			Site Fence Site Fencing				**/lnft**	**25,183**	**38,442**
		Site Grading	**Grading**						
			Selective clearing, brush, light clearing, with dozer.	1.00	acre	876.27	/acre	876	1,294
			Fine grading, finish grading, small area	4,000.00	sy	3.00	/sy	12,017	17,748
			Dewatering	1.00	ls	80,000.00	/ls	80,000	118,146
			Site Grading Grading				**/cuyd**	**92,894**	**137,188**
		Site Landscape	**Site Landscaping**						
			Precast concrete parking bumpers, wheel stops, precast concrete, 8" x 13" x 6' - 0", 2 dowels per each	20.00	ea	71.20	/ea	1,424	2,171
			Pipe bollards, steel, concrete filled/painted, 8' L x 4' D hole, 8" di	10.00	ea	263.00	/ea	2,630	4,042

Facility	CSI	Proc/Systm	Description	Takeoff Quantity	Total Unit Price	Total Amount	Grand Total
		Site Landscape	**Site Landscaping**				
			Site Landscape Complete	1.00 ls	60,000.00 /ls	60,000	91,609
			Site Landscape Site Landscaping		/sqft	**64,054**	**97,822**
		Site Manhole	**Miscellaneous Site Structures Including Manholes, Catch Basins, Valve**				
			South filter effluent bypass valve vault	1.00 ea	122,624.00 /ea	122,624	185,509
			Splitter Box	1.00 ea	195,000.00 /ea	195,000	295,001
			North filter effluent bypass valve vault	1.00 ea	162,572.00 /ea	162,572	245,943
			Equalization outfall structure	1.00 ea	10,000.00 /ea	10,000	15,128
			Storm structures precast curb box inlets	6.00 ea	1,000.00 /ea	6,000	9,077
			Drop box inlet	5.00 ea	1,600.00 /ea	8,000	12,103
			Concrete headwall	1.00 ea	3,050.00 /ea	3,050	4,614
			Stone rock headwall	2.00 ea	4,960.00 /ea	9,920	15,007
			Storm Manhole 4' diameter	7.00 ea	8,625.00 /ea	60,375	91,337
			Storm manhole 5' diameter	1.00 ea	9,925.00 /ea	9,925	15,015
			Site Manhole Miscellaneous Site Structures Including Manholes, Catch Basins, Valve		/each	**587,466**	**888,733**
		Site Pilings	**Site Pilings**				
			Sheet Pile	23,000.00 SF	50.00 /SF	1,150,000	1,698,348
			Site Pilings Site Pilings			**1,150,000**	**1,698,348**
		Site Road Temp	**Site Temporary Access Road**				
			Asphaltic concrete paving 6"stone base 2"base course 1"topping	35,000.00 sf	2.50 /sf	87,500	134,472
			Site Road Temp Site Temporary Access Road		/sqft	**87,500**	**134,472**
			02000 SITEWORK		/sqft	**5,051,362**	**7,638,081**
	03000		**CONCRETE**				
		Con Beam	**Concrete Cast In Place Beam**				
			Concrete Beams	155.00 cuyd	750.00 /cuyd	116,250	171,681
			Con Beam Concrete Cast In Place Beam		/cuyd	**116,250**	**171,681**
		Con Column	**Concrete Cast In Place Column**				
			Concrete Columns	200.00 cuyd	750.00 /cuyd	150,000	221,524
			Con Column Concrete Cast In Place Column		/cuyd	**150,000**	**221,524**
		Con Elev Slab	**Concrete Cast In Place Elevated Slab**				
			Elevated Slab	1,090.00 cy	1,150.00 / cy	1,253,500	1,881,283
			Con Elev Slab Concrete Cast In Place Elevated Slab		/cuyd	**1,253,500**	**1,881,283**
		Con Footing	**Concrete Cast In Place Footing**				
			Foundations	2,200.00 cuyd	550.00 /cuyd	1,210,000	1,786,957
			Miscellaneousequipment pads	11.00 cuyd	550.00 /cuyd	6,050	8,935
			Con Footing Concrete Cast In Place Footing		/cuyd	**1,216,050**	**1,795,892**
		Con Grout	**Concrete Grout**				
			Miscellaneous Concrete Fill, Grout	1.00 ls	800.00 /ls	800	1,229
			Con Grout Concrete Grout		/cuyd	**800**	**1,229**

Facility	CSI	Proc/System	Description	Takeoff Quantity		Total Unit Price		Total Amount	Grand Total
		Con Precast	**Precast Roof Slabs and Precast Double Tees**						
			Precast tees, double, roof, 50' span, 24" x 8' wide, prestressed	24.00	ea	2,942.33	/ea	70,616	107,923
			Slabs, precast prestressed, roof and floor members, 12" thick	320.00	sf	8.85	/sf	2,832	4,352
			Con Precast Precast Roof Slabs and Precast Double Tees				**/sqft**	**73,448**	**112,275**
		Con Wall	**Concrete Wall**						
			Concrete Walls	7,480.00	cuyd	750.00	/cuyd	5,610,000	8,284,983
			Con Wall Concrete Wall				**/cuyd**	**5,610,000**	**8,284,983**
			03000 CONCRETE				**/cuyd**	**8,420,048**	**12,468,866**
	04000		**MASONRY**						
		Masonry Brick	**Masonry Brick**						
			Standard Selrct Common 4x2 2/3	18,000.00	sf	12.40	/sf	223,200	335,729
			Soldier Course	325.00	sf	13.10	/sf	4,258	6,398
			Concrete Block Wall Reinforced 4"	2,895.00	sf	5.06	/sf	14,649	21,905
			Concrete Block Wall Reinforced 8"	1,138.00	sf	6.30	/sf	7,169	10,744
			Concrete Block Wall Reinforced 12"	3,000.00	sf	8.70	/sf	26,100	39,175
			Concrete Block Backup Reinforced 12"	5,600.00	sf	9.39	/sf	52,584	78,864
			Scaffolding	1.00	ls	40,000.00	/ls	40,000	59,073
			Masonry Brick Masonry Brick				**/sqft**	**367,960**	**551,887**
			04000 MASONRY				**/sqft**	**367,960**	**551,887**
	05000		**METALS**						
		Metal Stair	**Ladders**						
			Ladder, shop fabricated, aluminum, 20" w, bolted concrete, excl cage	128.00	vlf	85.86	/vlf	10,991	16,680
			Steel Ladder	48.00	risr	233.53	/risr	11,209	17,004
			Metal Stair Ladders				**/lnft**	**22,200**	**33,684**
		Metals Grating	**Metal Grating**						
			Grating frame, aluminum, 1" to 1-1/2" D, field fabricated	454.00	lf	16.15	/lf	7,334	11,054
			Grating frame, aluminum, 1" to 1-1/2" D, field fabricated, for each corner, add	12.00	ea	6.45	/ea	77	119
			Floor grating, aluminum, 1-1/2" x 1/8" bearing bars @ 1-3/16" O.C., cross bars @ 4" O.C., over 300 S.F., field fabricated from panels	1,710.00	sf	53.79	/sf	91,976	139,137
			Metals Grating Metal Grating				**/sqft**	**99,387**	**150,310**
		Metals Handrail	**Metal Handrail**						
			Railing, pipe, aluminum, satin finish, 2 rails, 1-1/2" dia, shop fabricated	1,902.00	lf	44.54	/lf	84,709	128,524
			Railing, pipe, aluminum, wall rail, satin finish, 1-1/2" dia, shop fabricated	356.00	lf	26.67	/lf	9,494	14,358
			Aluminum pipe & picket railing, double top rail, round pickets, shop fabricated, straight & sloped	65.00	lf	111.84	/lf	7,269	11,063
			Metals Handrail Metal Handrail				**/lnft**	**101,473**	**153,945**
		Metals Misc	**Metal Trusses**						
			Open web trusses, factory fabricated WT chords, average cost	131.00	ton	5,547.52	/ton	726,725	1,112,152
			Miscellaneous structural steel	5.00	ton	5,547.52	/ton	27,738	42,449

Facility	CSI	Proc/Systm	Description	Takeoff Quantity		Total Unit Price		Total Amount	Grand Total
			Metals Misc Metal Trusses					**754,463**	**1,154,601**
			05000 METALS				**/sqft**	**977,523**	**1,492,540**
	07000		**THERMAL & MOISTURE PROTECTION**						
		Roof BuiltUp	**Roofing Built Up**						
			Roof Deck Insulation, perlite, tapered for drainage	125.00	bf	1.23	/bf	153	232
			Polyisocyanurate Insulation, for roof decks, 2" thick, R14.29, 2#/CF density	3,000.00	sf	1.20	/sf	3,597	5,461
			Modified Bitumen Roofing, base sheet, #15 organic felt, fully mopped to deck	60.00	sq	26.53	/sq	1,592	2,390
			SBS modified cap sheet, smooth surface, glass fiber, mopped, 145 m	3,000.00	sf	1.90	/sf	5,699	8,503
			vapor barrier	3,000.00	sf	0.06	/sf	168	258
			Pavers	3,000.00	sf	4.47	/sf	13,417	20,118
			Roof BuiltUp Roofing Built Up				**/sqft**	**24,625**	**36,962**
		Roof Metal	**Roofing Standing Seam Metal**						
			Metal decking, steel, open type, wide rib, galvanized, over 500 Sq, 1-1/2" D, 22 ga	20,200.00	sf	1.62	/sf	32,639	49,607
			Metal Standing Seam Roof Complete	6,200.00	sf	20.00	/sf	124,000	188,706
			Roof Metal Roofing Standing Seam Metal				**/sqft**	**156,639**	**238,314**
		Spec Canopy	**Green Roof**						
			Green Roof With Mature Vegetation Included	14,600.00	sf	52.00	/sf	759,200	1,156,245
			Spec Canopy Green Roof				**/each**	**759,200**	**1,156,245**
		Wall Ext	**Exterior Wall Insulation**						
			Wall Insulation, Rigid, expanded polystyrene, 2" thick, R7.69	17,271.00	sf	1.20	/sf	20,757	31,287
			Wall Ext Exterior Wall Insulation				**/sqft**	**20,757**	**31,287**
			07000 THERMAL & MOISTURE PROTECTION				**/sqft**	**961,221**	**1,462,808**
	08000		**DOORS & WINDOWS**						
		Door HM	**Doors/Frames Hollow Metal**						
			Aluminum Entrance Doors	21.00	ea	3,250.00	/ea	68,250	103,943
			Door frames, steel channels with anchors	48.00	ea	376.92	/ea	18,092	27,289
			Doors, commercial, steel, flush, full panel,	28.00	ea	410.83	/ea	11,503	17,593
			Average, door hardware, exterior keyed, single, w/ panic	48.00	set	474.00	/set	22,752	34,810
			Door HM Doors/Frames Hollow Metal				**/each**	**120,597**	**183,636**
		Window HM	**Window Hollow Metal**						
			Metal Spandrel Panels	818.00	sf	7.00	/sf	5,729	8,677
			Windows, aluminum sash, stock, grade C, fixed casement, excl. glazing and trim	2,200.00	sf	18.17	/sf	39,968	60,689
			Insulating Glass, Tinted	2,132.00	sf	27.70	/sf	59,060	89,377
			Window HM Window Hollow Metal				**/each**	**104,757**	**158,743**
			08000 DOORS & WINDOWS				**/sqft**	**225,355**	**342,378**
	09000		**FINISHES**						
		Floor Fluid Applied	**Building Finishes**						
			Waterproofing	1.00	ls	50,000.00	/ls	50,000	75,941
			Porcelain tile, floor and walls	7,500.00	sf	7.97	/sf	59,775	90,234
			Complete Suspended Ceilings.	2,200.00	sf	4.89	/sf	10,758	16,153

Facility	CSI	Proc/Systm	Description	Takeoff Quantity	Total Unit Price	Total Amount	Grand Total
		Floor Fluid Applied	**Building Finishes**				
			Floor, Wall And Ceiling Finishes - Sealers, Colored Sealers, Paint.	1.00 ls	70,000.00 /ls	70,000	106,498
			Floor Fluid Applied Building Finishes		/sqft	**190,532**	**288,826**
			09000 FINISHES		/sqft	**190,532**	**288,826**
	10000		**SPECIALTIES**				
		Spec Wall Protection					
			Miscellaneous specilities	1.00 ls	10,000.00 /ls	10,000	15,368
			Spec Wall Protection			**10,000**	**15,368**
			10000 SPECIALTIES		/sqft	**10,000**	**15,368**
	11000		**EQUIPMENT**				
		Equip GAC	**Equipment**				
			GAC Drain Pump	1.00 ea	65,000.00 /ea	65,000	98,994
			UV Reactors	3.00 ea	351,000.00 /ea	1,053,000	1,603,696
			Wash Troughs and Supports	1.00 ls	295,000.00 /ls	295,000	449,283
			Underdrains With MS Cap	1.00 ls	767,000.00 /ls	767,000	1,168,124
			Air Header Pipe SS	1.00 ls	122,200.00 /ls	122,200	186,108
			GAC Media	2,742,221.00 lbs	1.80 /lbs	4,935,998	7,585,760
			Sand layer between the media and the underdrains	1.00 ls	30,000.00 /ls	30,000	46,105
			Equip GAC Equipment			**7,268,198**	**11,138,069**
		Equip Pump Submers	**Equipment Submersible Pump**				
			Equalization Basin Pumps	2.00 ea	36,500.00 /ea	73,000	111,168
			Submersible Pumps	2.00 ea	3,900.00 /ea	7,800	11,879
			Equip Pump Submers Equipment Submersible Pump			**80,800**	**123,047**
		Equip Pump Turbine	**Equipment Vertical Turbine Pump**				
			GAC Feed Pumps	3.00 ea	230,100.00 /ea	690,300	1,051,312
			Backwash Pumps	2.00 ea	143,000.00 /ea	286,000	435,572
			Slurry Pumps	2.00 ea	16,250.00 /ea	32,500	49,497
			Equip Pump Turbine Equipment Vertical Turbine Pump			**1,008,800**	**1,536,380**
		Equip Rotary Blower	**Equipment Rotary Positive Displacement Blower**				
			PD Blower and all Accessories	1.00 ea	52,000.00 /ea	52,000	79,195
			Equip Rotary Blower Equipment Rotary Positive Displacement Blower			**52,000**	**79,195**
			11000 EQUIPMENT		/sqft	**8,409,798**	**12,876,691**
	13000		**SPECIAL CONSTRUCTION**				
		I&C Instruments	**I&C Instruments**				
			Instrument and Control/General and Functional Requirements	1.00 ls	20,000.00 /ls	20,000	30,436
			Instruments and Controls	1.00 ls	430,000.00 /ls	430,000	649,854

Facility	CSI	Proc/System	Description	Takeoff Quantity	Total Unit Price	Total Amount	Grand Total
		I&C Instruments	**I&C Instruments**				
			Installation of Primary Sensors and Field Instruments	1.00 ls	35,000.00 /ls	35,000	53,189
			Control Consoles, Panels and Enclosures	1.00 ls	31,000.00 /ls	31,000	47,102
			Plant Control System (SCADA)/Telemetry Subsystem (TS)	1.00 ls	35,000.00 /ls	35,000	53,189
			Fire Detection and Alarm	1.00 ls	20,000.00 /ls	20,000	30,436
			Vibration Sensors	1.00 ls	52,000.00 /ls	52,000	79,195
			Security Access	1.00 ls	25,000.00 /ls	25,000	38,121
			I&C Instruments I&C Instruments			**648,000**	**981,522**
			13000 SPECIAL CONSTRUCTION		**/sqft**	**648,000**	**981,522**
	14000		***CONVEYING SYSTEMS***				
		Crane Mono	**Monorail Hoist, Bridge Crane, Elevator**				
			Building Elevator	1.00 ea	117,000.00 /ea	117,000	178,188
			Equalization Basin Monorail Crane	1.00 ls	6,500.00 /ls	6,500	9,899
			GAC Pump Station Bridge Crane	1.00 ls	27,900.00 /ls	27,900	42,487
			UV Room bridge crane	1.00 ls	41,800.00 /ls	41,800	63,663
			Crane Mono Monorail Hoist, Bridge Crane, Elevator			**193,200**	**294,238**
			14000 CONVEYING SYSTEMS		**/sqft**	**193,200**	**294,238**
	15000		***MECHANICAL***				
		Equip GAC	**Equipment**				
			4" Butterfly Valves With Motor Actuator	41.00 ea	4,758.00 /ea	195,078	297,099
			12" Butterfly Valves With Motor Actuator	11.00 ea	6,920.00 /ea	76,120	115,927
			18" Butterfly Valves With Motor Actuator	2.00 ea	9,390.00 /ea	18,780	28,598
			24" Butterfly Valves With Motor Actuator	16.00 ea	13,650.00 /ea	218,400	332,618
			14" Butterfly Valves With Motor Actuator	2.00 ea	8,100.00 /ea	16,200	24,669
			20" Butterfly Valves With Motor Actuator	16.00 ea	10,140.00 /ea	162,240	247,030
			30" Butterfly Valves With Motor Actuator	30.00 ea	20,700.00 /ea	621,000	945,728
			36" Butterfly Valves With Motor Actuator	3.00 ea	24,250.00 /ea	72,750	110,796
			24" Butterfly Valves With Manual valve & box	2.00 ea	7,150.00 /ea	14,300	21,779
			36" Butterfly Valves With Manual valve & box	1.00 ea	12,870.00 /ea	12,870	19,601
			24" Butterfly Valves With Manual	4.00 ea	7,150.00 /ea	28,600	43,557
			4" Check Valves	4.00 ea	1,430.00 /ea	5,720	8,711
			14" Check Valves	4.00 ea	9,581.00 /ea	38,324	58,367
			18" Check Valves	4.00 ea	17,160.00 /ea	68,640	104,537
			24" Check Valves	4.00 ea	28,600.00 /ea	114,400	174,229
			Equip GAC Equipment			**1,663,422**	**2,533,245**
		Mech Duct	**HVAC System**				
			Air devices	1.00 ls	4,215.00 /ls	4,215	6,428
			Louvers	1.00 ls	21,655.00 /ls	21,655	32,883
			Brick Vents	1.00 ls	880.00 /ls	880	1,347
			Exhaust fans	1.00 ls	14,510.00 /ls	14,510	21,955
			Heat systems, CU, AHU, HP, PTAC	1.00 ls	33,285.00 /ls	33,285	50,866
			Dehumidifier	1.00 ls	1,300.00 /ls	1,300	1,992
			Electric wall heaters, electric unit heaters	1.00 ls	82,425.00 /ls	82,425	126,137
			GAC dampers, dampers	1.00 ls	1,825.00 /ls	1,825	2,758
			Ductwork	1.00 ls	41,650.00 /ls	41,650	63,690
			Access doors	1.00 ls	115.00 /ls	115	173
			Refrigerant pipe	1.00 ls	8,300.00 /ls	8,300	12,480
			OBD	1.00 ls	2,650.00 /ls	2,650	4,010
			Controls	1.00 ls	8,500.00 /ls	8,500	12,853

Facility	CSI	Proc/System	Description	Takeoff Quantity	Total Unit Price	Total Amount	Grand Total
		Mech Duct	**HVAC System**				
			Height Adv.	1.00 ls	26,560.00 /ls	26,560	39,224
			Mech Duct HVAC System		**/lnft**	**247,870**	**376,796**
		Pipe C	**Carbon Slurry**				
			4" Stainless Steel Pipe	310.00 lf	116.38 /lf	36,079	55,012
			4" Stainless Steel 90 Degree Elbow	12.00 ea	317.38 /ea	3,809	5,700
			4" Loading/UnloadingStainless Steel Pipe	6.00 ea	362.39 /ea	2,174	3,265
			8" Stainless Steel Pipe	340.00 lf	158.88 /lf	54,020	82,186
			8" Stainless Steel 90 Degree Elbow	8.00 ea	1,242.38 /ea	9,939	14,973
			8" Stainless Steel Tee	16.00 ea	1,137.38 /ea	18,198	27,365
			Pipe C Carbon Slurry		**/lnft**	**124,220**	**188,502**
		Pipe FW	**Underground Piping**				
			Allowance For Small Bore Piping	1.00 ls	42,000.00 /ls	42,000	63,827
			12" DIP Underground Piping	90.00 lf	125.00 /lf	11,250	16,884
			24" DIP Underground Piping	1,270.00 lf	225.00 /lf	285,750	429,622
			24" MJ 90 Degree Elbow	2.00 ea	4,900.00 /ea	9,800	14,893
			24" MJ 11 1/4 Degree Elbow	1.00 ea	980.00 /ea	980	1,489
			24" MJ 45 Degree Elbow	3.00 ea	3,570.00 /ea	10,710	16,276
			24" 22 1/2 Degree Elbow	2.00 ea	1,575.00 /ea	3,150	4,787
			30" DIP Underground Piping	400.00 lf	255.00 /lf	102,000	153,636
			30" MJ 90 Degree Elbow	1.00 ea	7,140.00 /ea	7,140	10,851
			30" 22 1/2 Degree Elbow	2.00 ea	3,640.00 /ea	7,280	11,063
			36" DIP Underground Piping	1,190.00 lf	340.00 /lf	404,600	610,375
			36" MJ 22 1/2 Degree Elbow	8.00 ea	4,480.00 /ea	35,840	54,465
			36" MJ 45 Degree Elbow	10.00 ea	8,960.00 /ea	89,600	136,163
			36" MJ 11 1/4 Degree Elbow	2.00 ea	2,240.00 /ea	4,480	6,808
			48" DIP Underground Piping	335.00 lf	485.00 /lf	162,475	246,479
			48" MJ 90 Degree Elbow	7.00 ea	22,820.00 /ea	159,740	242,754
			Pipe FW Underground Piping		**/lnft**	**1,336,795**	**2,020,373**
		Pipe SS	**Storm Sewer**				
			Public Storm Utility Drainage Piping, reinforced concrete pipe (RCP), 30" diameter,	570.00 lf	175.00 /lf	99,750	149,023
			Public Storm Utility Drainage Piping, reinforced concrete pipe (RCP), 15" diameter,	192.00 lf	103.07 /lf	19,789	29,451
			Public Storm Utility Drainage Piping, reinforced concrete pipe (RCP), 12" diameter	804.00 lf	95.75 /lf	76,983	114,333
			Pipe SS Storm Sewer		**/lnft**	**196,522**	**292,807**
		Pipe UD	**Slurry Water Supply**				
			4" DIP	1,333.00 lf	44.00 /lf	58,652	89,098
			4" 90 Degree Elbow	42.00 ea	154.00 /ea	6,468	9,829
			4" Tee	40.00 ea	221.00 /ea	8,840	13,434
			4" 45 Degree Elbow	4.00 ea	138.00 /ea	552	839
			4" Blind Flange	6.00 ea	52.00 /ea	312	474
			18' DIP	22.00 lf	197.00 /lf	4,334	6,587
			18" 90 Degree Elbow	4.00 ea	2,117.00 /ea	8,468	12,869
			18" 22 1/2 Degree Elbow	4.00 ea	1,554.00 /ea	6,216	9,446
			18 Tee	2.00 ea	7,729.00 /ea	15,458	23,491
			24x18x24 Tee	1.00 ea	6,391.00 /ea	6,391	9,712
			24" DIP	24.00 lf	293.00 /lf	7,032	10,685
			24" 90 Degree Elbow	2.00 ea	4,857.00 /ea	9,714	14,762
			20' DIP	158.00 lf	228.00 /lf	36,024	54,746
			20" 90 Degree Elbow	18.00 EA	2,639.00 /EA	47,502	72,188
			20" Tee	8.00 EA	3,958.00 /EA	31,664	48,119
			30x20 Side-Outlet Elbow	8.00 EA	3,500.00 /EA	28,000	42,551
			30" DIP	440.00 LF	504.00 /LF	221,760	337,004

Facility	CSI	Proc/Systm	Description	Takeoff Quantity	Total Unit Price	Total Amount	Grand Total
		Pipe UD	**Slurry Water Supply**				
			30" 90 Degree Elbow	9.00 EA	7,119.00 /EA	64,071	97,367
			30" 45 Degree Elbow	2.00 EA	5,715.00 /EA	11,430	17,370
			30" Tee	9.00 EA	10,976.00 /EA	98,784	150,120
			30x24x30 Tee	2.00 EA	10,331.00 /EA	20,662	31,400
			30" Blind Flange	2.00 EA	2,958.00 /EA	5,916	8,990
			30x4 Reducer	2.00 EA	7,714.00 /EA	15,428	23,446
			30x8x30 Tee	1.00 EA	10,279.00 /EA	10,279	15,621
			36" DIP	130.00 LF	728.00 /LF	94,640	143,823
			48" DIP	95.00 LF	611.00 /LF	58,045	88,207
			48" 90 Degree Elbow	5.00 EA	22,789.00 /EA	113,945	173,160
			48" Tee	3.00 EA	41,098.00 /EA	123,294	187,368
			48" Cross	1.00 EA	72,621.00 /EA	72,621	110,361
			48x36 Reducer	6.00 EA	16,418.00 /EA	98,508	149,701
			48x20x48 Tee	4.00 EA	36,984.00 /EA	147,936	224,816
			4" Wall Pipe	26.00 EA	189.00 /EA	4,914	7,468
			12" Wall Pipe	1.00 EA	518.00 /EA	518	787
			18" Wall Pipe	2.00 EA	973.00 /EA	1,946	2,957
			24" Wall Pipe	1.00 EA	1,470.00 /EA	1,470	2,234
			30" Wall Pipe	26.00 EA	2,345.00 /EA	60,970	92,655
			36" Wall Pipe	2.00 EA	3,367.00 /EA	6,734	10,234
			48" Wall Pipe	9.00 EA	6,013.00 /EA	54,117	82,241
			Miscellaneous Connections Fittings and couplings	1.00 LS	11,200.00 /LS	11,200	17,020
			Pipe Hangers, Supports, And Restraints	1.00 LS	5,000.00 /LS	5,000	7,564
			Pipe UD Slurry Water Supply		**/lnft**	**1,579,815**	**2,400,744**
		Plumbing Bldg Serv	**Plumbing Building Services**				
			Trench drain	1.00 ls	81,610.00 /ls	81,610	122,872
			Sanitary drainage	1.00 ls	80,690.00 /ls	80,690	121,231
			Plumbing fixtures	1.00 ls	19,250.00 /ls	19,250	29,016
			Storm drainage	1.00 ls	45,050.00 /ls	45,050	67,773
			Roof drains	1.00 ls	7,770.00 /ls	7,770	11,842
			Potable water, hose valves, hydrant	1.00 ls	51,030.00 /ls	51,030	76,472
			Backflow preventer	1.00 ls	5,050.00 /ls	5,050	7,749
			Plumbing Bldg Serv Plumbing Building Services		**/lnft**	**290,450**	**436,955**
			15000 MECHANICAL		**/sqft**	**5,439,094**	**8,249,423**
	16000		**ELECTRICAL**				
		Elec Systems	**Electrical Systems**				
			Basic Electrical Materials and Methods	1.00 ls	60,000.00 /ls	60,000	91,309
			Wire and Cable Conductors	1.00 ls	175,000.00 /ls	175,000	264,444
			Grounding and Bonding For Electrical Systems	1.00 ls	10,000.00 /ls	10,000	15,218
			Conduit and Fittings/Raceways and Boxes	1.00 ls	225,000.00 /ls	225,000	339,785
			Electrical System Analysis	1.00 ls	25,000.00 /ls	25,000	37,521
			Generator	1.00 ls	600,000.00 /ls	600,000	916,094
			Medium Voltage Switchgears	1.00 ls	100,000.00 /ls	100,000	152,482
			Low Voltage Transformer	1.00 ls	10,000.00 /ls	10,000	15,218
			Panelboards	1.00 ls	79,000.00 /ls	79,000	119,999
			Medium Voltage Transformers	1.00 ls	130,000.00 /ls	130,000	198,587
			Wiring Devices	1.00 ls	12,000.00 /ls	12,000	18,157
			Safety Switches	1.00 ls	135,000.00 /ls	135,000	206,121
			Low-Voltage Adjustable Frequency Drive System	1.00 ls	350,000.00 /ls	350,000	533,688
			Facility Lightning Protection	1.00 ls	5,000.00 /ls	5,000	7,624
			Lighting Fixtures and Outside Lights	1.00 ls	219,400.00 /ls	219,400	332,553
			Switchboards	1.00 ls	100,000.00 /ls	100,000	152,182

Facility	CSI	Proc/System	Description	Takeoff Quantity	Total Unit Price	Total Amount	Grand Total
			Elec Systems Electrical Systems			2,235,400	3,400,985
			16000 ELECTRICAL		/sqft	2,235,400	3,400,985
			W990 Final Fort Thomas WTP		/sqft	33,129,493	50,063,613

Estimate Totals

Description	Amount	Totals		
Sales Tax	1,037,183		6.00	
General Conditions	3,312,949		10.00	%
	4,350,132	37,479,625		
Overhead	3,747,963		10.00	
Profit	1,873,981		5.00	
Mob/Demob	2,248,778		6.00	
Insurance	2,267,517		5.00	%
Bond	254,168			
	10,392,407	47,872,032		
Contingency Shown On Bid Form	100,000			
	100,000	47,972,032		
Escalation	2,091,581		4.36	
	2,091,581	50,063,613		
Construction Total		50,063,613		

Case No. 2010-____
Exhibit ____A____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

Specifications prepared by CH2M Hill and HDR Engineers titled "Fort Thomas Treatment Plant Advanced Treatment Facility"

The following items are enclosed separately from this volume in hard copy and enclosed in this submittal in electronic copy.

- Plans prepared by CH2MHill titled "Advanced Treatment Facility Fort Thomas Treatment Plant" dated December 2009

- Specifications prepared by CH2MHill titled "Fort Thomas Treatment Plant Advanced Treatment" Dated December 1, 2009

2835 Crescent Springs Rd Erlanger, KY 41018 (859) 578-9898 Fax (859) 578-5456

Case No. 2010-____
Exhibit ____B____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

CERTIFIED STATEMENTS

Affidavit

Franchises

Plan Review and Permit Status

Easements and Right-of-Way Status

Construction Dates and Proposed Date In Service

Plant Retirements

AFFIDAVIT
Fort Thomas Treatment Plant Advanced Treatment Project

Affiant, Jack Bragg, Jr., being the first duly sworn, deposes and says that he is the Vice President of Finance of the Northern Kentucky Water District, which he is the Applicant in the proceeding styled above; that he has read the foregoing "Fort Thomas Treatment Plant Advanced Treatment Project" Application and knows the contents thereof, and that the same is true of his own knowledge, except as to matters which are therein stated on information or belief, and that is to those matters he believes them to be true.

Jack Bragg, Jr.
Vice President - Finance
Northern Ky. Water District

Subscribed and sworn to before me in said County to be his act and deed by Jack Bragg, Jr., Vice President of Finance of the Northern Kentucky Water District, this 22nD day of February 2010.

NOTARY PUBLIC
Kenton County, Kentucky
My commission expires 5-9-2011

Franchises required – None

Plan Review and Permit Status - The District has reviewed and approved the specifications prepared by CH2MHill and HDR Engineers titled "Advanced Treatment Facility Fort Thomas Treatment Plant" dated December 2009.

The District received approval from the Division of Water on November 10, 2009 (see attached letter).

Easements and Right-of-Way Status - Easement and Right-of-Way statements are not required.

Start date of construction – May 15, 2010

Proposed date in service – June 1, 2012

Plant retirements – No plant retirements.

STEVEN L. BESHEAR
GOVERNOR

LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
14 REILLY ROAD
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

November 10, 2009

Ms. Amy Kramer, PE
Northern KY Water District
700 Alexandria Pike
Fort Thomas, KY 41075

RE: Northern KY Water District
AI # 2485, APE20090011
PWSID # 0590220-09-011
Advanced Treatment Project- FTWTP & MPWTP
Kenton County, KY

Dear Ms. Kramer:

We have reviewed the plans and specifications for the **Fort Thomas Water Treatment Plant (FTWTP) portion** of the above referenced project. The plans for FTWTP include the construction of a Granular Activated Carbon (GAC) contactor facility and an Ultraviolet Light Treatment facility with a waste equalization basin. These facilities shall include 8 GAC contactor beds; 3 GAC variable speed feed pumps rated at 15,300 gpm @ 43.7 ft of TDH; 2 variable speed backwash pumps rated at 11,200 gpm @ 47 ft of TDH, to serve both the GAC and existing sand filters; a GAC/Backwash wet well supplying the feed and backwash pumps; an equalization basin to capture GAC backwash waste, GAC to waste and miscellaneous waste streams requiring no additional treatment before being pumped back to the raw water reservoirs; 2 Equalization basin return pumps rated at 3,300 gpm @ 49.1 ft of TDH; 2 GAC slurry pumps rated at 120 gpm @ 266.5 ft of TDH; an air blower rated at 1760 scfm for air scour backwash of the GAC contactors; and 3 Medium Pressure High Output UV reactors capable of producing a Validated Dose equal to or greater than 8.5 mJ/cm^2 at 95% UVT. This is to advise that plans and specifications for the FTWTP portion of the above referenced project are APPROVED with respect to sanitary features of design, as of this date with the requirements and stipulations below. A separate approval was issued for the Memorial Parkway Water Treatment Plant (MPTP) portion of the project.

1. Following this project, the rated potable water production and plant classification for FTWTP shall not change.

2. GAC contactors shall comply with all applicable portions of Recommended Standards for Water Works Section 4.2.1.

3. Validation of the UV system is required to receive LT2 credit for Cryptosporidium inactivation. See the US EPA UV Disinfection Guidance Manual, Chapter 5 for details or contact the Division of Water's Compliance and Technical Assistance Branch for further information regarding LT2 credit.

4. Flow rate, UV intensity and lamp status must be routinely monitored.

    a. Flow to each reactor must be measured either by active flow control with dedicated flow meters and control valves for each reactor or by passive flow distribution where equal flow split is monitored with flow meters (US EPA UV Disinfection Guidance Manual Section 4.1.2).

10. When this project is completed, the owner shall submit a written certification to the Division of Water that the above referenced water facilities have been constructed and tested in accordance with the approved plans. Such certification shall be signed by a licensed professional engineer.

11. Unless construction of this project is begun within 1 year from the issuance date of this permit, the permit shall expire. If requested prior to the permit expiration, an official extension from the Division of Water may be granted. If this permit expires, the original plans and specifications may be resubmitted for a new comprehensive review.

If you have any questions concerning this project, please contact Sarah Tucker at (502) 564-3410 ext. 4836.

Sincerely,

Solitha W. Dharman

Solitha Dharman, PE
Supervisor, Engineering Section
Drinking Water Branch
Division of Water

SWD:SAT

C: Brent Tippey, P.E., HDR/Quest Engineering, Inc.
CH2MHill
Kenton County Health Department
Kentucky Infrastructure Authority
Public Service Commission
Cathy Arnett, SRF & SPAP Section

Case No. 2010-_____
Exhibit ____C____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

BID INFORMATION AND BOARD RESOLUTION

Bid Tabulation

Engineer's Recommendation of Award

Board Resolution

Northern Kentucky Water District

ITEMS CONCERNING BID INFORMATION AND BOARD RESOLUTION

- The bid opening was January 21, 2010 and the bid tabulation is attached.
- The Engineer's Recommendation of Award is attached.
- The Board Resolution from the February 19, 2010 meeting is attached.

2835 Crescent Springs Rd Erlanger, KY 41018 (859) 578-9898 Fax (859) 578-5456

Case No. 2010-____
Exhibit ____C____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

Bid Tabulation

Bid Tabulation
Fort Thomas WTP Advanced Treatment
Northern Kentucky Water District
Erlanger, KY
Bids Received: December 16, 2009

Item No.	Description	Messer Construction - Building Crafts, Inc. (Joint Venture)	Reynolds, Inc.	Waldridge Aldinger Co. - Dugan & Meyers Construction Co. (Joint Venture)	Kokosing Construction Co.	Adams Robinson Enterprises, Inc.
1	Ultraviolet (UV) Disinfection System	$ 712,000	$ 700,000	$ 705,000	$ 700,000	$ 715,000
2	Advanced Treatment Facility	$ 23,111,000	$ 25,193,000	$ 25,417,000	$ 26,450,000	$ 27,133,000
Base Bid Total of 1 and 2 Above		**$ 23,823,000**	**$ 25,893,000**	**$ 26,122,000**	**$ 27,150,000**	**$ 27,848,000**
Alternate Bid No. 1 - Air Scour System (Deduct)		$ 152,000	$ 192,000	$ 70,000	$ 185,000	$ 150,000
Alternate Bid No. 2 - Elevator (Deduct)		$ 154,000	$ 168,000	$ 163,500	$ 100,000	$ 135,000
Alternate Bid No. 3 - Vegetated Roof (Deduct)		$ 278,000	$ 297,000	$ 304,000	$ 280,000	$ 100,000
Alternate Bid No. 4 - Stainless Underdrains (Add or Deduct)		$ 560,000	$ 509,000	$ 645,000	$ 800,000	$ 600,000
Alternate Bid No. 5 - Alternate UV Manufacturer (Add)		$ -	$ 10,000	$ 52,000	$ 50,000	$ -
Alternate Bid No. 6 - UV System (Deduct)		$ 787,000	$ 805,000	$ 721,000	$ 700,000	$ 600,000

I hereby certify that this is a true and correct tabulation of the bids.

Nicholas E. Winnike

Nicholas E. Winnike, P.E., Project Manager
CH2M HILL, Inc.

STATE OF KENTUCKY
N. E. WINNIKE
18916
REGISTERED
PROFESSIONAL ENGINEER

Case No. 2010-____
Exhibit ____C____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

Engineer's Recommendation of Award

CH2M HILL
300 E-Business Way
Suite 400
Cincinnati, Ohio 45241
Tel 513-489-0779
Fax 513-489-0807

CH2MHILL

February 10, 2010

Ms. Amy Kramer
2835 Crescent Springs Road
P.O. Box 18640
Erlanger, KY 41018

Subject: Advanced Treatment Facility at Fort Thomas Treatment Plant

Dear Ms. Kramer:

We have reviewed the bids received on January 21, 2010, and recommend award of the contract to the low bidder the Messer/Building Crafts Joint Venture (JV). The bid form from the low bidder was in order with the required inclusions and their bid amount was deemed highly competitive but reasonable in comparison to the other bids. The project resume for the two firms was ample. We believe the joint venture is qualified to do the work and has submitted the lowest responsive bid. There have been no challenges from other bidders.

Several of the subcontractors listed on the bid have performed successfully for NKWD in the past. The bidder clarified that ADGO is the panel fabricator. We have little direct experience with the subcontractors who have not been involved in previous NKWD projects. We requested the JV to submit information on past working history with the subcontractors and the submittal includes multiple projects that Messer has completed with each of the listed firms. We have also requested that the JV provide the information related to compliance with Kentucky law referenced in Article 10 of the Agreement for the firms on their team. The JV acknowledged receipt of the request and their intent to provide the requested information within the next week.

Materials related to the pursuit and selection of the subcontractors have been submitted by the JV and are in review by the State of Kentucky pursuant to the requirement to demonstrate that good faith efforts were taken to attract disadvantaged firms. Any comments related to this submittal will be directed to Northern Kentucky Water District and should be considered in the award of the contract.

Sincerely,

CH2M HILL

Nicholas S Winnike

Nicholas E. Winnike, P.E.
Project Manager

Cc: Brent Tippey/HDR

Case No. 2010-____
Exhibit ____C____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

Board Resolution

Northern Kentucky Water District
Board of Commissioners
Special Meeting
February 19, 2010

A special meeting of the Board of Commissioners of the Northern Kentucky Water District was held on February 19, 2010 at the District's facility located at 2835 Crescent Springs Road in Erlanger, Kentucky. All Commissioners were present, except Commissioner Frank Jackson and Commissioner Sommerkamp. Also present were Ron Lovan, Richard Harrison, Bari Joslyn, Mark Lofland, Jack Bragg, Don Gibson, Dave Enzweiler, Mary Carol Wagner, Scott Shepherd, Jim Dierig, Bill Wulfeck, Amy Kramer, and Brian Dunham.

Commissioner Collins called the meeting to order at 12:34 p.m.

Commissioner Macke led those in attendance in the Pledge of Allegiance.

On motion of Commissioner Koester, seconded by Commissioner Wagner, the Commissioners unanimously approved the minutes for the regular Board meeting held on January 20, 2010.

On motion of Commissioner Macke, seconded by Commissioner Wagner, and after discussion, the Commissioners unanimously approved the expenditures of the District for the month of January, 2010 as evidenced by the district check registers.

On motion of Commissioner Koester, seconded by Commissioner Wagner, the Commissioners unanimously approved the award of $27,000 for the easement across the Nicholas Filacchione and Rebecca Y. Schmitt property, approved the performance of work pursuant to the Restoration and Removal Agreements with such property owners, and authorized the District staff to execute the Restoration and Removal Agreements and other documents the District Staff and legal counsel deem reasonably necessary to resolve the new and existing easement disputes with such property owners.

On motion of Commissioner Wagner, seconded by Commissioner Macke, the Commissioners unanimously approved the purchase of distribution inventory materials from the vendors listed on the bid summary attached hereto, and authorized the District staff to execute the appropriate contract documents.

On motion of Commissioner Macke, seconded by Commissioner Koester, the Commissioners unanimously approved the purchase of copper service piping from Wiseway Supply, and authorized the District staff to execute the appropriate contract documents.

On motion of Commissioner Wagner, seconded by Commissioner Koester, the Commissioners unanimously approved awarding the contract with two one-year contract extensions at the District's discretion for grounds keeping services for pump stations and water towers to Wessell Lawn Care & Landscaping, awarding the contract with two one-year contract extensions at the District's discretion for grounds keeping services for the treatment plants and Central Facility to Law Systems, and authorized the District staff to execute the appropriate contract documents.

On motion of Commissioner Wagner, seconded by Commissioner Koester, the Commissioners unanimously approved purchasing #5 and #6 pump controls from GA Industries LLC, and authorized the District staff to execute the appropriate contract documents.

On motion of Commissioner Wagner, seconded by Commissioner Koester, the Commissioners unanimously approved awarding the Fort Thomas Treatment Plant Advanced Treatment construction project on the base bid amount, without any alternates, to the joint venture of Messer and BCI, and authorized the District staff to execute the appropriate contract documents.

On motion of Commissioner Macke, seconded by Commissioner Wagner, and after discussion, the Board unanimously agreed to enter into an amendment to the engineering services agreement with CH2MHill and HDR Inc. to increase the fee by $20,830 as a result of increased services, and authorized the District staff to execute the appropriate documents.

On motion of Commissioner Wagner, seconded by Commissioner Koester, and after discussion, the Board unanimously agreed to enter into an amendment to the engineering services agreement with Malcolm Pirnie, GRW, and CDP to increase the fee by $715,040 as a result of increased services, and authorized the District staff to execute the appropriate documents.

The District staff presented and the Commissioners reviewed the financial reports and other current Department reports.

On motion of Commissioner Wagner, seconded by Commissioner Macke, and after discussion, the Board unanimously agreed to move the regular meeting of the Board of Commissioners from March 18, 2010 to March 16, 2010.

There being no further business to come before the Board, the meeting was adjourned.

CHAIRMAN SECRETARY

Case No. 2010-____
Exhibit ____D____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

PROJECT FINANCE INFORMATION

Customers Added and Revenue Effect

Debt Issuance and Source of Debt

Additional Costs for Operating and Maintenance

USoA Plant Account

Depreciation Cost and Debt Service After Construction

Northern Kentucky Water District

Customers Added and Revenue Effect: There will be zero new customers added and no revenue effect as a result of the Fort Thomas Treatment Plant Advanced Treatment Facility Project.

Debt Issuance and Source of Debt: This project will be paid from the District's Five-Year Capital Budget, PSC No. 111 "FTTP Advanced Treatment" with a revised budget of $30,000,000 which includes construction cost, engineering, and contingencies. A summary of the project costs is provided below:

o Design Engineering	$ 2,218,000
o Construction Engineering	$ 1,600,000
o Contractor's Bid	$23,823,000
o Misc. & Contingencies	$ 2,359,000
Total Project Cost	$30,000,000

The project will be funded through multiple sources. The project is already partially funded through BAN 2007 in the amount of $821,966 and BAN 2009 in the amount of $1,945,034 for a total of $2,767,000 for engineering services. The District has been approved for an $8,000,000 State Revolving Fund loan, which will not be used to fund this project as shown in the attached Exhibit D1. It is proposed that the remaining $27,233,000 be taken from future BAN 2010.

USoA Accounts: The anticipated amounts for the project cost of $30,000,000 will fall under the following Uniform System of Accounts Codes:

Code 304 "Structures and Improvements"	$18,900,000
Code 310 "Power Generation Equipment"	$1,500,000
Code 311 "Pumping Equipment"	$2,100,000
Code 320 "Water Treatment Equipment"	$7,500,000

Additional Costs and O&M: Additional operating and maintenance costs incurred for the project are as follows:

Power	$ 250,000
Labor	$ 70,000
Maintenance	$8,371,000
	$ 8,691,000 Annual O&M

<u>Depreciation and Debt Service:</u> Annual depreciation and debt service after construction are as follows:

Depreciation:	\$504,000/year over 37.5 years for Code 304 Structures & Improvements
	\$75,000/year over 20 years for Code 310 Power Generation Equipment
	\$105,000/year over 20 years for Code 311 Pumping Equipment
	\$250,000/year over 20 years for Code 320 Water Treatment Equipment

Debt Service: \$2,128,573.72 over 25 years (conventional 5.0% loan).

STEVEN L. BESHEAR
GOVERNOR

LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
200 FAIR OAKS LANE, 4TH FLOOR
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

To: Rob

November 30, 2009

Mr. John Covington
Executive Director
Kentucky Infrastructure Authority
1024 Capital Center Drive, Suite 340
Frankfort, Kentucky 40601

Re: DWL1014
Northern KY Water Service--2485
Activity ID: FGL20100003
DWSRF
Watershed Name: Banklick Creek
HUC 11# 05100101290

Dear Mr. Covington:

The Division of Water (DOW) hereby certifies that the Northern Kentucky Water District is entitled to receive priority for funding for the NKWD ADVANCED TREATMENT PROJECT and is eligible to receive $8,000,000 from the Drinking Water State Revolving Fund. The following requirements have been addressed as follows:

1. Plans and specifications were approved on November 10, 2009.

2. Construction bids are expected to be opened on December 10, 2009.

3. The Categorical Exclusion Determination (CED) was approved on October 27, 2009.

The binding commitment letter should include the following general conditions to satisfy federal requirements:

1. The Authority to Award (bid) package must be submitted to DOW for approval within 14 days of bid opening. DOW must perform the DBE review, conduct a pre-construction and project management conference and approve executed contract documents.

2. Loan Agreement must be executed within six (6) months from bid opening.

3. The city must agree to expend all loan funds within six months of the date of initiation of operation.

4. Documentation of final funding commitments from all parties other than the Kentucky Infrastructure Authority (KIA) as reflected in the credit analysis shall be provided to KIA prior to their loan closing and disbursement of the loan monies. Rejections of any anticipated

project funding shall be immediately reported to KIA and may cause this loan to be subject to further consideration.

The SRF application review has been completed by staff of the Kentucky Infrastructure Authority. As a reminder to the borrower, if the community should have any questions or concerns, regarding missing items or additional submission requirements, they should contact Kasi White at 502-573-0260. Should you have any questions concerning this letter, do not hesitate to contact Cathy Arnett, Project Administrator, at (502) 564-8158, extension 4594.

Sincerely,

Shafiq S. Amawi

Shafiq S. Amawi, Manager
Water Infrastructure Branch

SSA:CA

Enclosures

C: Brent Tippey, P. E., HDR/Quest Engineering, Inc.

KENTUCKY INFRASTRUCTURE AUTHORITY
Minutes of the Full Board

Meeting Date/Location: **December 3, 2009 – 1:00 p.m.**
Kentucky Infrastructure Authority
1024 Capital Center Drive, Suite 340, Frankfort

Members present:

Mr. Tony Wilder, Commissioner, Department for Local Government
Mr. Greg Haskamp, Finance and Administration Cabinet
(proxy for Secretary Jonathan Miller, FAC)
Mr. Peter Goodmann, Energy and Environment Cabinet
(proxy for Secretary Leonard K. Peters, EEC)
Mr. Ken Robinson, Economic Development Cabinet
(proxy for Secretary Larry Hayes, EDC)
Mr. Jeff Derouen, Executive Director, Public Service Commission
Mr. Gregory Heitzman, representing the American Water Works Association
Mr. David W. Cartmell, Mayor, City of Maysville, representing the Kentucky League of Cities
Mr. Thomas P. Calkins, representing the Kentucky Municipal Utilities Association
Ms. Linda C. Bridwell, representing for-profit private water companies
Mr. Jody Jenkins, Union County Judge/Executive, representing the Kentucky Association of Counties

Members absent:

Mr. Damon Talley, representing the Kentucky Rural Water Association

Guests:

Mr. Shafiq Amawi, Division of Water
Ms. Kristi Culpepper, Legislative Research Commission
Ms. Samantha Gange, Legislative Research Commission
Ms. Linda Magee, Kentucky Cable Association
Ms. Deanna Sandefur, Flint Group
Mr. Mike Jones, Florence & Hutcheson Engineers
Mr. Joseph Anderson, Princeton Water and Wastewater Commission
Mr. Richard Harrison, Northern Kentucky Water District
Mr. Bob Sturdivant, HDR Engineering
Mr. John Scheben, Northern Kentucky Water District
Ms. Stacia Peyton, Department for Local Government
Mr. Ralph Johanson, GRW Engineers
Mr. Roger Recktenwald, Kentucky Association of Counties
Mr. Bobby Riffe, Geotech Engineering and Testing, Inc.
Mr. Pete Conrad, Green River Area Development District
Ms. Jennifer McIntosh, Kentucky River Area Development District
Mr. Steve Harris, R.M. Johnson Engineering
Mr. B. Russell Harper, Kentucky Council of Area Development Districts
Mr. Joe Burns, Kentucky Rural Water Association
Mr. Rusty Hollis, Kentucky Cable Telecommunications Association

EXHIBIT D1
page 3 of 11
9

PROCEEDINGS

Chair Tony Wilder called the meeting of the Kentucky Infrastructure Authority (KIA) Board to order. He noted that a quorum was present and that the press had been notified regarding the meeting. Chair Wilder asked board members and guests to introduce themselves.

Mr. Rusty Anderson, KIA, made available for viewing via the Water Resource Information System (WRIS) maps which showed an overview of all the projects that were to be considered at this board meeting.

I. BUSINESS (Board Action Required)

A. 1. APPROVAL OF MINUTES
For: KIA Regular Board Meeting of November 12, 2009

Mr. Tom Calkins moved to approve the minutes of the November 12th, 2009 regular board meeting. Mr. Jeff Derouen seconded, and the motion carried unanimously.

At this time the Chair congratulated Louisville Water Company in obtaining a AAA credit rating from Standard & Poors.

B. NEW PROJECTS/ACTION ITEMS

1. CONSIDERATION OF THE KENTUCKY INFRASTRUCTURE AUTHORITY BUDGET REQUEST FOR FISCAL YEARS 2010-2011 AND 2011-2012

Ms. Denise Pitts, KIA, presented the Agency Budget Request Overview Report (handout) to the board. She summarized the operating budget and the capital budget that was submitted to the Governor for fiscal years 2010-2011 and 2011-2012.

Ms. Linda Bridwell moved to adopt the KIA Budget Request for Fiscal Years 2010-2011 and 2011-2012. Mr. Greg Heitzman seconded, and the motion carried unanimously.

2. RESOLUTION AND ORDER OF THE BOARD OF DIRECTORS OF THE KENTUCKY INFRASTRUCTURE AUTHORITY AUTHORIZING ISSUANCE OF A CONDITIONAL COMMITMENT FOR A FEDERALLY ASSISTED WASTEWATER REVOLVING FUND LOAN IN THE AMOUNT OF $497,409 TO THE OHIO COUNTY REGIONAL WASTEWATER COMMISSION, OHIO COUNTY, KENTUCKY (A2 09-31) FUNDED IN WHOLE OR IN PART BY THE AMERICAN RECOVERY AND REINVESTMENT ACT (ARRA) OF 2009

Mr. Shafiq Amawi, Division of Water (DOW), and Ms. Kasi White, KIA, presented the project to the board. The Ohio County Regional Wastewater Commission

EXHIBIT D1
page 4 of 11
10

requested a $497,409 Fund A ARRA loan for the construction of a lift station and 10,000 linear feet of new sewer line. The project will allow the elimination of an on-site package treatment plant owned and operated by the Ohio County School District which discharges into a nearby unnamed tributary that is adjacent to the school's playground area. The new line will run from the lift station at Bluegrass Crossings Industrial Park to a newly constructed lift station at Southern Elementary School. In addition to removing a potential health hazard from the area the project will relieve the school system of the burden of maintaining and operating a sewer system. The commission provides wastewater treatment service to the cities of Beaver Dam, Centertown and Hartford. Both DOW and KIA staff recommended approval of the loan with the standard conditions and the additional ARRA conditions.

Mr. Greg Heitzman moved to approve the resolution. Ms. Linda Bridwell seconded, and the motion carried unanimously.

3. **RESOLUTION AND ORDER OF THE BOARD OF DIRECTORS OF THE KENTUCKY INFRASTRUCTURE AUTHORITY AUTHORIZING ISSUANCE OF A CONDITIONAL COMMITMENT FOR A FEDERALLY ASSISTED WASTEWATER REVOLVING FUND LOAN IN THE AMOUNT OF $750,000 TO THE MOUNTAIN WATER DISTRICT, PIKE COUNTY, KENTUCKY (A2 09-32) FUNDED IN WHOLE OR IN PART BY THE AMERICAN RECOVERY AND REINVESTMENT ACT (ARRA) OF 2009**

Mr. Shafiq Amawi, DOW, and Ms. Sandy Williams, KIA, presented the project to the board. The Mountain Water District requested a $750,000 Fund A ARRA loan for the Shelby Sanitary Sewer Project – Phase III. This project includes the installation of 2" to 6" collector sewer lines. The project will serve approximately 50 new customers and will provide sanitary sewer service to an area of the county with a high number of straight pipes and/or failing septic systems. Both DOW and KIA Staff recommended approval of the loan with the standard conditions, the additional ARRA conditions and the following special condition: The Repair and Maintenance Fund required by Kentucky Infrastructure Authority loan agreements with the Mountain Water District was underfunded by $560,948 as of December 31, 2008. This deficiency is the result of not making scheduled deposits to the reserve and transferring reserve funds to the operating account to make loan payments. The Mountain Water District will negotiate with the KIA Executive Director for an equitable agreement to replenish the deficient reserve balances. Mr. Greg Heitzman recommended adding to the special condition that the Mountain Water District have until 12 months or until December 31, 2010, to correct the deficiency in the reserve balances.

Mr. Greg Heitzman moved to approve the resolution with the special condition and an additional condition that the replacement reserve deficiency is corrected within 12 months or by December 31, 2010. Mr. Tom Calkins seconded, and the motion carried unanimously. It was noted that Mr. Jeff Derouen's vote does not speak for the three commissioners who serve on the Public Service Commission.

4. **RESOLUTION AND ORDER OF THE BOARD OF DIRECTORS OF THE KENTUCKY INFRASTRUCTURE AUTHORITY AUTHORIZING ISSUANCE OF**

EXHIBIT D1
page 5 of 11

A CONDITIONAL COMMITMENT FOR A FEDERALLY ASSISTED WASTEWATER REVOLVING FUND LOAN IN THE AMOUNT OF $625,000 TO THE MEADE COUNTY RIVERPORT AUTHORITY, MEADE COUNTY, KENTUCKY (A2 09-42) FUNDED IN WHOLE OR IN PART BY THE AMERICAN RECOVERY AND REINVESTMENT ACT (ARRA) OF 2009

Mr. Shafiq Amawi, DOW, and Ms. Sandy Williams, KIA, presented the project to the board. The Meade County Riverport Authority requested a $625,000 Fund A ARRA loan for construction of eight inch diameter gravity sewers, two proposed duplex submersible lift stations and six inch HDPE sanitary sewer force mains to be constructed on the Riverport Authority in Meade County, KY. The individual lift stations will collect sanitary sewer from the proposed Riverport development and pump through independent force mains to the headworks facility at the existing City of Brandenburg Wastewater Treatment Plant. Specifically, the project includes approximately 2,400 linear feet of six inch diameter HDPE sewer force main, 1,400 linear feet of eight inch gravity sewer lines, several road crossings and two individual submersible sanitary sewer lift stations complete with emergency electrical generation systems and standard electrical facilities. Debt service will be funded through revenues and will be guaranteed by the Meade County Fiscal Court. Both DOW and KIA staff recommended approval of the loan with the standard conditions and the additional ARRA conditions.

Ms. Linda Bridwell moved to approve the resolution. Judge Jody Jenkins seconded, and the resolution was approved with eight approving and two opposing votes.

5. **RESOLUTION AND ORDER OF THE BOARD OF DIRECTORS OF THE KENTUCKY INFRASTRUCTURE AUTHORITY AUTHORIZING ISSUANCE OF A CONDITIONAL COMMITMENT FOR A FEDERALLY ASSISTED WASTEWATER REVOLVING FUND LOAN IN THE AMOUNT OF $1,500,000 TO THE TROUBLESOME CREEK ENVIRONMENTAL AUTHORITY, KNOTT COUNTY, KENTUCKY (A2 09-43) FUNDED IN WHOLE OR IN PART BY THE AMERICAN RECOVERY AND REINVESTMENT ACT (ARRA) OF 2009**

Mr. Shafiq Amawi, DOW, and Ms. Sandy Williams, KIA, presented the project to the board. The Troublesome Creek Environmental Authority requested a $1,500,000 Fund A ARRA loan for construction of a new 100,000 gallon per day wastewater treatment plant with collection lines initially running to 85 individual residences, 2 businesses, 18 apartments and a car wash. The project will eliminate straight pipes and failing systems in the area and restore the condition of Troublesome Creek. The creation of this wastewater treatment plant will also aid in the development of Knott County through Chestnut Mountain. Once the plant is operational, development can begin. It is expected that over 400 new homes will be constructed along with several new businesses. The development is expected to create over 100 new jobs for the area. Handouts were provided regarding information about the Troublesome Creek Environmental Authority and the proposed Chestnut Mountain development. Both DOW and KIA staff recommended approval of the loan with the standard conditions, the additional ARRA conditions and the following special conditions: (1) The Troublesome Creek Environmental Authority shall provide to KIA the Public Service Commission approved rates and service charges within 2 weeks of the final

EXHIBIT D1
page 6 of 11
12

approval of those rates; (2) KIA requests that the Knott County Fiscal Court put a high priority on their authorization request for Coal Severance funding to retire the debt for the Economic Stimulus Funding Loan of the Troublesome Creek Environmental Authority for the purpose of constructing a wastewater treatment plant and sewer collection system in the Ball Creek area; and (3) If Coal Severance funding is unavailable to repay this loan, the Troublesome Creek Environmental Authority shall include annual debt service of $41,164 in their budget submitted to the Public Service Commission in their rate case submittal and shall charge rates sufficient to repay the KIA loan.

Ms. Linda Bridwell moved to approve the resolution. Mayor David Cartmell seconded, and the motion carried unanimously. It was noted that Mr. Jeff Derouen's vote does not speak for the three commissioners who serve on the Public Service Commission.

6. **RESOLUTION AND ORDER OF THE BOARD OF DIRECTORS OF THE KENTUCKY INFRASTRUCTURE AUTHORITY AUTHORIZING ISSUANCE OF A CONDITIONAL COMMITMENT FOR A FEDERALLY ASSISTED WASTEWATER REVOLVING FUND LOAN (A09-27) IN THE AMOUNT OF $975,000 TO THE CITY OF PRINCETON, CALDWELL COUNTY, KENTUCKY**

Mr. Shafiq Amawi, DOW, and Ms. Kasi White, KIA, presented the project to the board. The City of Princeton requested a $975,000 Clean Water SRF loan to complement its previously approved $1,000,000 Clean Water SRF ARRA loan to allow for additional rehabilitation as a result of the inspection conducted with ARRA funding. The original project included a detailed sewer system inspection followed by a major sewer rehabilitation project in two collection system basins. Due to the extensive deterioration of the lines found during the inspection, Princeton chose the pipe-bursting rehabilitation method versus cured-in-place to avoid extensive repairs before rehab can be completed. Approximately 75,000 l.f. of gravity sewer was inspected and approximately 19,500 l.f. will be included in the rehabilitation portion of the project. Both DOW and KIA staff recommended approval of the loan increase with the standard conditions.

Mayor David Cartmell moved to approve the resolution. Ms. Linda Bridwell seconded, and the motion carried unanimously.

7. **RESOLUTION AND ORDER OF THE BOARD OF DIRECTORS OF THE KENTUCKY INFRASTRUCTURE AUTHORITY AUTHORIZING ISSUANCE OF A CONDITIONAL COMMITMENT FOR A FEDERALLY ASSISTED DRINKING WATER REVOLVING FUND (F09-02) LOAN IN THE AMOUNT OF $8,000,000 TO THE NORTHERN KENTUCKY WATER DISTRICT, KENTON COUNTY, KENTUCKY**

Mr. Shafiq Amawi, DOW, and Ms. Kasi White, KIA, presented the project to the board. The Northern Kentucky Water District requested an $8,000,000 Drinking Water SRF loan for its Advanced Treatment Project. The project is comprised of four phases and will promote public health and help maintain compliance with the Safe Drinking Water Act in a number of ways. Phase I involves replacement of filter media, underdrains and the addition of an air scour system to all 12 filters at the Fort Thomas WTP (FTTP) along with improvements to repair and correct

EXHIBIT D1
page 7 of 11
13

moisture damage to the walls in the filter area. Phase II includes the addition of covers on sedimentation basins to control algae at the FTTP. Phases III and IV involve the installation of granular activated carbon (GAC) post-filter contactors, ultraviolet disinfection and replacement of undersized emergency power generators at two treatment plants (FTTP and Memorial Parkway). The addition of GAC is necessary for the District to comply with Stage 2 of the Disinfection By-Product Rule (DBPR) by 2012. The District will not be able to comply with this new regulation with the existing treatment processes at the treatment plants. Both DOW and KIA Staff recommended approval of the loan with the standard conditions.

Mr. Greg Heitzman discussed the standing policy of the board in limiting drinking water loan amounts to $4,000,000 per applicant. He asked the KIA staff to research and see if it would be appropriate to raise the limit from $4,000,000 to a higher level based on the applicant's request, considering there may be a pool of leveraged funds plus twice the amount of funding available from future capitalization grants. Mr. John Covington, KIA, agreed that a look the Drinking Water program assets and ability to loan funds would be beneficial.

Ms. Linda Bridwell moved to approve the resolution. Mr. Tom Calkins seconded, and the motion carried unanimously. It was noted that Mr. Jeff Derouen's vote does not speak for the three commissioners who serve on the Public Service Commission.

8. **RESOLUTION AND ORDER OF THE BOARD OF DIRECTORS OF THE KENTUCKY INFRASTRUCTURE AUTHORITY AUTHORIZING AND APPROVING THE ISSUANCE OF OBLIGATIONS OF THE KENTUCKY INFRASTRUCTURE AUTHORITY TO REIMBURSE CAPITAL EXPENDITURES MADE BY GOVERNMENTAL AGENCIES PURSUANT TO LOANS MADE BY THE KENTCKY INFRASTRUCTURE AUTHORITY TO SUCH GOVERNMENTAL AGENCIES**

Ms. Sandy Williams, KIA, noted that this is a routine resolution allowing KIA to reimburse expenses that are paid out of the Authority's funds with bond proceeds. The projects listed below are covered under this resolution.

APPLICANT	FUND	AMOUNT
Ohio County Regional Wastewater Commission	A	$ 497,409
Mountain Water District	A	$ 750,000
Meade County Riverport Authority	A	$ 625,000
Troublesome Creek Environmental Authority	A	$ 1,500,000
City of Princeton	A	$ 975,000
Northern Kentucky Water District	F	$ 8,000,000

Mr. Greg Heitzman moved to approve the resolution. Ms. Linda Bridwell seconded, and the motion carried unanimously.

EXHIBIT D1
page 8 of 11

9. CONSIDERATION OF AMENDMENTS TO KIA BYLAWS

Ms. Sandy Williams, KIA, presented the proposed change to the KIA Bylaws. Upon request by the board last month, the official meeting time was taken out of the by-laws in order to set that meeting time by resolution.

Mr. Peter Goodmann moved to adopt the revised KIA Bylaws. Mr. Tom Calkins seconded, and the motion carried unanimously.

10. RESOLUTION AND ORDER OF THE BOARD OF DIRECTORS OF THE KENTUCKY INFRASTRUCTURE AUTHORITY TO ESTABLISH A STANDARD MEETING TIME FOR MONTHLY AUTHORITY BOARD MEETINGS OF 1:00 P.M. EASTERN TIME

Ms. Sandy Williams, KIA, presented the resolution to the board.

Mr. Peter Goodmann moved to approve the resolution. Ms. Linda Bridwell seconded, and the motion carried unanimously.

II. EXECUTIVE DIRECTOR'S REPORT

Mr. John Covington, KIA, updated the board on the following items:

A. All ARRA projects have now been approved by the board. There are 17 Drinking Water ARRA projects of which 15 have opened bids and the remaining two are out to bid. There are two fully executed assistance agreements, three are out for signature, five have been drafted and seven are to be drafted. Six of the projects are under construction. There are 44 Clean Water ARRA projects of which 23 have opened bids, seven are anticipating opening bids in December and 10 open bids in January. There are two fully executed assistance agreements, two are out for signature, two are being drafted and 38 are to be drafted. Nine of the projects are under construction. The staff participated in a conference call this week with EPA Region IV and all states in Region IV to discuss the progress of each state's projects in order to meet the February 17, 2010, deadline.

B. Mr. Covington presented the Wastewater project rankings and the Water project rankings that were submitted by the 15 Area Water Management Councils. A total of 300 projects were ranked by the Area Water Management Councils. Mr. Covington recommended that the board accept the rankings.

C. Mr. Covington informed the board that they would receive a copy of the letter dated November 18, 2009, from the Capital Projects and Bond Oversight Committee explaining why they did not take action at its November 17th meeting on the loans to General Burnside State Park, Green River State Park and Pennyrile Forest Resort Park. The Committee did not question KIA's authority to make the loans, but questioned the Department of Park's ability to incur debt without budget authorization from the General Assembly. The letter was sent to the Secretary of the Finance Administration Cabinet who has the authority to override the Committee's decision. KIA is waiting for the Secretary's decision.

EXHIBIT D1
page 9 of 11

III. STATUS REPORT FOR FUNDS

A. 2003 Coal/Tobacco Development Grants
B. IEDF Fund Grants
C. 2020 Account / Fund B Grants
D. Funds A, A1, B, B1, C, F, F1

IV. ANNOUNCEMENTS/NOTIFICATIONS

- Next scheduled KIA board meeting:
  Tentatively scheduled for
  Thursday, January 7th, 2009
  1024 Capital Center Drive, Suite 340
  Frankfort, Kentucky

There being no further business Ms. Linda Bridwell moved to adjourn. Mr. Tom Calkins seconded and the motion carried unanimously. The December 3rd, 2009, regular meeting of the Board of the Kentucky Infrastructure Authority was adjourned.

Submitted by:

Sandy Williams 12-18-2009

Sandy Williams, Secretary
Kentucky Infrastructure Authority

Date

EXHIBIT D1
page 10 of 11

Part III - Budget Information
Project Cost Summary

Project Title Advanced Treatment - Phase IV Fort Thomas Plant **WRIS# WX:21117208**

Project Budget: Estimated 65,000,000 (enter date: 7/1/2009) **As Bid** 30,000,000 (enter date: 1/26/2010) **Revised** 30,000,000 (enter date: 1/26/2010)

	Cost Classification	DWSRF KIA Loan	Funding Source 1	Funding Source 2	Funding Source 3	Funding Source 4	Funding Source 5	Local Funds	Unfunded Costs	Total
1	Administrative Expenses		8,000							8,000
2	Legal Expenses		1,000							1,000
3	Land, Appraisals, Easements		-							-
4	Relocation Expense & Payments		-							-
5	Planning		-							-
6	Engineering Fees - Design		2,218,000							2,218,000
7	Engineering Fees - Construction		600,000							600,000
8	Engineering Fees - Inspection		1,000,000							1,000,000
9	Engineering Fees - Other		-							-
10	Construction	-	23,823,000							23,823,000
11	Equipment		-							-
12	Miscellaneous		-							-
13	Contingencies		2,350,000							2,350,000
	Total	-	30,000,000	-	-	-	-	-	-	30,000,000

	Funding Sources	Amount	Date Committed
1	Funding Source 1	30,000,000	NKWD
2	Funding Source 2	-	
3	Funding Source 3	-	
4	Funding Source 4	-	
5	Funding Source 5	-	
	Total	30,000,000	

Cost Categories	Funding Source	Total Cost
Treatment	SRF/S1	30,000,000
Transmission and Distribution		
Source		
Storage		
Purchase of Systems		
Restructuring		
Land Acquisition		
TOTAL COSTS		30,000,000

	Local Funding Sources	Amount	Date Committed
1			
2			
3			
	Total	-	

Total Funding 30,000,000

EXHIBIT D1
Page 11 of 11

Fort Thomas Treatment Plant			
Advanced Treatment Project			
		Depreciation	**Annual**
Depreciation	**Cost**	**Years**	**Depreciation**
Account 304 Structures & Improvements	$18,900,000	37.5	$504,000.00
Account 310 Power Generation Equipment	$1,500,000	20	$75,000.00
Account 311 Pumping Equipment	$2,100,000	20	$105,000.00
Account 320 Water Treatment Equipment	$7,500,000	30	$250,000.00
Total	**$30,000,000.00**		**$934,000.00**
Debt Service on SRF Loan			
Total Borrowed	$0		
Interest Rate including administration fee	2.20%		
Term (Years)	20		
Annual Debt Service SRF	**$0.00**		
Debt service on bond issue			
Total Borrowed	$30,000,000		
Interest Rate	5.00%		
Term (Years)	25		
Annual Debt Service Traditional	**$2,128,573.72**		
Total Annual Debt Service	**$2,128,573.72**		

EXHIBIT D2
page 1 of 1

KENTUCKY INFRASTRUCTURE AUTHORITY
1024 Capital Center Drive, Suite 340
Frankfort, Kentucky 40601
Phone (502) 573-0260
Fax (502) 573-0157
http://kia.ky.gov

Steven L. Beshear
Governor

John E. Covington III
Executive Director

February 22, 2010

The Honorable C. Ronald Lovan, P.E., President / CEO
Northern Kentucky Water District
2835 Crescent Springs Road
Erlanger, KY 41018

KENTUCKY INFRASTRUCTURE AUTHORITY
FEDERALLY ASSISTED DRINKING WATER REVOLVING LOAN FUND
CONDITIONAL COMMITMENT LETTER (F09-02)

Dear President Lovan:

The Kentucky Infrastructure Authority ("the Authority") commends your efforts to improve public service facilities in your community. On December 3, 2009, the Authority approved your loan for the Advanced Treatment Project subject to the conditions stated below. The total cost of the project shall not exceed $45,300,000 of which the Authority loan shall provide $8,000,000 of the funding. Other anticipated funding for the project is reflected in Attachment A. The final loan amount will be equal to the Authority's portion of estimated project cost applied to the actual project cost. Attachment A incorporated herein by reference fully describes the project.

An Assistance Agreement will be executed between the Authority and the Northern Kentucky Water District upon satisfactory performance of the conditions set forth in this letter. A period of twelve months from the date of this letter (2/22/2011) will be allowed for you to meet the conditions set forth in this letter and enter into an Assistance Agreement. A one-time extension of up to six months may be granted for applicants that experience extenuating circumstances. Funds will be available for disbursement only after execution of the Assistance Agreement.

The Assistance Agreement and this commitment shall be subject, but not limited to, the following terms:

1. The Authority project loan shall not exceed $8,000,000.

2. The loan shall bear interest at the rate of 2.0% per annum commencing with the first draw of funds.

3. The loan shall be repaid over a period not to exceed 20 years from the date the loan is closed.

4. Interest shall be payable on the amount of actual funds received. The first payment shall be due on June 1 or December 1 immediately succeeding the date of the initial draw of funds, provided that if such June 1 or December 1 shall be less than three months since the date of the initial draw of funds, then the first interest payment date shall be the June 1 or December 1 which is at least six months from the date of the initial draw of funds. Interest payments will be due each six months thereafter until the loan is repaid.

5. Full principal payments will commence on the appropriate June 1 or December 1 within twelve months from initiation of operation. Full payments will be due each six months thereafter until the loan is repaid.

6. A loan servicing fee of 0.25% of the annual outstanding loan balance shall be payable to the Authority as a part of each interest payment.

7. Loan funds will be disbursed after execution of the Assistance Agreement as project costs are incurred.

8. The Authority loan funds must be expended within six months of the official date of initiation of operation.

9. Fund "F" loan funds are considered to be federal funds. OMB Circular A-133, "Audits of States, Local Governments and Non-Profit Organizations, requires that all recipients and subrecipients **expending $500,000 or more in a year in federal awards must have a single or program-specific audit conducted for that year** in accordance with the Circular. If the federal amount expended plus all other federal funds expended exceeds the threshold, you are required to arrange for an A-133 audit to be performed by an independent, licensed CPA, or in special cases, the Auditor of Public Accounts of the Commonwealth of Kentucky. The Authority requires an annual audit to be preformed for the life of the loan.

The following is a list of the standard conditions to be satisfied prior to execution of the Assistance Agreement or incorporated in the Assistance Agreement. Any required documentation must be submitted to the party designated.

1. The Authority to Award (bid) package must be submitted to the Division of Water for approval within 14 days of bid opening.

2. The Assistance Agreement must be executed within six (6) months from bid opening.

3. The Borrower must agree to expend all Authority loan funds within six months of the date of initiation of operation.

4. Documentation of final funding commitments from all parties other than the Authority as reflected in the credit analysis shall be provided prior to preparation of the Assistance Agreement and disbursement of the loan monies. Rejections of any anticipated project funding shall be immediately reported and may cause this loan to be subject to further consideration.

5. The loan must undergo review by the Capital Projects and Bond Oversight Committee of the Kentucky Legislature prior to the state's execution of the Assistance Agreement. The committee meets monthly on the third Tuesday. At this time we know of no further submission required for their review; however, they may request information as needed.

6. Any required adjustment in utility service rates shall be adopted by ordinance, municipal order or resolution by the appropriate governing body of the Borrower. Public hearings as required by law shall be held prior to the adoption of the service rate ordinance, order, or resolution. Any required approvals by the Kentucky Public Service Commission shall be obtained.

7. All easements or purchases of land shall be completed prior to commencement of construction. Certification of all land or easement acquisitions shall be provided to the Division of Water.

8. The Borrower must complete and return to the Authority the attached "Authorization For Electronic Deposit of Vendor Payment" Form.

9. The Authority to Award Package documentation shall be submitted to and approved by DOW.

10. An environmental review shall be conducted by the Division of Water for all construction projects receiving DWSRF funds, within the term of this binding commitment and prior to project bid.

11. Technical plans and specifications and a complete DWSRF specifications checklist shall be approved by the Division of Water prior to project bid.

12. A clear site certificate shall be obtained and DOW representatives shall be notified for attendance of the pre-construction conference.

13. Project changes or additions shall require a complete environmental and change order review before they can be included in the DWSRF loan project.

14. The project shall use federal wage rates as described in the Davis/Bacon Act.

Any special conditions listed below and/or stated in Attachment A must be resolved.

Please inform the Authority of any changes in your financing plan as soon as possible. We wish you every success for this project which will benefit both your community and the Commonwealth as a whole.

Sincerely,

Kasi L. White

Kasi L. White
Financial Analyst

Attachments

cc: Richard Harrison, P.E., Northern Kentucky Water District
Division of Water
Dirk Bedarff, Peck, Shaffer & Williams LLP
State Local Debt Office, DLG
Borrower File - Northern Kentucky Water District - F09-02

Please sign and return a copy of this letter indicating your acceptance of this commitment and its terms. Also attach the completed "Authorization For Electronic Deposit of Vendor Payment" Form.

Accepted

2/23/10
Date

AUTHORIZATION FOR ELECTRONIC DEPOSIT
OF BORROWER PAYMENT
KENTUCKY INFRASTRUCTURE AUTHORITY
(FUND F09-02)

Borrower Information:

Name: NORTHERN Kentucky WATER DISTRICT

Address: 2835 Crescent Springs ROAD

City: ERLANGER **State:** KY **Zip:** 41018

Telephone: 859-442-0665 **Contact:** JACK BRAGG

Federal I.D. # 61-1311695

Financial Institution Information:

Bank Name: PARK NATIONAL BANK

Branch: Florence **Phone No:** 859-282-3556

City: Florence **State:** KY **Zip:** 41042

Transit / ABA No.: ~~0444101~~ 242272489

Account Name: GRANT / LOAN ACCOUNT

Account Number: 12401251110461

I, the undersigned, authorize payments directly to the account indicated above and to correct any errors which may occur from the transactions. I also authorize the Financial Institution to post these transactions to that account.

Signature: ______ **Date:** 2/23/10

Name Printed: JACK BRAGG JR **Job Title:** CFO

Please return completed form to:

Kentucky Infrastructure Authority
1024 Capital Center Drive, Suite 340
Frankfort, KY 40601
phone: 502-573-0260
fax: 502-573-0157

ATTACHMENT A

Northern Kentucky Water District
F09-02

EXECUTIVE SUMMARY **KENTUCKY INFRASTRUCTURE AUTHORITY** **FUND F, FEDERALLY ASSISTED DRINKING WATER REVOLVING LOAN FUND**		Reviewer: Date: KIA Loan Number: WRIS Number	Kasi White December 3, 2009 **F09-02** **WX21117208**

BORROWER:	**NORTHERN KENTUCKY WATER DISTRICT** **KENTON COUNTY**
BRIEF DESCRIPTION:	The Northern Kentucky Water District is requesting an $8,000,000 Drinking Water SRF loan for it's Advanced Treatment Project. The project will promote public health and help maintain compliance with the Safe Drinking Water Act in a number of ways. SRF Funding will be used for Phase 3 and Phase 4 of the project. Phases III and IV involve the installation of granular activated carbon (GAC) post-filter contactors, ultraviolet disinfection and replacement of undersized emergency power generators at two treatment plants (FTTP and Memorial Parkway). The addition of GAC is necessary for the District to comply with Stage 2 of the Disinfection By-Product Rule (DBPR) by 2012. The District will not be able to comply with this new regulation with the existing treatment processes at the treatment plants.

PROJECT FINANCING:			PROJECT BUDGET		
Fund F Loan	$	8,000,000	Administrative Expenses	$	12,000
NKWD		37,300,000	Legal Expenses		1,500
TOTAL	$	45,300,000	Engineering Fees		5,664,000
			Construction		36,050,000
			Contingency		3,572,500
			TOTAL	$	45,300,000

REPAYMENT			Est. Annual	
	Rate	2.00%	Payment	$507,290
	Term	20 years	1st Payment	6 Mo. after first draw
PROFESSIONAL SERVICES	Engineer	n/a		
	Bond Counsel	Peck, Shaffer, & Williams		

PROJECT SCHEDULE		Phase III (FTTP GAC)	Phase IV (MPTP GAC)
	Bid Opening:	12/01/09	11/01/09
	Construction Start:	04/01/10	04/01/10
	Construction Stop:	04/01/12	04/01/12

DEBT PER CUSTOMER	Existing:	$	2,462
	Proposed:	$	2,783
OTHER DEBT	See Attached		
OTHER STATE-FUNDED PROJECTS LAST 5 YRS	See Attached		

RESIDENTIAL RATES		Users		Avg. Bill	
	Current	79,980	$	30.24	(for 4,000 gallons)
	Additional	0	$	30.24	(for 4,000 gallons)

REGIONAL COORDINATION: This project is consistent with regional planning recommendations.

CASHFLOW	Cash Available for Debt Service	Debt Service	Income after Debt Service	Coverage Ratio
Audited 2005	18,591,662	10,800,890	7,790,772	1.72
Audited 2006	19,020,640	11,210,374	7,810,266	1.70
Audited 2007	22,885,106	11,917,712	10,967,394	1.92
Audited 2008	24,986,558	12,871,327	12,115,231	1.94
Projected 2009	25,425,160	15,288,071	10,137,089	1.66
Projected 2010	26,338,113	15,494,211	10,843,902	1.70
Projected 2011	27,376,407	15,497,033	11,879,374	1.77
Projected 2012	28,639,670	20,434,681	8,204,988	1.40
Projected 2013	20,715,938	20,613,381	102,557	1.00
Projected 2014	21,536,626	20,790,515	746,111	1.04

Reviewer: Kasi White
Date: December 3, 2009
Loan Number: F09-02

KENTUCKY INFRASTRUCTURE AUTHORITY
DRINKING WATER REVOLVING LOAN FUND (FUND "F")
NORTHERN KENTUCKY WATER DISTRICT, KENTON COUNTY
PROJECT REVIEW
WX21117208

I. PROJECT DESCRIPTION

The Northern Kentucky Water District is requesting an $8,000,000 Drinking Water SRF loan for its Advanced Treatment Project. The project will promote public health and help maintain compliance with the Safe Drinking Water Act in a number of ways. SRF funding will be used for Phases III and IV which involve the installation of granular activated carbon (GAC) post-filter contactors, ultraviolet disinfection and replacement of undersized emergency power generators at two treatment plants (FTTP and Memorial Parkway). The addition of GAC is necessary for the District to comply with Stage 2 of the Disinfection By-Product Rule (DBPR) by 2012. The District will not be able to comply with this new regulation with the existing treatment processes at the treatment plants.

II. PROJECT BUDGET

	Amounts
Administration	$12,000
Legal	1,500
Engineering	
Total	**$ 45,300,000**

III. PROJECT FUNDING

	Amounts	%
Fund F Loan	$ 8,000,000	18%
NKWD	37,300,000	82%
Total	**$ 45,300,000**	**100%**

IV. KIA DEBT SERVICE

Construction Loan	$	8,000,000
Interest Rate		2.00%
Loan Term (Years)		20
Estimated Annual Debt Service	$	487,290
Administrative Fee (0.25%)		20,000
Total Estimated Annual Debt Service	**$**	**507,290**

V. PROJECT SCHEDULE

	Phase III (FTTP GAC)	Phase IV (MPTP GAC)
Bid Opening:	12/01/09	11/01/09
Construction Start:	04/01/10	04/01/10
Construction Stop:	04/01/12	04/01/12

VI. RATE STRUCTURE

Customers	Current	Proposed	Total
Residential	75,491	0	75,491
Commercial	4,376	0	4,376
Industrial	113	0	113
	79,980	0	79,980

Rates

As of March, 2008, the monthly charge for water utility service as of the last is:

Service Charges:

Meter Size	Monthly	Quarterly
5/8"	$12.54	$18.97
3/4"	$12.96	$19.99
1"	$14.15	$22.98
1 1/2"	$15.93	$27.08
2"	$20.13	$38.07
3"	$48.61	$118.45
4"	$60.89	$148.45
6"	$90.16	$219.44
8"	$121.75	$299.79
10" and larger	$161.91	$391.47

Commodity Charges:

	Monthly Block	Quarterly Block	Rate
First	1,500 cu ft	4,500 cu ft	$3.31/100 cu ft
Next	163,500 cu ft	490,500 cu ft	$2.88/100 cu ft
Over	165,000 cu ft	495,000 cu ft	$2.55/100 cu ft

Quarterly Residential Bill for 4,000 gallons	**$30.24**
Affordability Index	**0.85%**

Subdistrict Monthly Surcharges:

Subdistrict A	$ 9.03
Subdistrict B	$ 18.36
Subdistrict C	$ 19.44
Subdistrict D	$ 30.00
Subdistrict E	$ 30.00
Subdistrict F	$ 30.00
Subdistrict G	$ 30.00
Subdistrict K	$ 21.09
Subdistrict R	$ 18.50
Subdistrict RF	$ 25.47
Subdistrict RL	$ 36.22

Wholesale Water Rates

Bullock Pen Water District	$2.22 per 100 cu ft or $2.97 per 1000 gallons
City of Walton	$2.22 per 100 cu ft or $2.97 per 1000 gallons
Pendleton County Water District	$2.22 per 100 cu ft or $2.97 per 1000 gallons

VII. DEMOGRAPHICS

The district is located in Kenton County, in the northern part of the state and provides service to Campbell and Kenton counties and portions of Boone, Grant and Pendleton counties. The following census information is from the 2000 census.

	Borrower Population	Borrower MHI
Campbell	88,616	41,903
Kenton	151,464	43,906
Boone	85,991	53,593
Grant	22,384	38,438
Pendleton	14,390	38,125

The MHI for the Commonwealth is $33,672.

The Northern Kentucky Water District, by providing water service to multiple cities, counties and water districts, is multi-jurisdictional. The water district is considered regional and the project will qualify for the 2% interest rate.

VIII. FINANCIAL ANALYSIS (See Exhibit 1)

Financial information for the utility was obtained from the audited financial statements of the Northern Kentucky Water District for the years ended December 31, 2005 - 2008.

HISTORICAL

Revenues have increased a net of 20% over the past four years with the only decline occurring during 2006 when revenues dropped 2% due to weather conditions that provided for a more mild summer. Water rates were increased approximately 15% in March, 2008 contributing to the 8% increase in revenues. Increases in operating expenses averaged 5.7% between 2005 and 2008 taking into account 2006 when expenses remained flat. Non-operating income, comprised primarily of investment income and capital contributions, made up approximately one-fourth of the cash available for debt service. Capital contributions represent assessments and reimbursements to recover the costs of new services and extensions of the distribution system. The district does not include the amount of costs incurred and contributed by outside contractors for installation of distribution systems for which the costs are absorbed and provides for their operations and maintenance. The district has maintained a strong debt coverage ratio which averaged 1.82 for the period reviewed.

The current ratio for 2005 through 2007 shows the district had current assets of more than one and a half times the amount necessary to cover current liabilities. In 2008, this amount drops because of an approximate $28 million dollar bond anticipation note that was due. The utility however issued bonds in early 2009 to cover the short fall so that there would be no significant impact on the district. Utility plant assets represent approximately 75% of the total assets for the district while long term liabilities represent less than 50% of the total liabilities and equities.

PROFORMA

The proforma is based on the following assumptions:

- Revenues are projected to increase 5% each year except for 2009. Revenues for 2009 are projected to increase 10%.
- O & M expenses are projected to increase 5% per year except in 2013 when an additional $10 million for increased costs in electricity, chemical and fuels is estimated as a result of the project.
- Due to the Improvement, Repair and Replacement Account self funded by the district, an additional annual replacement reserve amount will not be required.
- KIA Fund F principal, interest and administrative fees totaling $507,290 annually beginning in FY 2012.

Based on these assumptions, the utility shows adequate cashflow to repay the KIA Fund F loan. Based on these assumptions the NKWD is projected to have a 1.40 coverage ratio in 2012 when principal and interest payments begin.

REPLACEMENT RESERVE

The Northern Kentucky Water District self funds an "Improvement, Repair and Replacement Account" which is available to make major repairs and replacements and to pay the cost of construction of additions, extensions and improvements to the water system. The account assets as of December 31, 2008 are $2,873,636. Based on the account already in place, the system will not be required to further fund an additional replacement reserve specifically for this loan.

IX. DEBT OBLIGATIONS

Debt Issuance	Outstanding	Maturity
Series 1997 Revenue Bonds	$ 3,760,000	2022
Series 1998 Revenue Bonds	9,005,000	2028
Series 2001 Revenue Bonds	14,750,000	2026
2000 Rural Development Loan	2,115,000	2039
Series 2002A Revenue Bonds	43,270,000	2027
Series 2002B Revenue Bonds	7,360,000	2017
Series 2003A Revenue Bonds	1,440,000	2032
Series 2003B Revenue Bonds	25,965,000	2028
Series 2003C Revenue Bonds	17,570,000	2020
Series 2004 Revenue Bonds	9,335,000	2029
Taylor Mill Purchase Financing	1,625,000	2018
Series 2006 Revenue Bonds	27,980,000	2031
Series 2007 Bond Anticipation Note	27,165,000	2009
KIA Fund F Loan	3,348,035	2028
Series 2009 Revenue Bonds	28,290,000	2033
TOTAL	**$ 222,978,035**	

X. OTHER STATE OF FEDERAL FUNDING IN PAST FIVE YEARS

Project Title	Funding Source	Amount
Unserved and Underserved Projects	HB 608	$ 500,000
Pike Street - Bromley	HB 608	300,000
Robbins Street Water Project	HB 608	300,000
Campbell Co. Unserved/Underserved Improvements	HB 608	1,000,000
Campbell Co. System Improvements	HB 608	1,200,000
Campbell Co. Unserved/Underserved Improvements	HB 608	750,000
3 Mile Rd/Gibson Lane from I-275 to Licking Pike	HB 380	200,000
Various Water Projects	HB 267	1,000,000
Main Replacement in City of Covington	HB 380	1,000,000
Subdistrict I Water System Improvements	HB 380	2,000,000
Covington Water System Improvements	HB 380	2,500,000
Various Water and Sewer Projects	HB 267	600,000
Water Line Extension	HB 267	688,000

XI. CONTACTS

Applicant		**Applicant Contact**	
Name	Northern Kentucky Water District	Name	Northern Kentucky Water Dist.
Address	2835 Crescent Springs Road Erlanger, KY 41018	Address	2835 Crescent Springs Road Erlanger, KY 41018
County	Kenton	Contact	Richard Harrison, P.E.
Contact	C. Ronald Lovan, P.E.	Phone	(859) 578-5458
Phone	(859) 578-9898	Email	rharr@nkwater.org
Email	rlovan@nkwater.org		

XII. RECOMMENDATIONS

KIA staff recommends approval of the loan with the standard conditions.

EXHIBIT 1
NORTHERN KENTUCKY WATER DISTRICT
CASH FLOW ANALYSIS

	Audited 2005	% Change	Audited 2006	% Change	Audited 2007	% Change	Audited 2008	Projected 2009	Projected 2010	Projected 2011	Projected 2012	Projected 2013	Projected 2014
Operating Revenues													
Water Sales	33,229,278	-2%	32,499,994	15%	37,410,245	8%	40,409,737	44,450,711	46,673,246	49,006,909	51,457,254	54,030,117	56,731,623
Forfeited Discounts	752,736	-5%	713,273	10%	784,386	16%	906,636	951,968	999,566	951,968	999,566	1,049,544	1,102,022
Rents From Property	506,326	-2%	493,795	7%	527,552	-6%	493,590	518,270	544,183	571,392	599,962	629,960	661,458
Other Water Revenue	358,282	15%	413,202	-11%	366,560	4%	380,160	399,168	381,963	387,097	389,409	386,156	387,554
Total Revenues	34,846,622	-2%	34,120,264	15%	39,088,743	8%	42,190,123	46,320,116	48,598,958	50,917,365	53,446,191	56,095,777	58,882,656
Operating Expenses													
Operating Expenses	21,023,284	-1%	20,831,914	14%	23,782,968	1%	24,033,139	25,234,796	26,496,536	27,821,363	29,212,431	39,807,431	41,797,802
Depreciation	5,562,139	5%	5,814,572	2%	5,916,329	28%	7,563,621	7,941,802	8,338,892	8,755,837	10,265,837	10,779,129	11,318,085
Total Expenses	26,585,423	0%	26,646,486	11%	29,699,297	6%	31,596,760	33,176,598	34,835,428	36,577,199	39,478,267	50,586,559	53,115,887
Net Operating Income	8,261,199	-10%	7,473,778	26%	9,389,446	13%	10,593,363	13,143,518	13,763,530	14,340,166	13,967,924	5,509,218	5,766,769
Non-Operating Income and Expenses													
Investment Income	1,862,615	20%	2,227,971	12%	2,506,262	-16%	2,112,845	2,155,102	2,198,204	2,242,168	2,287,011	2,332,752	2,379,407
Miscellaneous Non-Operating Income	5,432	-6890%	(368,821)	-141%	152,913	18%	181,116	184,738	37,487	38,236	118,898	94,840	72,365
Capital Contributions	2,900,277	34%	3,873,140	27%	4,920,156	-8%	4,535,613	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Amort of Debt Discount and (Expense)	(576,617)	2%	(585,345)	-2%	(575,605)	-1%	(567,231)	(558,857)	(550,483)	(542,109)	(533,735)	(525,361)	(516,987)
Total Non-Operating Income & Expenses	4,191,707	23%	5,146,945	36%	7,003,726	-11%	6,262,343	3,780,983	3,685,208	3,738,295	3,872,174	3,902,230	3,934,785
Add Non-Cash Expenses													
Depreciation	5,562,139	5%	5,814,572	2%	5,916,329	28%	7,563,621	7,941,802	8,338,892	8,755,837	10,265,837	10,779,129	11,318,085
Amortization	576,617	2%	585,345	-2%	575,605	-1%	567,231	558,857	550,483	542,109	533,735	525,361	516,987
Cash Available for Debt Service	**18,591,662**	**2%**	**19,020,640**	**20%**	**22,885,106**	**9%**	**24,986,558**	**25,425,160**	**26,338,113**	**27,376,407**	**28,639,670**	**20,715,938**	**21,536,626**
Debt Service													
Existing Principal	4,674,000		4,806,000		5,267,000		5,890,853	7,078,548	6,933,433	7,194,436	7,464,560	7,755,808	8,838,494
Existing Interest	6,126,890		6,404,374		6,650,712		6,980,474	8,209,523	8,400,778	8,142,597	7,868,617	7,582,424	6,676,872
Anticipated Bond Issues ($80 MM)											4,767,860	4,767,860	4,767,860
Proposed KIA Loan									160,000	160,000	333,645	507,290	507,290
Total Debt Service	10,800,890		11,210,374		11,917,712		12,871,327	15,288,071	15,494,211	15,497,033	20,434,681	20,613,381	20,790,515
Income After Debt Service	7,790,772		7,810,266		10,967,394		12,115,231	10,137,089	10,843,902	11,879,374	8,204,988	102,557	746,111
Debt Coverage Ratio	1.72		1.70		1.92		1.94	1.66	1.70	1.77	1.40	1.00	1.04

NORTHERN KENTUCKY WATER DISTRICT
BALANCE SHEETS

ASSETS	2005	2006	2007	2008	Upon Project Completion
Current Assets					
Cash and Cash Equivalents	6,478,053	5,326,214	10,205,218	11,509,211	11,611,768
Accounts Receivable	8,840,182	8,436,177	9,732,583	10,156,102	9,291,261
Assessments Receivable	37,767	73,008	77,906	82,711	87,516
Inventory	1,150,975	1,245,380	1,289,824	1,268,952	1,238,783
Prepaid Items	842,700	464,883	246,623	898,284	613,123
Total Current Assets	17,349,677	15,545,662	21,552,154	23,915,260	22,842,450
Restricted Assets					
Boone Florence Settlement	3,344,622	3,023,965	2,771,076	2,426,639	2,082,202
Bond Proceeds Fund	17,242,047	13,149,342	19,167,438	15,081,881	12,116,219
Debt Service Reserve Account	12,472,874	13,157,181	14,173,637	13,359,108	14,422,154
Debt Service Account	6,547,631	7,713,194	8,549,511	9,885,153	12,342,875
Improvement, Repair & Replacement	3,074,102	1,932,787	3,331,799	2,612,396	3,004,255
Total Restricted Assets	42,681,276	38,976,469	47,993,461	43,365,177	43,967,705
Utility Plant					
Property, Plant and Equipment	253,634,326	277,798,907	283,057,774	289,419,623	334,719,623
Unclassified Plant - Construction in Progress	19,738,958	11,907,816	30,336,979	39,560,254	79,323,254
Less Accumulated Depreciation	(54,448,687)	(58,245,471)	(63,047,992)	(69,391,199)	(70,901,199)
Net Fixed Assets	218,924,597	231,461,252	250,346,761	259,588,678	343,141,678
Other Assets					
Deferred Charges	9,821,617	10,339,671	9,355,708	9,026,934	8,698,160
Total Other Assets	9,821,617	10,339,671	9,355,708	9,026,934	8,698,160
Total Assets	288,777,167	296,323,054	329,248,084	335,896,049	418,649,993
LIABILITIES					
Current Liabilities					
Bonded Indebtedness	4,556,000	5,017,000	5,578,000	5,775,000	7,400,000
Accounts and Notes Payable	5,882,832	2,785,094	2,071,042	29,570,206	2,430,584
Accrued Payroll and Taxes	273,867	339,778	364,749	148,361	281,689
Other Accrued Liabilities	161,958	187,673	206,004	213,586	192,305
Total Current Liabilities	10,874,657	8,329,545	8,219,795	35,707,153	10,304,578
Liabilities Payable - Restricted Assets					
Accounts Payable	2,848,054	762,498	2,717,818	1,898,706	1,079,594
Accrued Interest Payable	2,737,097	2,944,301	3,251,309	3,181,843	3,112,377
Total Liabilities Payable - Restricted Assets	5,585,151	3,706,799	5,969,127	5,080,549	4,191,971
Long Term Liabilities					
Bonded Indebtedness	144,145,000	168,128,000	162,550,000	156,775,000	202,070,000
Note Payables	20,205,000	1,975,000	28,890,000	4,769,487	10,718,776
Total Long Term Liabilities	164,350,000	170,103,000	191,440,000	161,544,487	212,788,776
Total Liabilities	180,809,808	182,139,344	205,628,922	202,332,189	227,285,325
Retained Earnings:					
Invested in Capital	46,163,597	56,091,252	53,078,761	64,800,643	102,100,643
Restricted	37,096,125	35,269,670	42,024,334	38,284,628	46,484,943
Unrestricted	24,707,637	22,822,788	28,516,067	30,478,589	42,779,082
Total Retained Earnings	107,967,359	114,183,710	123,619,162	133,563,860	191,364,668
Total Liabilities and Equities	288,777,167	296,323,054	329,248,084	335,896,049	418,649,993
Balance Sheet Analysis					
Current Ratio	1.60	1.87	2.62	0.67	2.22
Debt to Equity	1.67	1.60	1.66	1.51	1.19
Working Capital	6,475,020	7,216,117	13,332,359	(11,791,893)	12,537,872
Percent of Total Assets in Working Capital	2.24%	2.44%	4.05%	-3.51%	2.99%

Case No. 2010-____
Exhibit ____E____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant Advanced Treatment Facility

Campbell County
184-0447

PSC ANNUAL REPORT – 2008

Water

CLASS A & B

WATER DISTRICTS AND ASSOCIATIONS

ANNUAL REPORT

OF

Northern Kentucky Water District

2835 Crescent Springs Road, Erlanger, Kentucky 41018

TO THE

PUBLIC SERVICE COMMISSION

OF THE

COMMONWEALTH OF KENTUCKY

211 SOWER BOULEVARD
P. O. BOX 615
FRANKFORT, KENTUCKY 40602

FOR THE CALENDAR YEAR ENDED DECEMBER 31, 2008

Rev. 7-19-2004

KENTUCKY PUBLIC SERVICE COMMISSION
REPORT OF GROSS OPERATING REVENUES DERIVED FROM INTRA-KENTUCKY BUSINESS FOR THE YEAR ENDING DECEMBER 31, 2008

NORTHERN KENTUCKY WATER DISTRICT
(Utility Reporting)

Post Office Box 18640
2835 Crescent Springs Rd - Erlanger, Ky 41018-0640
(Address)

FEIN # (Federal Employer Indentification Number)
61-1311695

(DO NOT INCLUDE TAXES COLLECTED)

(1)	Gross Revenues of Electric Utility	$
(2)	Gross Revenues of Gas Utility	$
(3)	Gross Revenues of Water Utility	$ 40,409,737
(4)	Gross Revenues of Sewer Utility	$
(5)	Other Operating Revenues	$ 1,780,386
	*** TOTAL GROSS REVENUES............	$ 42,190,123

OATH

State of Kentucky.......)
) ss.
County Campbell ....)

Jack Bragg, CPA being duly sworn, states that being duly sworn, states that he/she is Vice-President/CFO of the Northern Kentucky Water District that the above report of gross revenues is exact accordance with Northern Kentucky Water District, and that such books accurateley show the gross revenues of Northern Kentucky Water District derived from Intra-Kentucky business for the calendar year ending December 31, 2008

VP/CFO
(Officer)

This the 30th day of March, 2009

Notary Public — Campbell County — 5-9-2011 Commission Expires

Checklist for the Annual [illegible] rt for C Ware Companies
To be completed and returned with the annual report

Page No.	Account No.		Page No.		Yes	No	If no, explain why
4 to 6	The identification pages have been completed				X		
7	101-106	agrees with	13	Total 101-106	X		
7	108-110	agrees with	15	Total 301-34& Cols c & h	X		
7	114-115	agrees with	16	Net Blanace 114-115	X		
7	123	agrees with	17	Total 123	X		
7	124-125	agrees with	17	Total 124 & Total 125	X		
7	126	agrees with	17	Total 126	X		
7	127	agrees with	17	Total 127	X		
7	141-144	agrees with	18	Net Balance 141-144	X		
7	151-153	agrees with	19	Total 151-153	X		
7	162	agrees with	19	Total 162	X		
8	181	agrees with	20	Total 181	X		
8	182	agrees with	21	Total 182	X		
8	186	agrees with	20	Total 186	X		
9	214	agrees with	12	Total 214	X		
9	215.1	agrees with	12	Total 215.1	X		
9	215.2	agrees with	12	Total 215.2	X		
9	221	agrees with	23	Total Col 4	X		
9	221	agrees with	23	Total Col 12	X		
9	224	agrees with	22	Total Col f	X		
9	232	agrees with	24	Total 232	X		
9	223	agrees with	24	Total 233	X		
9	234	agrees with	24	Total 234	X		
9	236	agrees with	25	Beginning & Ending Balance 236	X		
9	237	agrees with	25	Total 237 Cols b & e	X		
9	242	agrees with	26	Total 242	X		
9	251	agrees with	20	Total 251	X		
9	252	agrees with	21	Beginning & Ending Balance 252	X		

Checklist for the Annual [illegible] rt for C Ware Companies

To be completed and returned with the annual report

Page No.	Account No.		Page No.		Yes	No	If no, explain why
10	400	agrees with	27	Total Water Operating Revenue Col e	X		
10	401	agrees with	28	Total 601-675, Col c	X		
10	408.1&408.2	agrees with	25	Total Taxes Accrued 408-10-408.20	X		
14	427	agrees with	25	Total Interest Accrued Col c	X		
11	Net Income Before Contribution agrees with		12	Balance Trans Inc Col c	X		
13	101	agrees with	14	Total Water Plant Col f	X		
14	The analysis of water utility plant acounts cols c throuh k has been Completed				X		
27	The analysis of accumulated depreciation & amortization by primary accounts has been completed				X		
20	186.1	agrees with	26	Total 186.1 Col c	X		
22	Schedule of Long-Term Debt has been completed				X		
23	Schedule ofBond Maturities has been completed				X		
27	Taxes collected (example: school tax, sales tax, granchise tax) have been excluded from Revenue and Expenses				X		
27	The analysis of water operating revenue Cols c,d, and e has been completed				X		
28	The analysis of water utility expense Cols c through k has been complete				X		
29	Schedule of Pumping and Purchased Water Statistics has been completed				X		
29	Total Col (d)	agrees with	30	Line 4, Total Production & Purchased	X		
29	Total Col (e)	agrees with	30	Line 13, Total Water Sales	X		
30	466 Total Gals	agrees with	30	Line 11, Sales for Resale (466)	X		
	Oath page has been completed				X		

PUBLIC SERVICE COMMISSION OF KENTUCKY

PRINCIPAL PAYMENT AND INTEREST INFORMATION

FOR THE YEAR ENDING DECEMBER 31, 2008

1. Amount of Principle Payment during calender year $ 5,890,852.78

2. Is Principal Current? Yes X No ______

3. Is Interest Current ? Yes X No ______

4. Has all long-term debt been approved by the Public Service Commission?

Yes X No ______ PSC Case No ______

SERVICES PERFORMED BY

INDEPENDENT CERTIFIED PUBLIC ACCOUNTANT ("CPA")

Are your financial statement examined by a Certified Public Accountant?

Yes X No ______

If yes, which service is performed?

Audit X

Compilation ______

Review ______

Please enclose a copy of the accountant's report with the annual report

ADDITIONAL REQUESTED INFORMATION

Utility Name	Norther Kentucky Water District
Contact Person	Jack Bragg, Jr, CPA
Contact Person'ss E-Mail Address	Jbragg@nkywater.org
Utility's Web Address	www.nkywater.org

PLEASE COMPLETE THE ABOVE INFORMATION, IF IT IS AVAILABLE.

IF THERE ARE MULTIPLE STAFF WHO MAY BE CONTRACTS PLEASE INCLUDE THEIR NAMES AND E-MAIL ADDRESS ASLO.

Additional Information Required by Commission Orders

Provide any special information required by prior Commission orders, as well as any narrative explanations necessary to fully explain the data. Examples of the types of special information that may be required by Commission orders include surcharge amounts, collected, refunds issued, and unusual debt requirments.

Case #	Date of Order	Item/Explanation	
96-234	8/26/1996	Merger of Campbell Co. Ky. Water District and Kenton Co. Water District No.1. Effective date of Merger 1/1/1997	
97-3	9/21/1997	Defeasance of the former Campbell Co. Ky. Water District Bonds	
		Principal of the issue	$9,630,000
92-482	3/14/1992	SubDistrict A	
		a. Number of Customers as of 12-31-2007	555
		b. Total Surcharge billed during 2007	$61,593
		c. Accumulated surcharge billed.	$1,136,724
		d. Remaining Debt Service on debt which NKWD Issued to Finance Facilities	$674,063
94-409	1/26/1995	SubDistrict B	
		a. Number of Customers as of 12-31-2007	285
		b. Total Surcharge billed during 2007	$64,497
		c. Accumulated surcharge billed.	$652,611
		d. Remaining Debt Service on debt which NKWD Issued to Finance Facilities	$1,503,918
95-582	2/8/1996	SubDistrict R	
		a. Number of Customers as of 12-31-2007	239
		b. Total Surcharge billed during 2007	$53,955
		c. Accumulated surcharge billed.	$600,984
		d. Remaining Debt Service on debt which NKWD Issued to Finance Facilities	$857,418
95-582	2/8/1996	SubDistrict RL	
		a. Number of Customers as of 12-31-2007	87
		b. Total Surcharge billed during 2007	$39,154
		c. Accumulated surcharge billed.	$430,200
		d. Remaining Debt Service on debt which NKWD Issued to Finance Facilities	$595,833
97-468	9/4/1998	Per Item 7 on the order. See attached exhibit ML 1	
2000-329	7/21/2000	SubDistrict C	
		a. Number of Customers as of 12-31-2007	943
		b. Total Surcharge billed during 2007	$217,931
		c. Accumulated surcharge billed.	$1,133,677
		d. Remaining Debt Service on debt which NKWD Issued to Finance Facilities	$5,853,904
2000-171	5/5/2000	SubDistrict D	
		a. Number of Customers as of 12-31-2007	147
		b. Total Surcharge billed during 2007	$51,510
		c. Accumulated surcharge billed.	$224,181
		d. Remaining Debt Service on debt which NKWD Issued to Finance Facilities	$1,279,182
2001-198	6/27/2001	Defeasance of the former Kenton County Water District No.1 Bonds	
		- Principle Issue	$45,448,000
2002-00363	10/1/2002	Defeasance of the former Klenton County Water District No.1 Bonds	$10,575,000
2002-00468	3/1/2003	Defeasance of 1995C Bonds with Issuance of 2003A Bonds	$1,615,000
2002-00105	4/30/2003	Water Rate Increase	

Additional Information Required by Commission Orders - Continued			
2002-00105	6/1/2003	Issue of 2003 B Bonds	$30,270,000
2003-00167	7/18/2003	SubDistrict E	
		a. Number of Customers as of 12-31-2007	177
		b. Total Surcharge billed during 2007	$62,444.00
		c. Accumulated surcharge billed.	$150,476.62
		d. Remaining Debt Service on debt which NKWD Issued to Finance Facilities	$1,013,539.38
2003-00191	7/18/20003	SubDistrict RF	
		a. Number of Customers as of 12-31-2007	28
		b. Total Surcharge billed during 2007	$8,525
		c. Accumulated surcharge billed.	$31,962
		d. Remaining Debt Service on debt which NKWD Issued to Finance Facilities	$189,791
2003-00224	6/14/2004	Issue of 2004A Bonds	$10,455,000
2003-00224	6/14/2004	SubDistrict K	
		a. Number of Customers as of 12-31-2007	33
		b. Total Surcharge billed during 2007	$10,043
		c. Accumulated surcharge billed.	$15,691
		d. Remaining Debt Service on debt which NKWD Issued to Finance Facilities	$204,076
2003-00404	12/2/2003	Defeasance of 1993, 1195A and 1995B Bonds with Issuance of 2003C Bonds	$23,790,000
2005-00148	4/28/2006	Water Rate Increase & Bond Issuance	$29,000,000
2006-00315	12/26/2007	SubDistrict F	
		a. Number of Customers as of 12-31-2007	0
		b. Total Surcharge billed during 2007	$0
		c. Accumulated surcharge billed.	$0
		d. Remaining Debt Service on debt which NKWD Issued to Finance Facilities	$415,102
2007-00131	6/27/2007	SubDistrict G	
		a. Number of Customers as of 12-31-2007	0
		b. Total Surcharge billed during 2007	$0
		c. Accumulated sruchage billed.	$0
		d. Remaining Debt Service on debt which NKWD Issued to Finance Facilities	$1,042,078
2007-00135	12/21/2007	Water Rate Increase & Bond Issuance	$30,075,125

MAJOR WATER PROJECTS

Instructions: Provide details about each major water project which is planned but has not yet been submitted for approval to the Public Service Commission. For the limited purposed of this report a "Major Project" is defined as one which is not in the ordinary course of business, and which will increase your current utility plant by at least 20%

Brief Project Description (improvement, replacement, building construction, expansion. If expansion, provide the estimated number of new customers):

N/A

Projected Costs and Funding Sources/Amounts:

Approval Status: (Application for financial assistance filed, but not approved; or application approved, but have not advertised for construction bids)

Location: (community, area or nearby roads)

TABLE OF CONTENTS

HISTORY

1. Exact name of utility making this report. (Use the words: "The, Company, Incorporated or Incorporated" only when a part of the corporate name.)

   Northern Kentucky Water District

2. Give location including city, street and number, of the executive office:

   2835 Crescent Springs Road
   P.O. Box 18640
   Erlanger, Kentucky 41018-0640

3. Give the location, including street, street number, and telephone number of the principle office in Kentucky:

   Same as #2

4. Date of organization:

   January 1, 1997

5. If a consolidated or merged entity, name all the previously separate entities.

   Kenton County Water District
   Campbell County Water District

6. Date of each consolidation and each merger

   January 1, 1997

7. State whether the respondent is a water district or association.

Water District under Chapter 74 – KRS

8. Name all operating departments other than water.

None

9. Name of counties in which you furnish water service.

Kenton, Campbell, & Boone

10. Give the number of employees:

Full Time: 155 **Part Time: 16**

Report of: **Northern Kentucky Water District**
Fiscal Year Ended: **12/31/2008**
Location where books and records are located: **2835 Crescent Springs Road, Erlanger, Ky 41018**

Contacts:

Name	Title	Principal Business Address	Salary Charged Utility	Current Term Expires
Send correspondence to: Jack Bragg	VP of Finance	2835 Crescent Springs Road P.O. Box 41018-0640 Erlanger, Kentucky 41018	xxxxxxxxx	xxxxx
Report prepared by: Jack Bragg	VP of Finance	Same as above	xxxxxxxxx	xxxxx
	Officers and Managers			
Fred Macke	Chairperson	Same as above	6,000.00	8/26/2012
Drew Collins	Treasurer	Same as above	6,000.00	8/28/2011
[illegible] Wagner	Secretary	Same as above	6,000.00	8/26/2009
Dr. Pat Sommerkamp	Commissioner	Same as above	6,000.00	8/21/2009
Frank Jackson	Commissioner	Same as above	6,000.00	8/28/2011
Joe Koester	Commissioner	Same as above	6,000.00	7/26/2012
C. Ronald Lovan	President/CEO	Same as above	xxxxxxxxxx	xxxxx

COMPARATIVE BALANCE SHEET - ASSETS AND OTHER DEBITS

Account No. (a)	2008 Account Name (b)	Ref. Page (c)	Previous Year (d)	Current Year (e)
	UTILITY PLANT			
101-106	Utility Plant	13	$ 307,878,617	$ 323,463,743
108-110	Less: Accumulated Depreciation and Amortization	13,15-16	(61,398,205)	(67,540,294)
	Net Plant		$ 246,480,412	$ 255,923,449
114-115	Utility Plant Acquisition Adjustments (Net)	16	3,866,351	3,665,231
116	Other Utility Plant Adjustments			
	Total Net Utility Plant		$ 250,346,763	$ 259,588,680
	OTHER PROPERTY & INVESTMENTS			
121	Nonutility Property		$	$
122	Less: Accumulated Depreciation and Amortization			
	Net Nonutility Property		$	$
123	Investment in Asso. Companies	17		
124	Utility Investments	17	26,054,947	25,856,656
125	Other Investments	17	2,771,076	2,426,639
126-127	Special Funds	17		
	Total Other Property & Investments		$ 28,826,023	$ 28,283,295
	CURRENT AND ACCRUED ASSETS			
131	Cash		$ 10,205,219	$ 11,509,211
132	Special Deposits			
133	Other Special Deposits		19,167,438	15,081,881
134	Working Funds			
135	Temporary Cash Investments			
141-144	Accounts Receivable, Less Accumulated Provision for Uncollectible Accounts	18	5,610,489	5,538,813
145	Accounts Receivable from Associated Companies			
146	Notes Receivable from Associated Companies			
151-153	Materials & Supplies	19	1,289,823	1,268,952
161	Stores Expense			
162	Prepayments	19	246,623	898,284
171	Accrued Interest & Dividends Receivable			
172	Rents Receivable			
173	Accrued Utility Revenues		4,200,000	4,700,000
174	Misc. Current & Accrued Assets			
	Total Current & Accrued Assets		$ 40,719,592	$ 38,997,141

COMPARATIVE BALANCE SHEET - ASSETS AND OTHER DEBITS (CONT'D)

Account No. (a)	2008 Account Name (b)	Ref. Page c	Previous Year (d)	Current Year (e)
	DEFERRED DEBITS			
181	Unamortized Debt Discount & Expense	20	$ 2,997,786	$ 2,804,587
182	Extraordinary Property losses	21		
183	Preliminary Survey & Investagation Charges			
184	Clearing Accounts			
185	Temporary Facilities			
186	Misc. Deferred Debits	20	6,357,920	6,222,346
187	Research & Development Expenditures			
	Total Deferred Debits		$ 9,355,706	$ 9,026,933
	TOTAL ASSETS AND OTHER DEBITS		$ 329,248,084	$ 335,896,049

COMPARATIVE BALANCE SHEET - EQUITY CAPITAL AND LIABILITIES

Account No. (a)	2008 Account Name (b)	Ref. Page c	Previous Year (d)	Current Year (e)
	Equity Capital			
214	Appropriated Retained Earnings	12	$ 36,672,874	$ 31,053,385
215.1	Retained Earnings from Income Before Contributions	12	$ 35,057,198	$ 46,085,772
215.2	Donated Capital	12	$ 51,889,090	$ 56,424,703
	Total Equity Capital		$ 123,619,162	$ 133,563,860
	LONG-TERM DEBT			
221	Bonds	23	$ 168,128,000	$ 162,550,000
222	Reacquired Bonds			
223	Advances from Asso. Companies			
224	Other Long-Term Debt	22	1,875,000	4,973,035
	Total Long-Term Debt		$ 170,003,000	$ 167,523,035
	CURRENT & ACCRUED LIABILITIES			
231	Accounts Payable		$ 3,139,763	$ 2,504,050
232	Notes Payable	24	27,265,000	27,265,000
233	Accts. Payable to Asso. Co.	24		
234	Notes Payable to Asso. Co.	24		
235	Customer Deposits		11,207	10,310
236	Accrued Taxes	25		
237	Accrued Interest	25	3,251,310	3,181,843
239	Matured Long-Term Debt			
240	Matured Interest			
241	Tax Collections Payable			
242	Misc. Current & Accrued Liabilities	26	1,909,549	1,803,786
	Total Current & Accrued Liabilities		$ 35,576,829	$ 34,764,989
	DEFERRED CREDITS			
251	Unamortized Premium on Debt	20	$ 49,093	$ 44,165
252	Advances for Construction	21		
253	Other Deferred Credits			
	Total Deferred Credits		49,093	44,165
	OPERATING RESERVES			
	Accumulated Provision for:			
261	Property Insurance		$	$
262	Injuries & Damages			
263	Pensions & Benefits			
265	Miscellaneous Operating Reserves			
	Total Operating Reserves		$	$
	TOTAL EQUITY CAPITAL & LIABILITIES		$ 329,248,084	$ 335,896,049

(0)

COMPARATIVE OPERATING STATEMENT

Acct. No. (a)	Account Name (b)	Ref. Page c	Previous Year (d)	Current Year (e)
	Utility Operating Income			
400	Operating Revenues	27	$ 39,088,743	$ 42,190,123
401	Operating Expenses	28	$ 23,170,620	$ 23,432,760
403	Depreciation Expenses		5,715,209	7,362,501
406	Amortization of Utility Plant Acquisition Adjustment		201,120	201,120
407	Amortization Expense		378,962	378,962
408.1	Taxes Other Than Income	25	612,350	600,378
	Utility Operating Expenses		$ 30,078,261	$ 31,975,721
	Utility Operating Income		$ 9,010,482	10,214,402
413	Income From Utility Plant Leased to Others			
414	Gains (Losses) From Disposition of Utility Property		(19,374)	211,231
	Total Utility Operating Income		$ 8,991,108	$ 10,425,633
	Other Income and Deductions			
415	Revenues From Merchandising, Jobbing and Contract Deductions		$	$
416	Costs and Expenses of Merchandising, Jobbing and Contract Work			
419	Interest & Dividend Income		2,506,262	2,112,845
420	Allowance for Funds Used During Construciton			
421	Nonutility Income		172,289	(30,113)
426	Miscellaneous Nonutility Expense			
	Total Other Income & Deductions		$ 2,678,551	2,082,732
	TAXES APPLICABLE TO OTHER INCOME			
408.2	Taxes Other Than Income		$	$
	Total Taxes Applic. To Other Income		$	$

COMPARATIVE OPERATING STATEMENT - Continued

Account No. (a)	Account Name (b)	Ref. Page ©	Previous Year (d)	Current Year (e)
	INTEREST EXPENSE			
427	Interest Expense		$ 6,957,720	$ 6,911,009
428	Amortization of Debt Discount & Exp.		201,571	188,269
429	Amortization of Premium on Debt		4,928	-
	Total Interest Expense		$ 7,154,363	$ 7,099,278
	EXTRAORDINARY ITEMS			
433	Extraordinary Income		$	$
434	Extraordinary Deductions			
	Total Extraordinarly Items		$ -	$ -
	NET INCOME		$ 4,515,296	$ 5,409,085

Statement of Retained Earnings

ACCT. NO. (a)	2008 (b)	Amount (c)
214	Appropriated Retained Earnings (state balance and purpose of each appropriated amount at year end):	
	Bond Proceeds	$ 15,081,881
	Debt Service and Reserve	$ 13,359,108
	Improvement, Repair and Replacement	$ 2,612,396
	Total Appropriated Retained Earnings	$ 31,053,385

215.1	Retained Earnings From Income Before Contributions:	
	Balance Beginning of Year	$ 35,057,198
435	Balance Transferred from Net Income Before Contributions	$ 5,409,085
	Other Changes to Account:	
436	Appropriations of Retained Earnings	$ 5,619,489
439	Adjustments to Retained Earnings (requires Commission approval prior to use):	
	Credits (explain)	$
	Debits (explain)	$
	Balance End of Year	$ 46,085,772

		Tapping Fees	Grants	Other	Total
215.2	Donated Capital:				
	Balance Beginning of Year	7,233,544	13,417,368	31,238,178	51,889,090
	Credits:				
432	Proceeds from capital contributions	486,071	4,049,542	-	4,535,613
	Other Credits (explain)				
	Debits: (explain - Requires Commission Approval)				
	Balance End of Year	7,719,615	17,466,910	31,238,178	56,424,703

NET UTILITY PLANT (ACCTS. 101 - 106)

Account No.	Plant Accounts	Total
101	Utility Plant in Service	$ 283,903,489
102	Utility Plant Leased to Others	
103	Property Held for Future Use	
104	Utility Plant Purchased or Sold	
105	Construction Work in Progress	39,560,254
106	Completed Construction Not Classified	
	Total Utility Plant	$ 323,463,743

ACCUMULATED DEPRECIATION (ACCT. 108)

Description	Total
Balance first of year	$ 61,398,207
Credit during year:	
Accruals Charged to Account 108.1	7,362,501
Accruals Charged to Account 108.2	
Accruals Charged to Account 108.3	
Accruals Charged to Other Accounts (specify)	
Salvage	
Other Credits (specify)	
Total Credits	$ 7,362,501
Debits during year:	
Book Cost of Plant Retired	$ 1,220,414
Cost of Removal	
Other Debits (specify)	
Total Debits	$ 1,220,414
Balance end of year	$ 67,540,294

WATER UTILITY PLANT ACCOUNTS

Acct No. (a)	Account Name (b)	End of Previous Year (c)	Additions (d)	Retirement (e)	End of Current Year (f)	.1 Intangible Plant Intan- (g)	.2 SOS & Pumping Plant (h)	.3 Water Treatment Plant (i)	.4 Trans & Distrib Plant (j)	.5 General Plant (k)
301	Organization						$XXXXXXX	$XXXXXXX	$XXXXXXX	$XXXXXXX
302	Franchises						$XXXXXXX	$XXXXXXX	$XXXXXXX	$XXXXXXX
303	Land & Land Rights	$2,868,437	$34,337	$9,000	$2,893,774	$XXXXXXX	29,200	72,496	192,530	2,599,548
304	Structures & Improvements	$72,679,253	$678,627	$685,829	$72,672,051	$XXXXXXX	16,624,874	30,851,698	7,701,646	17,493,833
305	Collecting & Impounding Reserviors					$XXXXXXX		$XXXXXXX	$XXXXXXX	$XXXXXXX
306	Lake, River & Other Intakes	$1,463,171			$1,463,171	$XXXXXXX	1,463,171	$XXXXXXX	$XXXXXXX	$XXXXXXX
307	Wells and Springs					$XXXXXXX		$XXXXXXX	$XXXXXXX	$XXXXXXX
308	Infiltration Galleries & Tunnels							$XXXXXXX	$XXXXXXX	
309	Supply Mains	$2,821,711	$0		$2,821,711	$XXXXXXX	2,821,711	$XXXXXXX	$XXXXXXX	$XXXXXXX
310	Power Generation Equipment					$XXXXXXX		$XXXXXXX	$XXXXXXX	$XXXXXXX
311	Pumping Equipment	$9,567,388	$174,775	$2,576	$9,739,587	$XXXXXXX	3,259,372	6,480,215	$XXXXXXX	$XXXXXXX
320	Water Treatment Equipment	$10,286,622	$91,120	$2,104	$10,375,638	$XXXXXXX	$XXXXXXX	10,375,638	$XXXXXXX	$XXXXXXX
330	Distribution Reserviors & Standpipes	$7,500,741	$1,984,024		$9,484,765	$XXXXXXX	$XXXXXXX	$XXXXXXX	9,484,765	$XXXXXXX
331	Transmission & Distribution Mains	$124,523,750	$5,309,505	$2,791,924	$127,041,331	$XXXXXXX	$XXXXXXX	$XXXXXXX	127,041,331	$XXXXXXX
333	Services	$22,018,754	$1,195,573	$348,517	$22,865,810	$XXXXXXX	$XXXXXXX	$XXXXXXX	22,865,810	$XXXXXXX
334	Metes & Meter Installations	$7,737,814	$165,744	$0	$7,903,558	$XXXXXXX	$XXXXXXX	$XXXXXXX	7,903,558	$XXXXXXX
335	Hydrants	$5,529,015	$267,332	$92,029	$5,704,318	$XXXXXXX	$XXXXXXX	$XXXXXXX	5,704,318	$XXXXXXX
336	Backflow Prevention Devices					$XXXXXXX	$XXXXXXX	$XXXXXXX		$XXXXXXX
339	Other Plant & Misc. Equipment	$3,340,890	$879	$1,005	$3,340,764				3,340,764	$XXXXXXX
340	Office Furniture & Equipment	$2,395,259	$171,697	$33,633	$2,533,323	$XXXXXXX	$XXXXXXX	$XXXXXXX	$XXXXXXX	2,533,323
341	Transportation Equipment	$2,661,578	$248,507	$139,908	$2,770,177	$XXXXXXX	$XXXXXXX	$XXXXXXX	$XXXXXXX	2,770,177
342	Stores Equipment	$278,672		$1,799	$276,873	$XXXXXXX	$XXXXXXX	$XXXXXXX	$XXXXXXX	276,873
343	Tools, Shop, & Garage Equipment	$132,169	$23,995	$712	$155,452	$XXXXXXX	$XXXXXXX	$XXXXXXX	$XXXXXXX	155,452
344	Laboratory Equipment	$66,086	$33,605	$5,000	$94,691	$XXXXXXX	$XXXXXXX	$XXXXXXX	$XXXXXXX	94,691
345	Power Operated Equipment	$786,449	$61,320	$1,419	$846,350	$XXXXXXX	$XXXXXXX	$XXXXXXX	$XXXXXXX	849,350
346	Communication Equipment	$286,136	$64,677	$28,369	$322,444	$XXXXXXX	$XXXXXXX	$XXXXXXX	$XXXXXXX	322,444
347	Miscellaneous Equipment	$597,746	$0	$45	$597,701	$XXXXXXX	$XXXXXXX	$XXXXXXX	$XXXXXXX	597,701
348	Other Tangible Plant					$XXXXXXX	$XXXXXXX	$XXXXXXX	$XXXXXXX	
	Total Water Plant	$277,541,641	$10,505,717	$4,143,869	$283,903,489	0	24,198,328	47,780,047	184,234,722	27,693,392

Analysis of Accumulated Depreciation and Amort[illegible] by Primary Account

Acct. No. (a)	2008 Account (b)	Balance Beginning of Year (c)	Credits During the Year: Charges to Dep. Exp. (d)	Credits During the Year: Other Credits (e)	Charges During The Year: Plant Retirements (f)	Charges During The Year: Other Charges (g)	Balance End of Year (h)
		$	$	$	$	$	$
301	Organization						
302	Franchises						
303	Limited Term Interest in Land and Land Rights						
304	Structures & Improvements	16,262,186	2,377,223		420,388		18,219,021
305	Collecting & Impounding Reservoirs						
306	Lake River & Other Intakes	813,877	27,701				841,578
307	Wells & Springs						
309	Supply Mains	414,539	57,586				472,125
310	Power Generating Equip.						
311	Pumping Equipment	4,510,728	506,823		2,459		5,015,092
320	Water Treatment Equip.	3,821,913	367,719		1,655		4,187,977
330	Distribution Reservoirs & Standpipes	2,943,671	280,690				3,224,361
331	Transmissions & Distribution Mains	14,896,971	2,006,413		455,963		16,447,421
333	Services	7,114,760	551,939		113,100		7,553,599
334	Meters & Meter Installations	1,908,926	137,863				2,046,789
335	Hydrants	1,347,155	152,246		29,250		1,470,150
339	Other Plant & Misc. Equip.	2,012,324	331,294		1,005		2,342,613
340	Office Furniture & Equip.	1,540,017	220,137		26,471		1,733,683
341	Transportation Equipment	2,017,932	252,076		139,908		2,130,100
342	Service Equipment						
343	Tools, Shop & Garage Equip.	323,500	20,734		1,799		342,435
344	Shop Equipment	40,455	18,162				58,617
345	Power Operated Equip.	555,624	51,614				607,238
346	Telecommunications Equipment	281,406	1,746		28,369		254,783
347	SCADA						
348	Other Tangible Plant	592,222	535		45		592,712
	Totals	$ 61,398,206	$ 7,362,501	$ -	$ 1,220,412	$ -	$ 67,540,294

ACCUMULATED AMORTIZATION (ACCT. 110)

Description	Total
Balance first of year	$ N/A
Credit during year:	
Accruals Charged to Account 110.1	$
Accruals Charged to Account 110.2	
Other Accruals (specify)	
Total Credits	$
Debits during year:	
Book Cost of Plant Retired	$
Other Debits (specify)	
Total Debits	$
Balance end of year	$

UTILITY PLANT ACQUISITION ADJUSTMENT (ACCTS. 114 - 115)

Report each acquisition adjustment and related accumulated amortization separately. For any acquisition adjustment approved by the Commission, include the Order Number.

ACCOUNT NAME	TOTAL
Acquisition Adjustments (114)	
Original District 9-14-55	$ 263,366
District # 2 & 3 12-31-73	18,712
Mentor District 9-1-76	10,741
City of Cold Spring	228,253
City of Silver Grove	24,853
Newport Water Works	4,970,211
Total Plant Acquisition Adjustments	$ 5,516,136
Accumulated Amortization (115)	
Original District 9-14-55	$ 263,366
District # 2 & 3 12-31-73	18,712
Mentor District 9-1-76	10,741
City of Cold Spring	228,253
City of Silver Grove	24,853
Newport Water Works	1,304,980
Total Accumulated Amortization	$ 1,850,905
Net Acquisition Adjustments	$ 3,665,231

Investments and Special Funds (Acct. 123-127)

Report hereunder all investments and special funds carried in Account 123-127.

Description of Security or Special Fund (a)	Face or Par Value (b)	Year-End Book Cost c
Investment In Associated Companies (Acct. 123):		
	$	$
Total Investment in Asso. Companies		$
Utility Investments (Acct. 124):		
IRR Account	$	$ 2,612,396
Debt Service Account		9,885,153
Debt Service Reserve Account		13,359,108
Total Utility Investments		$ 25,856,656
Other Investments (Acct. 125):		
Boone County/Florence KY Settlement	$	$ 2,426,639
Total Other Investments:	$	$ 2,426,639
Special Funds (Acct. 126 & 127):		
Prepayment Reserve		
Total Special Funds		$

ACCOUNTS AND NOTES RECEIVABLE - NET (ACCOUNTS 141 - 144)

Report hereunder all accounts and notes receivable included in Accounts 141,142,and 144. Amounts included in Accounts 142 and 144 should be listed individually.

Description		Total
ACCOUNTS & NOTES RECEIVABLE:		
Customer Accounts Receivable (Acct. 141)		$ 5,328,898
Other Accounts Receivable (Acct. 142)		
Assessments	$ 82,711	
Other	127,204	
		209,915
Notes Receivable (Acct. 144)		
	$	
Total Accounts and Notes Receivable		$ 5,538,813
Accumulated Provision for Uncollectable Accounts (Acct. 143)		
Balance first of year	$ -	
Add: Provision for uncollectables for current year	$	
Collections to accounts previously written off		
Utility accounts		
Others		
Total Additions	$	
Deduct accounts written off during year:		
Utility Accounts	$	
Other		
Total accounts written off	$	
Balance end of year		$ -
Total Accounts and Notes Receivable		$ 5,538,813

Materials and Supplies (151 - 153)

Account Name	Total
Plant Materials and Supplies (Account 151)	$ 1,268,952
Merchandise (Account 152)	
Other Materials and Supplies (Account 153)	
Total Materials & Supplies	$ 1,268,952

Prepayments (Acct. 162)

Description	Total
Prepaid Insurance	$ 76,416
Prepaid Rents	
Prepaid Interest	
Prepaid Taxes	
Other Prepayments (Specify) Prepaid Antenna Rent Sprint	(11,400)
Expenses/Services	$ 833,268
Total Prepayments	$ 898,284

Miscellaneous Deferred Debits (Acct. 186)

2008 Description	Total
Miscellaneous Deferred Debits (Acct. 186):	
Deferred PSC Assessment	31,330
Deferred Rate Case Expense 2004-2005	85,830
Deferred Rate Case Expense 2007	73,828
Other Deferred Debits	6,031,358
Total Miscellaneous Deferred Debits	$ 6,222,346

Unamortized Debt Discount & Expense & Premium on Debt (Accts. 181 & 251)

Report the net discount & expense or premium separately for each security issue.

Description	Amount Written Off During Year	Year-End Balance
Unamortized Debt Discount & Expense (Acct. 181):		
Bond Issue Cost 1997	$ 4,916	$ 68,001
Bond Discount 1997	6,735	93,168
Bond Discount 1998	7,570	150,770
Bond Issue Costs 1998	3,147	62,693
Cost of Issue 2001 Bond	3,699	65,984
Discount 2001 Bond	13,038	232,520
Cost of Issue 2002 A	13,731	248,302
Bond Discount 2002 A	27,209	492,030
Cost of Issue 2002 B	9,300	83,314
Cost of Issue 2003 A	1,620	35,930
Bond Discount 2003 A	1,087	25,103
Cost of Issue 2003 B	11,760	227,390
Bond Discount 2003 B	8,520	165,433
Cost of Issue 2003 C	14,940	173,013
Discount 2003 C	7,404	82,085
Cost of issue 2004A Bonds	3,952	67,700
Discount 2004A Bond	7,920	164,902
Bond Discount 2006	6,994	159,119
Cost of Issue Bond 2006	8,640	196,560
Discount 2007 BAN	1,222	407
Cost of Issue BAN 2007	30,490	10,163
Total Unamortized Debt Discount & Expense	$ 193,194	$ 2,804,587
Unamortized Premium on Debt (Acct. 251):		
Premium on 2002 B Bond	4,928	$ 44,165
Total Unamortized Premium on Debt	$ 4,928	$ 44,165

EXTRAORDINARY PROPERTY LOSSES (ACCT. 182)

Report each item separately.

Description	Total
Extraordinary Property Losses (Acct. 182) :	
N/A	$
	$
	$
	$
Total Extraordinary Property Losses	$

ADVANCES FOR CONSTRUCTION (ACCT. 252)

DESCRIPTION N/A	TOTAL
Balance first of year	$
Add credits during year	$
Deduct charges during year	$
Balance end of year	$

Long Term Debt (Acct. 224)

Description of Obligation And Amount of Original Issue (a)	Date of Issue (b)	Date of Maturity (c)	Interest Expense For Year Rate (d)	Interest Expense For Year Amount (e)	Principal per balance Sheet Date (f)
				$	$
Notes Payable City of Taylor Mill	Mar-2004	7/1/2018	0	0	$ 1,625,000.00
Kentucky Infrastructure Authority Loan	June 2008 1st Draw	2028	3.0%	$ 63,669.90	$ 3,348,035.00
Total				$	$ 4,973,035.00

Account 221, BONDS

Line No.	Par Value of Actual Issue 1	Cash Realized on Actual Issue 2	Par Value of Amount Held by or for Respondent 3	Actually Outstanding at Close of year 4	Interest During Year Accrued 5	Interest During Year Actually Paid 6
1	11,225,000	11,131,694		3,760,000	182,123	199,738
2	11,355,000	11,141,619		9,005,000	438,245	443,786
3	2,287,000	2,287,000		2,115,000	106,207	106,443
4	16,325,000	15,835,250		14,750,000	707,567	710,400
5	48,485,000	44,121,624		43,270,000	2,117,778	2,125,465
6	10,575,000	10,625,204		7,360,000	293,105	302,219
7	1,615,000	1,583,553		1,440,000	62,622	63,000
8	30,270,000	30,068,115		25,965,000	979,492	985,950
9	23,790,000	23,532,357		17,570,000	657,105	669,969
10	10,455,000	10,195,116		9,335,000	384,762	387,632
11	29,000,000	28,736,444		27,980,000	1,161,488	1,173,488
Total	195,382,000	189,157,976	-	162,550,000	7,090,494	7,169,090

Schedule of Bond Maturities

Line No.	Bond Numbers 7	Maturity Date 8	Interest Rate 9	Principal Amount 10	Amount Paid 11	Remaining Bonds Outstanding 12
1						
2		See Attachments 23.1 Through 23.11				
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Northern Kentucky Water Service District Bond Issue: 11,225,000 , Dated September 1, 1997					Attachment 23.1
Bond Number	Maturity Date	Interest Rate	Principle Amount	Amounts Paid	Outstanding
Registered	1998	4.700%	210,000.00	210,000.00	
Registered	1999	4.700%	580,000.00	580,000.00	
Registered	2000	4.700%	610,000.00	610,000.00	
Registered	2001	4.700%	640,000.00	640,000.00	
Registered	2002	4.700%	670,000.00	670,000.00	
Registered	2003	4.700%	700,000.00	700,000.00	
Registered	2004	4.700%	735,000.00	735,000.00	
Registered	2005	4.700%	770,000.00	770,000.00	
Registered	2006	4.700%	810,000.00	810,000.00	
Registered	2007	4.700%	850,000.00	850,000.00	
Registered	2008	4.750%	890,000.00	890,000.00	
Registered	2009	4.750%	930,000.00		930,000.00
Registered	2010	4.750%	975,000.00		975,000.00
Registered	2011	4.750%	1,025,000.00		1,025,000.00
Registered	2012	4.750%	60,000.00		60,000.00
Registered	2013	4.750%	60,000.00		60,000.00
Registered	2014	4.750%	65,000.00		65,000.00
Registered	2015	4.750%	70,000.00		70,000.00
Registered	2016	4.750%	70,000.00		70,000.00
Registered	2017	4.750%	75,000.00		75,000.00
Registered	2018	4.750%	80,000.00		80,000.00
Registered	2019	4.750%	80,000.00		80,000.00
Registered	2020	4.750%	85,000.00		85,000.00
Registered	2021	4.750%	90,000.00		90,000.00
Registered	2022	4.750%	95,000.00		95,000.00
TOTALS			11,225,000.00	7,465,000.00	3,760,000.00

Northern Kentucky Water Service District					Attachment 23.2
Bond Issue: 11,355,000 , Dated December 1, 1998					
Bond Number	Maturity Date	Interest Rate	Principle Amount	Amounts Paid	Outstanding
Registered	02/01/1999	4.700%	250,000.00	250,000.00	
Registered	02/01/2000	4.700%	200,000.00	200,000.00	
Registered	02/01/2001	4.700%	200,000.00	200,000.00	
Registered	02/01/2002	4.700%	210,000.00	210,000.00	
Registered	02/01/2003	4.700%	220,000.00	220,000.00	
Registered	02/01/2004	4.700%	230,000.00	230,000.00	
Registered	02/01/2005	4.700%	240,000.00	240,000.00	
Registered	02/01/2006	4.700%	255,000.00	255,000.00	
Registered	02/01/2007	4.700%	265,000.00	265,000.00	
Registered	02/01/2008	4.750%	280,000.00	280,000.00	
Registered	02/01/2009	4.750%	280,000.00		280,000.00
Registered	02/01/2010	4.750%	295,000.00		295,000.00
Registered	02/01/2011	4.750%	310,000.00		310,000.00
Registered	02/01/2012	4.750%	325,000.00		325,000.00
Registered	02/01/2013	4.800%	340,000.00		340,000.00
Registered	02/01/2014	4.850%	360,000.00		360,000.00
Registered	02/01/2015	4.875%	375,000.00		375,000.00
Registered	02/01/2016	4.875%	395,000.00		395,000.00
Registered	02/01/2017	4.875%	415,000.00		415,000.00
Registered	02/01/2018	4.875%	435,000.00		435,000.00
Registered	02/01/2019	4.875%	455,000.00		455,000.00
Registered	02/01/2020	4.875%	480,000.00		480,000.00
Registered	02/01/2021	4.875%	505,000.00		505,000.00
Registered	02/01/2022	4.875%	530,000.00		530,000.00
Registered	02/01/2023	4.875%	555,000.00		555,000.00
Registered	02/01/2024	4.875%	585,000.00		585,000.00
Registered	02/01/2025	4.875%	610,000.00		610,000.00
Registered	02/01/2026	4.875%	645,000.00		645,000.00
Registered	02/01/2027	4.875%	675,000.00		675,000.00
Registered	02/01/2028	4.875%	435,000.00		435,000.00
TOTALS			11,355,000.00	2,350,000.00	9,005,000.00

Northern Kentucky Water Service District FmHA Load $2,287,000 - 2000					Attachment 23.3
Year	Maturity Date	Interest Rate	Principle Amount	Amounts Paid	Outstanding
2000			0.00	0.00	0.00
2001			0.00	0.00	0.00
2002			21,000.00	21,000.00	0.00
2003			22,000.00	22,000.00	0.00
2004			24,000.00	24,000.00	0.00
2005			24,000.00	24,000.00	0.00
2006			26,000.00	26,000.00	0.00
2007			27,000.00	27,000.00	0.00
2008			28,000.00	28,000.00	0.00
2009			30,000.00		30,000.00
2010			31,000.00		31,000.00
2011			33,000.00		33,000.00
2012			34,000.00		34,000.00
2013			36,000.00		36,000.00
2014			38,000.00		38,000.00
2015			40,000.00		40,000.00
2016			42,000.00		42,000.00
2017			44,000.00		44,000.00
2018			46,000.00		46,000.00
2019			49,000.00		49,000.00
2020			51,000.00		51,000.00
2021			54,000.00		54,000.00
2022			56,000.00		56,000.00
2023			59,000.00		59,000.00
2024			62,000.00		62,000.00
2025			65,000.00		65,000.00
2026			68,000.00		68,000.00
2027			72,000.00		72,000.00
2028			75,000.00		75,000.00
2029			79,000.00		79,000.00
2030			83,000.00		83,000.00
2031			87,000.00		87,000.00
2032			92,000.00		92,000.00
2033			96,000.00		96,000.00
2034			102,000.00		102,000.00
2035			107,000.00		107,000.00
2036			112,000.00		112,000.00
2037			118,000.00		118,000.00
2038			124,000.00		124,000.00
2039			130,000.00		130,000.00
Totals			2,287,000.00	172,000.00	2,115,000.00

Northern Kentucky Water Service District Bond Iusse $16,325,000.00 Dated 10-23-2001					Attachment 23.4
Bond Number	Maturity Date	Interest Rate	Principle Amount	Amounts Paid	Outstanding
Registered	2/1/2002	2.700%	285,000.00	285,000.00	
Registered	2/1/2003	3.000%	235,000.00	235,000.00	
Registered	2/1/2004	3.250%	240,000.00	240,000.00	
Registered	2/1/2005	3.450%	230,000.00	230,000.00	
Registered	2/1/2006	3.600%	215,000.00	215,000.00	
Registered	2/1/2007	3.750%	200,000.00	200,000.00	
Registered	2/1/2008	3.900%	170,000.00	170,000.00	
Registered	2/1/2009	4.000%	155,000.00		155,000.00
Registered	2/1/2010	4.100%	75,000.00		75,000.00
Registered	2/1/2011	4.200%	80,000.00		80,000.00
Registered	2/1/2012	4.350%	80,000.00		80,000.00
Registered	2/1/2013	4.450%	735,000.00		735,000.00
Registered	2/1/2014	4.550%	770,000.00		770,000.00
Registered	2/1/2015	4.670%	810,000.00		810,000.00
Registered	2/1/2016	4.750%	845,000.00		845,000.00
Registered	2/1/2017	4.820%	890,000.00		890,000.00
Registered	2/1/2018	4.850%	930,000.00		930,000.00
Registered	2/1/2019	4.900%	980,000.00		980,000.00
Registered	2/1/2020	4.950%	1,030,000.00		1,030,000.00
Registered	2/1/2021	5.000%	1,080,000.00		1,080,000.00
Registered	2/1/2022	5.000%	1,135,000.00		1,135,000.00
Registered	2/1/2023	5.000%	1,190,000.00		1,190,000.00
Registered	2/1/2024	5.100%	1,255,000.00		1,255,000.00
Registered	2/1/2025	5.100%	1,320,000.00		1,320,000.00
Registered	2/1/2026	5.100%	1,390,000.00		1,390,000.00
TOTALS			16,325,000.00	1,575,000.00	14,750,000.00

Northern Kentucky Water Service District Bond Iusse $45,485,000.00 Dated 2/1/2002					Attachment 23.5
Bond Number	Maturity Date	Interest Rate	Principle Amount	Amounts Paid	Outstanding
Registered	2/1/2003				
Registered	2/1/2003	4.50%	350,000.00	350,000.00	0.00
Registered	2/1/2004	4.50%	345,000.00	345,000.00	0.00
Registered	2/1/2005	4.50%	360,000.00	360,000.00	0.00
Registered	2/1/2006	4.50%	370,000.00	370,000.00	0.00
Registered	2/1/2007	4.50%	380,000.00	380,000.00	0.00
Registered	2/1/2008	4.50%	410,000.00	410,000.00	0.00
Registered	2/1/2009	4.50%	365,000.00		365,000.00
Registered	2/1/2010	4.50%	465,000.00		465,000.00
Registered	2/1/2111	4.50%	485,000.00		485,000.00
Registered	2/1/2012	4.50%	1,530,000.00		1,530,000.00
Registered	2/1/2013	4.50%	950,000.00		950,000.00
Registered	2/1/2114	4.50%	990,000.00		990,000.00
Registered	2/1/2115	4.65%	1,035,000.00		1,035,000.00
Registered	2/1/2116	4.75%	1,100,000.00		1,100,000.00
Registered	2/1/2117	4.75%	1,625,000.00		1,625,000.00
Registered	2/1/2118	4.75%	2,520,000.00		2,520,000.00
Registered	2/1/2119	4.75%	2,640,000.00		2,640,000.00
Registered	2/1/2020	5.00%	3,080,000.00		3,080,000.00
Registered	2/1/2021	5.00%	3,240,000.00		3,240,000.00
Registered	2/1/2022	5.00%	3,405,000.00		3,405,000.00
Registered	2/1/2023	5.00%	3,580,000.00		3,580,000.00
Registered	2/1/2024	5.00%	3,765,000.00		3,765,000.00
Registered	2/1/2025	5.00%	3,960,000.00		3,960,000.00
Registered	2/1/2026	5.00%	4,160,000.00		4,160,000.00
Registered	2/1/2027	5.00%	4,375,000.00		4,375,000.00
TOTALS			45,485,000.00	2,215,000.00	43,270,000.00

Northern Kentucky Water Service District					Attachment 23.6
Bond lusse $10,575,000.00 Dated 12/5/2002					
Bond Number	Maturity Date	Interest Rate	Principle Amount	Amounts Paid	Outstanding
Registered	12/5/2002				
Registered	2/1/2003	3.00%	535,000.00	535,000.00	0.00
Registered	2/1/2004	3.00%	455,000.00	455,000.00	0.00
Registered	2/1/2005	3.00%	490,000.00	490,000.00	0.00
Registered	2/1/2006	3.00%	530,000.00	530,000.00	0.00
Registered	2/1/2007	3.50%	580,000.00	580,000.00	0.00
Registered	2/1/2008	3.50%	625,000.00	625,000.00	0.00
Registered	2/1/2009	3.50%	745,000.00		745,000.00
Registered	2/1/2010	3.75%	775,000.00		775,000.00
Registered	2/1/2111	4.00%	805,000.00		805,000.00
Registered	2/1/2012	4.00%	835,000.00		835,000.00
Registered	2/1/2013	4.00%	870,000.00		870,000.00
Registered	2/1/2114	4.00%	900,000.00		900,000.00
Registered	2/1/2115	4.00%	930,000.00		930,000.00
Registered	2/1/2116	4.00%	965,000.00		965,000.00
Registered	2/1/2117	4.00%	535,000.00		535,000.00
TOTALS			10,575,000.00	3,215,000.00	7,360,000.00

Attachment 23.7

Northern Kentucky Water Service District
Bond Issue: $1,615,000.00 Dated 3/13/2003

Bond Number	Maturity Date	Interest Rate	Principle Amount	Amounts Paid	Outstanding
Registered	2/1/2004	1.20%	35,000.00	35,000.00	0.00
Registered	2/1/2005	1.38%	35,000.00	35,000.00	0.00
Registered	2/1/2006	1.75%	35,000.00	35,000.00	0.00
Registered	2/1/2007	2.20%	35,000.00	35,000.00	0.00
Registered	2/1/2008	2.60%	35,000.00	35,000.00	0.00
Registered	2/1/2009	3.00%	40,000.00		40,000.00
Registered	2/1/2010	3.30%	40,000.00		40,000.00
Registered	2/1/2111	3.55%	40,000.00		40,000.00
Registered	2/1/2012	3.37%	40,000.00		40,000.00
Registered	2/1/2013	3.85%	45,000.00		45,000.00
Registered	2/1/2114	3.95%	45,000.00		45,000.00
Registered	2/1/2115	4.05%	45,000.00		45,000.00
Registered	2/1/2116	4.15%	50,000.00		50,000.00
Registered	2/1/2117	4.25%	50,000.00		50,000.00
Registered	2/1/2118	4.50%	55,000.00		55,000.00
Registered	2/1/2119	4.50%	55,000.00		55,000.00
Registered	2/1/2020	4.50%	60,000.00		60,000.00
Registered	2/1/2121	4.50%	60,000.00		60,000.00
Registered	2/1/2022	4.50%	65,000.00		65,000.00
Registered	2/1/2023	4.55%	65,000.00		65,000.00
Registered	2/1/2024	4.55%	70,000.00		70,000.00
Registered	2/1/2025	4.55%	75,000.00		75,000.00
Registered	2/1/2026	4.55%	75,000.00		75,000.00
Registered	2/1/2027	4.55%	80,000.00		80,000.00
Registered	2/1/2028	4.60%	85,000.00		85,000.00
Registered	2/1/2029	4.60%	85,000.00		85,000.00
Registered	2/1/2030	4.60%	90,000.00		90,000.00
Registered	2/1/2031	4.60%	95,000.00		95,000.00
Registered	2/1/2032	4.60%	30,000.00		30,000.00
TOTALS			1,615,000.00	175,000.00	1,440,000.00

Northern Kentucky Water Service District Bond Issue $30,270,000.00 Dated 8/1/2003					Attachment 23.8
Bond Number	Maturity Date	Interest Rate	Principle Amount	Amounts Paid	Outstanding
Registered	2/1/2004	2.00%	825,000.00	825,000.00	0.00
Registered	2/1/2005	2.00%	845,000.00	845,000.00	0.00
Registered	2/1/2006	2.00%	860,000.00	860,000.00	0.00
Registered	2/1/2007	2.00%	880,000.00	880,000.00	0.00
Registered	2/1/2008	2.25%	895,000.00	895,000.00	0.00
Registered	2/1/2009	2.75%	915,000.00		915,000.00
Registered	2/1/2010	3.00%	940,000.00		940,000.00
Registered	2/1/2111	3.13%	965,000.00		965,000.00
Registered	2/1/2012	3.13%	995,000.00		995,000.00
Registered	2/1/2013	3.13%	1,030,000.00		1,030,000.00
Registered	2/1/2114	3.25%	1,060,000.00		1,060,000.00
Registered	2/1/2115	3.50%	1,095,000.00		1,095,000.00
Registered	2/1/2116	4.00%	1,135,000.00		1,135,000.00
Registered	2/1/2117	4.00%	1,175,000.00		1,175,000.00
Registered	2/1/2118	4.00%	1,225,000.00		1,225,000.00
Registered	2/1/2119	4.13%	1,275,000.00		1,275,000.00
Registered	2/1/2020	4.13%	1,325,000.00		1,325,000.00
Registered	2/1/2121	4.13%	1,380,000.00		1,380,000.00
Registered	2/1/2022	4.13%	1,440,000.00		1,440,000.00
Registered	2/1/2023	4.13%	1,500,000.00		1,500,000.00
Registered	2/1/2024	4.13%	1,565,000.00		1,565,000.00
Registered	2/1/2025	4.13%	1,630,000.00		1,630,000.00
Registered	2/1/2026	4.13%	1,700,000.00		1,700,000.00
Registered	2/1/2027	4.13%	1,770,000.00		1,770,000.00
Registered	2/1/2028	4.13%	1,845,000.00		1,845,000.00
TOTALS			30,270,000.00	4,305,000.00	25,965,000.00

Northern Kentucky Water Service District Bond Issue $23,790,000.00 Dated 12/18/2003					Attachment 23.9
Bond Number	Maturity Date	Interest Rate	Principle Amount	Amounts Paid	Outstanding
Registered	2/1/2004	2.00%	1,430,000.00	1,430,000.00	0.00
Registered	2/1/2005	2.00%	1,160,000.00	1,160,000.00	0.00
Registered	2/1/2006	2.00%	1,180,000.00	1,180,000.00	0.00
Registered	2/1/2007	2.25%	1,215,000.00	1,215,000.00	0.00
Registered	2/1/2008	2.50%	1,235,000.00	1,235,000.00	0.00
Registered	2/1/2009	2.75%	1,270,000.00		1,270,000.00
Registered	2/1/2010	3.00%	1,305,000.00		1,305,000.00
Registered	2/1/2111	3.25%	1,350,000.00		1,350,000.00
Registered	2/1/2012	3.50%	1,395,000.00		1,395,000.00
Registered	2/1/2013	3.50%	1,445,000.00		1,445,000.00
Registered	2/1/2114	4.00%	1,505,000.00		1,505,000.00
Registered	2/1/2115	4.00%	1,565,000.00		1,565,000.00
Registered	2/1/2116	4.00%	1,625,000.00		1,625,000.00
Registered	2/1/2117	4.00%	1,690,000.00		1,690,000.00
Registered	2/1/2118	4.00%	1,595,000.00		1,595,000.00
Registered	2/1/2119	4.13%	1,665,000.00		1,665,000.00
Registered	2/1/2020	4.25%	1,160,000.00		1,160,000.00
TOTALS			23,790,000.00	6,220,000.00	17,570,000.00

Northern Kentucky Water Service District					Attachment 23.10
Bond Issue	$10,455,000.00	11/18/2024			
Bond Number	Maturity Date	Interest Rate	Principle Amount	Amounts Paid	Outstanding
Registered	2/1/2005	2.000%	270,000.00	270,000.00	0.00
Registered	2/1/2006	2.000%	275,000.00	275,000.00	0.00
Registered	2/1/2007	2.125%	285,000.00	285,000.00	0.00
Registered	2/1/2008	2.375%	290,000.00	290,000.00	0.00
Registered	2/1/2009	2.625%	295,000.00		295,000.00
Registered	2/1/2010	3.000%	305,000.00		305,000.00
Registered	2/1/2111	3.000%	315,000.00		315,000.00
Registered	2/1/2012	3.250%	325,000.00		325,000.00
Registered	2/1/2013	3.375%	335,000.00		335,000.00
Registered	2/1/2014	3.500%	345,000.00		345,000.00
Registered	2/1/2015	4.000%	360,000.00		360,000.00
Registered	2/1/2016	4.000%	375,000.00		375,000.00
Registered	2/1/2017	4.000%	390,000.00		390,000.00
Registered	2/1/2018	4.000%	405,000.00		405,000.00
Registered	2/1/2019	4.000%	425,000.00		425,000.00
Registered	2/1/2022	4.500%	1,385,000.00		1,385,000.00
Registered	2/1/2024	4.500%	1,035,000.00		1,035,000.00
Registered	2/1/2026	4.000%	1,135,000.00		1,135,000.00
Registered	2/1/2029	4.500%	1,905,000.00		1,905,000.00
TOTALS			10,455,000.00	1,120,000.00	9,335,000.00

Northern Kentucky Water Service District					Attachment 23.11
Bond Issue	9/1/2006	$29,000,000.00			
Bond Number	Maturity Date	Interest Rate	Principle Amount	Amounts Paid	Outstanding
Registered	2/1/2007	4.000%	300,000.00	300,000.00	0.00
Registered	2/1/2008	4.000%	720,000.00	720,000.00	0.00
Registered	2/1/2009	4.000%	750,000.00		750,000.00
Registered	2/1/2010	4.000%	775,000.00		775,000.00
Registered	2/1/2111	4.000%	805,000.00		805,000.00
Registered	2/1/2012	4.000%	835,000.00		835,000.00
Registered	2/1/2013	4.000%	870,000.00		870,000.00
Registered	2/1/2114	4.000%	900,000.00		900,000.00
Registered	2/1/2115	4.000%	940,000.00		940,000.00
Registered	2/1/2116	4.000%	980,000.00		980,000.00
Registered	2/1/2117	4.000%	1,020,000.00		1,020,000.00
Registered	2/1/2118	4.000%	970,000.00		970,000.00
Registered	2/1/2119	4.000%	1,010,000.00		1,010,000.00
Registered	2/1/2020	4.125%	1,320,000.00		1,320,000.00
Registered	2/1/2021	4.125%	1,205,000.00		1,205,000.00
Registered	2/1/2022	4.125%	1,255,000.00		1,255,000.00
Registered	2/1/2023	4.125%	1,420,000.00		1,420,000.00
Registered	2/1/2024	4.125%	1,375,000.00		1,375,000.00
Registered	2/1/2025	4.125%	1,440,000.00		1,440,000.00
Registered	2/1/2027	4.250%	3,075,000.00		3,075,000.00
Registered	2/1/2029	4.250%	3,360,000.00		3,360,000.00
Registered	2/1/2031	4.273%	3,675,000.00		3,675,000.00
TOTALS			29,000,000.00	1,020,000.00	27,980,000.00

Notes Payable (Acct. 232 & 234)

2008 a	Nominal Date of Issue b	Date of Maturity c	INTEREST Rate d	Amount of payment e	Principal Amount per Balance Sheet f
Account 232 - Note Payable					
Campbell Co. Fiscal Court			0.00%	$	$ 100,000
BAN 2007			3.70%	1,012,740	27,165,000
Total Account 232				$	$ 27,265,000
Account 234 - Notes Payable To Associated Companies		N/A		$	$
Total Account 234				$	$

Accounts Payable to Associated Companies (Acct. 233)

Show Payable to Each Associated Company Separately	Amount
	$
N/A	
Total	$

TAXES ACCRUED (ACCOUNT 236)

ACCT. NO. (a)	2008 DESCRIPTION (b)	TOTAL ©
	Balance first of year	$ -
	Accruals Charged:	
408.1	Utility regulatory assessment fees	
408.11	Property taxes	
408.12	Payroll taxes	600,378
408.13	Other taxes and licenses	
408.2	Taxes other than income, other income and deductions	
	Total taxes accrued	$ 600,378
	Taxes paid during year:	
408.1	Utility regulatory assessment fees	
408.11	Property taxes	
408.12	Payroll taxes	600,378
408.13	Other taxes and licenses	
408.2	Taxes other than income, other income and deductions	
	Total taxes paid	$ 600,378
	Balance end of year	$ -

ACCRUED INTEREST (ACCOUNT 237)

DESC. DEBT (a)	BALANCE BEGINNING OF YEAR (b)	INTEREST ACCRUED DURING YEAR (c)	INTEREST PAID DURING YEAR (d)	BALANCE END OF YEAR (e)
Acct. No. 237.1 - Accured Interest on Long-term Debt:				
Series 1997	92,031	182,123	199,738	74,416
Series 1998	187,682	438,245	443,786	182,141
2000 RUS Loan	18,083	106,207	106,443	17,847
Series 2001	297,417	707,567	710,400	294,584
Series 2002 A	889,454	2,117,778	2,125,465	881,767
Series 2002 B	130,482	293,105	302,219	121,368
Series 2003 A	26,439	62,622	63,001	26,060
Series 2003 B	414,959	979,492	986,950	407,500
Series 2003 C	285,586	657,405	669,969	273,021
Series 2004 A	162,948	384,762	387,632	160,078
Series 2006	494,953	1,161,488	1,173,488	482,953
Total Acct No. 237.1	$ 3,000,033	$ 7,090,792	$ 7,169,090	$ 2,921,735
Acct. No. 237.2 - Accured Interest on Other Liabilities:				
2007 BAN # 1	$ 251,276	1,013,937	1,005,105	$ 260,108
Total Acct No. 237.2	$ 251,276	$ 1,013,937	$ 1,005,105	$ 260,108
Total Acct No. 237	$ 3,251,309	$ 8,104,729	$ 8,174,196	$ 3,181,843

Gross interest expense	8,241,387
Less Surcharges	(603,337)
Less Capitalized Interest	(727,041)
Interest Expense	6,911,009

Miscellaneous Current & Accrued Liabilities (Account 242)

2008 Description (a)		Balance End of Year (b)
Accrued Payroll Taxes & Misc	$	58,725
Accrued Payroll		119,091
Accrued Sales Taxes		97,166
Accrued Pension		42,799
Accrued Vacation/Sick		845,878
Subdistrict Surcharges Payable		640,126
Total Miscellaneous Current & Accrued Liabilities	$	1,803,786

Regulatory Commission Expense (Accounts 666 and 667)

2006 DESCRIPTION OF CASE (DOCKET #) (a)	TOTAL INCURRED DURING YEAR (b)	AMOUNT TRANSFERRED TO ACCOUNT # 186.1 (c)	EXPENSED DURING YEAR	
			ACCT. (d)	AMOUNT (e)
Rate Case 2005-0148	$ -	$ -	667	$ 85,704
Rate Case 2007			667	$ 36,914
	$ -	$ -	667	-

WATER OPERATING REVENUE

Acct No. (a)	2008 Description (b)	Beginning Year No. Customer (c)	Year End Number Customers (d)	Amounts (e)
	Operating Revenues:			
460	Unmeter Water Revenue			$
461	Meter Water Revenue:			$
461.1	Sales to Residential Customers	73,361	73,666	$ 24,351,516
461.2	Sales to Commercial Customers	4,392	4,336	$ 6,336,052
461.3	Sales to Industrial Customers	111	114	$ 3,257,666
461.4	Sales to Public Authorities	482	486	$ 2,085,366
461.5	Sales to Multiple Family Dwellings	1,587	1,608	$ 3,190,713
461.6	Sales through Bulk Loading Stations			$ 37,910
	Total Metered Sales	79,933	80,210	$ 39,259,223
462	Fire Protection Revenue:			$
462.1	Public Fire Protection			$
462.2	Private Fire Protection	450	450	$ 31,987
	Total Fire Protection Revenue	450	450	$ 31,987
464	Other Sales to Public Authorities			$
465	Sales to			$
466	Sales for Resale	3	4	$ 1,118,527
467	Interdepartmental Sale			$
	Total Sales of Water	80,386	80,664	$ 40,409,737
	Other Water Revenues:			
469	Guaranteed Revenues			$
470	Forfeited Discounts			$ 906,636
471	Miscellaneous Service Revenues			$
472	Rents from Water Property			$ 493,590
473	Interdepartmental Rents			$
474	Other Water Revenues			$ 380,160
	Total Other Water Revenues			$ 1,780,386
	Total Water Operating Revenues			$ 42,190,123

			WATER EXPENSE ACCOUNT MATRIX							
	2008		1	2	3	4	5	6	7	8
Acct No (a)	Account Name (b)	Current Year (c)	Source of Supply & Pumping Expense-Operation (d)	Source of Supply & Pumping Expense-Maintenance (e)	Water Treatment Expense-Operation (f)	Water Treatment Expense-Maintenance (g)	Trans & Distribution Expense-Operation (h)	Trans & Distribution Expense-Maintenance (i)	Customer Accounts Expense (j)	Adminis-Trative & General Expenses (k)
601	Salaries & Wage - Employees	$8,489,680.00			$1,612,521.00	$744,944.00	$954,562.00	$2,291,142.00	$1,735,730.00	$1,150,781.00
603	Salaries & Wage - Officers	$0.00								
604	Employee Pensions & Benefits	$3,431,364.00			$742,609.00	$93,901.00	$717,501.00	$689,460.00	$865,089.00	$522,804.00
610	Purchased Water									
615	Purchased Power	$2,437,335.00	$787,555.00		$186,936.00		$1,284,141.00			$178,703.00
616	Fuel for Power Production	$160,113.00			$152,519.00		$7,594.00			
618	Chemicals	$1,642,807.00			$1,642,807.00					
620	Materials & Supplies	$1,943,629.00			$185,324.00	$214,690.00	$146,985.00	$921,621.00	$268,542.00	$206,567.00
631	Contractual Services - Accounting	$18,820.00								$18,820.00
633	Contractual Services - Engineering	$144,225.00			$3,696.00		$41,862.00	$998.00	$10,881.00	$86,788.00
634	Contractual Services - Mgt. Fees	$84,154.00								$84,154.00
635	Contractual Services - Water Testing	$2,980,197.00	$2,662.00	$31,824.00	$489,501.00	$360,858.00	$32,975.00	$949,952.00	$262,757.00	$849,668.00
636	Contractual Services - Other	$0.00								
641	Rental of Bldg./Real Property	$0.00								
642	Rental of Equipment	$750.00								$750.00
650	Transportation Expenses	$584,310.00			$74,846.00		$55,554.00	$324,289.00	$119,474.00	$10,147.00
656	Insurance - Vehicles	$66,417.00			$10,962.00		$36,755.00		$15,476.00	$3,224.00
657	Insurance - General Liability	$338,411.00			$108,259.00		$179,406.00		$33,831.00	$16,915.00
658	Insurance - Workers Compensation	$109,262.00			$28,607.00		$44,655.00		$25,816.00	$10,184.00
659	Insurance - Other	$109,533.00			$66,909.00					$42,624.00
660	Advertising Expenses	$18,417.00								$18,417.00
666	Regulatory Commission Expense -	$0.00								
	Amortization of Rate Case Expenses	$0.00								
667	Regulatory Commission Expense - Other	$183,052.00								$183,052.00
668	Water Resource Conservation	$0.00								
670	Bad Debt Expense	$602,772.00							$602,772.00	
675	Miscellaneous Expenses	$87,512.00			$7,133.00		$7,354.00	$7,883.00	$12,404.00	$52,738.00
699	Taxes	$0.00			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	Total Water Utility Expenses	$23,432,760.00	$790,217.00	$31,824.00	$5,312,629.00	$1,414,393.00	$3,509,344.00	$5,185,245.00	$3,752,772.00	$3,436,336.00

Pumping and Purchased Water Statistics

2008 a	Water Purchased for Resale (Omit 000's) b	Water Pumped From Plants (Omit 000's) c	Total Water Pumped and Purchased (Omit 000's) d	Water Sold to Customers (Omit 000's) e
January		821,910.0	821,910.0	540,696.5
February		750,664.0	750,664.0	520,232.7
March		789,415.0	789,415.0	893,704.2
April		797,842.0	797,842.0	472,499.8
May		841,826.0	841,826.0	743,434.6
June		949,307.0	949,307.0	628,736.5
July		1,041,792.0	1,041,792.0	631,322.7
August		1,111,851.0	1,111,851.0	607,966.7
September		987,102.0	987,102.0	1,174,240.8
October		907,511.0	907,511.0	773,277.5
November		795,802.0	795,802.0	616,157.4
December		829,275.0	829,275.0	1,009,816.9
Total for year		10,624,297.0	10,624,297.0	8,612,086.3

Maximum gallons pumped by all methods in any one day: 8/4/2008	42,000.0
Minimum gallons pumped by all methods in any one day (Omit 000's): 1/1/2008	23,000.0

If water is purchased for resale, indicate the folloinwg:

Vendor: ________

Point of delivery: ________

If water is sold to other water utilities for redistribution, list names of such utilities below:

		Maximum Daily	Maximum Monthly
Pendleton County Water District @ KY17	000's	576	17,280
Pendleton County Water District @ US27	000's	432	12,960
City of Walton	000's	1,500	45,000
Bullock Pen Water District	000's	600	18,000

G:\css\PumpPurStats31

Sales for Resale (466)

2008

Line	Company	Gallons(000's)	Avg. Rate (Cents)	Amount
1	Pendleton County Water Dist.	95,373.9	2.97/1,000gals	$275,853.83
2	City of Walton	147,761.4	2.97/1,000gals	$431,980.52
3	Bullock Pen Water District	142,398.4	2.97/1,000gals	$410,692.50
4				
5				
6				
7				
8				
Total		385,533.7		$1,118,526.85

WATER STATISTICS

Line	Item	Gallons (000's)
1	**WATER PRODUCED, PURCHASED, & DISTRIBUTED**	
2	Water Produced	10,624,297.0
3	Water Purchased	
4	**TOTAL PRODUCED AND PURCHASED**	10,624,297.0
5		
6	**WATER SALES:**	
7	Residential	4,407,566.7
8	Commercial	1,512,822.9
9	Industrial	926,923.0
10	Irrigation	
11	Resale	385,533.7
12	Other Sales	1,379,240
13	**TOTAL WATER SALES**	8,612,086.3
14		
15	**OTHER WATER USED (estimate portions not metered)**	
16	Utility/water treatment plant	191,491.1
17	Wastewater plant	
18	System flushing	144,435.2
19	Water main breaks/leaks	260,338.0
20	Storage tank overflow	
21	Fire Department	4,033.3
22	Other (construction, flushing, disinfection, ect.)	8,893.3
23	**TOTAL OTHER WATER USED**	609,190.9
24		
25	**UNACCOUNTED-FOR WATER LOSS:**	
26	Line 4 - (Line 13 + Line 23)	1,403,019.8
27		
28	**UNACCOUNTED-FOR WATER LOSS PERCENTAGE**	
29	Line 26 divided by Line 4	13.21%

PLANT STATISTICS

Give the following information:

1 Number of fire hydrants, by size.
2 Number of private fire hydrants, by size.
3 Wheter water supply is river, impounded streams, well, springs, artificial lake or collector type well.
4 Wether supply is by gravity, pumping, or a combination .
5 Type, capacity, and elevation of resrviors at overflow and ground level.
6 Miles of main by size and kind.
7 Types of filters: gravity or pressure, number of units, and total rated capacity in gallons per minute.
8 Type of chlorinators, number of units and capacity in pounds per 24 hours.
9 Station equipment. List each pump separately, giving type and capacity and H.P. of driving unit and character of driving unit (steam, electric, or internal combustion). State whether pump is high or low duty.
10 Quantity of fuel used: coal in pounds, gas in cu. ft., oil in gallons, and electric in KWH .
11 Give a description and total cost of any sizable additions or retirements to plant in service outside the normal system growth for the period covered by this report.
12 Capacity of clear well.
13 Peak month, in gallons of water sold.
14 Peak day, in gallons of water sold.

1) Kenton County 5,858; Campbell County 2,621.

2) 60.

3) Rivers: Ohio River and the Liking River.

4) Plants are pumped; Distribution is combination of pumped and gravity.

5) See attached 31A.

6) See attached 31B.

7) Fort Thomas Treatment Plant
12 - Gravity, each 560 sq. ft. - Rated at 5 gpm/ft2

Taylor Mill Treatment Plant
8 - Gravity, each 270 sq. ft. - Rated at 5 gpm/ft2

Memmorial Parkway Treatment Plant
8 - Gravity, each 612 sq. ft.
Actiflo 24gpm/ft2

8) See attached 31C

9) See attached 31D

10) N/A

11) None

PLANT STATISTICS Cont.

12) Fort Thomas Treatment Plant
1 - 3 million gallons
1 - 3 1/2 million gallons

Taylor Mill Treatment Plant
1 - 3 million gallons

Memorial Parkway Treatment Plant
1 - 1 million gallons

13) August 4, 2008 - 42,000,000gals

14) N/A

Water Sto[illegible] Facilities
Northern Kentucky Water District
Updated: 12-31-2008

Attachment 31A

Storage Location	Address	City Location	Type Of Storage	Year In Service	Structure Height (Feet)	Base Elevation (Feet)	Top Elevation (Feet)	Overflow Elevation (Feet)	Normal Elevation (Feet)	Normal Elevation (Feet)	Diameter (Feet)	Capacity (Gallons)
Aqua Drive	100 Aqua Drive	Cold Spring	Hydropillar		184			1017				2,000,000
Barrington Road	2 Barrington Road	Ft. Wright	Hydropillar	1969	141	916.5	1057.5	1046.7	1045.0	1040.0	74	1,000,000
Bromley	1674 Highwater Road	Bromley	Ground Storage	1966	103	670.0	773.0	764.0	763.0	750.0	75	3,000,000
Dayton Avenue	2816 Dayton St.	Dayton	Ground Storage		50			829.0				500,000
Devon	US 25	Florence	Hydropillar	1991	156	939.5		1082.0		1042.0	100	2,000,000
Dudley Pike	796 Dudley Pike	Edgewood	Ground Storage	1964	59	831.0	889.5	876.0	874.0	866.0	140	5,000,000
Dudley Pike	796 Dudley Pike	Edgewood	Ground Storage	1990	59	831.0	889.5	876.0	874.0	866.0	140	5,000,000
Ft. Thomas Plant	700 Alexandria Pike	Ft. Thomas	Clearwell	1936	31	734.0	765.3	764.5	762.0	760.0		3,000,000
Ft. Thomas Plant	700 Alexandria Pike	Ft. Thomas	Clearwell	1990	35	730.0	778.5	764.5	763.5	757.5	130	3,500,000
Harrison Ave.	2361 Harrison Ave.	Bellevue	Ground Storage		60			829.0				600,000
Ida Spence	Tower Place	Covington	Elevated Tank	1952	175	840.0	1015.0	1005.0	1003.0	1000.0	57	500,000
Independence	5685 Madison Pike	Independence	Hydropillar	1981	137	943.5		1080.0		1039.5	74	1,000,000
Industrial Park	Industrial Rd. & US 25	Florence	Hydropillar	1961	146	945.5	1091.5	1083.5	1081.0	1062.0	50	500,000
John's Hill Road	Knollwood Dr.	Highland Hts.	Elevated Tank		113			1017.0				500,000
Kenton Lands Rd.	26 Kenton Lands Road	Erlanger	Elevated Tank	1953	158	896.0	1054.0	1045.0	1043.0	1033.0	50	500,000
Lumley Tank	R47 Lumley Ave.	Fort Thomas	Elevated Tank	1937	187			1017.0				275,000
Main St. Tank	Main St. & US 27	Alexandria	Elevated Tank	1962	152			1017.0				300,000
Memorial Pkwy. Plant	2055 Memorial Pkwy.	Fort Thomas	Clearwell					741.0				3,000,000
Old St. 4 Tank	Old St. Road #4	Claryville	Elevated Tank	1976	143			1017.0				1,000,000
Rossford Tank	Marion Dr.	Fort Thomas	Elevated Tank	1962	191			1017.0				300,000
South Newport Tank	Kentucky Drive	Newport	Elevated Tank		155			965.0				1,000,000
Taylor Mill Plant	608 Grand Ave.	Taylor Mill	Clearwell		15	509.5	524.5	522.0	520.0	518.0		1,000,000
Taylor Mill Standpipe	5907 Taylor Mill Rd.	Taylor Mill	Standpipe		143			1010.0	130.0	110.0		329,000
Claryville Tank	Old St. Road #4	Alexandria	Elevated Tank	2008	152	864.0		1017.0			66	750,000
								Total storage owned by NKWSD:				36,554,000

Northern Kentucky Water District
PSC Annual Report 2008

Attachment 31B

Size	Type	2007 YTD TOTALS	2007 Miles	2007 Percent	2008 Additions	2008 Retirements	2008 YTD TOTALS	2008 Miles	2008 Percent
2"	Cast Iron	45.00	0.01	0.001%			45.00	0.009	0.001%
3"	Cast Iron	-	-	0.000%			-	0.000	0.000%
4"	Cast Iron	372,101.68	70.47	6.221%	437.00	9,844.00	362,694.68	68.692	6.017%
6"	Cast Iron	1,911,309.74	361.99	31.955%	1,106.00	8,159.00	1,904,256.74	360.655	31.591%
8"	Cast Iron	1,193,431.17	226.03	19.953%	18,400.00	7,160.00	1,204,671.17	228.157	19.985%
10"	Cast Iron	135,106.54	25.59	2.259%			135,106.54	25.588	2.241%
12"	Cast Iron	669,707.48	126.84	11.197%	14,967.00	6,045.00	678,629.48	128.528	11.258%
16"	Cast Iron	293,423.08	55.57	4.906%			293,423.08	55.573	4.868%
18"	Cast Iron	1,949.00	0.37	0.033%			1,949.00	0.369	0.032%
20"	Cast Iron	130,867.79	24.79	2.188%	699.00	926.00	130,640.79	24.743	2.167%
24"	Cast Iron	97,522.00	18.47	1.630%	15,066.00		112,588.00	21.323	1.868%
30"	Cast Iron	28,563.00	5.41	0.478%	736.00		29,299.00	5.549	0.486%
36"	Cast Iron	23,548.21	4.46	0.394%	607.00		24,155.21	4.575	0.401%
42"	Cast Iron	18,523.00	3.51	0.310%			18,523.00	3.508	0.307%
				0.000%					0.000%
20"	Concrete	6,050.00	1.15	0.101%			6,050.00	1.145	0.100%
24"	Concrete	21,530.00	4.08	0.360%			21,530.00	4.077	0.357%
36"	Concrete	35,000.00	6.63	0.585%			35,000.00	6.629	0.581%
				0.000%					0.000%
2"	Galvanizec	375.00	0.07	0.006%			375.00	0.071	0.006%
				0.000%					0.000%
4"	Transite	50,241.00	9.52	0.840%			50,241.00	9.515	0.833%
6"	Transite	94,528.00	17.90	1.580%			94,528.00	17.903	1.568%
				0.000%					0.000%
1 1/2"	Steel	226.00	0.04	0.004%			226.00	0.043	0.004%
2"	Steel	677.00	0.13	0.011%			677.00	0.128	0.011%
4"	Steel	83.00	0.02	0.001%			83.00	0.016	0.001%
6"	Steel	11.00	0.00	0.000%			11.00	0.002	0.000%
8"	Steel	31.00	0.01	0.001%			31.00	0.006	0.001%
10"	Steel	15.00	0.00	0.000%			15.00	0.003	0.000%
12"	Steel	1,681.00	0.32	0.028%			1,681.00	0.318	0.028%
16"	Steel	582.00	0.11	0.010%			582.00	0.110	0.010%
24"	Steel	549.00	0.10	0.009%			549.00	0.104	0.009%
3/4"	Copper	52.00	0.01	0.001%			52.00	0.010	0.001%
1"	Copper	3,787.00	0.72	0.063%			3,787.00	0.717	0.063%
1 1/2"	Copper	4,150.00	0.79	0.069%			4,150.00	0.786	0.069%
2"	Copper	12,648.30	2.40	0.211%			12,648.30	2.396	0.210%
				0.000%					0.000%
1"	Plastic	2,973.00	0.56	0.050%			2,973.00	0.563	0.049%
1 1/2"	Plastic	2,292.00	0.43	0.038%			2,292.00	0.434	0.038%
2"	Plastic	74,396.00	14.09	1.244%	1,645.00		76,041.00	14.402	1.262%
3"	Plastic	108,846.00	20.61	1.820%			108,846.00	20.615	1.806%
4"	Plastic	29,539.00	5.59	0.494%			29,539.00	5.595	0.490%
6"	Plastic	145,941.60	27.64	2.440%	3,210.00	1,531.00	147,620.60	27.958	2.449%
8"	Plastic	501,744.00	95.03	8.389%	20,815.00		522,559.00	98.970	8.669%
12"	Plastic	7,145.00	1.35	0.119%	2,584.00		9,729.00	1.843	0.161%
	TOTAL	**5,979,183.59**		**1,132.80**	**78,265.00**	**31,658.00**	**6,025,790.59**	**1,141.63**	

Northern Kentucky Water District
Chlorinators and Sodium Hypochlorite Feeders In System
Updated 12/31/2008

Attachment 31C

Location	# of Units	Form of Chlorine	Type	Capacity (ea.)
Bromley Pump Station	1	Sodium Hypochlorite	Jesco Pump	1.3 GPH
West Covington Pump Station	1	Sodium Hypochlorite	Jesco Pump	2.8 GPH
Bristow Road Pump Station	1	Sodium Hypochlorite	Jesco Pump	5 GPH
Dudley Pump Station	2	Sodium Hypochlorite	Jesco Pump	12 GPH
Fort Thomas Treatment Plant	8	Sodium Hypochlorite	Watson Marlow	77 GPH
Taylor Mill Treatment Plant	5	Sodium Hypochlorite	Watson Marlow	22.5 GPH
Ohio River Pump Station	4	Sodium Hypochlorite	Milton Roy Max Roy B	195 GPH
Memorial Pky Treatment Plant	1	Sodium Hypochlorite	Watson Marlow	9.1 GPH
	2		Seepex	8 GPH

Booster Pumping Station Facilities
Northern Kentucky Water District
Updated 12/31/2008

Pump Stations

Attachment 31D

PUMP STATION LOCATION	CITY LOCATED	NO. OF UNITS	PUMP TYPE	YEAR INSTALLED	HORSE POWER	VOLTS REQUIRED	PUMP CONTROL	RATING PER PUMP (GPM)	TDH (FEET)	SERVICE TYPE
Ohio River Raw	Brent	1	VT	2005	1250	4160	AUTO	8,400	430	HIGH
Water Pumping		2	VT	2005	1250	4160	AUTO	8,400	430	HIGH
Station #1		3	VT	1997	1250	4160	AUTO	8,400	430	HIGH
		4	VT	2009	1250	4160	AUTO	8,400	430	HIGH
(Feeds FTTP)		5	VT	1999	1250	4160	AUTO	8,400	430	HIGH
		6	VT	2005	1250	4160	AUTO	9,000	430	HIGH
Latonia Ave.	Covington	1	HC	2007	75	440	AUTO	700	400	HIGH
and 35th St.	(Const. 1953)	2	HC	2008	75	440	AUTO	700	400	HIGH
Bromley	Bromley	1	VT	1968	60	440	AUTO	500	340	HIGH
		2	VT	1986	75	440	AUTO	700	315	HIGH
		3	VT	1986	75	440	AUTO	700	340	HIGH
Licking River Raw	Taylor Mill	1	VT	1990	350	440	AUTO	8333	126	LOW
Water Pumping		2	VT	1971	250	440	AUTO	6250	126	LOW
Station		3	VT	1993	150	440	AUTO	4900	94	LOW
Taylor Mill	Taylor Mill	1	VT	2001	600	2300	AUTO	6945	250	HIGH
Treatment		2	VT	1954	450	2300	AUTO	3472	385	HIGH
Plant		3	VT	1997	700	2300	AUTO	3472	385	HIGH
		4	VT	1974	1250	2300	AUTO	6945	490	HIGH
		5	VT	1974	1250	2300	AUTO	6945	490	HIGH
		6	VT	1982	600	2300	AUTO	6945	250	HIGH
Dudley Pike	Edgewood	1	VT	1965	250	440	AUTO	2825	270	HIGH
1040 System		2	VT	1965	250	440	AUTO	2825	270	HIGH
		3	VT	1965	250	440	AUTO	2825	270	HIGH
		4	VT	1979	250	440	AUTO	2222	375	HIGH
Dudley Pike	Edgewood	5	VT	1990	600	460	AUTO	6000	282	HIGH
1080 System		6	VT	2007	600	460	AUTO	6000	282	HIGH
		7	VT	2008	600	460	AUTO	6000	282	HIGH
		8	VT	2006	600	460	AUTO	5000	282	HIGH
Richardson Rd.	Independence	1	VT	1981	400	440	AUTO	2100	515	HIGH
		2	VT	2001	400	440	AUTO	2100	515	HIGH
		3	VT	1998	400	440	AUTO	2100	515	HIGH
Hands Pike	Covington	1	VT	1983	75	440	AUTO	500	426	HIGH
		2	VT	1983	75	440	AUTO	500	426	HIGH
West Covington	Covington	1	VC	1987	40	440	AUTO	1600	60	LOW
		2	VC	1987	40	440	AUTO	1600	60	LOW
Bristow Rd.	Independence	1	VT	2002	75	480	AUTO	2900	65	LOW
		2	VT	2002	75	480	AUTO	2900	65	LOW
(Peerless Pumps)		3	VT	2002	75	480	AUTO	2900	65	LOW
Newport PS	Fort Thomas	1	VT	2000	500	440	AUTO	4200	372	HIGH
Variable Speed		2	VT	2000	500	440	AUTO	4200	372	HIGH
		3	VT	2000	500	440	AUTO	4200	372	HIGH
US 27 10 MGD	670 Alex. Pk.	1	VT	1990	350	440	AUTO	3500	300	HIGH
	Fort Thomas	2	VT	1990	350	440	AUTO	3500	300	HIGH
		3	VT	1990	350	440	AUTO	3500	300	HIGH
		4	VT	2006	350	440	AUTO	3500	300	HIGH
		5	VT	2006	350	440	AUTO	3500	300	HIGH
		6	VT	2006	350	440	AUTO	3500	300	HIGH
Ripple Creek	Cold Spring	1	VC	1991	75	440	AUTO	2050	100	LOW
		2	VC	2008	75	440	AUTO	2050	100	LOW
		3	VC	2007	75	440	AUTO	2050	100	LOW
Ohio River Raw	Fort Thomas	1	VT	1987	800	2400	AUTO	5500	365	HIGH
Water Pumping		2	VT	1999	800	2400	AUTO	5000	365	HIGH
Station #2		3	VT	2002	800	2400	AUTO	4000	365	HIGH
(Feeds MPTP)										
Memorial Parkway	Fort Thomas	1	VC	2008	75	440	AUTO	3575	64	LOW
Treatment Plant		2	VC	2008	200	440	AUTO	5300	64	LOW
Raw Water Pumps		3	VC	2008	200	440	AUTO	5300	64	LOW
Carothers Rd.	Newport	1	VT	1996	150	460	AUTO	1800	263	HIGH
Pump Stn.		2	VT	1996	150	460	AUTO	1800	263	HIGH

OATH

Common wealth of Kentucky):
County of Kenton): SS:

Jack Bragg, CPA makes oath and says

that he is Vice President of Finance of

Northern Kentucky Water District ;

that it is his duty to have supervision over the books of account of the respondent and to control the manner in which such books are kept; that he knows that such books have, during the period covered by the foregoing report, been kept in good faith in accordance with the accounting and other orders of the Public Service Commission of Kentucky, effective during the said period; that he has carefully examined the said report and to the best of his knowledge and belief the entries contained in the said report have, so far as they relate to matters of account, been accurately taken from the said books of account and are in exact accordance therewith; that he believes that all other statements of fact contained in the said report are true; and that the said report is a correct and complete statement of the business and affairs of the above-named respondent during the period of time from and including

January 1, 2008 to and including December 31, 2008

Signature of official

Subscribed and sworn to before me, a NOTARY PUBLIC in and for the

State and County above named, this 27 day of March, 2009.

(Apply Seal Here)

My commission expires: 5-9-2011

(Signature of officer authorized to administer oath)

Case No. 2010-________
Exhibit ____F____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

SCHEDULE OF MORTGAGES, BONDS, NOTES, AND OTHER INDEBTEDNESS

Northern Kentucky Water District
Schedule of Outstanding Debt
As of December 31, 2009

Description		Amount
Bonds		
1997		2,830,000
1998		8,725,000
2000 Rural Development Loan		2,085,000
2001		14,595,000
2002 A		42,905,000
2002 B		6,615,000
2003 A		1,400,000
2003 B		25,050,000
2003 C		16,300,000
2004		9,040,000
2006		27,230,000
2009		28,290,000
Total Bonds	**$**	**185,065,000**
Notes		
KIA Loans		10,839,068
Taylor Mill purchase note	$	1,450,000
Deferred note payable		100,000
BAN 2009		29,160,000
Total Notes	**$**	**41,549,068**
Total Debt	**$**	**226,614,068**

Case No. 2010-____
Exhibit ____G____

NORTHERN KENTUCKY WATER DISTRICT

Project
Fort Thomas Treatment Plant
Advanced Treatment Facility

Campbell County
184-0447

CURRENT BALANCE SHEET AND INCOME STATEMENT

Northern Kentucky Water District
Balance Sheet
As of January 31, 2010

	2010	2009
ASSETS		
CURRENT ASSETS		
Cash and Cash Equivalents	$171,982	$12,012,339
Accured Interest Receivable	6,971	
Accounts Receivable		
Customers	(909,553)	4,054,659
Unbilled Customers		4,700,000
Other	(17,261)	88,782
Assessments Receivable		82,711
Inventory Supplies for New Installation and Maintenance, at Cost	(68,452)	1,246,293
Prepaid Items	219,587	207,574
TOTAL CURRENT ASSETS	(596,726)	22,392,358
RESTRICTED ASSETS		
Boone/Florence Settlement Account	455	2,427,856
Bond Proceeds Fund	(823,788)	13,969,360
Debt Service Reserve Account	10,496,743	15,518,357
Debt Service Account	(9,217,840)	1,252,430
Improvement, Repair & Replacement	(919,917)	2,149,237
TOTAL RESTRICTED ASSETS	(464,347)	35,317,240
NONCURRENT ASSETS		
Miscellaneous Deferred Charges	(109,023)	9,370,070
Capital assets:		
Land, System, Buildings and Equipment	137,920	289,484,685
Construction in Progress	(516,434)	40,326,498
Total capital assets before accumulated depreciation	(378,514)	329,811,183
Less Accumulated Depreciation	(676,760)	(70,087,052)
Total capital assets before accumulated depreciation	(1,055,274)	259,724,131
TOTAL NONCURRENT ASSETS	(1,164,297)	269,094,201
TOTAL ASSETS	(2,225,370)	326,803,799

Northern Kentucky Water District
Balance Sheet
As of January 31, 2010

	2010	2009
LIABILITIES AND RETAINED EARNINGS		
CURRENT LIABILITIES		
Current Portion of Long Term Debt		($666,452)
Accounts Payable	(253,511)	1,998,087
Accured Payroll & Liabilities	62,708	174,721
Other Accrued Liabilities	(106,744)	91,915
TOTAL CURRENT LIABILITIES	(297,547)	1,598,271
CURRENT LIABILITIES PAYABLE FROM RESTRICTED ASSETS		
Accounts Payable	(2,255,794)	1,157,342
Accured Interest Payable	763,046	(21,935)
TOTAL CURRENT LIABILITIES PAYABLE FROM RESTRICTED ASSETS	(1,492,748)	1,135,407
LONG-TERM DEBT		
Long-Term Portion of Bonded Indebtedness		189,284,487
Bond Anticipation Notes Payable		
Note Payable - Taylor Mill		1,450,000
Deferred Note Payable		100,000
TOTAL LONG-TERM DEBT		190,834,487
TOTAL LIABILITIES	(1,790,295)	193,568,165
Unrestricted Retained Earnings	(435,071)	104,384,642
TOTAL NET ASSETS	(435,071)	133,235,634
TOTAL LIABILITIES AND NET ASSETS	(2,225,366)	326,803,799

Northern Kentucky Water District
Revenue Actual to Actual
For the Month Ending January 31, 2010

Acct. #	Description	January 2010	January 2009	Variance	YTD 2010	YTD 2009	Variance
	Revenue						
(461 TO 466...	Water Sales	$2,727,980	$2,933,102	7%	$2,727,980	$2,933,102	7%
(470 TO 470)	Forfited Discounts	76,205	77,688	2%	76,205	77,688	2%
(4720001000...	Rents from Water Property	32,997	23,226	(42%)	32,997	23,226	(42%)
(471 TO 471...	Other Water Revenues	10,380	23,900	57%	10,380	23,900	57%
	Total Operating Revenues	2,847,562	3,057,916	7%	2,847,562	3,057,916	7%
	Non-Operating Income						
4190001000 ...	Interest Income	72,840	80,733	10%	72,840	80,733	10%
(474 TO 474...	Miscellaneous	23,528	967	(2,333%)	23,528	967	(2,333%)
	Total Non-Operating Income	96,368	81,700	(18%)	96,368	81,700	(18%)
	Total Revenues	2,943,930	3,139,616	6%	2,943,930	3,139,616	6%

Northern Kentucky Water District

Balance Sheet
As of November 30, 2009

Assets	2009	2008
Current Assets		
Cash and Cash Equivalents	$9,976,159	$11,072,942
Accrued Interest Receivable	$51,437	$0
Accounts Receivable Customers	$3,721,199	$4,247,014
Accounts Receivable Unbilled Customers	$4,700,000	$4,200,000
Accounts Receivable Other	$12,298	$10,135
Assessments Receivable	$82,711	$77,906
Inventory Supplies for New Installation and Maintenance, at Cost	$1,026,307	$1,186,276
Prepaid Expenses	$86,832	$153,625
Total Current Assets	**$19,656,943**	**$20,947,898**
Restricted Assets		
Bond Proceeds Fund	$38,949,956	$15,829,195
Debt Service Reserve Account	$16,601,821	$13,445,608
Debt Service Account	$8,838,193	$9,585,271
Improvement, Repair, & Replacement	$305,626	$2,660,954
Boone/Florence Settlement Account	$2,429,820	$2,862,493
Total Restricted Assets	**$67,125,416**	**$44,383,521**
Non Current Assets		
Miscellaneous Deferred Charges	$8,701,263	$9,002,973
Capital Assets:		
Land, System, Buildings, and Equipment	$291,577,553	$284,718,119
Construction in Progress	$57,444,324	$41,371,802
Total Capital Assets before Accumulated Depreciation	$349,021,877	$326,089,921
Less: Accumulated Depreciation	($76,590,152)	($70,702,366)
Capital Assets Net of Accumulated Depreciation	$272,431,725	$255,387,555
Total Noncurrent Assets	**$281,132,988**	**$264,390,528**
Total Assets	**$367,915,347**	**$329,721,947**

Northern Kentucky Water District

Balance Sheet
As of November 30, 2009

Liabilities and Retained Earnings	2009	2008
Current Liabilities		
Current Portion of Long Term Debt	$6,778,381	$6,025,000
Accounts Payable	$1,650,002	$1,574,519
Accrued Payroll & Liabilities	$367,503	$173,501
Other Accrued Liabilities	$82,696	$100,151
Total Current Liabilities	**$8,878,582**	**$7,873,171**
Current Liabilities From Restricted Assets		
Accounts Payable	$2,180,009	$1,340,500
Accrued Interest Payable	$2,669,516	$2,530,444
Total Current Liabilities From Restricted Assets	**$4,849,525**	**$3,870,944**
Long Term Debt		
Long Term Portion of Bonded Indebtedness	$188,864,489	$160,185,888
Bond Anticipation Notes Payable	$29,160,000	$27,165,000
Note Payable-Taylor Mill Purchase	$1,275,000	$1,375,000
Deferred Note Payable	$100,000	$100,000
Total Long Term Debt	**$219,399,489**	**$188,825,888**
Total Liabilities	**$233,127,596**	**$200,570,003**
Retained Earnings	**$134,787,751**	**$129,151,944**
Total Liabilites and Retained Earnings	**$367,915,347**	**$329,721,947**

CASE NO: 2010-00093

CONTAINS

LARGE OR OVERSIZED

MAP(S)

RECEIVED ON: February 26, 2010