JOHN N. HUGHES
ATTORNEY AT LAW
PROFESSIONAL SERVICE CORPORATION
124 WEST TODD STREET
FRANKFORT, KENTUCKY 40601

Telephone: (502) 227-7270 **jnhughes@johnnhughespsc.com**

October 13, 2015

Mr. Jeff Derouen
Executive Director
Public Service Commission
211 Sower Blvd.
Frankfort, KY 40601

Re: Northern Kentucky Water District:
Case No. 2015-00324

Dear Mr. Derouen:

Northern Kentucky Water District submits its response to the Commission's letter of October 13, 2015. I certify that the electronic filing is a complete and accurate copy of the original documents to be filed in this matter, which will be filed within two days of this submission.

If you have any questions about this matter, please contact me.

Very truly yours,

John N. Hughes

John N. Hughes

Attorney for Northern Kentucky
Water District

(1) 807 KAR 5:001, Section 15(2)(a) - The facts relied upon to show that the proposed construction or extension is or will be required by public convenience or necessity.

Northern Kentucky Water District: "2008 Asset Management Program Update"

A. Executive Summary - See pages E-5;
B. Identified Needs and Improvements – See p. 4-25
C. Hydraulic Model Update – See p.1-28

Madison Pike from Mary Laidley to Hands Pike 24 inch Hydraulic Redundancy Project (Phase 1), Covington, Kenton County, Kentucky
184-0731

Project Description:

The District's Water Distribution System Master Plan has identified the need for a hydraulic improvement project along Madison Pike from Dudley Road to Hands Pike, which is broken down into three phases. This overall project is designed to improve flows to the Richardson Road Pump Station and southern end of Kenton County and is in anticipation of a future 1080 pump station. This improvement will also help strengthen and improve redundancy to the industrial area along Madison Pike.

This project involves the construction/installation of approximately 5,610 linear feet of 24-inch Class 50 ductile iron pipe, approx. 146 linear feet of 20-inch/12-inch/8-inch Class 50 ductile iron pipe, together with fire hydrants, valves, fittings, appurtenances and related work along Madison Pike from Mary Laidley to Hands Pike in the City of Covington, Kenton County Kentucky.

Bids for this project were opened on September 3, 2015 and are subject to acceptance for 90 days. Therefore, the bids will expire on December 1, 2015

NKWD ASSET MANAGEMENT PROGRAM UPDATE -2008

EXECUTIVE SUMMARY

ES.1. Purpose and Scope of Project

The Northern Kentucky Water District (NKWD) serves over 80,000 accounts in Campbell and Kenton Counties, including retail accounts and wholesale agreements. The most recent expansions of the NKWD service area included the acquisitions of the water system from the City of Newport in 2002 and the water system from the City of Taylor Mill in 2004. Recognizing the need to proactively and cost effectively manage its growing infrastructure base and sustain a high level of customer service; NKWD adopted a formal Asset Management Program in 2004, which established base-line condition assessment data for all above ground assets, provided a preliminary assessment of the overall water distribution system and resulted in a 5-year and 20-year capital improvement program.

The goal of this Asset Management Program (AMP) Update is to integrate the on-going planning for capacity and regulatory needs with an update of the 2004 Asset Management Program. This AMP Update provides a comprehensive planning document for the prioritized and coordinated implementation of all required initiatives within a phased capital improvement program. Key elements of this AMP update include the following:

- Update to the current water distribution hydraulic model including; the allocation of current and projected future water demands, storage requirements, pumping requirements and distribution piping hydraulic improvements through 2030.
- Evaluation of requirements for all three water treatment plant including; raw water intake and pumping, treatment needs and asset renewal and replacement needs.
- Evaluation of water distribution system pumping stations and storage tanks for asset renewal and replacement needs.
- Further evaluation of the water distribution system for renewal and replacement program development.
- Further development of the overall asset management "road map" focusing on condition assessment methods, asset criticality, performance measures, data management, reporting needs and O&M practices, which can guide subsequent updates.
- Review of current information technology tools and development of recommendations for the phased implementation of technology improvements to support and sustain the asset management program.

- Assessment of potential rate impacts in the development of alternatives for the minimum, moderate and aggressive 5-year and 20-year capital improvement programs.
- This AMP Update provides the final 5-yr and 20-yr capital improvement program recommendations consistent with the Northern Kentucky Water District's vision, mission and overall business objectives.

ES.2. Hydraulic Model Update and Analysis

The hydraulic model update included a full model calibration to replicate average day and maximum day demand conditions observed in 2007. The model was then used for several analyses to identify improvements for the existing system and for the planning horizons of 2020 and 2030. These analyses were conducted under average and maximum demand conditions to determine deficiencies in pumping, storage, and pipe capacity. An overall existing system storage and pumping gap analysis was also conducted.

ES.2.1. Population and Demand Projections

Key findings from this effort include the following:

- Supply to wholesale customers is not expected to increase more than 3% a year. These customers used the following amount of water in 2006:
  - City of Walton - 500,000 gpd
  - Bullock Pen Water District – 280,000 gpd
  - Pendleton County Water District – 250,000 gpd
- Population projections indicate that during the planning period through 2030, the average annual increase in population will be about 2.4%.
- Based on area planning information, the District is expected to add about 12,700 accounts through year 2020 and another 10,500 between 2020 and 2030. This number is also less than 3% a year.
- The peaking factor for average day to maximum day demand for this plan is 1.60. While average day demands heavily influence annual operating costs, the size of treatment, pumping, and storage facilities are designed to meet maximum day demand. This slight reduction in the peaking factor from the previous plan means that proposed expansions can generally be postponed for several years.
- Total demand increases about 2% a year.
- Existing treatment capacity is sufficient to meet 2020 demands.

The projected average day and maximum day demands are presented in the table below:

Demand Projections		
Year	Average Day, MGD	Maximum Day, MGD
2006	28.58	43.15
2010	30.86	48.57
2020	36.59	57.74
2030	41.44	65.50

ES.2.2. Treatment Capacity Expansion

An expansion of Memorial Parkway Treatment Plant to at least 15 MGD (up to 20 MGD) is recommended prior to year 2030. The expansion to Memorial Parkway Treatment Plant will include the addition of another ACTIFLO® train and gravity thickener, and replacement of an existing pump with a larger pump at the Reservoir Pump Station plus replacement of the Reservoir Pump Station discharge line with a 24 inch main. The chemical feed pumps would need to be upgraded to feed additional chemical. One 10 MGD pump would also be added to Ohio River Pump Station No. 2.

ES.2.3. Pumping and Storage Analysis

Key findings from this effort include the following:

- All pump stations have sufficient capacity to meet existing demand requirements. The Ripple Creek Pump Station serving southern Campbell County will not be capable of supplying 2020 demand projections and beyond.
- The combined volume from the Rossford and Lumley Tanks serving the 1017 pressure zone north of the Fort Thomas Treatment Plant are currently undersized to provide storage for meeting recommended volumes for consumption, emergency and fire flows, and equalization. These tanks are filled from the US 27 Pump Station (takes water from Fort Thomas Treatment Plant) and Waterworks Road Pump Station (takes water from Memorial Parkway Treatment Plant). Because of the dual plant supply and the fact that the US 27 Pump Station has a backup power generator, the gap in recommended storage volume is not alarming.
- There is currently a storage gap in the 1080 areas in southern Kenton County that are served by the Industrial, Independence, and Devon Tanks. Having a backup power generator to reliably supply water from Dudley 1080 Pump Station that draws water from the 10 million gallon Dudley Tanks greatly mitigates any immediate concern.
- In addition to the areas discussed above where the present gap increases with added customer demand, the Southern Campbell County area will also have a storage shortfall in year 2020 and beyond.

- The pumps at Bristow Road, Richardson Road, and West Covington Pump Stations do not operate at their best efficiency points. The pumps may have been selected to meet higher demand conditions or improvements to the system piping may have resulted in lower head conditions. This means that a different pump could use less power than the current pumps. The District should consider replacing these pumps with pumps that are better suited to the system conditions when the pumps have reached the end of their useful life or when power savings are sufficient to justify the cost of a new pump.
- The 1010 pressure zone supplied by regulators fed from the 1040 and 1080 pressure zones shows a number of areas where pressures can fall below 35 psi. Until recommended improvements are made, the District should closely monitor the pressure regulator settings and water level in the Taylor Mill Standpipe to help address this condition.

ES.2.4. Recommended Hydraulic Improvements

Recommendations to the existing system to meet projected demands and address existing or future hydraulic concerns include:

Storage Tanks:

- Replace the existing Rossford and Lumley with increased storage volume totaling 1 million gallons. The District will need to decide if one larger tank at the Rossford Tank site or two separate tanks at the existing sites will be maintained. Having two tanks in each pressure zone is helpful and sometimes required for redundancy, particularly when a tank needs to be taken out of service for maintenance. The District should be able to construct a new tank adjacent to the existing Rossford Tank. The Lumley location, however, poses challenges because the property was formerly used as a dump site and is presently used for parking by the City of Ft. Thomas.
- Build a new 1 million gallon tank east of Independence between 2015 and 2020. As this area is already quite developed, the District should consider locating and securing property for this tank around Stephens Road and Taylor Mill Road.
- Build a new 1 million gallon tank in Southern Campbell County between 2015 and 2020. The District should consider locating and securing property for this tank in the vicinity of AA Highway and Lick Hill. The Main Street Tank may be retired for water quality reasons when this new tank is in place.
- Between 2015 and 2020, retire the Taylor Mill Standpipe and convert the 1010 Taylor Mill area to 1040 pressure zone. The District should consider locating and securing property for this tank in the vicinity of the existing standpipe.
- Build a new 1 million gallon tank in Southern Kenton County near Walton between 2025 and 2030.

Pumping Stations:

- Add flow meters for each individual pump at all new pump stations.
- Replace Richardson Road Pump Station with a larger station along KY 17 between 2015 and 2020. The Hands Pike Pump Station could be retired at the same time, although redundancy is desirable in emergencies. The District should identify potential locations for this station and consider procuring the site should the opportunity arise.
- Add variable frequency drives to the pumps at US 27 Pump Station between 2015 and 2020.
- Replace the Ripple Creek Pump Station with a larger station between 2015 and 2020. The existing site may be larger enough to accommodate a new station, but the District should review the site and determine if additional property should be secured.
- Add VFDs at the Dudley 1080 and 1040 Pump Stations and two of the pumps at US 27 Pump Station.
- Between 2025 and 2030, build a new pump station from downtown Newport to downtown Covington for a merged 741 and 763 pressure zone that can be supplied by both Fort Thomas and Memorial Parkway Treatment Plants.

Piping Improvements:

- Add flow meters to the gravity discharge mains from Fort Thomas and Memorial Parkway Treatment Plants.
- By 2020, build a 24 inch pipe upstream and downstream of the existing Richardson Road Pump Station and proposed KY 17 Pump Station along Madison Pike to the new tank east of Independence.
- Build additional piping capacity upstream and downstream of the Ripple Creek Pump Station by 2020.
- Construct piping along AA Highway from Highway 547 and California Cross Roads to the new tank in Southern Campbell County by 2020.
- Between 2025 and 2030, build three miles of 24 inch main and two miles of 16 inch main to serve the South County and Claryville Tanks in Southern Campbell County.

ES.3. Asset Management

The renewal and replacement (R&R) of assets based on the condition and criticality of the asset was the focus of this effort. Approximately 1,600 above-ground assets were assigned to a priority grouping for planning based on their score. Group 1 and 2 assets

are the highest priority and were considered for inclusion within a 5-year period. Groups 3 and 4 are lower priority and were placed in the 20-year period. Groups 5 are lowest priority and were not included in the 20-year planning horizon. For the above-ground assets, approximately 60% are located at treatment plants, 20% are tanks, and 20% are pump stations.

ES.3.1. Condition Assessment for Existing Assets

Key findings of the condition assessment and asset evaluation are summarized below:

Above-Ground Assets

- The majority of assets are in good or very good condition.
- Assets should be replaced on the following schedule:
    - 10% fall within 3 to 5 years (it should be noted that the new chemical building and filter improvements at Memorial Parkway Treatment Plant has since addressed most of these items).
    - 15% fall within 6 to 10 years.
    - 30% fall within 10 to 20 years.
    - 40% fall beyond 20 years.
- Larger projects were identified as specific projects for the 5-year capital improvement projects through year 2030.
- An annual R&R fund was established to address a number of smaller projects each year.

Below-Ground Assets

- The American Water Works Association recommends a pipe break/leak rate of no more than 30 per 100 miles per year.
    - The District averaged 42 breaks/leaks per 100 miles per year for 2003 to 2007. The District is also above the median rate of 33 breaks/leaks per 100 miles per year by a national survey of utilities;
    - Approximately 50% of the distribution system piping meets this rate. The most reliable materials include PVC, ductile iron wrapped with polyethylene, and polyethylene pipe.
    - Approximately 50% of the distribution system piping does not meet this rate. The most failures occurred in cast iron and unwrapped ductile iron followed by asbestos cement and concrete.
- Achieving 30 breaks/leaks per 100 miles per year is estimated to require an expenditure of $76.8 million by targeting 120 miles of main having the highest breaks.

ES.3.2. Recommended R&R Improvements for Existing Assets

A list of the major facilities and recommendations for doing capital improvements to address aging infrastructure through the 5-year budget or the Annual R&R budget are listed below:

Raw Water Supply:

- Ohio River Pump Station No. 1 – address small items through Annual R&R Fund including adding a potable water line for lubrication of pumps, chemical make-up water, equipment washdown, and restroom use; and adding an air handling unit to cool the electrical equipment room.
- Ohio River Pump Station No. 2 – replace the entire station in 2015.
- Licking River Pump Station – add generator and miscellaneous improvements by 2015, and add a dewatering pump for the wetwell.

Treatment Plants:

- SCADA and Security – replace all plant and distribution system SCADA and security systems.
- Building, Mechanical, and Electrical Systems – replace general facility and system needs through the Annual R&R. Building items may include masonry tuck pointing, replacement of roofs and flashing, patching and painting walls, and replacement of tile/skylights/doors/windows. Site items may include driveways and walkways, fencing, and storm water drainage. Mechanical systems may include plumbing, fire protection, air handling and cooling, heating, and dehumidification. Electrical may include analytical instruments, security systems, and power distribution inside the plant.
- Fort Thomas:
    - Replace and upgrade residuals handling system (pumps, belt conveyors, presses, polymer feed, add third bay to dumpster area, upgrade HVAC, add two flow equalization tanks ahead of presses, upsize recycle line and incoming settled water line, and add a plate settler housed in a building to remove solids prior to returning to the reservoir or allowing discharge under a KPDES permit);
    - Renovate by replacing media and installing air scour backwash (note this was completed in 2011) and repair walls;
    - Replace filter backwash tank (may not be needed after installation of new backwash pumps as part of Advanced Treatment);
    - Repair deteriorating concrete walls in flocculation/sedimentation basins (No. 2 and No. 3) and upgrade to 3-stage flocculation.
    - Install an emergency generator for the laboratory;
    - Replace the raw water line to the South reservoir with a new 36" pipe;

- Replace filter valves and actuators;
- Rehabilitate or replace chemical feed systems;
- Upgrade HVAC in sludge pump room;
- Relocate copper sulfate feed system closer to feed point to minimize clogging (first investigate quality of chemical to see if performance could be enhanced by different product);
- Replace nine 30" raw water valves in the yard piping;
- Replace valves on outlet side of clearwell with SCADA controlled, electrically actuated valves to prevent large loss of water in an emergency;
- Replace fan in fluoride room with a larger unit to increase air changes and reduce corrosion (or add another fan);
- Replace laboratory equipment;
- Replace electrical components as indicated by evaluation.

- Memorial Parkway:
  - Replace suction and discharge piping for Reservoir Pump Station;
  - Remove solids from North and South Reservoirs by dredging (equipment purchase would be capitalized, but contractor services or in-house labor would be an O&M expense);
  - Upgrade residuals handling system by adding a gravity thickener, replacing 3 sludge pumps with positive displacement pumps, modify truck loading area roof height for dumpster, and modifications to holding tank and electrical improvements;
  - Rehabilitate or replace chemical feed systems;
  - Rehabilitate or replace the 24" raw water piping located in the tunnel below the old Chemical Building area;
  - Replace raw and finished water valves in yard piping;
  - Demolish or renovate old Chemical Building;
  - Replace actuators on Filters 4, 5, and 6 (note this is part of the Advanced Treatment project);
  - Replace electrical components as indicated by evaluation.

- Taylor Mill:
  - Replace filter control system (includes panels and programmable logic control);
  - Replace rapid mixing, flocculation basins, and sedimentation basins;
  - Replace sludge conveyor and belt filter press and make repairs to dumpster room;
  - Rehabilitate or replace chemical feed systems;
  - Replace electrical components as indicated by evaluation.

Pump Stations:

- Replace valves and actuators in Taylor Mill PS;
- Replace up to 4 pumps in Dudley 1040 PS;

- Replace all 6 pumps in Taylor Mill PS (4 pumps in first phase and 2 pumps in second phase);
- Replace all 3 pumps at Bromley PS, chlorine feed system (if still needed for maintaining residual), valves, actuators, and various electrical and security improvements;
- Replace motor control centers and upgrade electrical, mechanical, and lighting systems at Dudley 1040 PS;
- Replace pumps, motors, motor control centers, and electrical upgrades at Carothers Road PS;
- Replace pumps and install new VFDs at Bristow Road PS;
- Replace motor control centers and upgrade electrical, mechanical, and lighting systems at Dudley 1080 PS;
- Replace motor control centers and upgrade electrical, mechanical, and lighting systems at Latonia PS (if not retired with Ida Spence Tank);
- Replace motor control centers and upgrade electrical, mechanical, and lighting systems at Waterworks Road PS and add an emergency generator;
- Replace motor control centers and upgrade electrical, mechanical, and lighting systems at US 27 PS.

Tanks:

- Inspection – a schedule for conducting maintenance inspections after coating a tank was developed which includes a 5-year and 10-year post coating inspection. The 10-year inspection will be more detailed and will indicate whether a renovation or re-painting project needed, typically within 5 to 10 years following the 10-year inspection.
- Install isolation valves on Dudley Tanks to keep the tanks from rapid water loss that could occur from a large water main break;
- Replace Bellevue Tank (or rehabilitate if suitable);
- Replace Dayton Tank (or rehabilitate if suitable);
- Replace Lumley Tank (or retire with addition of larger Rossford Tank);
- Replace Ida Spence Tank (or retire it and Latonia PS and serve from 1040 system);
- Replace Kenton Lands Tank.

ES.3.3. Recommendations for Asset Management Program

It is recommended the District incorporate into its asset management program the recommendations provided below:

Program:

- Develop a modified hierarchy of assets in accordance with the format outlined in this report.
- Use the same asset ID for work order system, financial system, and asset management system.
- Considering the magnitude of upcoming capital program for adding advanced treatment and the need to address water main R&R, a minimal staffing review is recommended particularly considering the record high number of overtime hours reported in 2007.
- Review performance using the following eight performance measures:
    1. Service and Reliability
        - Total Water Main Breaks/Leaks
        - Total Water Quality Complaints
        - Low Water Pressure Events
    2. Regulatory Compliance
        - Total Water Quality Incidents/Failure of Safe Drinking Water Act Standards (Primary and Secondary)
    3. Financial and Business Operations
        - Total Percent of Non-Revenue Water
        - O&M Cost Ratio (O&M cost per account and per MGD processed)
    4. Operations and Maintenance
        - Planned Maintenance Ratio (scheduled vs. unscheduled) for Distribution, Pump Stations, and Plants
        - Total Miles of Water Mains Flushed (planned to actual and percent of system per year)

Above-Ground Assets:

- Develop a comprehensive condition assessment data collection form for specific types of assets and link to the work order system;
- Add the following fields to the Antero database and populate with available information and update by periodic inspections:
    - installed date;
    - installed cost;
    - estimated remaining useful life;
    - replacement cost;
    - criticality;
    - physical condition;
    - performance condition;

- For the performance condition rating (i.e. how well is the asset doing its job) need to assess its ability to:
    - Meet capacity;
    - Comply with regulations;
    - Perform reliably without breakdown;
    - Run without abnormal maintenance;
    - Find repair parts;
- Consider a separate work order type for all predictive maintenance types (e.g. similar to PUMPVIB task for pump vibration monitoring) which will allow tracking time spent on each asset;
- Prepare reports to:
    - Track corrective maintenance identified and completed as a result of scheduled preventative maintenance;
    - Review asset condition versus effective useful life by criticality (prioritize assets in worst condition that are beyond their expected life and are also a critical asset);
    - Determine maintenance cost per asset replacement value;
    - Identify mean time between asset failures;
- Review updates to new releases of the Antero and Operator 10 software from AllMAX;
- Consider upgrades to Operator 10 that will allow operator log sheets to be managed in the software instead of Excel;
- Integrate SCADA with Antero to automate comparison of equipment run-time recorded in SCADA with vibration analyses delivered from hand-held units;
- Add an electronic link to Antero to notify user that a Standard Operating Guideline exists for a particular task.

Below-Ground Assets:

- Review records and add information where it may be missing for installed date, material type, and lining;
- Consider implementing cathodic protection for new and to retrofit existing pipe and consult with a corrosion engineer to develop guidance;
- Establish internal improvement goals with the next AMP update based on recommended benchmarks and budget constraints;
- Focus R&R program on most unreliable cast iron pipe while also performing strategic replacement (or rehabilitation) of unwrapped ductile iron;
- Correct inconsistencies in pipe identification and numbering in work orders;

- Develop a Standard Operating Guideline for capturing information from mapping and updating GIS, and require as-built information from contractors and electronic record drawings from engineers;
- Consider implementing a leak detection program and utilize data to prioritize water main R&R program;
- Consider implementing a valve exercising program on a limited basis, subject to resource availability, to focus on the most reliable mains which will not be targeted for replacement.

ES.3.4. Recommendations for Additional Studies

It is recommended the District perform the following studies as part of its O&M budget:

- Electrical Systems Evaluation - evaluate power distribution systems at all 3 treatment plants as an electrical failure inside the plant would be crippling to the treatment and supply process.
- Surge Analysis – conduct a computer model surge analysis for ORPS1 to verify that the existing surge relief valve will perform as intended following a power failure. If the analysis indicates a problem, the surge valve should be converted from a pressure relief design to a surge relief design. It is also recommended that sediment protection features be added to the surge valve to help prevent possible clogging from silt.
- Pipe Corrosion Soils Analysis – implement a program to perform corrosion testing at water main break locations or other areas of concern to develop information to support on-going analysis and project prioritization. Monitoring of newly installed cathodic protection systems is also needed. The District should consult with a corrosion specialist to develop a program.
- Plant Capacity Analysis – conduct a comprehensive analysis of the treatment plants to identify hydraulic bottlenecks that may restrict plant capacity and to determine the true capacity as compared to the rated capacity. One area of concern is the filter influent flume at Fort Thomas Treatment Plant. This information will be critical for timing the expansion of MPTP.
- ORPS2 Structural Analysis – conduct a structural analysis of the building foundation, flooring, and walls. Numerous structural and destructive testing are recommended to be preformed to accurately assess the condition of the existing superstructure. The pump station's concrete and brick have significantly deteriorated over the years and any rehabilitation would be challenging and unpredictable.

ES.4. IT Master Plan

Information systems and access to key data contained in the systems play a key role in supporting the successful implementation of an Asset Management Program. The District's key IT systems related to management of assets include:

- Geographic Information System (GIS)
- Work Order System
- Customer Information System (CIS)
- Laboratory Information Management System (LIMS)
- Supervisory Control and Data Acquisition (SCADA)
- Financial Information System (FIS)

ES.4.1. Information Systems Assessment

The key findings and recommendations of information systems is summarized below:

- Use a phased approach to implement improvements in core business processes and integration of systems;
- Convert GIS to a "geodatabase" structure;
- Continue to improve reliability and speed of data network communications between facilities;
- Continue to use GBA for below-ground assets and Antero for above-ground assets in the near term, but consider migrating to one system long term;
- Implement a service request and tracking system to schedule work by IT staff;
- Identify opportunities for outsourcing IT services by issuing a solicitation for IT services by gauging the local availability and cost of services;
- Add integration of GIS, work order systems, and SCADA to improve key business processes and support the asset management program;
- Reconcile inventory control by standardizing on one method to eliminate disparity between CIS, FIS, and work order system;
- Add integration of CIS and LIMS to consolidate billing and to streamline customer inquiries;
- Long-term, through a major systems evaluation and consolidation/integration of systems, implement of a Data Management/Reporting services system or a Business Intelligence system to leverage operational data for strategic purposes.

ES.5. Funding Strategy

ES.5.1. Development of Strategy

The Asset Management Program is intended to be a comprehensive source of guidance for the District in the planning and implementation of various programs and improvements to properly respond to customers' needs, changing regulatory requirements, and aging infrastructure systems. These competing areas of needs must be satisfied and accomplished while continuing to operate the utility in a sound fiscal manner that maximizes the return for the money spent and minimizes the resulting rate impacts on the customers.

The primary guide for plotting the District's course is the 5-Year Capital Improvement Plan (CIP) which outlines significant projects that should be implemented and the timeline for their accomplishment. The current CIP includes projects to address needs identified through year 2030. It is important to understand that the implementation of projects constantly evolves depending on numerous drivers such as regulatory changes, customer viewpoints, rate making strategy, resources to implement projects, and actual water consumption. The conclusions and recommendations that are part of this report should be reviewed at regular intervals to ensure that they keep pace with the latest trends.

ES.5.2. Scenarios

With the first Asset Management Program report, the District developed and has since effectively used an approach for analyzing the potential impact on rates. This approach considers three scenarios for implementing the recommended improvements: Aggressive, Minimal, and Moderate.

Aggressive – In this scenario all projects are built at the ideal time, if economic constraints did not exist.

Minimal – This scenario would meet system demand and regulatory requirements but would not include system reliability and other items important to consumer confidence and customer care because it provides limited rehabilitation and replacement funding even though this ignores deterioration of the infrastructure. It also removes funding for extending water service to new customers.

Moderate – This scenario is intended to balance needs with practical financial limitations that exit. Timing of projects is important to maintain a desirable level of customer service.

The estimated total costs for these scenarios for 5-Year CIP projects between 2009 and 2030 are as follows:

Minimal	$382,424,000
Moderate	$567,318,000
Aggressive	$737,978,000

The Moderate approach results in a cost reduction of 23% over the Aggressive approach, while the Minimal approach would result in a reduction of 48% over the Aggressive approach.

The proposed cost reductions for the Minimal approach would be as follows:

- Delete the "Annual Water Main Replacement" projects from 2009 through 2030 for a total reduction of $126,850,000. We would continue with the program for "Coordinated Water Main Replacement" that sets aside monies for coordinating projects with cities at $2,500,000 a year.
- Delete "Annual Mains into Unserved Areas" for $250,000 each year for a total reduction of $5,500,000.
- Eliminate back-up power generators at Carothers Road Pump Station, Licking River Pump Station, and FTTP Laboratory for a reduction of $4,724,000.
- Cancel projects for upgrading systems and improving technology for SCADA and IT for a total reduction of $11,395,000.
- Eliminate ten water transmission system redundancy projects for a total reduction of $17,098,000.
- Defer tank replacement of aging tanks by rehabilitating instead of replacing Bellevue, Dayton, Lumley, Taylor Mill, Ida Spence and Kenton Lands for a total reduction of $10,722,000.
- Cancel or defer 7 projects to improve hydraulics or system operations for a total reduction of $4,107,000.

The total reductions would be $180 million over the Moderate approach. Deferring or canceling projects is a difficult decision that must be weighed against many factors. It is anticipated the District will carefully consider their options as part of the annual budgeting and rate making process.

The $170 million differences in cost between the Moderate and Aggressive approach are attributed to:

- Increasing funding for "Annual Mains into Unserved Areas" for a total of $27,500,000 through 2030. The funding for unserved areas would be increased from $250,000 to $1,500,000 each year.
- Increasing "Coordinated Main Replacement by a total of $143,150,000. The accelerated funding for main replacement would bring the budget to the full amount proposed in this plan.

ES.5.3. Summary of Costs

The total costs by year for the 5-Year CIP and the annual O&M costs are presented in the table below for the planning period.

Yearly Costs for Projects and O&M				
Year	5-Year CIP, Million Dollars			O&M, Million Dollars
	Minimal	Moderate	Aggressive	
2009	$15.47	$22.17	$26.32	$23.43
2010	$23.08	$29.50	$33.25	$23.45
2011	$26.08	$30.51	$34.26	$23.47
2012	$45.73	$53.16	$57.41	$23.63
2013	$17.30	$28.69	$33.44	$26.55
2014	$12.92	$22.60	$27.85	$27.80
2015	$22.40	$38.12	$42.87	$27.99
2016	$21.39	$27.69	$32.69	$28.34
2017	$21.58	$28.63	$33.88	$28.34
2018	$11.35	$21.05	$26.55	$28.50
2019	$26.30	$38.05	$43.80	$28.68
2020	$5.88	$16.85	$23.11	$28.85
2021	$6.17	$12.92	$20.17	$29.04
2022	$20.26	$27.01	$35.26	$29.22
2023	$9.59	$16.34	$25.59	$29.42
2024	$4.32	$11.07	$21.32	$29.68
2025	$12.65	$19.40	$30.65	$29.83
2026	$6.88	$13.88	$25.88	$30.04
2027	$10.50	$17.75	$30.50	$30.26
2028	$25.64	$33.39	$46.64	$30.49
2029	$29.78	$38.03	$51.78	$30.72
2030	$7.16	$20.51	$34.76	$30.96
Total	**$382.42**	**$567.32**	**$737.98**	-

ES.5.4. Financial Analysis

A major component of any Asset Management Program and CIP program is the financial impact on the District and its rate payers. Rate payers continue to signal a disdain for any rate increase in the new economy post the 2008 "Financial Meltdown". Projects require obtaining funds, which in turn may result in a rate increase to provide revenue to sufficiently service the debt. The political climate continues to perpetuate the belief that utilities should continue to operate and provide services without raising rates and in many cases to lower rates through efficiency. This is the challenging climate in which the

District must address the multiple issues of aging infrastructure, increased uncontrollable operating costs, and unfunded regulatory mandates.

The climate has drastically redefined what is meant by "customer rate shock" to include almost any rate increase. As a result, it will be incumbent on the District to analyze and prioritize any project to demonstrate the need and potential return each project will provide. The following sections attempt to evaluate the financial impact of CIP scenarios knowing that the longer the projection horizon the more difficult to forecast the outcomes in a climate of such uncertainty.

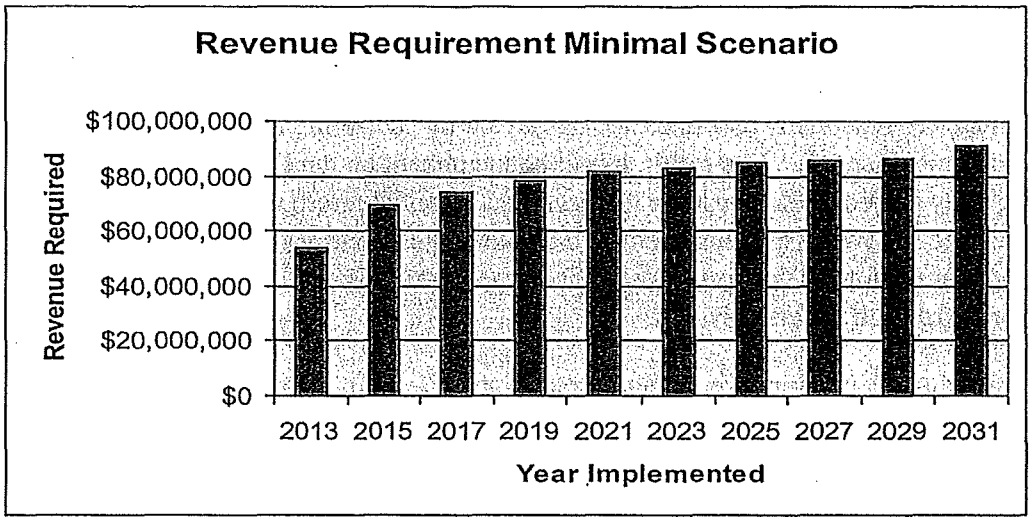
The District uses a combination of debt, grants (when available), and cash from the Internal Repair and Replacement (IRR) budget to finance major necessary capital improvements. Debt instruments include open-market revenue bonds, Kentucky Infrastructure Authority low interest loans, and Bond Anticipation Notes (BANs). The regulatory process conducted by the Kentucky Public Service Commission (PSC) requires approval before long-term debt may be issued and is part of a rate case. The following assumptions apply for projects requiring the issuance of long term debt:

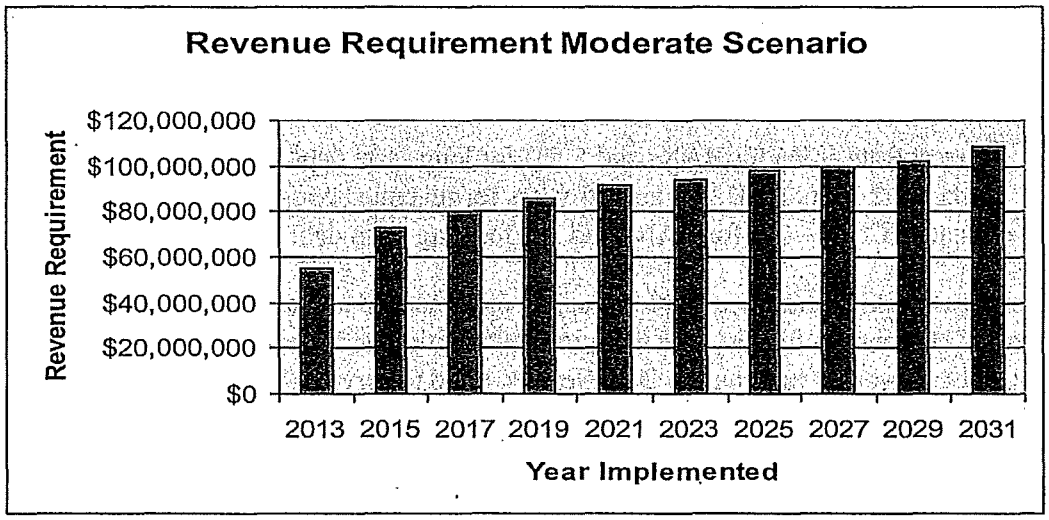
Interest Rate – 3% for BANs and 5.5% for long-term debt
Tenure – 2 years for BANs and 25 years for revenue bonds
Issuance Costs – 2% for BANs and 3% for long-term debt

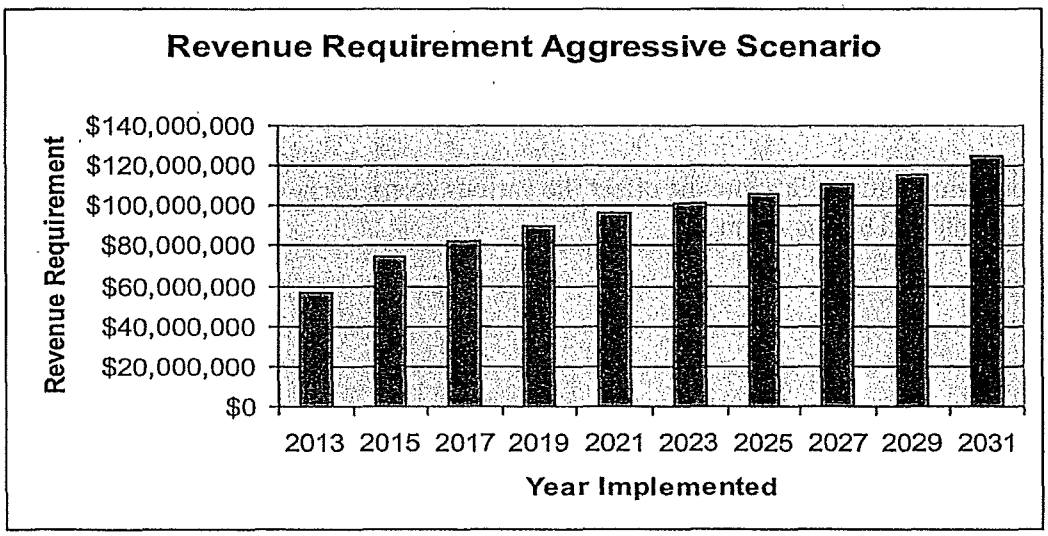
Annual repairs and replacements are typically cash financed and are satisfied from the IRR cash. This cash is funded after the normal Operating and Maintenance expenses are provided for as well as funding the Debt Service Fund to service the long term debt payments and maintaining adequate cash balances.

In general, the District files approximately every two years for rate adjustments to provide for Operation and Maintenance Expense increases, service additional long term debt acquired by paying off BANS, and changes in depreciation as a result of adding infrastructure. Revenue adjustments are effective in the analysis for 9 months of the year implemented.

The following figures illustrate the effect the various scenarios have on revenue requirements and ultimately rates.


Revenue Requirement Minimal Scenario
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
Revenue Required
2013 2015 2017 2019 2021 2023 2025 2027 2029 2031
Year Implemented


Revenue Requirement Moderate Scenario
$120,000,000
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
Revenue Requirement
2013 2015 2017 2019 2021 2023 2025 2027 2029 2031
Year Implemented


Revenue Requirement Aggressive Scenario
$140,000,000
$120,000,000
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
Revenue Requirement
2013 2015 2017 2019 2021 2023 2025 2027 2029 2031
Year Implemented

ES.5.5. Financial Summary

Reviewing the results of the analysis highlights several key issues as the District moves forward into an uncertain future. The Operational and Maintenance cost increase with the introduction of the Granular Activated Carbon process and the resulting replacement of spent carbon, is illustrated in the large revenue requirement increase in all the scenarios when the 2014 rate case results are implemented in 2015. As would be expected, the intensity of capital projects and the resulting debt service is the primary difference in the revenue requirements projected in each of the scenarios. At the beginning of the analysis period and subsequent to the 2010 rate case, the average monthly residential bill based on 6,000 gallons of consumption was $40.99. At the conclusion of the analysis period, the average monthly residential bills in year 2031 for each of the scenarios are as follows:

Minimal Scenario	$76.99
Moderate Scenario	$91.67
Aggressive Scenario	$105.21

The average yearly increase is 3.85% for Minimal, 6.18% for Moderate, and 7.83% for Aggressive. The actual yearly increases will vary based on the particular projects being implemented and other cost factors prevailing at the time. While it is certain the District will not implement the Aggressive scenario, it is prudent for the District as a viable service provider to implement projects listed in the Minimal scenario. The District will continually scrutinize O&M costs to dampen the impacts of implementing necessary capital projects.

The takeaways from this analysis are that many of the factors considered are unknown and highly volatile. The time frame alone in this time of drastic change and uncertainty makes it very difficult to project with any sense of reality and accuracy. Projecting what exactly will be needed and the cost to construct and implement are educated estimates at best. The current economic conditions we now face are in many ways new territory that we have little precedent to guide us into the future. The ability and desire of the rate payers to absorb higher bills to support the efforts necessary to address the increasing operation and maintenance expense, the aging infrastructure, and unfunded mandates is tenuous at this time with limited prospects to improve in the future.

In this environment, the District must keep in mind methods of operating to best represent the needs of all the stakeholders while keeping its focus on the primary mission of providing a safe water supply to meet the needs of the customer base. The District must move ahead with caution and use the rate payers' resources to the best of its abilities to provide the most basic of resources and to assure the vitality of our community.

NKWD ASSET MANAGEMENT PROGRAM UPDATE -2008

IDENTIFIED NEEDS AND IMPROVEMENTS

Table 4-11.
5-Year CIP Project Description

Designation	Description
12-08	Madison Ave. Parallel 24-inch Main Between Dudley & Hands Pike This project involves constructing a new large transmission water main along Madison Pike from the existing 42-inch at Dudley Pike to Hands Pike. This project is designed to provide additional water to the Richardson Road Pump Station and Hands Pike Pump Station. The District's newest Master Plan identified this as needed improvement.
12-9	Orphanage Rd. Parallel 24-inch Main Between Redwood & Valley Plaza This project involves constructing a 24-inch transmission water main along Orphanage Road from the existing 24-inch at Horsebranch Road between Redwood School and Valley Plaza. This project is designed to provide additional water to the 1040 pressure zone. The District's newest Master Plan identified this as needed improvement.
12-10	Hands Pike Between KY16 & Edwin The proposed project involves constructing a new 12-inch water main along Hands Pike from Ky. 16 to Edwin Drive, Covington, Kenton County, Kentucky. The length of this project is approx. 2,500 LF. No new right-of–ways of easements will be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to support existing water systems, improve quality, and improve fire protection in the area. The District's Master Plan identified this as a needed hydraulic improvement.
12-11	KY 16 Between Hands Pike & Klette Rd The proposed project involves constructing a new 12-inch water main along Ky. 16 from Hands Pike to Klette Road, Covington/Independence, Kenton County, Kentucky. The length of his project is approx. 3,000 LF. No new right-of-ways of easements will be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to support existing water systems, improve water quality, and improve fire protection in the area. The District's Master Plan identified this as a needed hydraulic improvement.
12-15	Highland Avenue 12-inch from Kyles Lane to new reg pit near Hanser pit The proposed project involves constructing a new 12-inch water main along Highland Ave. from Kyles Lane to regulator pit at Hanser Drive in Fort Wright, Kenton County, Kentucky. New right-of-ways of easements may be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to support existing water systems, improve water quality, and improve fire protection in the area. The District's Master Plan identified this as a needed hydraulic improvement.

to provide the best fit to the SCADA data as well as some minor PRV setting adjustments to model valves.

Upon completion, the calibration curves showed very good agreement between the SCADA data and model results given the high demand for this date. Calibration results were well within industry guidelines for the margins of error. A summary of the calibration results can be found in Appendix B.

There were some calibration challenges that included a discrepancy between the predicted Industrial Road tank levels and the SCADA data. The SCADA tank levels appeared to be much lower than the model tank levels during the off-peak hours of midnight to 6 a.m. A second calibration using average day demand data for the date of April 17, 2007 verified that the model was accurately predicting what the tank levels should be for that date. The peak day data seems to be an anomaly and may be the result of atypical water usage by one of the industrial customers near the tank on that particular day. Other calibration challenges included model predictions of tanks levels increasing and decreasing at a faster rate compared to SCADA results even when flows from pump stations appeared very accurate. It is believed that this error may have been due to minor losses associated with tank piping and valves that were not accounted for in the model. This situation often occurs in modeling because it is difficult to predict instantaneous peak demands for users, especially those located near the elevated tanks, using one-hour intervals for demand pattern calculations.

Another modeling calibration challenge was determining the flow through different pressure regulating valves. For several pressure zones, the regulators are the only source of water (i.e. there are no pumped flows recorded by SCADA). In addition, the valve settings are adjusted in the field and not automatically recorded in SCADA. For future model calibration exercises, it is recommended to install temporary flow meters or other recording equipment to better capture the entry of water into those zones.

Additional pressure data was collected by NKWD at various locations in the system in the spring of 2008 as a final check of the model calibration accuracy. These comparisons also showed a high degree of correlation.

See page 1-28 & 1-32

1.6. Existing System Performance Analysis

The performance of the existing system during average and maximum day conditions was analyzed using the calibrated model. The performance criteria used for the analysis were based on industry standards for acceptable pressures, velocities, and headloss (Recommended Standards for Water Works, Great Lakes – Upper Mississippi River

NKWD ASSET MANAGEMENT PROGRAM UPDATE -2008

HYDRAULIC MODEL UPDATE AND ANALYSES

Board of State and Provincial Public Health and Environmental Managers, 2003; Distribution System Requirements for Fire Protection, AWWA Manual M31, 1998; Distribution Network Analysis for Water Utilities, AWWA Manual M32, 1989; Advanced Water Distribution Modeling and Management, Haested Methods et al, 2003). The criteria are summarized in Table 1-16.

Table 1-16.
Summary of System Performance Criteria for Maximum Day Demand

Item	Performance Criteria
Velocity	5 feet per second maximum
Pressure	35 psi minimum
Headloss	3 feet per 1,000 feet of pipe for transmission (12" and larger) 10 feet per 1,000 feet of pipe for distribution (less than 12")

In general, it is recommended that pipe pressures not exceed 100 psi due the increased risk of pipe failure. However, pressures often exceed 100 psi in the NKWD distribution system especially in the low lying areas. The variability of the terrain, including steep slopes and rolling hills, prevent NKWD from maintaining pressures below the 100 psi guideline.

1.6.1. Average Day Demand Analysis

The Average Day Demand Analysis was performed using the calibrated model with base demands set to the average consumption in 2006 and a global multiplier set to 1.0. Tank levels were used to control the pump on/off status and gravity flows from FTTP to TMTP were set at 8.64 mgd. An extended period simulation of 14-days was run for this analysis.

The results of the analysis show that the District has very few areas of concern in regard to excessive pipe velocities on an average day (see Figure 1-4). The 16-inch distribution main running south along Madison Pike near the Dudley Pump Stations showed a velocity just over 5 fps. This transmission pipe is the main feed for the Hands Pike and Richardson Road pump stations. As demands increase over the next 10-15 years in the 1080 pressure zone along the Taylor Mill Road corridor, additional capacity will be needed from the Richardson Road Pump Station. Since this pipe line is already slightly exceeding the recommended maximum velocity, it should be considered of high priority to provide additional capacity along this route.

A few other small areas of concern were identified in the average day analysis. A 2,000 foot segment of 8 inch pipe along Senour Rd was found to be exceeding 5 fps during

peak demand hours of the day. The upstream pipe segment is a 16-inch transmission mainsand downstream pipes are a 6-inch and 8-inch diameter. Additional capacity is needed to bridge this gap and allow water to move more freely along Senour Rd.

Similarly in the John's Hill Drive area, there is 1,200 feet of 16-inch pipe that runs along U.S.27 between Marshall Road and John's Hill Rd that needs to be increased in capacity. The transmission main is 20 inches both up and downstream along U.S.27.

An analysis of the minimum system pressures during an average day demand found just one large area of concern (see Figure 1-5). The 1010 Pressure Zone appears to have multiple locations that fall below 35 psi on a regular basis. This area is highly residential and would be considered especially vulnerable during a fire emergency. The Taylor Mill standpipe does serve this area and back-up power is available at the Dudley 1040 pump station to provide emergency flow. NKWD staff has confirmed that low pressures are often a problem in this area.

Other isolated areas where junction pressures fell below 35 psi are located mainly close to tanks (Dayton and Bellevue Tanks) at the higher elevations within a pressure zone and near PRV valves which could be adjusted to provide additional pressure.

1.6.2. Maximum Day Demand Analysis

The Maximum Day Demand Analysis for the existing system was performed using the calibrated model with base demands set to the average consumption in 2006 and a global multiplier set to 1.6. Tank levels were used to control the pump on/off status and gravity flows from FTTP to TMTP were set at 17.3 mgd. An extended period simulation of 3-days was run for this analysis.