Nationwide, water and sewer utilities are facing challenges related to aging infrastructure.

American Society of Civil Engineers Report Card describes condition for the nation’s infrastructure.

2017 Infrastructure Report Card

- *Drinking Water*: D
- *Wastewater*: D+

Wichita experiences the same challenges related to poor asset condition, scarce resources, and high risk assets which could cause catastrophic failures.
Utilities Optimization

• During Phase One, the selected firm will analyze existing asset, revenue, and staffing conditions to determine ways to optimize the utilities.

• Project Deliverables include: a formal asset management plan, an optimized operations and maintenance plan, a funding plan, an integrated decision support tool, and a proposed approach to a long-term partnership.
The RFP dated May 14, 2015 states:

“A new management model will be developed to create a long-term partnership with the selected firm. As Phase 1 draws to a close, the City would negotiate exclusively with the selected firm to enter into Phase 2. The second phase is expected to be a long-term arrangement that could span approximately ten years. In Phase 2 the City would partner with the selected firm to jointly manage the utilities and implement the plans set forth in the first phase.”
Phased Approach

PHASE ONE

February 28, 2017

City Only Implementation

Partnership Implementation
Project Timeline

- RFP released (May 2015)
- Selection process (June to October 2015)
- Contract with CH2M Hill approved by City Council (November 2015)
- Contract expired and final report submitted (February 2017)
- Staff report (June 2017)
Asset Condition Results

• CH2M conducted on-site assessments and visual inspections
  • 203,601 assets are represented in the asset hierarchy and decision support tools
  • 108,816 assets were assessed
  • Following visual inspection, results were reviewed with City staff and supplemental information was considered and included in final Asset Condition Rating
  • Incorporated Master Plan and Water Supply Plan assets

<table>
<thead>
<tr>
<th>Asset Condition Rating</th>
<th>Description of Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very Good – only normal maintenance required</td>
</tr>
<tr>
<td>2</td>
<td>Good – minor maintenance required</td>
</tr>
<tr>
<td>3</td>
<td>Fair – significant maintenance required</td>
</tr>
<tr>
<td>4</td>
<td>Poor – significant renewal/upgrade required</td>
</tr>
<tr>
<td>5</td>
<td>Very Poor – over 50% of asset requires replacement</td>
</tr>
</tbody>
</table>
Asset Condition Results

- Vertical assets are in poor to very poor condition and in need of investment
  - Main Water Treatment Plant – 67% of assets are in **poor** condition
    - East WTP – 83% of assets are in **very poor** condition
    - Central WTP – 70% of assets are in **poor** condition
  - Sewage Treatment Plant 1 - 59% of assets are in **very poor** condition
  - Sewage Treatment Plant 2 - 33% of assets are in **very poor** condition and 22% are in **poor** condition

- Linear assets have benefited from recent investment and are in better overall condition
Asset Condition Results

<table>
<thead>
<tr>
<th>Total Number of Assets:</th>
<th>2,707</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Poor or Very Poor Assets:</td>
<td>1,178</td>
</tr>
</tbody>
</table>

Oldest assets date back to 1939

High Risk Assets

Water Treatment Plants are considered high risk assets. WTP failures can result in large scale water outages.
Asset Condition Results

<table>
<thead>
<tr>
<th>Total Number of Assets:</th>
<th>48,911</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Poor or Very Poor Assets:</td>
<td>22,392</td>
</tr>
</tbody>
</table>

Oldest assets date back to 1910

Low Risk Assets

Underground piping is generally considered a low risk asset. Piping failures can result in temporary water outages in isolated areas.
Asset Condition Results

<table>
<thead>
<tr>
<th>Total Number of Assets:</th>
<th>4,200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Poor or Very Poor Assets:</td>
<td>1,042</td>
</tr>
</tbody>
</table>

Oldest asset dates back to 1957

**High Risk Assets**

Wastewater Treatment Plants are considered high risk assets. WWTP failures can result in environmental impacts and costly consent decrees.

The pie chart shows the distribution of asset conditions:
- Condition 1, Very Good: 22%
- Condition 2, Good: 24%
- Condition 3, Fair: 25%
- Condition 4, Poor: 10%
- Condition 5, Very Poor: 15%
- Not Evaluated: 4%
Asset Condition Results

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Assets:</td>
<td>52,998</td>
</tr>
<tr>
<td>Number of Poor or Very Poor Assets:</td>
<td>9,285</td>
</tr>
</tbody>
</table>

Oldest asset dates back to 1900

**Low Risk Assets**

Underground piping is generally considered low risk assets. Piping failures can result in localized blockages and backups.
Main Water Treatment Plant - Critical Infrastructure Need

• Investment in the Main Water Treatment Plant stands out as highest priority due to its age and critical role.
  • Originally constructed in 1939.
  • Single source of treated drinking water for the region.
Main Water Treatment Plant - Critical Infrastructure Need

Figure 3-11. Water Vertical, Main WTP, Percentage of Assets by Condition Rating
Asset Condition Results

Main Water Treatment Plant - Critical Infrastructure Need

Corrosion of Chemical Feed System

May 2017 MWTP Filter Repairs

Structural corrosion
Sewer Treatment Plant 2 - Critical Infrastructure Need

- Investment in Sewer Treatment Plant 2 stands out as highest priority due to its condition and upcoming regulation.
  - Constructed in 1957.
  - Subject to upcoming federal and state regulations.
Asset Condition Results

Sewer Treatment Plant 2 - Critical Infrastructure Need

Figure 3-23. Wastewater Vertical, Plant 2, Percentage of Assets by Condition Rating
Equipment corrosion and leaks

Concrete erosion.

Sewer Treatment Plant 2 - Critical Infrastructure Need
Operations Needs

• Develop and implement Standard Operating Procedures (SOPs)
• Improve and better define workflows and roles/responsibilities
• Improve monitoring, trending, and planning
• Provide additional training opportunities
Operations and Maintenance Results

Maintenance Needs

• Improve Computerized Maintenance Management System (CMMS) and O&M Manuals
• Improve work orders with more definition to reduce mobilization and wrench time
• Improve and better define workflows and roles/responsibilities
• Utilize additional resources to allow for a stronger preventive maintenance culture and approach
• Provide additional training opportunities
Utilities Finance Results

- Water and Sewer Utilities are financially strong, allowing for the opportunity to utilize any of the following financing options:

<table>
<thead>
<tr>
<th>Financing Type</th>
<th>Cost to Issue</th>
<th>20-Year Rate</th>
<th>40-Year Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue Bonds</td>
<td>2%</td>
<td>3.36%</td>
<td>4.11%</td>
</tr>
<tr>
<td>Subordinate Bonds</td>
<td>2%</td>
<td>3.96%</td>
<td>4.71%</td>
</tr>
<tr>
<td>Private AMT Bonds</td>
<td>5%</td>
<td>4.26%</td>
<td>5.26%</td>
</tr>
<tr>
<td>Private Subordinate Bonds</td>
<td>5%</td>
<td>4.94%</td>
<td>5.94%</td>
</tr>
<tr>
<td>WIFIA</td>
<td>2%</td>
<td>30-Year Term that Matches Long-Term Treasury Yield</td>
<td></td>
</tr>
</tbody>
</table>
Data-Driven Decision Making

Decision Support Tool (DST)

- Water Vertical DST
- Water Linear DST
- Sewer Vertical DST
- Sewer Linear DST

4 Operations Strategies
- Operations Water/Sewer DST

4 Maintenance Strategies
- Financial DST
Optimization Modeling

MODELING INPUTS

Operations DST
- 40 years ops costs
- Over 1,500 line items to customize

Financial DST
- Algorithm calculates 40 years of capital project capacity
- 5 financing sources with 40 potential terms per financing source

ASSET & MAINTENANCE MODEL RUNS

Water Vertical
Modeled Assets: 2,707

Water Linear
Modeled Assets: 48,911

Sewer Vertical
Modeled Assets: 4,200

Sewer Linear
Modeled Assets: 52,998

4 Maintenance Strategies

OPTIMIZATION

Financial DST
- Metrics for Optimization
- 27 scenarios modeled
- Millions more scenarios possible
- 40-year outputs:
  - Total lifecycle costs
  - System value
  - Rates
## Current Approach

### Water Utility
- Portions of main water treatment plant built during World War II – single point of failure
- Existing budget may keep it operational for up to another 10 years
- Deferred replacement on other critical assets could cause citywide, lengthy service outages

### Sewer Utility
- Required to meet new nitrogen and phosphorous regulations in as soon as 10 years (BNR)
- Existing budget can fund about half of the expected BNR compliance costs
- Failure to comply with permit could result in a consent decree with major fines

### DEFERRED REPLACEMENT IMPACT

<table>
<thead>
<tr>
<th></th>
<th>Water Utility</th>
<th>Sewer Utility</th>
<th>Combined Utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Amount</td>
<td>$459 million</td>
<td>$95 million</td>
<td>$554 million</td>
</tr>
<tr>
<td>40-Year Amount</td>
<td>$909 million</td>
<td>$170 million</td>
<td>$1.1 billion</td>
</tr>
<tr>
<td>Annual Additional</td>
<td>$11 million</td>
<td>$2 million</td>
<td>$13 million</td>
</tr>
<tr>
<td>Deferred Replacement</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Includes previously projected 5.5% combined, maximum annual increase
Catastrophic failure of water treatment plant could make it impossible to deliver water to half a million people for an extended period of time.

Other failures modes could result in diminished capacity, resulting in critical impacts:
- Delayed firefighting capacity could result in difficulty containing fires to room, structure, or block of origin
- Rolling water outages similar to rolling blackouts experienced by western and southern energy users
- Permanent boil order due to unsanitary condition of the available water
- Spike in main breaks due to pressure changes

Sewer permit violation could result in consent decree from EPA.

EPA consent decree requires multiple fines and projects up to an amount of 2.5% of median household income (MHI).

Current sewer rates are at 0.74% MHI, meaning that a consent decree risks a sewer rate increases of nearly 240%.
<table>
<thead>
<tr>
<th>Water System Failures</th>
<th>Sewer System Failures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flint, MI (2014)</strong>&lt;br&gt;Changes in water supply sources result in pipe corrosion and unacceptable levels of lead in the drinking water, exposing more 8,000 children under the age of 6 to dangerous lead levels.</td>
<td><strong>Kansas City, MO (2002)</strong>&lt;br&gt;Since 2002, Kansas City has experienced over 1,300 sewer system overflows and is now under consent decree. Estimated cost to come into compliance is $2.5 billion</td>
</tr>
<tr>
<td><strong>Chapel Hill, NC (2017)</strong>&lt;br&gt;Water plant failure relating to chemical overfeed interrupted service for two days.</td>
<td><strong>DeKalb County, GA (2010)</strong>&lt;br&gt;Fats, oils and grease exceeded NPDES permit thresholds resulting in a consent decree. Estimated cost of compliance is $326 million.</td>
</tr>
</tbody>
</table>
High Risk Rate Impacts

### Water Utility – Upon Treatment Plant Failure

- Status Quo Rate Increases
- Emergency Rate Increases

### Sewer Utility – Upon Wastewater Permit Violation

- Status Quo Rate Increases
- Emergency Rate Increases

### Combined Utilities

- Status Quo Rate Increases
- Emergency Rate Increases
### Optimization Steps

<table>
<thead>
<tr>
<th>Option #1</th>
<th>O&amp;M Optimization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>O&amp;M</strong></td>
<td></td>
</tr>
<tr>
<td>- Agree to five-year program management contract</td>
<td></td>
</tr>
<tr>
<td>- Do not agree to a five-year program management contract</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option #2</th>
<th>CIP Optimization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deferred Maint &amp; Large Project</strong></td>
<td></td>
</tr>
<tr>
<td>- Raise rates to eliminate deferred replacement. Construct water treatment plant in 2035 and BNR in 2025.</td>
<td></td>
</tr>
<tr>
<td>- Do not raise rates to eliminate deferred replacement. Do not construct water treatment plant and BNR</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option #3</th>
<th>Project Optimization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timing</strong></td>
<td></td>
</tr>
<tr>
<td>- Proceed with water treatment plant in 2019 and BNR in 2025.</td>
<td></td>
</tr>
<tr>
<td>- Proceed later with Water Treatment Plant and BNR</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option #4</th>
<th>Project Optimization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Delivery</strong></td>
<td></td>
</tr>
<tr>
<td>- Proceed with alternative delivery (DBo)</td>
<td></td>
</tr>
<tr>
<td>- Do not proceed with alternative delivery and utilize traditional delivery</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option #5</th>
<th>Project Optimization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financing</strong></td>
<td></td>
</tr>
<tr>
<td>- Utilize longer term revenue bonds</td>
<td></td>
</tr>
<tr>
<td>- Utilize standard terms on revenue bonds (lowers costs but has higher initial rates)</td>
<td></td>
</tr>
</tbody>
</table>

*Red text indicates full optimization with smoothed rates, resulting in lowest total lifecycle costs and highest system value.*
Option #1: O&M Optimization

Agree to five-year program management contract

Do not agree to five-year program management contract and maintain current approach.

Cumulative O&M Costs: Difference Between current approach and Option #1

($250,000,000)  ($200,000,000)  ($150,000,000)  ($100,000,000)  ($50,000,000)  $0  $50,000,000

2018  2019  2020  2021  2022  2023  2024  2025  2026  2027  2028  2029  2030  2031  2032  2033  2034  2035  2036  2037
**Option #1: O&M Optimization**

**Option 1: Operations and Maintenance Optimization**

<table>
<thead>
<tr>
<th>Agree to five-year program management contract</th>
<th>Do not agree to five-year program management contract and maintain current approach.</th>
</tr>
</thead>
</table>

### DEFERRED REPLACEMENT IMPACT

<table>
<thead>
<tr>
<th></th>
<th>Water Utility</th>
<th>Sewer Utility</th>
<th>Combined Utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current approach</td>
<td>$909 million</td>
<td>$170 million</td>
<td>$1.1 billion</td>
</tr>
<tr>
<td>After Option #1</td>
<td>$644 million</td>
<td>$115 million</td>
<td>$759 million</td>
</tr>
<tr>
<td>Difference in Deferred Replacement</td>
<td>($265 million)</td>
<td>($55 million)</td>
<td>($341 million)</td>
</tr>
</tbody>
</table>

**Details of Optimization**

- **Creates efficiencies and realizes savings** through a 5-year program management contract with CH2M. No privatization or loss of City jobs. Does not fund critical Master Plan projects.
- **Savings**: $8 million annually through 40 years. Would require an ongoing 6% rate increase to generate that amount of revenue.
- **Cost**: $6 million per year for five years. Requires an estimated additional *4% increase* in 2018 that sunsets after 5 years.
Option #2: CIP Optimization

Deferred Replacement & Large Project Optimization

Raise rates to reduce deferred replacement. Construct water treatment plant and BNR

Do not raise rates to reduce deferred replacement. Do not construct water treatment plant and BNR and maintain current approach.

Condition Assessment
Main Water Treatment Plant

- Condition 1 - Very Good, 0%
- Condition 2 - Good, 0%
- Condition 3 - Fair, 0%
- Condition 5 - Very Poor, 33%
- Condition 4 - Poor, 67%

Risk of Asset Failure

- All components of the main water treatment plant are presently either in poor or very poor condition, due primarily to age
- Lengthening the period between now and construction of a new treatment plant increases the risk of catastrophic failure and a significant (appx 50%) emergency rate increase
- This option would construct a new water treatment plant in 2035.
Option #2: CIP Optimization

Deferred Replacement & Large Project Optimization

Raise rates to reduce deferred replacement. Construct water treatment plant and BNR

Do not raise rates to eliminate deferred replacement. Do not construct water treatment plant and BNR and maintain current approach.

DEFERRED REPLACEMENT IMPACT

<table>
<thead>
<tr>
<th></th>
<th>Water Utility</th>
<th>Sewer Utility</th>
<th>Combined Utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>After Option #1</td>
<td>$644 million</td>
<td>$115 million</td>
<td>$759 million</td>
</tr>
<tr>
<td>After Option #2</td>
<td>$581 million</td>
<td>$104 million</td>
<td>$685 million</td>
</tr>
<tr>
<td>Difference in Deferred Replacement</td>
<td>($63 million)</td>
<td>($11 million)</td>
<td>($74 million)</td>
</tr>
</tbody>
</table>

Details of Optimization

- *Reduces deferred replacement* and constructs the new water treatment plant and BNR.
- *Creates a sustainable capital improvement program* that optimizes investment into critical assets.
- *Carries higher risk* due to prolonged use of the main water treatment plant, a critical single-point failure asset.
- Requires an estimated additional *4.5% rate increase*. Future increases could be higher.
Option #3: Project Optimization

Timing Optimization of Large Projects (NWTP & BNR)

Proceed Soon with Water Treatment Plant and BNR
Proceed Later with Water Treatment Plant and BNR and maintain current approach.

Details of Optimization

- Greatly reduces risk of a water treatment plant failure through earlier construction of new water treatment plant beginning in 2019.
- Reduces total lifecycle costs.
- BNR would be constructed after the water treatment plant but would meet permit requirements.
- Requires an estimated additional 3% rate increase initially with the ability to reduce rate impact with further optimization steps. Future increases could be higher.
## Option #4: Project Optimization

### Project Delivery Optimization

<table>
<thead>
<tr>
<th>Proceed with Alternative Delivery (DBo)</th>
<th>Do not proceed with Alternative Delivery and utilize traditional delivery</th>
</tr>
</thead>
</table>

- **Design-Bid-Build (DBB)** is the traditional delivery method that results in all risk being held by the City.
- **Design-Build-Operate (DBo)** is an alternative delivery method that awards a single contract for the design, construction and operation of an asset. DBo delivery includes a performance guarantee; transferring construction and short-term operation risk. City staff would operate and maintain the asset after a short-term (up to five years) commissioning and shake-out period.
- **Design-Build-Finance-Operate-Maintain (DBFOM)** is an alternative delivery method that awards a single contract for all aspects of project delivery, including the use of private sector financing sources and a long-term (30 years or more) contract for privatized operations and maintenance.
## Option #4: Project Optimization

**Project Delivery Optimization**

### Proceed with Alternative Delivery (DBo)

<table>
<thead>
<tr>
<th>Option</th>
<th>PV, $millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBB</td>
<td>$926</td>
</tr>
<tr>
<td>DB</td>
<td>$897</td>
</tr>
<tr>
<td>DBo</td>
<td>$773</td>
</tr>
<tr>
<td>DBOM</td>
<td>$784</td>
</tr>
<tr>
<td>DBFOM</td>
<td>$871</td>
</tr>
</tbody>
</table>

- **$1,076**
- **$1,042**
- **$865**
- **$797**
- **$884**

### Do not proceed with Alternative Delivery and utilize traditional delivery

- **$700**
- **$750**
- **$800**
- **$850**
- **$900**

### NW WTP Analysis - Project Cost Range

- **Project Delivery Optimization could reduce the rate increase by an estimated 2%**
**Option #5: Project Optimization**

**Utilize Longer Term Revenue Bonds**

- **Total Cost, $3,725**
  - Revenue Bond, 40 Yr: $1,558
  - Revenue Bond, 30 Yr: $1,039
  - Revenue Bond, 20 Yr: $200.24

**Utilize Standard Terms on Revenue Bonds (Lowers Total Costs But Has Higher Initial Rates)**

- **Total Cost, $3,044**
  - Revenue Bond, 40 Yr: $1,039
  - Revenue Bond, 30 Yr: $400
  - Revenue Bond, 20 Yr: $640

- **Total Cost, $2,519**
  - Revenue Bond, 40 Yr: $200.24
  - Revenue Bond, 30 Yr: $400
  - Revenue Bond, 20 Yr: $1,279

- **$125,971,465**

- **Total Cost in $Millions**
  - Water CIP Capital
  - NW WTP Capital
  - Water CIP Financing Cost
  - NW WTP Financing Cost
  - Annual

- **Revenue Bond, 40 Yr: $1,558**
- **Revenue Bond, 30 Yr: $1,039**
- **Revenue Bond, 20 Yr: $200.24**

- **Project Financing Optimization could reduce the rate increase by an estimated 1%**
Anticipated Results from Optimization

<table>
<thead>
<tr>
<th>O&amp;M SAVINGS (OPTIMIZATION)</th>
<th>Total: $300,512,456</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery Optimization</td>
<td>$89,800,000</td>
</tr>
<tr>
<td>5-Year Program Management</td>
<td>$210,712,456</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOTAL LIFECYCLE COST SAVINGS</th>
<th>Total: $727,332,665</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIFIA Financing</td>
<td>$105,803,384</td>
</tr>
<tr>
<td>Delivery Optimization</td>
<td>$246,830,502</td>
</tr>
<tr>
<td>O&amp;M Optimization</td>
<td>$300,512,456</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INCREASED SYSTEM VALUE</th>
<th>Total: $81,795,004</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIP Optimization</td>
<td>$64,214,647</td>
</tr>
<tr>
<td>5-Year Program Management</td>
<td>$17,580,357</td>
</tr>
</tbody>
</table>

Results anticipated with moving forward with all optimization options. Amounts shown are based on present value over a 40-year planning period.
Subject to change during rate discussions prior to 2019. The rate modeling process will incorporate updated information related to construction cost and schedule, financing terms and WIFIA.
Implementation Timeline

- **September 2017** – return to City Council with 2018 rates, O&M contract with CH2M Hill and WIFIA preparation.

- **May 2018** – return to City Council with 2019 rates for CIP optimization, possible WIFIA application.

- **November 2018** – return to City Council with competitive DBo agreement for Northwest Water Treatment Plant (if WIFIA approved).