Infrastructure Management Group, Inc.

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Tulsa Metropolitan Utility Authority
Comprehensive Assessment

Executive Summary

And Additional Summary Documents

August 2012

Infrastructure Management Group, Inc. and the IMG Team

BRINGING BUSINESS TO GOVERNMENT™

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TMUA COMPREHENSIVE ASSESSMENT: SPECIAL BRIEFING SUMMARY

Overview

The Tulsa Utility Board and the Tulsa Metropolitan Utility Authority are tasked with providing efficient and reliable water and sewer services to its customers (hereafter referred to jointly as TMUA). In doing so, it depends upon services provided by departments within the Tulsa city government. Like all water and sewer utilities, TMUA faces an evolving business and regulatory environment. Achieving TMUA's strategic mission is made even more difficult by the constraints of short-term municipal budgeting and rate setting. Accordingly, TMUA determined that it needed a genuinely strategic context – a Comprehensive Assessment – within which the array of shorter-term decisions can be made. In this summary, the IMG Team presents the key findings and recommendations of each of the seven separate tasks of the Assessment.

Overall, the IMG Team finds that the Tulsa metropolitan region enjoys water and sewer services that operate within industry norms for service quality and – excluding non-core administrative and engineering support services – within the norms for cost-efficiency. However, without significant changes to the utility, increasingly stringent national and state regulations and the system's aging infrastructure will combine to force water and sewer rates to grow significantly faster than local household incomes for decades to come. Moreover, TMUA's financial condition – including high sewer-related debt, asset replacement liabilities, and non-core service costs – has heretofore limited the utility's ability to respond.

The Comprehensive Assessment analyzed all of these issues as well as the current and projected condition of the utility. The bulk of the Assessment was devoted to asset condition and operating efficiency, but the concluding tasks evaluated several options for performance improvement and for mitigating future rate increases. The options ranged from various forms of privatization to aggressive internal improvement.

IMG concluded that TMUA's unique structural attribute (in which the governing board and owner of the assets contracts with the City for utility operating services) could be used to impose significant and lasting improvements in a way that most US water utilities cannot. IMG concludes that operating and capital program improvements could – if supported by critical new performance and asset management systems linked to the TMUA-City lease and operating contract – make durable improvements roughly equivalent to privatization, and thereby reduce future rate increases by 20 to 30 percent compared to current projections.

1.0 Governance and Management Analysis

Key Findings

The utilities' fragmented structure restrains performance and limits the TMUA's ability to deliver value to ratepayers. The dispersion of authority among TMUA and various City departments, as well as the disconnection of critical support services from utility operations (particularly engineering and customer service), could lead to a steady erosion of staff cohesion, service levels and asset preservation.

The utility's indirect costs are significantly out of line with peers and best practices. Notwithstanding some recent efforts by the respective support service managers, the utility's indirect costs appear excessive

compared to the ratio of indirect to direct costs for peer utilities. Part of the gap is likely due to inadequate information technology investment that would support higher levels of efficiency, communication and responsiveness of the service processes (e.g., unification of work order and customer inquiry systems), and part is due to the lack of enforceable, competitive service level agreements.

To address these issues, IMG recommends the following for improving governance, management and the relationship between the TMUA and the City of Tulsa:

Governance & Management Recommendations	
• Nurture a stronger unity of purpose via the TUB	• Significantly expand utility performance reporting
• Appoint a full-time board coordinator	• Pursue long-term rate covenants
• Enhance board consultation on senior utility management	• Pursue accumulation of strategic financial reserves
• Implement more enterprise-like support contracts	• Focus on enterprise value via cutting edge analytic tools
• Significantly improve asset management systems	• Implement new governance information reporting
• Provide TMUA with greater utility budget input	

The Bottom Line

TMUA currently lacks even the most basic information tools necessary to carry out its governance mandate, let alone to compel and oversee the kind of operational and capital program reforms required to hold down future rate increases. Addressing this shortcoming and managing the utility in a more enterprise-like fashion is key to better performance. Fortunately, the TMUA-City contractual relationship offers an opportunity to implement these reforms in a manner reminiscent of the best corporate reformations.

2.0 Operations Analysis

Key Findings

Considering the organizational and budgetary limitations, the Water System operates very effectively. Even so, there are numerous opportunities for efficiencies that can deliver significant new value to ratepayers. The utility is efficiently managed at the plant and field service level, with few examples of overstaffing or understaffing compared to workload. Outsourcing of selected services is generally well-directed, although there are opportunities for expanding and streamlining the outsourcing. That said, IMG has identified significant operational efficiencies that the utility can achieve.

The utility lacks critical tools and systems that will help them operate at more efficient levels. Technology usage appears below the level of high-performing municipal utilities, particularly for performance management information and linking core utility services to support services. Although operations and maintenance staff clearly recognize the issues and opportunities, and seem eager to implement improved and consolidated systems for work order management, asset management and customer service, progress has been slow. IMG attributes the slow progress to an absence of both budgetary resources and an overall utility-oriented technology strategy. That said, several new initiatives are currently underway to improve existing systems, streamline technology-dependent processes, and bring upgraded software and hardware into the utility.

The utility is eager to shift to a more performance-based culture. IMG found that core utility management and staff are eager to shift to a more performance-based organization. Staff offered numerous suggestions for improvement, with most of them related to technology and business process improvement for core software systems and support services.

Recommendations

IMG believes that TMUA can lower water bills by implementing the following recommendations:

Enterprise-wide Improvements	Water Optimization	Wastewater Optimization
• Employ enterprise approach to performance management • Plan enterprise-wide operations improvement transition period • Develop internal optimization specialists team • Implement enterprise-wide asset management system & CMMS	• Optimize chemical costs • Optimize hauling costs • Implement aggressive pipeline monitoring program • Expand use of AMR meters • Expand use of seasonal hires • Make Spavinaw treatment plant a training facility	• Pursue aggressive sludge optimization • Install operator process labs • Optimize digesters • Reduce recycle loads • Pursue aggressive SSO performance improvement • Implement risk-based cleaning

The Bottom Line

Compared to the top-performing water and sewer utilities, the utility's performance management systems are fragmented, outdated or non-existent. In that light, the performance of its core services versus its peers is impressive and representative of a positive internal culture. However, the IMG Team noted numerous points of stress in the utility's business processes, particularly HR, operations-engineering collaboration, and utility information technologies. Improvement programs do exist, but appear to be relatively uncoordinated.

3.0 Capital Improvement Program

Key Findings

Water Growth: Based upon the most credible demographic projections, an annual growth rate of 1% was established for the Tulsa metro area. This growth is largely manageable with current facilities except for drought conditions. It is financially untenable for TMUA to develop and maintain standby capacity sufficient to cover 100 percent of potential drought conditions, nor is it common practice among US utilities to do so.

TMUA has adopted the 60% drought coverage for planning purposes, which means Tulsa's projected raw water conveyance needs will exceed current capacity by around 2039. This represents the latest that a third flow line to the AB Jewell Water Treatment Plant would need to be in place and operational.

Distribution Needs: The cumulative system upgrades relative to the current (2011) water distribution system required to meet the needs of the anticipated 2030 water system include:

- 10.9 miles of 72-inch waterline
- 8.9 miles of 48-inch waterline
- 13.3 miles of 24-inch waterline

- 2.1 miles of 16-inch waterline
- 25.6 miles of 12-inch waterline.

Wastewater Growth: Wastewater growth will parallel water usage growth. Portions of the existing collection system will require capacity enhancement improvements in order to accommodate increased flows from population growth and expansion into new areas. Additional capacity enhancements will be needed to eliminate persistent SSOs. The TMUA/RMUA treatment plants are generally functioning appropriately and meeting the permitted effluent limits. However, maintenance and replacement of worn and deteriorated equipment is a continuing, ongoing necessity.

Collection System Needs: Reinvestment to replace aging and deteriorating pipelines is needed and will be efficiently administered as asset management processes are incorporated into the organizational culture. A parallel effort to aggressively identify and eliminate I&I sources is needed and, if successfully executed, is the single greatest cost efficiency obtainable for the TMUA. These two collection system programs represent 30% of the overall CIP cost for the TMUA over the next 50 years.

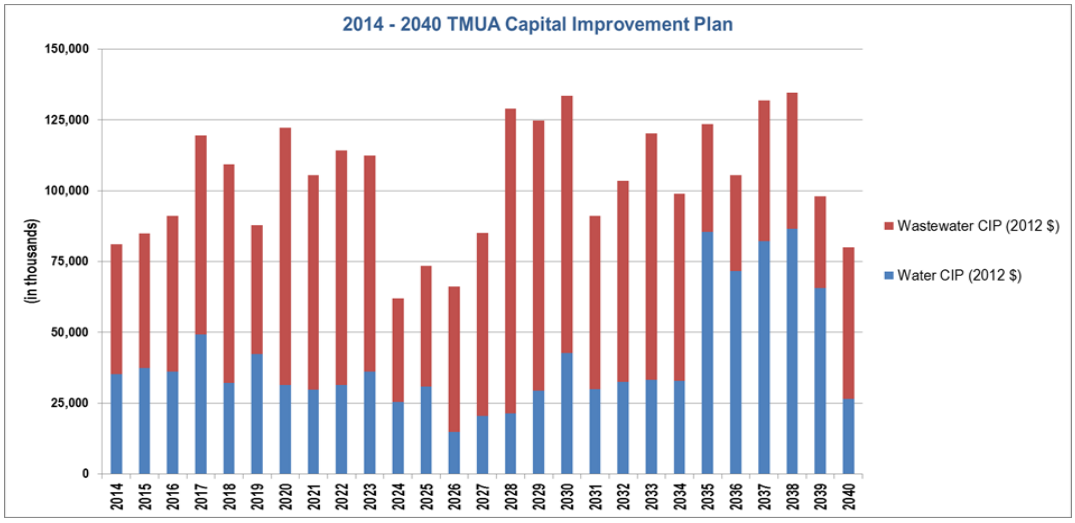
Wastewater Capacity: As part of this Comprehensive Plan, the historical performance of each of the wastewater treatment plants was reviewed, and the operation of each facility was assessed. The results of this review of historical performance and operation identified several key process constraints at each wastewater treatment plant that would impact future treatment capacity without additional expansion.

Recommendations

1. Assignment of an asset manager or director.

2. Implementation of a cross functional management team for asset management /CIP decisions.

3. The IMG Team recommends that TMUA pursue the following capital improvement spending plan to properly address its long-term infrastructure needs.



The Bottom Line

Task 3 identified an extensive roster of capital improvement and major repair and replacement needs over the coming decades. These needs were organized into short-term and long-term capital improvement

programs, the costs of which are summarized in the chart above. These costs are the primary driver of the rate increases expected over the coming decades. Unfortunately, Tulsa does yet not have a robust asset management system or sufficient asset condition databases – especially for underground infrastructure – that could help it reduce and/or smooth out these expenditure

4.0 Market Expansion Analysis

Key Findings

Task 4 included a comprehensive review of new revenue opportunities for TMUA, including expanding the utility's service area for water or sewer. It also examined opportunities for the utility to provide certain types of specialty services to smaller systems in Oklahoma, including laboratory services and the use of expert licensed operating engineers. The tables below summarize the IMG Team's assessment of the most promising service expansion opportunities.

Collinsville	Bixby	Glenpool	Non-Core Opportunities
• Service: Water • Avg usage: 0.6 mgd • Growth: 2% • Rate: $2.59/1,000 gal • Return: 10% • Revenue: $567K/year	• Service: Wastewater • Avg usage: 1.35 mgd • Growth: 2.3% • Rate: $3.24/1,000 gal • Return: 10% • Revenue: $1.6M/year	• Service: Wastewater • Avg usage: 1.2 mgd • Growth: 2.3% • Rate: $3.44/1,000 gal • Return: 10% • Revenue: $1.5M/year	• Service: Consulting • Enterprise Group • Non-profit corporation • Technical Services Agreement w/ TMUA • 100% profits to TMUA

The Bottom Line

The IMG Team examined a wide range of potential service expansions but concluded that only three – water services to Collinsville and wastewater treatment services to Bixby and Glenpool – could benefit both parties. Non-core services such as lab testing and consulting provided by an internal enterprise unit (akin to several independent airport authorities in North America) could offer some additional limited revenue, but they are not likely to succeed until TMUA implements a broader performance improvement initiative.

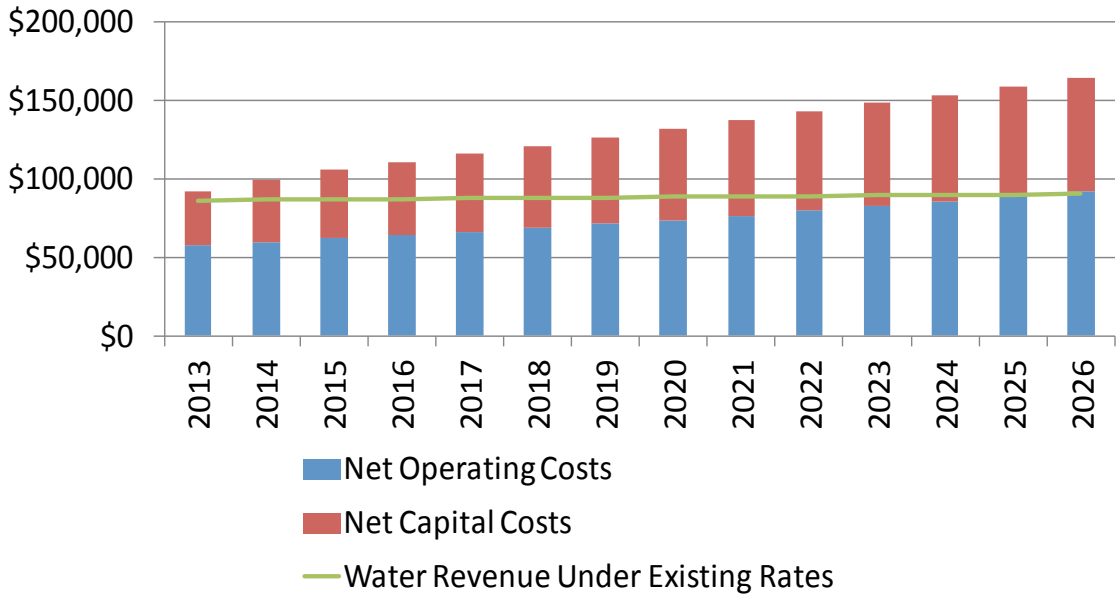
5.0 TMUA Financial Condition and Utility Rate Outlook

Key Findings

Capital improvement needs will drive rates higher: Implementation of the capital programs identified in Task 3 will be the driving factor for future water rate changes. As demonstrated in the graph on the following page, by 2026 water revenue will need to increase by 81.4% over the 14 year period to cover debt service payments associate with the capital investment. Because of the increased capital needs associated with the consent decree, projected increases in wastewater rates are larger than for water.

Tulsa exhibits mixed performance against its peers: Combining both water and sewer finances, Tulsa underperforms against its peers in major financial management performance measures of high

administrative and support costs, collection costs, and personnel costs. Tulsa over performs against its peers in the financial management measures of treatment costs and operating costs.



Tulsa underperforms on financial efficiency: Tulsa underperforms against its peers on two important financial efficiency indicators: utility dedicated days of operating reserves and General Fund Transfer as a Percentage of Revenue. The level of operating reserves dedicated exclusively to each utility is less than a third of the level maintained by most utilities. The transfer to the City General Fund is two to three times the level typical of utilities identified in the benchmarking exercise. The effect is that Tulsa's utilities find themselves borrowing a higher percentage of capital reinvestment than their peers.

Compared to peers, commercial customers carry a greater share of revenue: Tulsa gets a smaller share of its water revenue from residential customers than most water and sewer utilities while wastewater's revenue balance is typical of other utilities.

Water affordability is average compared to peers: Tulsa's water affordability is in the middle range of water utilities for similar-sized cities. As the chart on the following page shows, Atlanta and Kansas City stand out as much more expensive than Tulsa, while Omaha and Memphis are the best affordability performers.

Sewer affordability is worse than peers: Sewer is somewhat worse than water among peer cities, requiring residents to pay roughly twice the portion of the median income as residents of Denver and Omaha and well above even cities like Indianapolis, Louisville and Fort Worth.

The table below summarizes the key findings of the financial condition assessment. The long-term rate outlook is incorporated into the Baseline Scenario in the strategic options analysis.

			Average Residential Water Customer		
City	State	Mean Household Income	Typical Bill	Percent Household Income	Persons Below Poverty Level
Omaha	NE	$51,878	$14.34	0.33%	13.1%
Memphis	TN	$36,473	$13.10	0.43%	25.4%
Denver	CO	$45,501	$18.74	0.49%	19.2%
Arlington	TX	$52,094	$21.81	0.50%	14.3%
Nashville	TN	$45,063	$19.72	0.53%	17.8%
Dallas	TN	$41,682	$19.70	0.57%	22.3%
Oklahoma City	OK	$43,798	$23.15	0.63%	16.6%
Tulsa	OK	$39,289	$21.41	0.65%	19.3%
Fort Worth	TX	$49,530	$27.02	0.65%	17.0%
Colorado Springs	CO	$53,074	$30.56	0.69%	11.8%
Louisville	KY	$43,009	$24.99	0.70%	17.3%
Indianapolis	IN	$43,088	$26.41	0.74%	17.9%
Kansas City	MO	$44,113	$35.29	0.96%	18.1%
Atlanta	GA	$49,347	$43.61	1.06%	15.7%

Key Findings	
Revenue Requirement	• TMUA faces significant revenue requirement increases due to projected CIP
Financial Efficiency	• Tulsa underperforms its peers on most financial management performance measures • Higher indirect (non-core) costs, collection costs, debt service and personnel costs
Financial Management	• Tulsa significantly underperforms its peers on key financial efficiency indicators • Days of Working Capital Maintained and General Fund Transfer as Percentage of Revenue
Revenue Source Distribution	• Tulsa gets a smaller share of its water revenue from residential customers than most utilities • Wastewater's revenue balance is typical of other utilities
Affordability	• Revenue requirement outlook will result in a significant increase in ratepayers' projected water and wastewater bill as a percentage of gross mean income

Recommendations

The IMG Team believes that TMUA will need to take a more enterprise-like approach to managing its cash, its debt issuance, and financing its long-term asset replacement and preservation. It should increase operating reserves dedicated to utilities and focus its resources on preserving assets and extending their useful lives through improved systems, better data and reengineering business processes. Most of all, TMUA will need to govern the utilities in a cohesive, strategic and financially forward-looking fashion supported by better data and bottom-line measures of the utilities' ongoing (and ever-changing) enterprise value. These improvements will require significant cooperation and support from the City of Tulsa.

The Bottom Line

Tulsa's utilities have relatively low core operating costs, but compared to their industry peers they pay more for non-core support services to their city's General Fund. These factors, combined with a relatively high debt load on the wastewater side and the increasing impact of EPA regulatory requirements, hurt Tulsa when it comes to the local affordability of their water and sewer rates. Moreover, regulatory and asset replacement needs are projected to worsen affordability over the coming years.

6.0 Strategic Options Analysis

TMUA faces capital requirements over the next 50 years that will result in significant rate increases for Tulsa residents (approximately 5.6% per year). However, TMUA has the capacity to pursue creative solutions that will slow the rate growth and result in lower, more reasonable utility bills for ratepayers over the period.

Approach

IMG developed a modified utility enterprise valuation model in order to calculate the change in the utility's value; i.e., the rates paid by consumers combined with the asset value of the utility at the end of the analysis period. Overall, a higher value indicates a better deal for ratepayers.

The Baseline projection is the scenario that incorporates prevailing utility cost trends and projected capital spending under the long-term capital improvement program developed in Task 3. This was compared against the various performance improvement options, which are based on IMG's hypothetical modifications to operations and the capital program based upon its knowledge of private operator practices, with slight changes in assumptions from scenario to scenario.

Under all but the long-term lease ("Concession") options, any performance improvements are assumed to flow directly through to ratepayers in the form of lower rates and a higher utility value. Under the concession scenario, the benefit would flow to the City in the form of a large up-front lease payment, which IMG estimates could total to as much as $1 billion or more (however, utility rates would be the same as under the Baseline scenario).

Analysis

The comparative results are shown in the table below.

Option	Valuation	Average Annual Revenue Growth	Average Monthly Water Bill	% Change in Average Monthly Water Bill
Baseline	$1,619.0	4.97%	$166.0	-
Market Expansion	$1,686.2	4.90%	$165.6	(0.72%)
Partial Outsourcing	$1,709.9	4.87%	$164.6	(1.37%)
AI - Base	$2,108.0	4.50%	$149.4	(10.45%)
AI - Management	**$2,394.2**	**4.33%**	**$142.4**	**(14.63%)**
AI - Upside	$2,495.6	4.28%	$140.2	(15.95%)
O&M Contract	$2,576.6	4.24%	$138.2	(17.17%)
Lease	$2,785.7	4.09%	$132.4	(20.64%)
Concession	$3,056.5	3.96%	$127.7	(23.47%)

Although the Concession Option appears to show the greatest total benefit, there are two related caveats in comparing that option with the others in the table.

- First, the values shown do not consider the higher cost of capital faced by the concessionaire. If, as seems likely, the current tax-exempt debt of the utility would have to be "defeased" and replaced with taxable financing (a mix of debt and equity), and if all future financing of improvements must be done with taxable financing, then the reduction in rates compared to the Baseline scenario will be roughly the same as for the O&M Contracting Option (assuming that the City uses 100% of the lump sum payment or lease payments to hold down rates).

- Second, compared to the other options, the Concession Option has the highest level of uncertainty with regard to its impact on ratepayers. It is likely that ratemaking for the utility would drastically change and could even fall under the authority of state regulators. Finally, most of the benefit of the Concession Option lies in restructuring of the long-term capital improvement program. Of all of the changes assumed in these hypothetical options, these types of changes are the most speculative.

7.0 Comparison of Options

IMG therefore concludes that three options could significantly reduce water and sewer rates in the future:

- contract operation,
- long-term lease concession, and
- an internal aggressive improvement option.

IMG's experience is that internal improvement initiatives usually wane after the threat of privatization abates, and the utility eventually returns to something like its old performance level after a few years. However, the TMUA-City relationship is relatively unique among municipal utilities because it utilizes an asset lease and operating contract, one that could readily emulate a government – contractor performance relationship.

No major City has ever privatized its existing water or sewer utility via a long-term lease-type concession. IMG believes that this is because the politics of relinquishing direct control of water or sewer are so daunting, not because the economics are unappealing. We doubt Tulsa could overcome the many hurdles in the path of a concession. This is unfortunate because we believe that the utility's best opportunity for

reducing its costs (and rates) like in better management of its assets, reduction of unit costs for support services, and the optimization of its internal capital-operations relationship; i.e., exactly the costs that a long-term concessionaire is likely to reduce most.

As for operations and maintenance contracting, this is the right solution for many cities but not, we think, the City of Tulsa. Unlike most systems that have privatized their operations, Tulsa has relatively low unit costs, low hourly labor rates and reasonably good labor productivity *for its core water and sewer operations services* (not including support services like human resources, customer service, purchasing, engineering services, etc.). While it is possible that this is a temporary phenomenon reflecting the City's broad pay and hiring freezes and cost cutting, IMG believes that the operating savings from contract operation would be in the 10-15 percent range rather than the 20-30 percent range routinely associated with privatization.

As noted before, we believe that most of the utility's cost reduction opportunity lie with reducing unit support costs, improving its asset and capital improvement management programs, and in optimizing the interface between capital and operations. This is not what an operations and maintenance contract is designed to do.

This leaves the Aggressive Improvement Option. This option would utilize the unique City-TMUA/TUB contractual relationship to capture the benefits of privatization without the associated transaction costs and the loss of public control over water and sewer; that is, improved internal performance becomes a *contractual* matter rather than simply an internal service goal. Performance tracking and enforcement is made possible – and durable -- by new performance management systems, asset management systems, and support service contracts.

8.0 Recommendations

This Utility Enterprise Initiative ("the Initiative"), as we describe it here, is designed to cause the utility to incorporate the most publicly-valuable aspects of private contract operation and capital investment, along with the best practices of the water and sewer industries, to reduce future rate increases by at least 20 to 30 percent compared to current projections. Future performance improvements would be implemented in accordance with a long-term business strategy, measured against a long-term baseline from year to year, and enforced through specific annual action plans agreements between the City and the TMUA.

The components of the Initiative would unify and enhance the utility's management, operations, capital programming and support services, all to the benefit of Tulsa's ratepayers. They would do so by amending selected utility business processes and by implementing new performance reporting, asset management and executive information systems.

Internal improvement would not ordinarily offer the contract-based certainty of the Operations & Maintenance Contracting Option or even the Concession Option: the constant pressure to improve performance is difficult for a municipal operator to sustain over time, especially after the threat of privatization is gone. However, unlike most water and sewer utilities, TMUA (and TUB) contracts with the City of Tulsa for operations and support services. This contracting structure places TMUA in a similar position to what a city might be if it contracted out its operations to a private operator. Accordingly, by relying upon this contract and TMUA's governance position, IMG believes the utility can – with appropriate new performance management and governance systems – achieve performance and cost-efficiency similar to a private contractor with less risk and with lower transaction costs.

IMG recommends that TMUA take the following actions:

1. **Greater Budget Input:** More formal and direct input by Utility in the creation, deliberations and approval of the annual utility operating budgets and work of the Water and Sewer Department.

2. **Greater Executive Consultation:** TMUA should have formal, consistent and direct means for input into the selection, hiring, firing, evaluation and compensation of the most senior executives in the Water and Sewer Department. For the senior-most executives, the selection, hiring, firing, evaluation and compensation would require the TMUA's consensus.

3. **Utility Strategic Business Plan:** TMUA should develop a Strategic Business Plan that includes specific, long-range and measureable goals for consistently improving the performance of the utility, along with a roster of related action items and milestones suitable for routine reference and regular updating by the Utility. An Annual Utility Performance Agreement (described below) should be developed in accordance with and in support of this Strategic Business Plan.

4. **Annual Utility Performance Agreement:** TMUA should develop and – in consultation with the Water and Sewer Department – update annually thereafter a Utility Service Performance Agreement (USPA) proscribing the performance expectations, goals and major action items to be achieved by the Water and Sewer Department during the year. The USPA should be referenced in the amended City-Utility lease and contract agreements cited in Section 3e above. The performance expectations and major action items embodied in the USPA should be based upon the Utility Strategic Business Plan (see above).

5. **Arms-length, Businesslike Support Contracts:** TMUA should create enforceable, demonstrably-competitive, unit-priced, and terminable contracts for support services provided to the utility by City departments, including but not limited to IT, finance, human resources, purchasing, customer service and engineering services. These contracts should mirror those with private vendors in nearly all respects.

6. **A Full-Time Board Coordinator:** TMUA should hire – via direct TUB or TMUA employment or a professional service contract – a full-time coordinator, and perhaps additional administrative support for the coordinator, to consolidate and interpret the information generated by the performance and asset management systems. The coordinator would also implement and monitor the new support service contracts, prepare relevant briefing materials (including consolidation of materials provided by City departments), and to provide routine administrative support.

7. **Privatized-Like Operational Improvements:** TMUA should identify which operations and maintenance practices of global private contract operators could be implemented in its plants and field operations, and what would be the cost and time required to implement those practices. It should also evaluate the risks and benefits of implementation. In cooperation with utility staff, it should review the roster of identified opportunities and make its selections, and then begin working to implement the changes (along with the appropriate new technology and risk management systems) over the appropriate time frames.

8. **Performance-Optimized Capital Program:** In consultation with utility staff, TMUA should revisit the recently-developed CIPs and the roster of possible changes identified in Task 6 of the Assessment. The Task 6 roster of hypothesized improvements should be expanded, detailed and refined in light of the other performance improvement initiatives – particularly the operational improvements and asset management system – included in the Initiative. This will be used to modify the prevailing CIPs as appropriate.

9. **Improved Asset Management System:** TMUA, the Water and Sewer Department, and the Department of Engineering Services should cooperate to establish a best-in-class utility asset management system. This system would provide the functions necessary to maximize the utilities' value to the public, minimize future rate increases, and contain long-term liabilities.

10. **Implement a Utility Performance Reporting System:** TMUA and the City should implement a utility-wide performance measurement and reporting system, including performance data for core water and sewer services and the utility support services provided by other City departments. The system should provide timely, accurate and useful performance information that is readily shared with senior utility management and staff, City administrators, and TMUA. It should also satisfy the information requirements of the Utility Strategic Business Plan, the Annual Utility Performance Agreement, and the support service contracts.

11. **Instrument for Long-Term Rate Stability:** The City and Utility should cooperate in seeking from the Tulsa City Council a formulaic means or other means that provide the Utility with greater long-term rate and revenue predictability, thereby allowing the Utility to act strategically to reduce long-term rates, assure quality service and preserve utility assets.

12. **Clear Reserves Management Authority:** In order to permit more timely investment, reduced capital financing costs, and greater flexibility to make investments that will help reduce long-term rates and improve TMUA's financial condition, the City and TMUA should cooperate in developing a new policy for the accumulation of, and TMUA control of, capital funding reserves.

13. **New Bottom-Line Performance Tools:** TMUA should create and make routine use of long-term (25 to 50 year) water and sewer rate models for water and wastewater. It should also create and implement a new Enterprise Value Model so that TMUA and the City can regularly track and forecast the economic value of the utility (which for infrastructure enterprises is a function of asset condition, long-term liabilities, and customer rates) resulting from its on-going capital investment and operating decisions. The latter will create a private-sector-like bottom-line indicator of the utility's performance.

14. **Governance Information:** TMUA should implement real-time, past-and-forward-looking governance information reporting that (1) consolidates the performance data from the new systems described herein, (2) tracks utility issues and goals across and between meetings, (3) is readily understandable to its users, and (4) allows TMUA to monitor progress and take informed actions toward the utilities' strategic business goals.

The Bottom Line

Tulsa has a unique institutional structure that might ordinarily be considered a weakness were it not for the lease and service contract structure that defines the TMUA-City relationship. These instruments provide the conduits for an arms-length contractual relationship that can emulate a city-contractor relationship. IMG recommends that TMUA implement a roster of new tools for doing so, and that its actions be guided by a long-term service and pricing strategy that ensures that water and sewer rates will be substantially lower than forecast under a status quo scenario.

7.0 KPMG Report Evaluation

Overview

The KPMG study has already yielded changes to the City's governance processes, and the establishment of the Mayor's Management Review Office portends more to come. Many have had a positive effect on the City's operational performance. However, the consolidation of support services and the isolation of engineering services have placed the utility in a dependent position without direct control over processes that are critical to its performance. Moreover, the study did not consider TMUA as a source of unified management or as a driver of performance improvement.

KPMG's line-item approach listed numerous opportunities for utility improvement, but the sole material recommendation for improvement was the utility-wide long-term privatization option. This appears to be based upon KPMG's initial conclusion that utility services are not core to the Tulsa City government's goals, and therefore those services should logically be left to the private sector. IMG concludes that, however valid that recommendation may or may not be, it is not sufficiently supported by the line item analyses in the report, especially in light of the study's in attention to other systemic performance improvement alternatives.

Key Findings

The study's coverage was impressive in light of its budget. It covered over 1,500 city services, of which roughly 120 were related to core water and sewer utility functions and another 200 to utility-related support services such as finance, human resources and purchasing. Its greatest benefit to the City was in providing a high-level guidebook for reducing costs, while also motivating the City to make major institutional changes and establish a permanent performance improvement structure. It accurately identified the lack of performance management systems as a major impediment to utility performance improvement.

Unfortunately, the analyses appear not to have considered the specific regulatory requirements, service processes or industry standards of water and sewer utility operations. This limited the insightfulness of the study with regard to TMUA and the utility. Moreover, the study's overarching recommendation for the core water and sewer service was to privatize it via a long-term lease. While potentially plausible, the report did not tie this recommendation to the cost and FTE analysis (or any other part of the utility analysis).

IMG's primary concern about the study is that it utilized a quantitative approach that did not yield quantified results (except for the few services targeted for elimination); that is, it cited the current budgets and FTE's associated with each service but gave no indication of how much the budget or FTE count could be reduced by the recommendation. Moreover, for many services the budget and FTE allocation appears to have been sliced so finely (or aggregated so thoroughly) that packaging the services into suitable-for-outsourcing bundles would be quite challenging.

The Bottom Line

The clear expectation of the KPMG report is that the City would conduct additional analyses for high-cost services, and would bundle those and other services in a way that would attract private sector bids, or at least a measure of process reengineering. However, the report provides little guidance in that regard. In nearly all cases the reader is left wondering about the next step and the potential value of taking it.

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Task 1: Governance and Management Review

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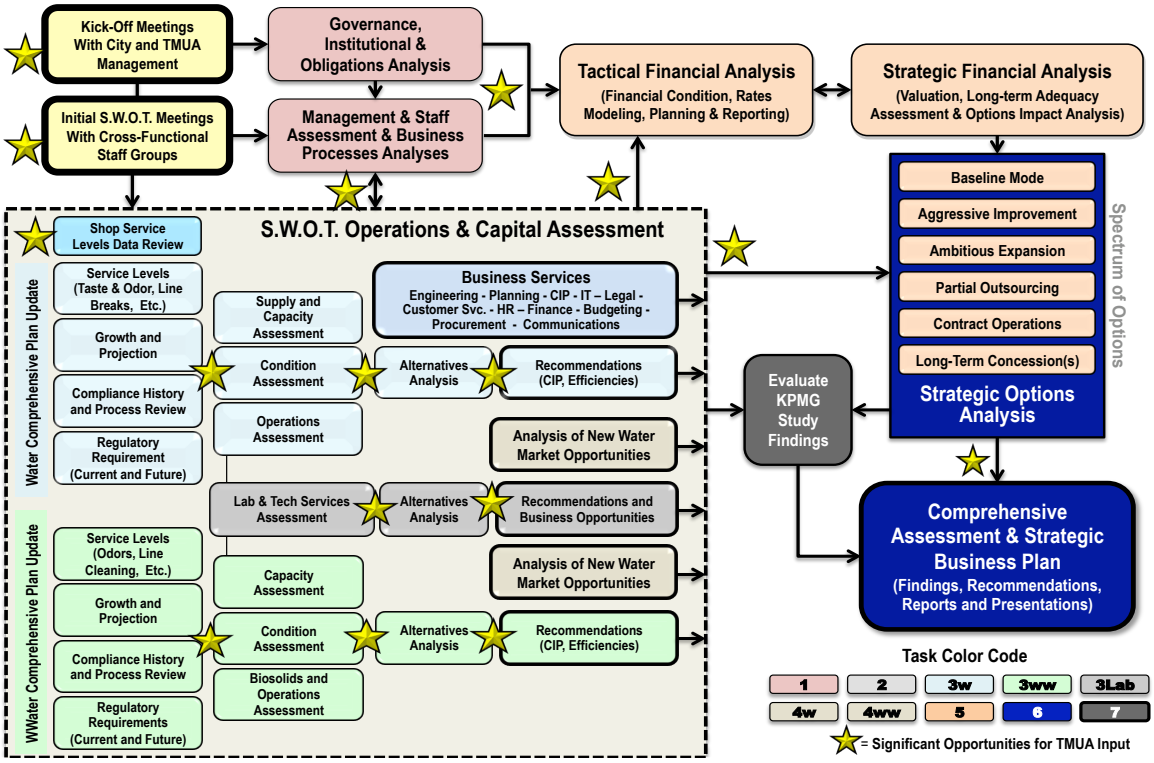
Introduction to the Comprehensive Assessment

The Tulsa Metropolitan Utility Authority (TMUA) is tasked with providing efficient and reliable water and sewer services to its customers. In doing so, it depends upon services provided by departments within the Tulsa city government. Like all water and sewer utilities, it faces an evolving business environment that is likely to become even more difficult in the future. While private corporations confront their challenges with multi-year business plans, a public utility's business timeframe is measured in decades. This creates special challenges for TMUA and places unique burdens on the organizational structure which functions beneath it.

Managing TMUA's strategic mission is made even more challenging by the dictates of short-term municipal budgeting and rate setting. Overcoming these constraints requires both an understanding of the utilities' current operational efficacy and its long-term investment and performance needs, as well as a genuinely strategic context within which the shorter-term decisions can be made. Accordingly, the TMUA board of directors have commissioned this Comprehensive Assessment, which consists of the tasks shown in the diagram below.



This Executive Summary incorporates the key findings and recommendations from each of the tasks.

Task 1: Governance And Management Review

The governance and management review began with a series of cross-functional meetings that included staff from different divisions involved with water and sewer services. It then progressed to interviews with individual unit managers, including relevant support and administrative services, as well as Mayor Bartlett. Various types of data were collected and analyzed, including charter documents and intergovernmental agreements, business process maps, budget and staffing data, cost and service analyses, and policy documents. Based upon this information, the IMG Team reached the following summary findings.

1.1 TMUA/TUB Mandate and Authority

The enabling legislation for public trusts states that one of the statutory presumptions about a public trust is that it is "a legal entity separate and distinct … from the governmental entity that is its beneficiary", acting "on behalf and in the furtherance of a public function or functions for which it is created."[i] As the creature of a public trust, TMUA is a separate legal entity from the City, existing with independence and permanence notwithstanding changes to Mayoral administration or council membership.

The TMUA Trust clearly states the purposes for which the TMUA was created. In addition to providing funds for the cost of financing the creation, operation, and maintenance of the water and wastewater systems, TMUA is to

- "develop, improve, operate, maintain, regulate, conserve, and protect water supply, sewage and garbage facilities"
- "supply to persons (natural, corporate, municipal or governmental, or any one or more thereof), services and the utilization of physical facilities of any and all kinds compatible with the nature of the Trust Estate"; and
- "acquire…and … construct, equip, maintain, hold, store, operate and administer any property (real personal and/or mixed), rights, privileges, immunities, franchises, benefits and any other things of value, designed, adaptable to or needful for utilization in instituting, extending, enlarging, furnishing, improving, providing, or supplying any of the aforementioned services and physical facilities."

This broad grant of authority is subject to minimal City oversight – requirements that TMUA trustees be appointed by the Mayor and approved by the City Council and that any TMUA debt undertaking be approved by a two-thirds vote of the City Council. Moreover, unlike the Board, whose ability to contract is subject to Mayoral approval, TMUA is under no such a requirement when expending the revenues which its use fees have generated.

Furthermore, the 1984 and 1989 Lease Agreements and Operation and Maintenance Contracts between TMUA and the City (acting with the express approval of the Board) amplify TMUA's preeminence by entitling it to the receipt of an array of services from its contractor, the City, in exchange for the issuance of revenue bonds. As the recipient of both the Board's and the City's interest in and control of its water and

wastewater systems, TMUA has a right and a duty to oversee the services it receives and ensure their adequacy against the yardstick of "first class order" which the City pledged.

TMUA, acting through its board of trustees, holds the ultimate responsibility for ensuring that safe drinking water and sound wastewater services are provided to the community. Moreover, TMUA has sufficient authority under its charter to establish water and sewer rates and to require that capital improvements, operations and maintenance be provided in a manner that it deems necessary to fulfill that responsibility. However, TMUA's ability to do so – that is, to direct and hold accountable the municipal providers of the essential contractual services – is significantly affected by the organization structure and business processes of the City of Tulsa.

There is at least some risk that the dispersion of authority among TMUA and various City departments, as well as the disconnection of critical support services from utility operations (particularly engineering and customer service), could lead to a steady erosion of staff cohesion, service levels and asset preservation.

1.2 Culture and Staffing

Core Water and Sewer Department employees appear remarkably devoted to their mission. They tend to identify themselves first and foremost as utility employees. Such is their pride in their work that -- acting independently and in groups -- many have developed ad hoc processes for steadily enhancing their work skills and preserving the condition of the assets with which they are charged.

On the whole, core Water and Sewer Department employees appear to have a great deal of respect for the TMUA board, which they view as professional and personally devoted to utility service quality, protection of the assets, and a positive culture among utility employees. However, many staff expressed increasing frustration with career and compensation advancement opportunities, training, turnover and the quality and responsiveness of centralized support services. They also felt that the cohesiveness of the staff responsible for the utilities had suffered under the combination of persistent City budget cuts and the recent reorganization.

The IMG Team noted the following staffing issues:

- **Compensation** - Based on our investigation, entry-level compensation is below market, making it difficult to attract and retain qualified staff. The City often uses a temp agency instead of advertising for permanent employment since the response rate is so light. However, this provides an opportunity for the supervisors to "test drive" the "temps" before offering employment. Still the turnover rate appears relatively high once a new entry-level hire is brought on board.
- **Progression** – Decision making for employee advancement and compensation increase were effectively removed from the direct control of utility management when the services consolidation was put into place. Moreover, promotion of top management remains beyond the control of the TMUA board. Improved dialogue between management and HR has made progress on this issue in some cases, such as a few positions at the wastewater treatment plants, but not in other critical positions. The lack of advancement opportunity has impacted the ability to retain employees.

- **Succession planning** - The loss of qualified and licensed staff appears to be a significant problem for water and wastewater systems nation-wide. Staff originally hired and trained as federal funding supported the construction of treatment facilities driven by the Clean Water Act and Safe Water Drinking Act are all now reaching retirement age. While the HR department and the Water and Sewer Department understand that this is an important issue, no formal program is in place to address it.
- **Overtime** - Impact of eliminating supervisor (straight time or regular hourly rate referred to in Tulsa as "premium pay") where supervisors are paid straight time for hours over 40 has led to reduction in hours worked by supervisors, likely leading to reduced crew productivity.

1.3 Organizational Structure

The following observations and findings were identified during the review of the organizational structure of Tulsa's water and wastewater utilities.

- There are no clear operational reporting lines from the Water and Sewer Department to the TMUA board, thereby limiting the ability of TMUA to fulfill its statutory responsibilities.
- The Value Chain of Utility Services (treatment – distribution – customer – collection - treatment) is spread across three different departments in the City (water & sewer, finance, and customer service), and arguably more than that.
- The organizational structure encourages silos.
- There are few formal joint processes facilitate the communication, align the goals and set priorities between the departments that affect the performance of Tulsa's utilities.

1.4 Critical Management Processes

The combined governance and organization structure that has been in place for the last two decades (with governance fully separated from management and operations) is a hybrid authority-departmental structure that is relatively unusual among its peers. As implemented in Tulsa, this structure has several points of vulnerability, beginning with weak and sometimes conflicting linkages between responsibility and execution.

For a time, those vulnerabilities were obscured – but not resolved – by a relatively powerful public works department and adequate working relationships among the participants, ranging from the mayor and the heads of various City departments to TMUA board members and the Tulsa City Council.

1.5 Coordination and Accountability

The inherent organizational vulnerabilities have been highlighted by the combination of persistent City of Tulsa general fund budget pressures and the recent reorganization of critical support services to the utilities, which leaves at least four – and arguably up to six – entities with determinant influence over the utilities' ability to perform.

The processes for coordinating management and decision-making among these entities range from relatively informal (coordination among utilities, finance, and engineering services) to seemingly arbitrary (rate approvals). Moreover, the emerging "service level agreements" among the various new support service entities appear to lack means for enforcement, particularly from TMUA's and the Water and Sewer Department's standpoint.

1.6 Support Services

The efficacy of critical support services – in the utilities' case, this includes engineering services, finance, human resources, purchasing, legal, information technology and customer service – depends upon their respective responsiveness, the efficiency of the individual support service's business processes, resource adequacy, and the level of direct control exercised by the utilities.

On the whole, the support services fall short on these criteria despite the apparent good-faith efforts of the respective support service managers. At least part of the shortfall is due to inadequate information technology investment to support higher levels of efficiency, communication and responsiveness of the service processes (e.g., unification of the various work order and customer inquiry systems), while much of the remainder appears attributable to organizational gaps between support service providers and the core utility staff. While this is tolerable, if frustrating, for core utilities staff, the greatest organizational risk to future performance and asset preservation appears to lie with the separation of engineering services from utility operations. The table below summarizes IMG's assessment of the relationship between the core water and sewer utility and the City departments that provide critical support services.

	Communication	Business Process	Lacking Required Content Knowledge	Missions Not Aligned	Staffing Resources	Accountability Unclear
HR	•	•	•	•		•
Purchasing	•	•	•	•	•	•
IT	•	•				•
Customer Service	•	•	•			•
Engineering	•	•		•		•
Legal	•		•	•		•

• *indicates where improvement is needed*

In addition, the IMG Team made the following observations:

- The Water and Sewer Department suffers from a broad range of unmet IT needs required to support operations, asset management and customer service. For example, the Water and Sewer Department uses multiple work order systems without a common platform.

- The IT department understands many of the problems and is taking action to address them. For example, a "ticket request" system is used that also provides for customer survey comments. The department is severely limited by budget constraints. It appears that IT purchasing is dependent on general funds through the sales tax based capital funding program on a 5 year cycle.
- Communications are not effective at all levels between the operators at the Water and Sewer Department and the engineers in the Engineering Department.
- Engineering project priorities in Tulsa have been traditionally driven by consent orders and funding, but engineering services are also needed to support efficient operations and a comprehensive asset management plan. The current collaboration process is relatively informal does not appear to be adequately coordinated with the Water and Sewer Department's short-term and strategic needs.
- Typically, pipe replacement would be based on age of pipe, break history and capacity considerations. In Tulsa, it appears to be based largely on the street rehabilitation cycle. While coordinating pipe replacement prior to street paving is important. This approach may be over emphasized in Tulsa, and could be adversely affecting the utility's asset management principals and its ability to deliver efficient and reliable service.
- The number of engineering services staff allocated to the utilities appears to be unusually large for the size of the utilities, particularly considering that so many services are outsourced to consultants. The number of engineers seems particularly large compared to the engineer/staff ratios of private water and sewer utility operations (concessions and private ownership).

1.7 Benchmarking

The core plant-level staffing appears to be within the industry norms for well-performing utilities with similar water and wastewater treatment volumes. However, Tulsa's support services staffing levels, plus general government overhead staffing, allocated to the utilities appear to be higher compared to the award-winning, best-in-class performers among utilities of similar size (as measured in terms of Full Time Equivalent employees per unit of utility service).

This finding is somewhat surprising considering the aggressive belt-tightening measures taken by the City over the past few years. It is possible, therefore, that the relatively poor "total staff" peer comparison (core + support + administrative head count) against high-performing peer utilities may be attributable to possible over-allocation of support staff to the utilities, at least on a budgeting basis.

A summary of the AWWA benchmarking performance indicators is shown in the table below.

	Water Operations				Wastewater Operations				Combined Operations			
	Top Quartile	Median	Bottom Quartile	Tulsa	Top Quartile	Median	Bottom Quartile	Tulsa	Top Quartile	Median	Bottom Quartile	Tulsa
Customer Accounts per Employee	667	456	333		809	555	378		771	538	390	
without indirects				288				348				314
with indirects				270				326				295
Customer Service Complaints per 1000 Customers	0.9	5	14.5	na	0.1	0.3	0.8	na	0.8	5.2	18.6	na
Technical Quality Complaints per 1000 Customers	1.9	4.4	11.2	na	0.3	1.9	5	na	2.3	6.2	16.4	na
Customer Service Cost per Account	$19.33	$30.22	$50.69	$36.59	$7.94	$11.76	$18.57	$31.93	$31.96	$42.03	$64.64	$68.66
Billing Accuracy Rate per 10,000 bills	3.5	10.8	36.2	na	0.1	2.2	6.2	na	2.6	7.1	16.1	na
MGD Water Delivered per Employee	0.33	0.24	0.15									
without indirects				0.23								
with indirects				0.21								
MGD Wastewater Processed per Employee					0.36	0.27	0.20					
without indirects								0.19				
with inidrects								0.18				
Debt Ratio	20.70%	28.60%	43.30%	29.46%	19.10%	28.10%	32.80%	35.09%	21.20%	32.20%	45.80%	32.21%

na - not available

In conducting its benchmarking analysis, the IMG Team also utilized NACWA data, which revealed similar and additional concerns about the level of non-core utility staff allocated to utility's account.

Distribution of Personnel by Function

		without indirects		with indirects	
	NACWA Survey	City of Tulsa Sewer		City of Tulsa Sewer	
Functional Category		staff	distribution	staff	distribution
Administration	21.0%	112	30.2%	136	34.4%
Collection	28.0%	120	32.3%	120	30.4%
Treatment	51.0%	139	37.5%	139	35.2%

The NACWA benchmarks demonstrate the impact that administrative and governmental overhead allocations have on the personnel requirements and associated costs of the wastewater utility. Review of the detailed staff allocations indicates Engineering allocates 93 of its 173 full time positions to the utilities. An additional 22 positions are allocated from Development Services.

Administration Personnel per 1000 Customers

	Average
NACWA Survey	0.54
City of Tulsa Sewer	
without indirects	0.87
with indirects	1.06

An additional evaluation of administrative costs is to benchmark the ratio of personnel per customer. NACWA data allows the calculation of personnel per 1000 customers. Comparison of Tulsa to industry averages is shown in the attached table. The Tulsa indicators support the finding that the Administrative costs allocated to the wastewater utility are out of line with the industry.

In order to evaluate the employees associated with Collection and Treatment benchmarks for personnel per treated MGD and personnel per 100 mile of pipe can be evaluated. A comparison of Tulsa's results with the NACWA benchmarks is shown below. Results indicate Tulsa's sewer operations are in line with industry averages.

	NACWA Survey	City of Tulsa Sewer
Personnel per MGD	1.83	1.99
Collection Personnel per 100 Mile of Pipe	5.40	6.12

* ***NOTE:*** *The Team's understanding from AWWA and NACWA is that the peer data on FTEs- per-service-unit includes personnel, such as support services, but some of the peer data may not include overhead general government staff.*

1.8 Recommendations

To address these issues, the IMG Team identified the following opportunities for improving governance, management and the relationship between the TMUA and the City of Tulsa:

1. **Nurture a Stronger Unity of Purpose via the TMUA Board:** Unify the utility's operations, capital programming and support services through the TMUA board by amending selected HR practices, modifying selected business processes, and implementing new performance and management reporting systems that are shared with the board.

2. **Appoint a Full-Time Board Coordinator:** Hire a full-time coordinator employed directly by the board (plus administrative support) to consolidate and interpret performance information, briefing information provided by City staff, distribute board directives, and coordinate deliberations involving senior management and the board.

3. **Enhance Board Consultation On Senior Utility Management:** Amend HR practices such that the board provides more direct and more determinant input into the selection, evaluation and compensation of the top senior managers in the utilities.

4. **Implement More Enterprise-Like Support Contracts:** Create enforceable, demonstrably competitive, unit-priced, and terminable support service contracts, including all or part of IT, HR, purchasing, customer service and engineering services. These contracts should mirror those with private vendors in nearly all respects, especially enforceability.

5. **Significantly Improve Asset Management Systems:** Establish a best-in-class utility asset management system that provides the functions necessary for the TMUA board to maximize the utilities' value to the public, minimize future rate increases, and contain long-term liabilities.

6. **Provide the TMUA With Greater Board With Greater Utility Budget Input:** Greater and more direct input in the creation of, and approval of, the annual utility operating budgets and capital improvement programs.

7. **Significantly Expand Utility Performance Reporting:** Implement a common, strategy-driven performance management and reporting system that is readily shared with senior utility management and staff, City administrators, and the TMUA board.

8. **Pursue Long-Term Rate Covenants:** Negotiate a series of long-term rate covenants (10 years or more), which effectively place rates under full TMUA's control once the terms of the covenants are negotiated. These covenants should be sufficiently flexible to allow TMUA to act strategically to reduce long-term rates, assure quality service and preserve the utilities' assets.

9. **Pursue Accumulation of Strategic Special-Purpose Financial Reserves:** Explicitly permit TMUA to accumulate and control capital funding reserves in order to ensure timely investment,

reduce capital financing costs (and thereby future water and wastewater rates), and more readily make small and mid-sized rate-reducing investments.

10. **Focus on Enterprise Value Via Cutting Edge Analytic Tools:** Implement and make routine use of a long-term (20 to 50 years) rate models for water and wastewater. Create and implement a new Enterprise Value Model so that the board and City can track and project the economic value of the utilities (a function of asset condition, long-term liabilities, and water and wastewater rates) resulting from on-going capital and operating decisions. These models are an important component of the Governance Information recommendation below.

11. **Implement New Governance Information Reporting:** Develop a real-time, past-and-forward-looking governance information system that tracks board issues and goals across and between TMUA meetings, is readily understandable to individual board members, and allows the board to independently establish, track, enforce and take appropriate actions toward the utilities' strategic business goals. This report will consolidate all of the relevant performance information, from budgeting and CIP to asset management, the rate model and a new Enterprise Value Model.

Task 2: Operations Review

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Task 2: Operations Review

Overview

Task 2 of the Comprehensive Assessment consists of an audit of utility operations. It includes a functional review of the organization, its assets and operating procedures across the utility. This includes staffing, key operations and maintenance processes, and the technology used to manage those processes. It also includes a high-level comparison or benchmarking with utility peers where possible, but does not include a detailed cost analysis of staffing, utilities and materials, which will be included as part of the Aggressive Performance Improvement Option in Task 6. Similarly, the recommendations for improvement are also deferred to the Task 6 report. A detailed analysis and recommendations for the asset management systems will be included with the capital needs assessment in Task 3.

Overall, we find the utilities to be relatively efficiently managed at the plant and field service level, with no obvious examples of overstaffing and a few examples of potentially-troublesome understaffing compared to workload. Outsourcing of selected services is generally well-directed, although there are opportunities for expanding, aggregating and streamlining the outsourcing (this finding will be expanded in Task 6).

Technology usage and reliability is somewhat below the level typical of high-performing utilities, although operations and maintenance staff clearly recognize the issues and opportunities, and seem eager to implement improved and consolidated systems for work order management, asset management and customer service. Several new initiatives are currently underway, and progress is being made to improve existing systems, streamline technology-dependent processes, and bring upgraded software and hardware into the utility.

As we did in Task 1, the IMG Team observed organizational and process disconnects between support services (customer service, information technology, engineering services, human resources, purchasing, etc.) and utility operations that affect overall performance, both efficiency and effectiveness. Moreover, the addition of these support costs and head counts shifts the utility from a relatively efficient performer to a weak performer among its high-performing peers. Moreover, the absence of formal collaboration pathways among organizational units and consolidated executive decision-making is a persistent risk factor that will be addressed again in future tasks. This issue was additionally addressed in Tasks 3, 6 and 7.

The following narrative summarizes the key findings for each major operating component of the utility.

1.0 Raw Water Supply System

- TMUA's raw water supply system is a complex system employing multiple sources, with flowlines and pump stations spread over a distance of approximately 53 miles for the Spavinaw/Eucha system and 23 miles for the Oologah system. Raw water pump station status is continuously monitored through SCADA, although operational control is manual and local. Implementing a more robust and

intelligent SCADA system would allow raw water staff to better manage and operate this complex raw water conveyance system.

- The large terminal storage reservoirs at the Mohawk and AB Jewell WTPs are crucial to overall system reliability and resiliency. Lake Yahola and Lynn Lane Lake provide equalization of raw water flowline demand requirements, reduce pumping costs for the Spavinaw and Olagah supply, and buffer rapid changes in raw water quality. These two terminal storage basins provide anywhere from 10 to 30 days of supply depending on the system demand and how much of the reservoir volumes can actually be used.

- The annual pumping energy costs for moving raw water from the Spavinaw/Eucha system to the Lake Yahola the terminal reservoir is approximately 1.1 cents per 1,000 gallons. For the Lake Oologah system the cost is approximately 2.1 cents per 1,000 gallons to get raw water to Lynn Lane Lake. This difference is primarily the the Spavinaw flowlines flow by gravity up to 60-65 MGD, while raw water from Lake Oologah must always be pumped. Therefore, from an energy cost standpoint it is beneficial to maximize the usage from the Spavinaw/Eucha system.

- Over the last three years, average raw water usage from the Spavinaw system was 59.9 MGD, versus 55.6 MGD from the Lake Oologah system. Since the dependable yield for the Spavinaw/Eucha system is approximately 59 MGD, it is clear that current usage of the Spavinaw system is maximized. Under these circumstances, TMUA raw water supply staff has adopted the good practice of maximizing Spavinaw system usage while minimizing the pumping from this supply to lower energy costs.

- A comparison of raw water and treated water production volumes shows raw water loss rates of approximately 10 to 12 percent. However, losses attributable to the raw water conveyance systems are estimated to be in the range of 5 to 10 percent. This is very good performance given the age of the Spavinaw system and the lengths of the four raw water flowlines.

2.0 Water Treatment

- Spavinaw and Oologah source waters are challenging to treat - requiring diligent operation to meet existing regulations, Partnership for Safe Water (PSW) best practices, current DBP limits, and taste & odor goals. In spite of this, TMUA maintains compliance with current regulatory requirements and voluntary PSW guidelines.

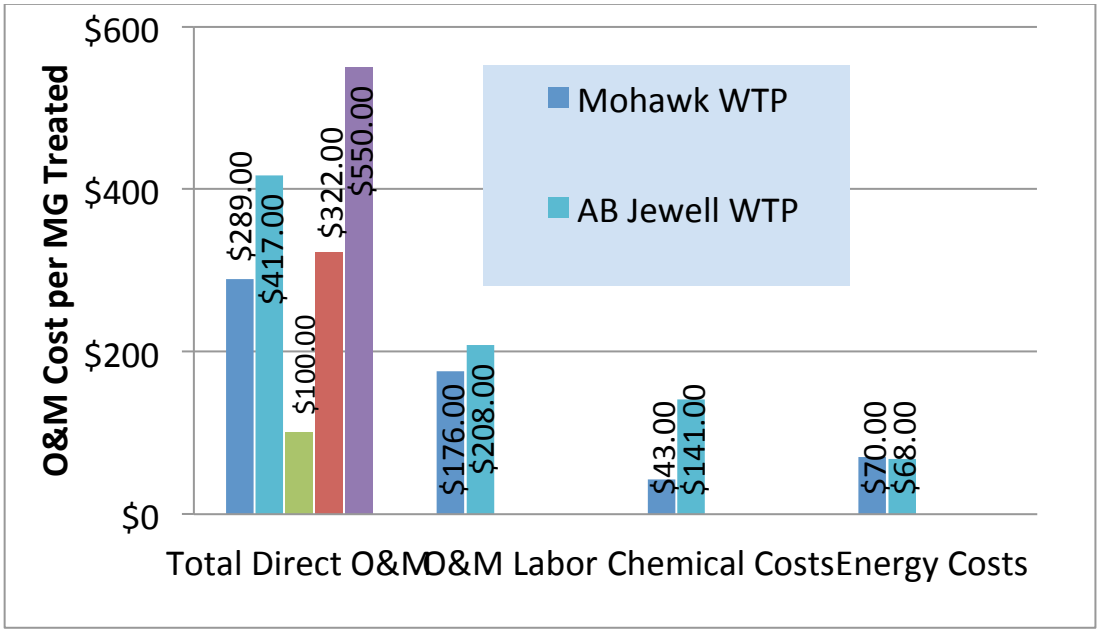
- Record water production occurred in August 2011, which stretched the system but did not result in significant performance or service level failures.

- Direct water treatment costs are currently in line with 2007 AWWA benchmarks, although treatment of Lake Oologah at AB Jewell WTP is more expensive than the treating Spavinaw water at Mohawk. Coagulation dosages and residuals handling/dewatering operations at AB Jewell WTP are in need of further optimization.

- WTP O&M staff are remarkably passionate about their mission, and extremely proud of their performance. Operations staffing levels are slightly below industry norms for facilities of comparable size and complexity. Maintenance staff levels are slightly above norms, although these personnel currently perform significant "maintenance capital" duties which reduce CIP needs.

- A spreadsheet-based Strategic Asset Management System (SAMS) is currently being used by TMUA for prioritization of O&M and CIP planning for raw water and WTP facilities. Other information management solutions (e.g. instrumentation and control, SCADA, computerized maintenance management system (CMMS)) are also in place at the WTPs, however these tools are not consistent or fully integrated and aligned across water supply operations.

- The IMG Team benchmarked unit operating costs for water treatment, the results of which are shown in the chart below.



- A benchmarking of Tulsa's water treatment staffing yielded results summarized in the table below:

WTP Staffing Level Comparison

WTP Facility	Operations	Plant Maintenance	Total
Erie County Water Authority Sturgeon Point WTP, Buffalo NY	16	11	27
Erie County Water Authority VanDeWater WTP, Buffalo NY	16	8	24
Metropolitan Water District of Southern California, Weymouth WTP	19	11	30

Greater Cincinnati Water Works Miller WTP, Cincinnati OH	14	9	21
TMUA Mohawk WTP	**13**	**10**	**23**
TMUA AB Jewell WTP	**14**	**11**	**25**

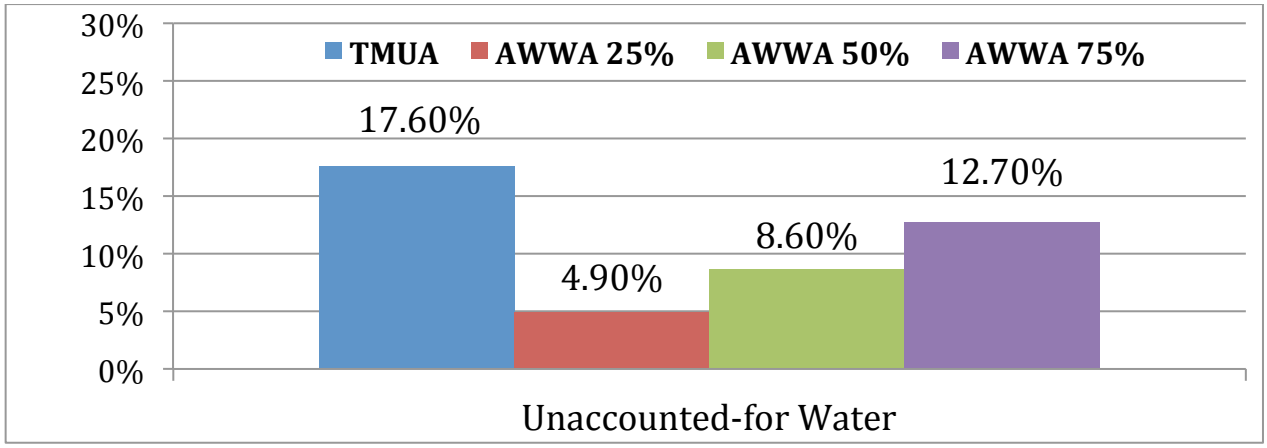
TMUA operations staffing levels at the two WTPs appear to be slightly below industry norms for facilities of comparable size and complexity. Maintenance staff levels are slightly above norms, although at TMUA these personnel currently also perform significant "maintenance capital" duties not generally undertaken at other utilities. Record water production occurred in August 2011, which stretched the capability of TMUA water treatment plant and pumping systems. Some pumping weaknesses were revealed during this event, and O&M activities were extensive, however there were no significant water treatment performance failures during this period.

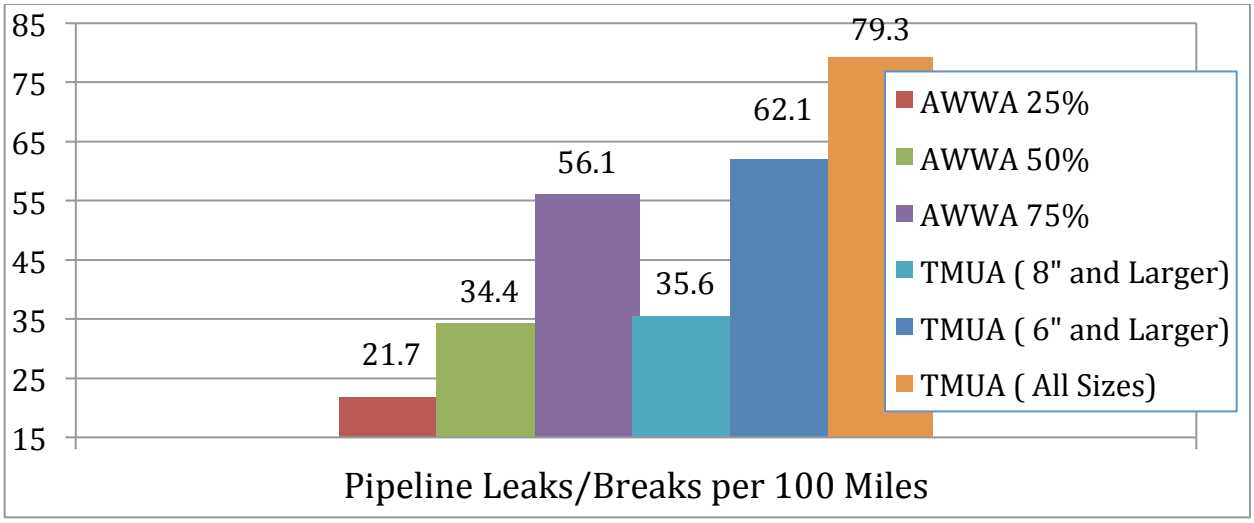
3.0 Water Distribution

- Distribution system operations meet and/or exceed performance criteria for water quality, pressure and flow. Furthermore, distribution system operations are carefully planned to maintain distribution water quality and minimize water age, both of which are considered to be best practice attributes by forward-looking water utilities.
- TMUA pumping stations and tanks (with the exception of Reservoir Hill) were found to be well maintained, and reflected a level of maintenance attention rarely seen in Tetra Tech's experience.
- Mainline crews respond quickly to "low pressure" and "no water" calls, and consistently complete leak/break repairs within five hours.
- Preventive Maintenance displays a proactive management style. For example, deployment and readiness of the back-up generators essentially eliminated the potentially highly disruptive consequences of the power outages associated with the major snow storm of February 2011. Standby power at each location is fired up and tested during one shift each week. This is an excellent testing and maintenance routine which ensures this equipment will operate when needed.
- Distribution system physical security is excellent. Multiple layers of physical security are provided for all tanks and pump stations, including alarms for fence lines, gates, all doors, and outside generator panels; and motion detectors inside buildings and stations. Security alarms are sent to both SCADA and hand-held devices.
- Distribution system integrity is adequate as measured by unaccounted-for water and leak/break AWWA QualServe[tm] benchmarks, which notably represent best in class integrity metrics. Distribution system integrity will benefit from replacement of legacy 2-inch waterlines.
- The Meter Shop currently changes out at least 16,000 small meters per year and diligently and aggressively executes the change out program (COP). The system currently applies AMR

technology on about 7,000 (or five percent) of the residential meters. TMUA should continue investigating further deployment of additional AMR technology.

- Leak detection, hydrant flushing and valve exercise programs are consistent with AWWA best practices, although more granular tracking of reported leaks would be beneficial. More resources are needed to reduce the flushing cycle time to approximately 90 days or pursuant to ODEQ guidelines.
- The disproportionate number of leaks and breaks occurring on 6-inch diameter waterlines during fire flow testing suggests the need for improved hydrant testing procedures. These procedures have been developed and submitted to the Tulsa Fire Department. TMUA distribution system personnel should assist Fire Department personnel with training and implementation of these improved fire hydrant testing procedures.
- Notwithstanding the excellent condition of TMUA storage and pumping station equipment, there is currently no systematic use of a CMMS or SAMS for tracking and prioritizing maintenance and capital planning.
- A brief benchmarking analysis of water distribution's performance yielded results summarized in the tables below:These tables compare the Tulsa water distribution system to the QualServe survey responses for water loss and frequency rate, respectively. For example, the survey indicates a median of 8.6% for water loss, while the widely accepted goal of 10 % is considered excellent performance.





4.0 Source Water Management and Protection Program

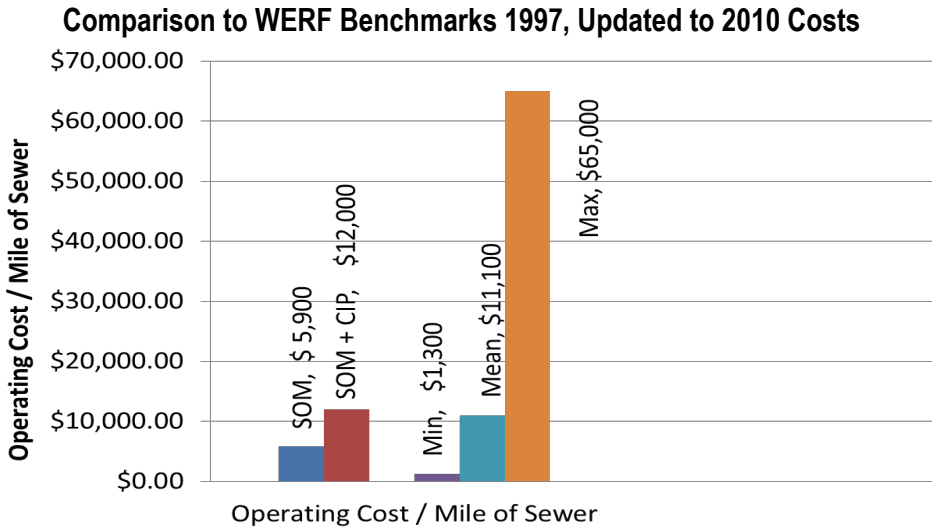
- Source water management and protection efforts are challenging and complex, and cannot be effectively outsourced without risking efficacy of the programs. TMUA conducts extensive water quality and flow monitoring in the Spavinaw watershed:
  - OWRB requirements
  - Operational imperatives
  - Nutrient control and management
  - Taste & odor early warning, and
  - Restoration/protection under the court-ordered Settlement Agreement.
- TMUA and watershed partners currently track numerous 319 Grant and CREP projects within the Eucha/Spavinaw systems.
- Tulsa and TMUA's source water protection program (SWPP) was reviewed for its consistency with best standards and practices published by the American Water Works Association (AWWA) and USEPA, and in comparison with two comparable and forward-looking utility SWPP programs (Beaver Lake Water District and Raleigh NC Falls Lake Watershed).
- Tulsa's and TMUA's SWPP for the Eucha/Spavinaw source meets all six AWWA standards and compares well with the two top-tier programs.The actual efficacy of some watershed programs is difficult to measure because no clear goals and/or metrics have been established.
- There are currently no formalized watershed protection or restoration programs in place in the Oologah watershed, although USACOE is in the process of completing a multi-year assessment which will identify BMPs for nutrient management.
- TMUA could better align current SWPP initiatives with AWWA/EPA best practices to more fully define and support strong communication, financial and program planning, and SWPP operations. As part of

this effort TMUA should focus on developing a more integrated assessment methodology, reconstituted past coordination stakeholder activity for the Eucha/Spavinaw, and increased partner support for source water protection in the Oologah and Hudson systems.

5.0 Wastewater Collection System

- Operation and maintenance of the wastewater collection system (WWCS) is carried out by both the Sewer Operations and Maintenance (SOM) and Engineering Services Division (ESD), with control of overall annual O&M funding split evenly between both entities.
- While a few formal Performance Standards have been adopted and are tracked on an annual basis, additional Performance Standards could be adopted and would lead to increase focus and accountability.
- Both ESD and SOM maintain Information Management Systems but the systems do not readily share data, limiting the ability of both groups to manage the system at increased levels of efficiency.
- A limited benchmarking analysis of Tulsa's wastewater collection operations yielded results summarized as follows. The Water Environment Research Foundation prepared a peer report entitled *"Benchmarking Wastewater Operations-Collection, Treatment, and Biosolids Management." Project 96-CTS-5, 1997.* This report collected data from 53 utilities to develop an econometric model as a basis for comparing operations of wastewater utilities to each other. To offer a valid comparison to the TMUA's operations, The IMG Team updated data from this model to 2010 using applicable Consumer Price Index (CPI) adjustments.

  The utilities in the survey were generally large, serving over 300,000 population base. The mean utility size served a population 365,000 with 74,426 Residential connections.



This comparison shows that Tulsa's operation including engineering support has O&M costs comparable to the mean of the utilities in the Study.

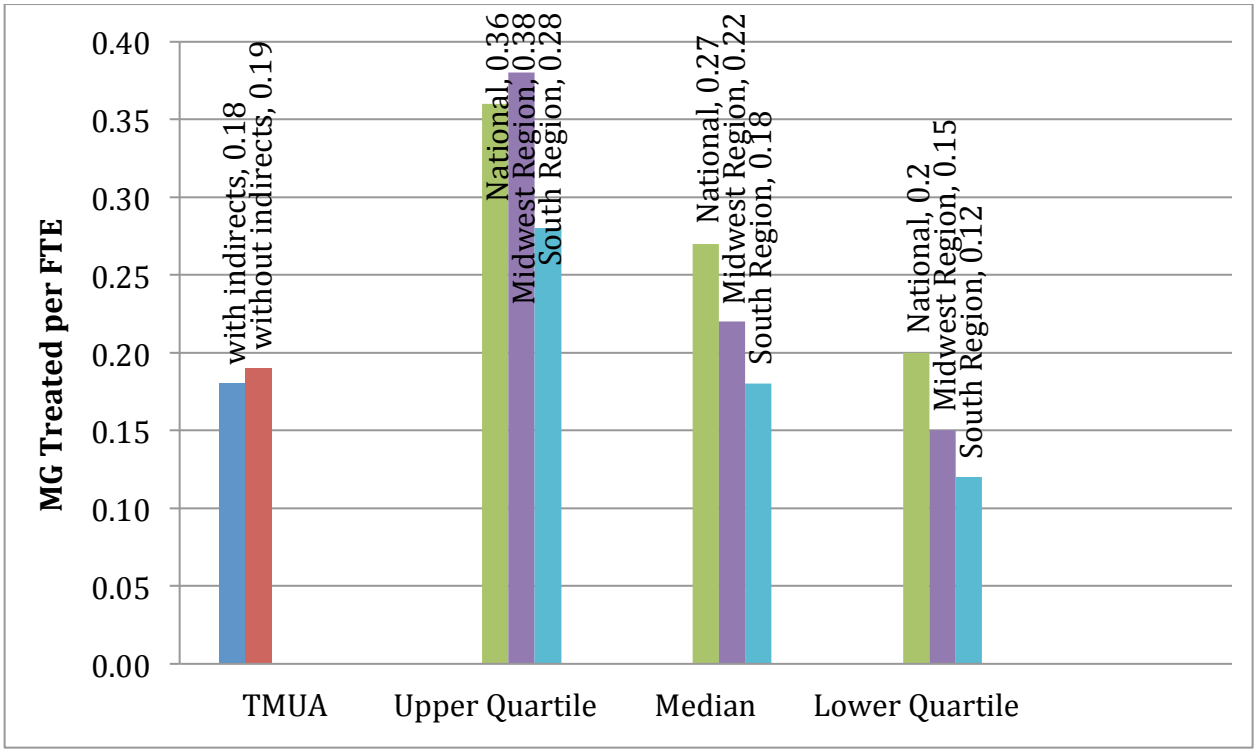
6.0 Wastewater Treatment System

- **CMMS/Asset Management Coordination.** Within Water Pollution Control, maintenance activities are increasingly more productive and focused through the use of the Antero computerized maintenance management system (CMMS), and better asset replacement decisions are made with the strategic asset management system (SAMS) spreadsheet tool. Combining these activities with the SAMS database being deployed as part of this project will further improve and consolidate decision making among the wastewater treatment plants. Consideration should be given to using Antero for the water treatment facilities and deploying the SAMS database tool through all of the Water and Sewer Department so that risk management decisions and CIP budgets can be managed at a higher level and not just at the department level. CIP budget decisions would be made for both O&M CIP projects and CIP projects managed in the Engineering Department.

- **Maintenance Personnel Deployment.** With increased CMMS proficiency and data, maintenance activities should be monitored and directed at a higher level, with more flexible pools among facilities, and perhaps between water and sewer facilities. A high level maintenance supervisor with the authority to direct activities and assign resources should be considered.

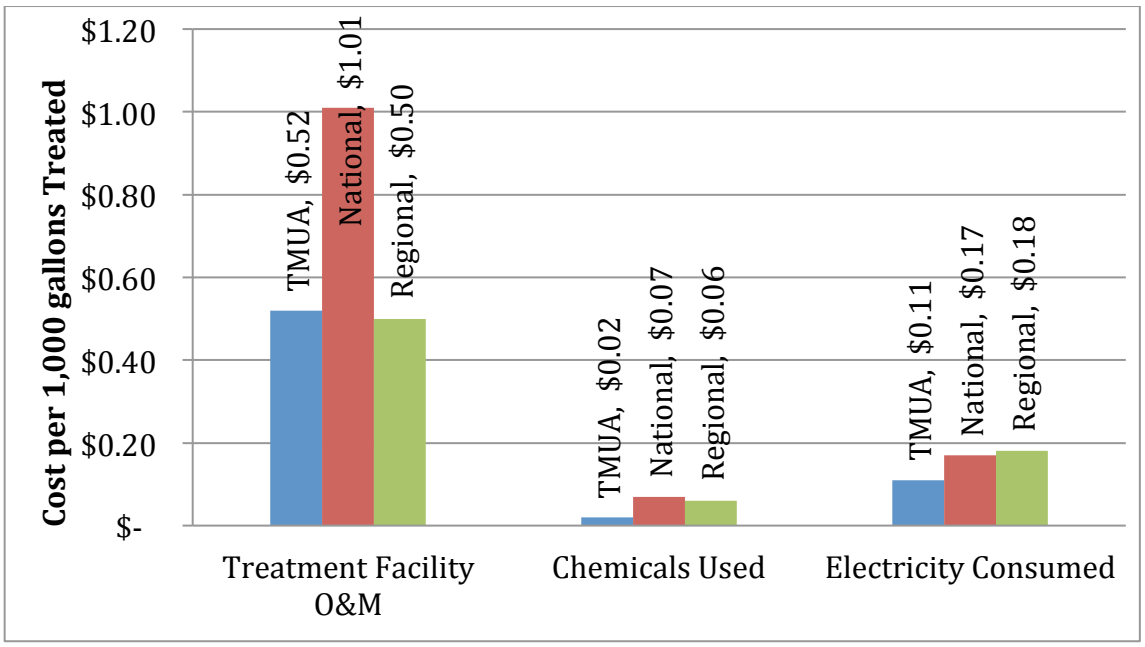
- **Use of SCADA.** SCADA systems are deployed with most capital projects throughout the water pollution control system, but not all devices are kept in service to allow automatic and efficient operations. Sufficient maintenance resources should be kept and management should demand that automatic operations through SCADA are to be expected. Future projects should consider device data downloads into Antero for key maintenance items (e.g., hour meters on equipment).

- **Benchmarks.** The IMG Team conducted a limited benchmarking of wastewater treatment operations, with the results summarized as follows.



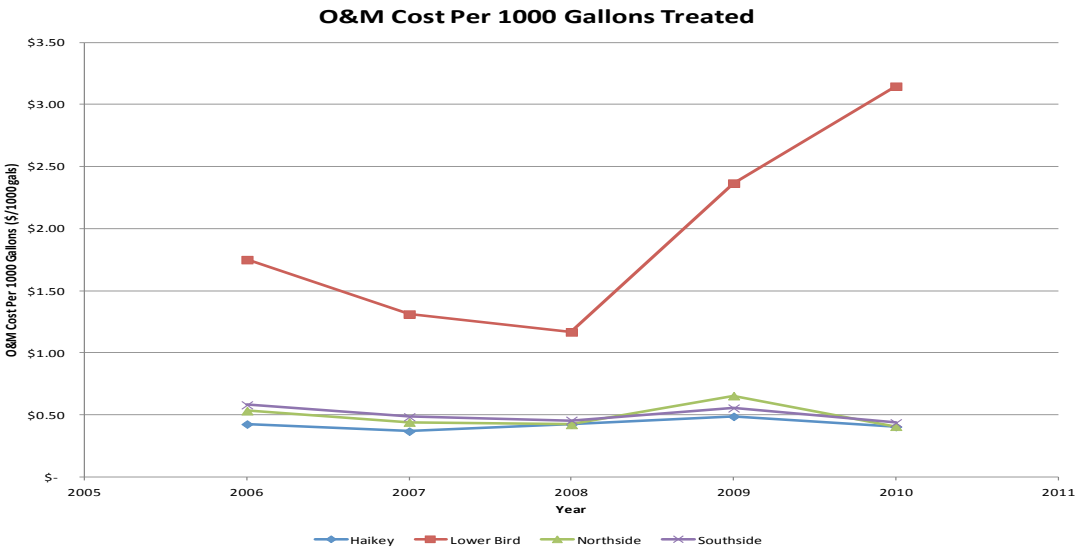
The AWWA benchmarks account for both direct and indirect labor when computing the national and regional averages. Comparing TMUA's Water Pollution Control staff at the wastewater treatment plants to the national benchmarks shows that TMUA is in the lower quartile of all utilities in the nation for staff utilization, but is in the median of all responding utilities in the Midwest and South regions. For reference, the Midwest and South regions identified in the AWWA benchmarking study include utilities in 27 states, including Kansas, Oklahoma, Missouri, Arkansas, and Texas.

The operations and maintenance efficiency was also compared to national and regional benchmarks on the basis of the total cost of services, including but not limited to labor, utilities, chemicals, and contract services per 1,000 gallons of wastewater treated. This metric was futher investigated to look at the cost of utilities and chemicals separately. These efficiency metrics were compared to national and regional benchmarks from the NACWA benchmarking report and are presented in the following chart:



Comparing TMUA's Water Pollution Control total expenditures for operations and maintenance to the national benchmarks shows that TMUA spends significantly less than national peer utilities. However, it is important to note that the available benchmarking data makes no distinction between the type of treatment nor the degree of treatment being provided by the responding utilities. As a result, utilities that are required to treat wastewater to stringent limits are lumped together with utilities that have less stringent treatment limits.

Unit O&M cost was also calculated for individual treatment plants, with results shown below



As expected, the Lower Bird Creek WWTP costs are considerably higher than the remaining facilities in the TMUA Water Pollution Control system. This is due to the higher relatively fixed personnel costs and higher utility costs per 1,000 gallons of water treated. The other three treatment plant costs are very similar and are lower than national industry benchmarking medians and higher than regional comparisons.

7.0 Collections and Customer Service

- Customer Service is typically a core function organized within the utility. However, in Tulsa, components reside outside the utility, in fact in 3 different departments (Mayors Action Center, Finance and Water and Wastewater). This contributes to response issues, particularly in tracking follow-up on queries and repairs.
- Customer calls are received in 3 different locations on 3 different customer call numbers (Mayors Action Center, Utility customer Service and dispatch). The utility would benefit significantly using a single consolidated utility customer service number.
- The lack of a common platform for work orders (there are three) make it difficult if not impossible to track and close out customer requests. The utility would benefit significantly from a single work order system, especially one that could be linked directly to the utility's asset management systems.
- New and improved performance metrics are needed to track and drive improved performance. Currently limited customer call data is collected, making it difficult to establish and track performance metrics. This tracking is particularly important since the customer service activity is beyond the reach of the core maintenance staff.
- Customer Service costs appear higher than peers. Benchmarks indicate over-allocation of staff positions to TMUA might exist, but software solutions are likely required before staff could become more efficient.

8.0 Quality Assurance Laboratory Operations

- KPMG's 2010 report suggested that TMUA's investment in QA Laboratory operations could be significantly reduced through out-sourcing and partnerships with local universities.
- TMUA's QA Laboratory is mission-critical! Current in-house capabilities allow TMUA to be constantly vigilant of water quality and treatment process efficacy, to react quickly when necessary to maintain high water quality standards. TMUA uses outside laboratories for analytical testing which is less frequent or too expensive to perform in-house, though TMUA personnel sample to assure QA/QC.
- Commercial laboratory and academic research institutions are seldom equipped to provide the specialized field sampling, analytical QA/QC standards and data turn-around required daily to support TMUA water/wastewater operations and ensure regulatory compliance.

- The QA Laboratory is an integral part of sampling and analysis mandated by consent agreement with the poultry industry for control of phosphorous entering the watershed and degrading water quality.

- TMUA's mission cannot be met without extensive in-house laboratory capabilities. The current laboratory capacity is appropriate for the protection of drinking water consumers and the environment.

- TMUA should explore the possibility of relocating the microbiology unit from Mohawk WTP to the new Northside WWTP Wet Chemistry Laboratory Building

Addendum: Other Opportunities For Operational Improvement

(Prepared By Infrastructure Management Group)

In addition to the analysis conducted in Task 2, Infrastructure Management Group (IMG) examined the utility's practices from the standpoint of what a private operator might do if it were proposing to assume responsibility for operations. Although this analysis was conducted as part of Task 6, it is included as an addendum to this Task 2 Executive Summary.

Note that IMG's review was not conducted at the same depth as a major private operator would do for an actual proposal (such proposals routinely involve months of detailed research, process critiques and cost analysis). Moreover, IMG was not able to investigate all of the operational and technology dependencies that currently determine Tulsa's operating practices. However, the roster of improvement opportunities listed below should provide a high level roadmap to how the water and sewer operations might be improved by emulating the practices of private operators.

1. **Optimize organizational structure and performance management system**:

   - **Streamline staff under a board CEO:** Shift all personnel under a board CEO, streamline staff so that there is a direct line of reporting from the front lines to CEO, and outsource selected functions.

   - **Employ enterprise approach to performance management and reporting:** Run TMUA units like businesses, requiring each team to track performance against key benchmarks, provide monthly performance reports, and report on results in quarterly utility-wide performance reviews.

   - **Plan an enterprise-wide operations improvement transition period:** Plan for a 12-18 month transition during which TMUA units will implement new strategic plan based on recommendations.

   - **Develop internal O&M optimization specialist team to implement operations improvements:** Internal team of O&M specialists and process engineers will provide support to TMUA units in their optimization efforts during the transition period. The team will act as internal consultants focused on optimization, integration, troubleshooting and training.

- **Pursue 10-to-1 ratio of direct to indirect staff:** Reduce indirect staff labor to less than 10% of direct staff labor.

2. **Optimize direct staff functions:**

- **Install operator process labs:** Implement operator process labs and broaden operator job descriptions to include running process tests and doing simple preventive maintenance tasks, checks, etc.

- **Conduct energy audits and implement aggressive energy conservation programs:** Although energy costs are currently low, nonetheless implement energy audits and energy conservation programs at all plants.

- **Pursue biological nutrient removal capability in WWTPs:** Shift WWTP operations towards biological nutrient removal (BNR) working only within the capabilities of existing plants in order to determine limits of existing facilities to achieve nitrification and denitrification, see if some degree of biological phosphorous removal can be achieved even within existing facilities (for example during warm weather), while also running at longer sludge ages and reducing both energy use (due to denitrification efficiencies) and lower sludge disposal costs (due to lower production).

- **Rehabilitate equipment and controls to support optimization:** Tune new (and old) equipment and controls, especially aeration blowers and aerators at the wastewater treatment plants, to support enhanced operations and energy conservation.

- **Optimize sludge operations:** Optimize sludge operations to enhance sludge solids content and produce additional sludge disposal savings.

- **Optimize chemical costs:** O&M optimization specialist team should go into each of TMUA's plants and target savings of 15-20% in chemical costs from optimization efforts.

- **Upgrade SCADA systems to provide auto and remote control:** This should free up 10 to 15% more time from direct staff to apply to improved process control or maintenance.

- **Establish an odor/corrosion control program:** Establish an odor/corrosion control program for the collection system to reduce corrosion, extend piping and pump station equipment lives and enhance air quality in pump stations and at key points on the collection system.

3. **Enhance focus on performance, quality and maintenance:**

- **Implement enterprise-wide CMMS and asset management system:** The system should be a management tool that will prioritize capital allocations, extend the useful life of assets and drive reductions in maintenance expenses over time.

- **Get ahead of compliance:** Get ahead of compliance by running with future goals and expected performance in mind. Push current facilities to better understand their performance capabilities and to collect data useful to supporting more cost-effective upgrade and expansion design.

- **Establish an SSO task force to drive reductions:** Establish as SSO champion to oversee reductions in SSOs and guide operational and CIP strategies to support SSO goals.

- **Set minimum reportable SSO standards:** Set minimum reportable SSO levels and appoint an SSO champion to track and guide efforts to reduce reportable SSOs.

- **Prioritize training:** Provide training programs focused on optimization, performance improvements, asset management and other current areas of focus (e.g. SSO reduction).

4. **Explicitly set up four categories of CIP expenditures, tracking each for effectiveness:**

- **Replacement in kind (O&M driven):** Track replacement actual versus expected life at replacement with shared goal to optimize with maintenance staffs within the system.

. **Capital projects:** Engineered capital projects for complex replacements or expansion driven capital needs. Track engineering content of CIP cost.

- **Efficiency-driven CIP:** targeted to reduce operational expenses (defined payback periods), and

- **Risk reduction CIP investments:** to enhance compliance and/or reduce the threat of system breakdowns and interruptions.

Task 3a: Wastewater Capital Needs Assessment

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Task 3a: Wastewater Capital Needs Analysis

1.0 Background, Overview and Scope of the Project

In June of 2011 the Tulsa Metropolitan Utility Authority (TMUA) authorized Infrastructure Management Group (IMG), Tetra Tech, and Black & Veatch to prepare a Comprehensive Wastewater System Study as part of the overall TMUA Comprehensive Assessment. The Comprehensive Wastewater System Study was designated as part of Task 3, Capital Needs, within the overall framework of the Comprehensive Assessment. The purpose of the Comprehensive Wastewater System Study was to analyze the long-term needs and capital requirements for the continued operation, maintenance, and expansion of 1,990 miles of sanitary sewer gravity and pressure mains, 49 sanitary sewage lift stations, wet-weather flow equalization basins, and the four wastewater treatment plants (WWTPs) currently operated solely by the TMUA or in conjunction with the Regional Metropolitan Utility Authority (RMUA).

The Comprehensive Wastewater System Study evaluated the service areas and facilities shown in Figure 1-1. The Study provides recommendations for capital improvements necessary to meet the wastewater system needs through the year 2060 with an emphasis on the near-term needs through year 2018. The Study also reviewed anticipated future regulatory requirements that will impact the sanitary sewer collection and treatment operatio ns over a 20-year time horizon, reviewed the TMUA's asset management approach, and provided improvements to the TMUA's existing asset management program at the WWTPs.

At the beginning of the Study, the performance of each WWTP and the condition of existing equipment installed at each WWTP was assessed by conducting field inspections of the major WWTP facilities. Historical operating data were reviewed and operational functions were discussed with system managers and operators. Based on these reviews of existing conditions and historical operations, improvements were identified for consideration for maintaining or improving upon current levels of service and operation.

Future and potential regulations regarding discharges of sanitary flows were reviewed and the impacts of potential regulations on future operation of the wastewater system were considered. Discussions were held with the Oklahoma Division of Environmental Quality (ODEQ), the Oklahoma Water Resources Board (OWRB), and the Indian Nations Council of Governments (INCOG) to identify potential issues where future regulatory authority may be enforced.

Population projections were prepared for a 50-year planning horizon and projected growth distributed within the Service Area. Growth projections were spatially distributed to the wastewater hydraulic model in order to facilitate analysis of future conditions for both the collection and treatment systems.

Wastewater flows from the TMUA's permanent flow monitors were analyzed, incorporated into the wastewater hydraulic model, and used to assess the system's response to rainfall. The hydraulic model was used to rank the various flow monitoring basins according to the infiltration and inflow (I&I) contribution and to identify capacity requirements of the gravity lines, lift stations, force mains, and flow equalization basins.

Data obtained during the field inspection and evaluation of the WWTPs was combined with the future raw sewage flow projections and the anticipated future regulatory requirements to identify wastewater treatment

expansion needs. The previous three years of operating records from each of the WWTPs were reviewed for performance and episodes of non-compliance.

During the course of the study Technical Memoranda were prepared to summarize major findings and conclusions. These memoranda were reviewed by staff, management, and the TMUA Board and comments returned to the IMG Team for consideration. The major findings and conclusions are summarized in this Executive Summary, and references are provided to the associated Technical Memoranda.

2.0 Findings

2.1 Study Area, Population, and Growth Projections

Population projections were prepared for a 50-year planning window and at eight distinct planning horizons. Based on historical growth trends, an annual growth rate of 1% was estimated for the overall Tulsa metropolitan area (TMA) through the 50-year planning horizon. The resulting annual population growth was then distributed within the TMA based on a number of considerations, including historical growth trends of the various TMA communities, market analysis, infrastructure availability, and parcel level population potential estimates prepared by INCOG. The resulting population estimates for the TMA and for the six largest communities within the TMA are provided in Table 1-1, along with the population estimates for the four WWTPs.

Table 1-1
Population Projections for Tulsa, Major Surrounding Communities, and WWTP Service Areas

Area	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
By Community (six largest communities)											
Tulsa	405,640	417,000	428,880	441,957	454,548	467,498	476,610	485,899	495,131	504,538	514,125
Broken Arrow	107,203	113,521	117,070	119,970	122,747	127,504	134,159	140,726	148,664	158,332	167,229
Owasso	43,581	50,040	55,933	60,739	63,870	66,662	68,694	70,289	73,022	76,069	78,624
Sapulpa	35,678	36,212	36,492	37,543	38,218	38,989	39,854	40,573	41,922	44,635	51,682
Sand Springs	30,937	32,042	33,026	34,838	37,099	39,647	41,869	44,022	46,976	53,367	64,782
Bixby	22,496	24,283	26,510	29,587	35,032	43,079	56,099	64,147	67,708	69,801	71,983
Total TMA	**778,124**	**817,816**	**859,533**	**903,378**	**949,549**	**997,891**	**1,048,794**	**1,102,293**	**1,158,521**	**1,217,617**	**1,279,727**

Table 1-1
Population Projections for Tulsa, Major Surrounding Communities, and WWTP Service Areas

Area	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
By Service Area											
Haikey Creek WWTP	108,025	112,932	116,408	118,125	118,562	118,921	119,439	120,646	122,602	124,017	124,770
Lower Bird Creek WWTP	-	3,377	10,359	15,567	19,989	24,178	27,314	30,950	35,849	42,195	49,439
Northside WWTP	181,670	182,938	183,892	187,708	193,460	199,011	203,900	207,916	212,583	216,875	221,380
Southside WWTP	147,101	148,841	150,705	153,820	157,925	162,483	169,539	179,007	189,150	196,391	198,900
Total Served	**436,796**	**448,088**	**461,364**	**475,220**	**489,936**	**504,593**	**520,192**	**538,519**	**560,184**	**579,478**	**594,489**

Details of the population and growth projections analysis are provided in Technical Memorandum TM2.

2.2 Regulatory Requirements

Regulatory requirements for the foreseeable future were discussed with the TMUA in separate meetings with ODEQ, OWRB, and INCOG. Although the full planning horizon for this Comprehensive Plan is 50 years, all discussions with the regulatory agencies were based on a 20-year planning horizon. This 20-year planning horizon is consistent with the anticipated regulatory time frame that the regulatory agencies are considering when setting their long-term goals for implementation and enforcement of new regulations.

Within the foreseeable future, the ODEQ is anticipating the establishment of expanded regulatory goals for wastewater treatment facilities in seven areas. These areas include:

- Wet-weather blending policy.
- Inclusion of additional potential pollutants of concern in the TMDL program.
- Expansion of the risk potential analysis (RPA) to include potential pollutants of concern.
- Development of water reuse regulations.
- Implementation of nitrogen and phosphorous criteria applied to treated wastewater discharges.
- Expanded requirements for industrial pretreatment.
- Review of biosolids management regulations relative to potential release of pathogens and trace elements into groundwater.

Similar to the ODEQ anticipated future regulatory goals, the OWRB is also considering implementation of nitrogen and phosphorous criteria for streams that are used for public water supply. Although nitrogen and phosphorous are both concerns for the OWRB, the focus on phosphorous as a limiting nutrient will be a primary focus in the future. In addition to nitrogen and phosphorous criteria, the OWRB will also be concerned with E. coli, Enterococci, and fecal coliform bacteria standards in waters of the state. Further, OWRB will also be concerned with regulation and discharge of stormwater, water quality standards for wetlands, and minimum flow requirements for recreational use of waters of the state. These goals have been published in the Oklahoma Comprehensive Water Plan by the OWRB and serve as an outline of the water issues that OWRB is anticipating focusing on in the future.

TMUA service area and pollutants that have been attributed to stream impairment. As progress continues to be made to reduce these pollutants, INCOG works with OWRB to remove these pollutants from the impaired stream listings when the data supports removal. INCOG is also responsible for modeling receiving streams in the TMUA service area to establish water quality requirements. In the next few years, INCOG will be modeling both Bird Creek and the Arkansas River to determine if any changes to the water quality models are needed and if any anticipated changes will impact the daily loads discharged from the TMUA treatment facilities. Revised water quality models are anticipated to have an impact on the discharges from the Lower Bird Creek WWTP. Based on OWRB's goal for minimum flow requirements for recreational use, changes to the water quality standards on the Arkansas River should also be anticipated. These Arkansas River water quality changes would be expected to impact both the Southside and Haikey Creek WWTPs. TMUA should closely follow INCOG's work with the water quality models to understand the potential impacts if the water quality model should change.

With regard to the wastewater collection system, it is possible that the Environmental Protection Agency (USEPA) will release the Sanitary Sewer Overflow (SSO) Rule which will require utilities to develop Capacity Management, Operation, and Maintenance (CMOM) Plans and follow them. The TMUA currently has a CMOM Plan, therefore the actual impact upon the TMUA will be minimal; however, changes may be needed with regard to public notification requirements and satellite systems.

Details regarding anticipated regulatory impacts can be found in Technical Memorandum 3-WW, Regulatory Requirements.

2.3 Existing Wastewater Collection System Facilities

The wastewater collection system was evaluated from the dual perspectives of its condition and its performance. The evaluation included the gravity collection system, lift stations, force mains, and those flow equalization basins not located at a WWTP. System performance was evaluated by examining wet and dry weather sanitary sewer overflows (SSOs) over the past 20 years. The analysis demonstrated that substantial improvement in wet weather performance has been realized but that additional work is needed to continue addressing wet weather SSOs. Wet and dry weather SSO occurrence over the past 20 years was reviewed for 15 Program Areas encompassing 95% of the collection system. An SSO Mitigation Program strategy was developed to enhance the effectiveness of the TMUA's I&I abatement efforts. The proposed SSO Mitigation Program provides both strategic level elements designed to engage proactively with deteriorating areas; and tactical level elements centered on the development of Specific Remediation Plans for each SSO. The Specific Remediation Plan process outlined in the Study provides a framework for aggressively evaluating SSO root causes and mitigating them. (TM4-WW)

Pipe condition data was summarized by maintenance area for five measures of system condition, and used to rank each maintenance area on the basis of its condition. These rankings are found in TM4-WW. The results of the condition analysis were combined with the hydraulic condition ratings developed in TM5-WW to identify priorities for additional SSO mitigation and pipeline reinvestment. The top fifteen flow monitoring basins selected for additional SSO mitigation efforts are provided in Table 1-2. The work to be performed in these areas should be based on an evaluation of ongoing efforts and Specific Remediation Plans developed for each SSO in the Program Area.

Table 1-2
Priority Flow Monitoring Basins for SSO Mitigation Efforts

Basin	Program Area	Comments
TL-17	Coal Creek 16, and 99-N	High I&I rates; high SSO occurrence; very little I&I abatement has been performed to date. I&I abatement and concrete pipe replacement are needed in this area.
TL-46/TL-21	Upper Joe Creek 64, 65, 66, 68, and 69-S	Rehabilitation work is in progress.
TL-52/TL-73	Central Bus. Distr. 28, 29, and 34-S	This area recorded the highest I&I rate in the system. I&I abatement and concrete pipe replacement are needed in this area.
TL-83	Jones Douglas 95-N	Additional I&I abatement is recommended to address reoccurring wet weather SSOs and overloaded lines.
TL-14/TL-15	Coal Creek 94-N	Ongoing capacity enhancement projects are expected to alleviate the SSOs in this flow monitoring basin.
TL-26	Crow Creek 44, 45, and 62-S	I&I abatement and concrete pipe replacement are needed in this area.
TL-85	Coal Creek 90-N	Ongoing capacity enhancement projects are expected to alleviate the SSOs in this flow monitoring basin.
TL-38A/TL-53/TL-63	Central Busn. Distr.	I&I abatement and concrete pipe replacement are needed in this area.
TL-24	Joe-LaFortune	Ongoing capacity enhancement projects are expected to alleviate the SSOs in this flow monitoring basin.
TL-41/TL-77	Flatrock	I&I abatement and capacity enhancements are needed to alleviate reoccurring SSOs.
TL-86	Joe-LaFortune	I&I abatement and capacity enhancements are needed to alleviate reoccurring SSOs.
TL-18/TL-70	Jones Douglas	High I&I rate recorded in this area. I&I abatement is needed to address reoccurring SSOs.
TL-81	Rolling Hills	High I&I rate recorded. I&I abatement is needed to address reoccurring SSOs upstream of the Rolling Hills lift station.
TL-67	Newblock	Post –rehabilitation study is in progress.
TL-44/TL-57	Flatrock	I&I abatement is recommended in mini-basins to address several isolated SSOs in upstream parts of the area.

The SSO Mitigation Program is estimated to cost about $200 million over the next 20 years (2012 dollars).

Long-term reinvestment needs were assessed on the basis of pipe age and pipe material. The analysis resulted in recommendations to address these needs by beginning with the replacement of unreinforced small diameter concrete pipe over the next 10 years; and evaluation and repair over the next 5 years of pipelines from the sewer operations group's backlog of unrepaired pipe. The estimated cost of these two programs is $37 million over the next 10 years. The proposed Asset Management process will provide long-term direction for the TMUA's infrastructure reinvestment program.

Nineteen of the TMUA's wastewater lift stations were inspected to assess station condition and develop recommendations to repair, replace, or relieve each station. Lift station rehabilitation is expected to cost $14 million over the next 10 years.

Technical Memorandum 4 – WW provides a complete summary of the condition assessment performed for the wastewater collection system and the recommended SSO Mitigation Program.

2.4 Wastewater Flows

Flow data from the TMUA's network of permanent flow monitors was obtained for the period August 1, 2010, through July 30, 2011, and was used to calibrate the TMUA's InfoWorks CS hydraulic model. Using the model, inflow coefficients and infiltration coefficients were generated for each flow monitoring basin and used to prioritize areas according to their relative infiltration and inflow (I&I) contribution. This data was used to establish priorities for additional SSO mitigation efforts. The Wastewater Flow Analysis is described in TM 5-WW.

2.5 Wastewater Collection System Capacity Evaluation and Service Area Expansion

The wastewater collection system was modeled using the TMUA's InfoWorks CS wastewater hydraulic model. The model included all pipes 10 inches and larger, major pump stations, and collection system flow equalization basins (FEBs). Model calibration was based on the rainfall and flow data from August 1, 2010, through July 30, 2011.

Fifteen Expansion Areas were identified as areas into which the collection system was likely to expand. These areas were added to the hydraulic model and their flow contributions modeled at each of the planning windows. The Expansion Areas are shown in Figure 1-1.

Portions of the existing collection system will require capacity enhancement improvements in order to accommodate increased flows from population growth and expansion into new areas. Additional capacity enhancements will be needed to eliminate persistent SSOs. The general approach applied in this assessment of the TMUA's collection system needs assumes that improved levels of I&I abatement will be realized as the TMUA implements an improved SSO mitigation strategy and that these improvements will reduce the size and extent of capacity enhancements needed to eliminate SSOs. If the TMUA is able to implement these improvements, many of the capacity enhancements that are being deferred for 5 to 10 years will not be needed with a resulting decrease in long term CIP costs. The actual expenditures will vary depending upon the success of I&I abatement efforts in current problem areas or unchecked system degradation in other areas that currently have adequate hydraulic capacity.

The significance of the next 5 years for the TMUA's long-term funding cannot be overemphasized. Many capacity enhancement projects constructed in the mid-80s through the mid-90s temporarily eliminated SSOs, but many of those SSOs have now begun to reoccur as I&I continued to increase. Accordingly, it is imperative that the TMUA become increasingly capable of eliminating I&I at its source. If the TMUA can mitigate SSO's effectively through its I&I Abatement program, it will be able to significantly reduce future expenditures for capacity enhancements and will experience substantive improvements in operating efficiencies and capital improvements. The improved SSO Mitigation strategies recommended in TM4-WW provide a framework within which I&I Abatement can be dealt with aggressively and proactively with increased accountability required from both SSES consultants and TMUA staff for the successful mitigation of SSOs.

2.6 Wastewater Treatment Plants Facility Condition and Capacity Evaluation

The TMUA/RMUA treatment plants are generally functioning appropriately and meeting the permitted effluent limits. However, maintenance and replacement of worn and deteriorated equipment is a continuing,

ongoing necessity. As part of this Comprehensive Plan, the historical performance of each of the WWTPs was reviewed, and the operation of each facility was assessed. The results of this review of historical performance and operation identified several key process constraints at each WWTP that would impact future treatment capacity without additional expansion.

2.6.1 Northside WWTP – Currently the Northside WWTP experiences annual average flows of 27.9 mgd based on the previous three years of historical data. The aeration basins at the Northside WWTP are limited to an annual average day flow capacity of 28.7 mgd based on maintaining a hydraulic retention time in the aeration basins of at least 6 hours per ODEQ requirements. Additionally, the final clarifiers are limited to an annual average day flow capacity of 37.2 mgd based on the basis of peak surface overflow rates, followed by the primary clarifiers that are limited to an annual average day flow of 39.2 mgd also on the basis of allowable peak surface overflow rates.

Based on the relatively low population growth projected for the Northside WWTP sewershed, the WWTP is projected to have adequate primary clarifier capacity through approximately year 2050. The aeration basin capacity should be further investigated for allowable capacity and may require expansion by approximately year 2025.

2.6.2 Lower Bird Creek WWTP – The smallest of TMUA facilities, Lower Bird Creek WWTP, has historically received less than 1 mgd of flow from the collection system; however, recent development and expansion of the Hard Rock Casino in Catoosa has caused these flows to routinely approach 1 mgd in the recent past. As a result, TMUA is currently expanding the Lower Bird Creek WWTP to increase the capacity of the facility from an annual average rated flow of 2 mgd to 4.1 mgd. This increase in capacity will accommodate anticipated expansion in this relatively undeveloped sewershed. Once this construction is completed, the limiting capacity of 4.1 mgd is based on the allowable solids loading rate on the final clarifiers.

Based on the population and flow projections for the Lower Bird Creek WWTP sewershed, the ongoing expansion project at Lower Bird Creek WWTP that will expand the capacity to 4.1 mgd should adequately serve the sewershed through approximately year 2030. However, should industrial development in this sewershed occur at a faster-than-historic rate, this capacity may need to be reassessed by as early as year 2020.

2.6.3 Southside WWTP – The Southside WWTP has historically received 23.5 mgd of flow on an annual average day basis. The current limiting process is the final clarifiers that are limited to an annual average day flow capacity of 27.4 mgd on the basis of peak allowable solids loading rates. Additionally, the aeration basins are limited to 37.3 mgd on the basis of allowable hydraulic retention time through the basins of at least 6 hours. Finally, the primary clarifiers are limited to an annual average day flow capacity of 36.3 mgd on the basis of the allowable peak surface overflow rate. Based on the population and flow projections for the primarily fully-developed Southside WWTP sewershed, the WWTP is projected to have adequate primary clarifier capacity through approximately year 2055 and adequate aeration basin and final clarifier capacity through approximately year 2040.

2.6.4 Haikey Creek WWTP – The Haikey Creek WWTP has historically received approximately 12 mgd of flow on an annual average day basis. The current limiting process is the final clarifiers that are limited to an annual average day flow capacity of 12 mgd. This limiting capacity is the result of recent changes to the

ODEQ standards that limit a peak solids load allowable through final clarifiers. Although the Haikey Creek facility continues to perform adequately and additional process capacity is currently being planned and executed for Haikey Creek, plant staff has confirmed that the final clarifier performance is a concern for them due to deeper than normal sludge blankets that must be maintained in the final clarifiers. Additionally, the activated sludge process at Haikey Creek WWTP is limited to 15.7 mgd on the basis of allowable biological load to the activated sludge basins for the existing basin volume.

Based on the population and flow projections for the Haikey Creek WWTP sewershed, the WWTP requires additional capacity now. The Haikey Creek Lift Station that delivers flow to the Haikey Creek WWTP is currently scheduled to be expanded to increase pumping capacity to Haikey Creek WWTP. However, without the construction of primary clarifiers at the treatment facilities and the improvement of the activated sludge process to allow additional biological load to the activated sludge process, the treatment capacity of Haikey Creek WWTP will remain limited.

Based on the anticipated emphasis by ODEQ on nitrogen and phosphorous limits to treated wastewater effluents, it is projected that all four of the WWTPs should anticipate nutrient limitations to be included in each discharge permit within the next 15 to 20 years. With this in mind, each WWTP was studied to determine the feasibility and cost of implementing process improvements capable of removing nitrogen and phosphorous from the wastewater such that the discharged effluent contains not more than 8.0 mg/L of total nitrogen and 1.0 mg/L of total phosphorous.

Technical memoranda TM7-WW, Existing Wastewater Treatment Facilities, and TM8-WW, Wastewater Treatment System Evaluation, provide detailed information on the capacities of each WWTP by unit process and the staging of recommended improvements within the Capital Improvements Plan.

2.7 Strategic Asset Management Database and Comprehensive Maintenance Management System

The Strategic Asset Management System (SAMS) is a methodology adopted by the TMUA Water Pollution Control Division to track assets installed at each WWTP and at key lift stations located remotely from WWTP facilities. The SAMS is used to develop service condition histories of all physical structures and equipment associated with the treatment and discharge of wastewater within the TMUA/RMUA system. The data collected by the SAMS process is used to support prioritization of structure and equipment repair and replacement needs and to develop long-term service condition and cost histories for these assets.

The SAMS was originally developed as discrete spreadsheets for each WWTP. Over time, as WWTP facilities have experienced capacity expansions or process improvements, additional equipment has been installed and some equipment has been retired from service. Currently there are 4,173 discrete, unique physical assets that are tracked and maintained in the SAMS relative to service condition and cost history. This addition of structures and equipment assets and the removal of some assets from service has resulted in very large and cumbersome spreadsheets that require significant TMUA staff time to track and maintain service condition and cost histories. In addition, the SAMS methodologies originally developed to evaluate service condition require consistent, uniform evaluation in order to allow all assets to be equitably evaluated. As a result, the existing SAMS methodology was reviewed to improve the system ease of use and to update the methodology for assessing asset condition of relative to the prioritization of repair or replacement.

During the field inspections of the WWTP facilities, asset records were updated with the goal of assessing the existing service condition. The results obtained from the field inspection of the assets at each facility were compiled into a database format and data entry screens were developed and programmed to convert the previous spreadsheet-based format into a more easily managed database format. Once compiled, the database was turned over to TMUA staff for use.

Using the SAMS methodology for asset management, the results of the asset investigations were converted into a Business Risk Exposure (BRE) score. The BRE score is a methodology used to rank the condition of any asset based on a variety of factors including the probability that the asset will fail, and the consequence that may result from the failure of the asset. Calculating the BRE score for each asset provides a way of analyzing the impact of a particular asset relative to the risk associated with the asset and allows comparison between assets in an equitable manner. By ranking assets based on each asset's BRE score, a maintenance and replacement priority list can be generated of all assets that are currently in need of replacement. This allows for better accuracy in the replacement of truly critical equipment and results in improved annual budgeting for the repair and replacement of critical infrastructure.

The costs for annual repair and replacement of assets identified with unacceptable BRE scores were incorporated into the annual Capital Improvements Plan forecasting. Technical Memorandum 9-WW, Strategic Asset Management (SAM) Database and Comprehensive Maintenance Management System (CMMS) Update, provides detailed information on the implementation and use of the SAMS.

2.8 Flow Equalization Basins, Lift Stations, and Force Mains

Condition assessments including field investigations were conducted by a team of consultants and TMUA Staff on all of the TMUA FEB facilities and nineteen of the forty-nine existing lift stations. These investigations found that FEBs and lift stations were generally in good to fair condition and were well operated and maintained, but that improvements were necessary to maintain operability. The findings of the condition assessment are presented in TM4-WW.

The condition data was used to develop and prioritize improvements leading to the identification of specific projects and costs that were included in the short- and long-term CIPs. A total of 5 specific lift station projects were identified for the short-term CIP totaling approximately $5.82 million dollars. The top five priorities were:

- South Lewis Lift Station Improvements
- Cherokee Park Lift Station Improvements
- Citywide Electrical, I&C Improvements
- Citywide Lift Station Grinder Improvements
- Replacement of the Kingston Lift Station

The analysis also found that approximately $7.8 million dollars would be necessary for the construction of relief sewers that would allow for the following lift stations to be decommissioned and abandoned:

- Northgate Lift Station
- Rosedew Lift Station
- Francis Hills Lift Station

Additional projects including FEB improvements and long-term lift station CIP needs are also presented in TM4-WW.

2.9 Asset Management Recommendations

In addition to the implementation of Strategic Asset Management based principles for the Water Pollution Control Division, TMUA also commissioned IMG to perform a Comprehensive Assessment of assets and services across all divisions. The purpose of this assessment is to evaluate both operations and strategic business elements with the goal of identifying common elements among all divisions that will enable TMUA to prolong the life of assets, set rates based on sound operational and financial planning, create budgets that are focused on critical activities, meet service and regulatory expectations, improve responses to emergencies, improve safety and security of assets, and reduce costs for operations and capital expenditures.

In order to identify methods of improving current asset management activities within TMUA, a utility-wide gap assessment was performed. This gap assessment evaluated TMUA's current program relative to industry best practices established by guidelines published by the Environmental Protection Agency (EPA) for asset management. The results of this gap assessment are presented in Table 1-3.

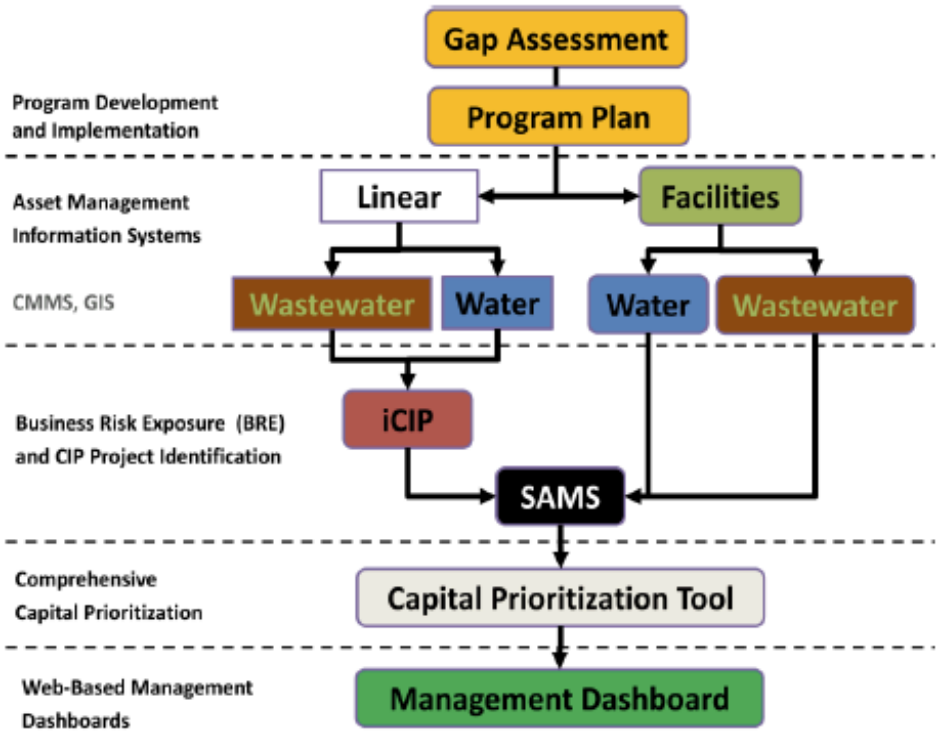
Table 1-3
Utility-Wide Gap Assessment Summary

Best Practice	Best Practice Description	Overall Utility Score
Current State of Assets	Do we know what we own, where it is, its condition, useful life, and value?	3
Sustainable Level of Service	Do we know the level of service our stakeholders and customers demand, our actual performance, and the physical limitations of the assets? Do we know what the regulators require?	3
Critical Assets	Do we know how and what assets fail, the probability, consequences, cost to repair, as well as other social or environmental costs?	4
Life Cycle Costs	Do we know what alternative strategies exist for O&M, personnel, and capital which are most feasible for us? What are the costs of rehabilitation, repair, and replacement of critical assets?	2
Funding Strategies	Have we established the appropriate rate structure to generate a reliable revenue stream adequate to annually reinvest in our assets?	2

Key:
1 - Reactive, out-of-date data and information.
2 – Historical, collect and review when something happens.
3 – Proactive, analyze and use knowledge to manage performance.
4 – Risk based, accumulate targeted info to manage risk profile.
5 – Collaborative, fully use knowledge engineering, share across partnerships.

Based on the results of the gap assessment, an Asset Management Program implementation plan was developed. An overview of the recommended implementation plan is shown in Figure 1-2.

Figure 1 - 2
Asset Management Program Overview



The proposed Asset Management Implementation Plan would consist of the following major elements:

- Program Structural and Procedural Development that would provide a structure for the overall program.
- Asset Management Information Systems Implementation that would develop Computerized Maintenance Management Systems (CMMS) and Geographic Information Systems (GIS) across all divisions within the utility to act as a common platform for data relative to asset condition assessments, capital planning, and maintenance management tools.
- Development and Implementation of Prioritization Tools that would enhance the developing of the SAMS program and expand this program to all divisions in support of utility-wide planning.
- Management Tool Implementation that would develop management dashboards to provide the overall perspective necessary to track progress on multiple fronts across the utility.
- Staffing changes in support of the Asset Management program, including a utility-wide asset manager position and assignment of division support staff.

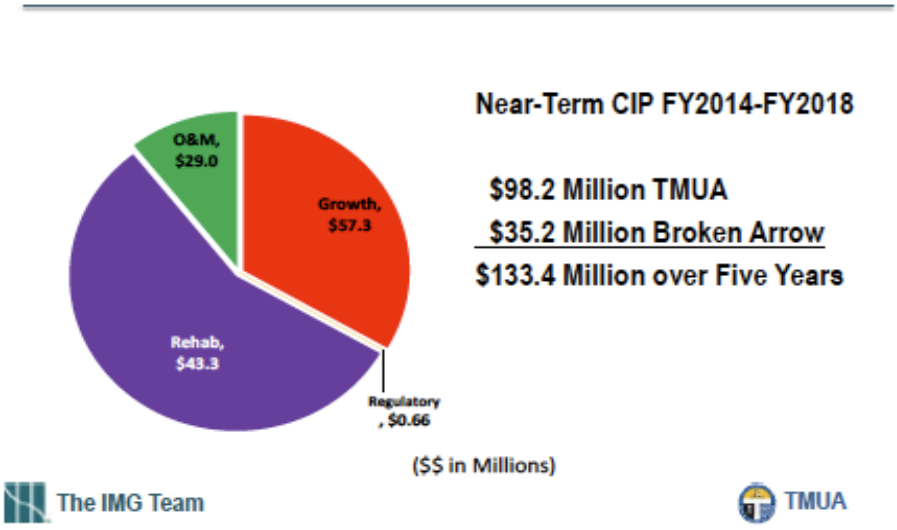
Technical memorandum TM11, Asset Management Approach, provides further information on asset management best practices and a potential implementation time line.

3.0 Summary of Wastewater Utility Capital Improvements Plan

Based on the results from the Comprehensive Wastewater System Study technical memoranda, a Capital Improvements Plan (CIP) for the TMUA's Water Pollution Control Division was established. This CIP contains prioritized projects over a period of 50 years based on projected population growth, with a particular emphasis on the near-term needs through year 2018.

Near-term project needs through the year 2018 are summarized in Figure 1-3.

Figure 1-3
Wastewater Treatment System Near-Term CIP



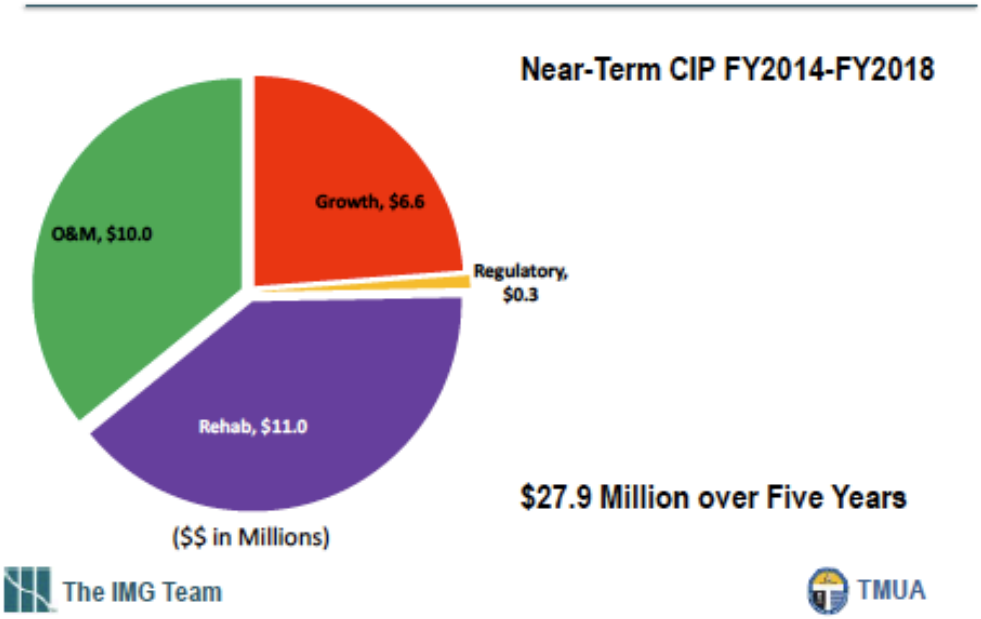
3.1 Northside WWTP Near-Term CIP Needs

The near-term needs for improvements at the Northside WWTP identified projects including:

- Addition of redundancy to the sludge pasteurization system.
- Rehabilitation of the waste sludge thickener system.
- Sludge lagoon dike improvements.
- Rehabilitation of Apache Lift Station, including improvements to the access road.
- Replacement of critical equipment components identified by the SAMS at:
- Northside WWTP
- Apache, Interceptor, and Airport Lift Stations
- Flat Rock, Coal Creek, Mingo, and Northside Flow Equalization Basins
-

The near-term project needs for the Northside WWTP through the year 2018 are summarized in Figure 1-4.
· Replacement of the bar screen at Interceptor Lift Station.

Figure 1-4
Northside WWTP Near-Term CIP



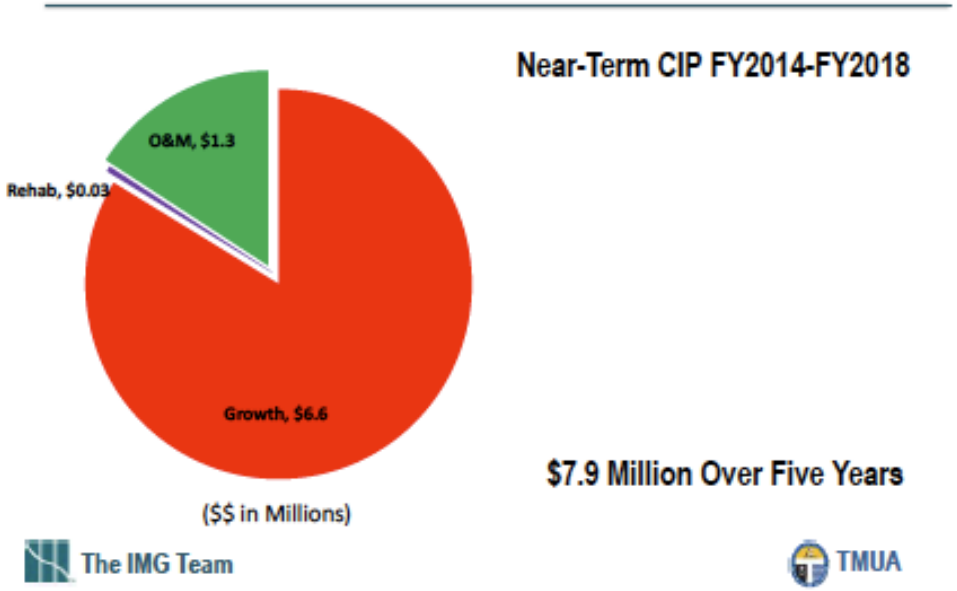
3.2 Lower Bird Creek WWTP Near-Term CIP Needs

Lower Bird Creek WWTP had the fewest near-term needs of all TMUA's WWTPs. This is due to the Lower Bird Creek being the smallest of all WWTP facilities as well as being the most recently constructed facility in the TMUA system. The near-term needs for improvements at the Lower Bird Creek WWTP identified projects including:

- Additional pumping capacity at Spunky Creek Lift Station based on projected growth in the collection system.
- Expansion of the Lower Bird Creek headworks facility and construction of additional excess flow pipeline from Lower Bird Creek WWTP to Port South Flow Equalization Basins to to accommodate projected Spunky Creek Lift Station flows.
- Replacement of critical equipment components identified by the SAMS at:
- Spunky Creek and Port South Lift Stations

Figure 1-5 summarizes project needs for the Lower Bird Creek WWTP through the year 2018.

Figure 1-5
Lower Bird Creek WWTP Near-Term CIP



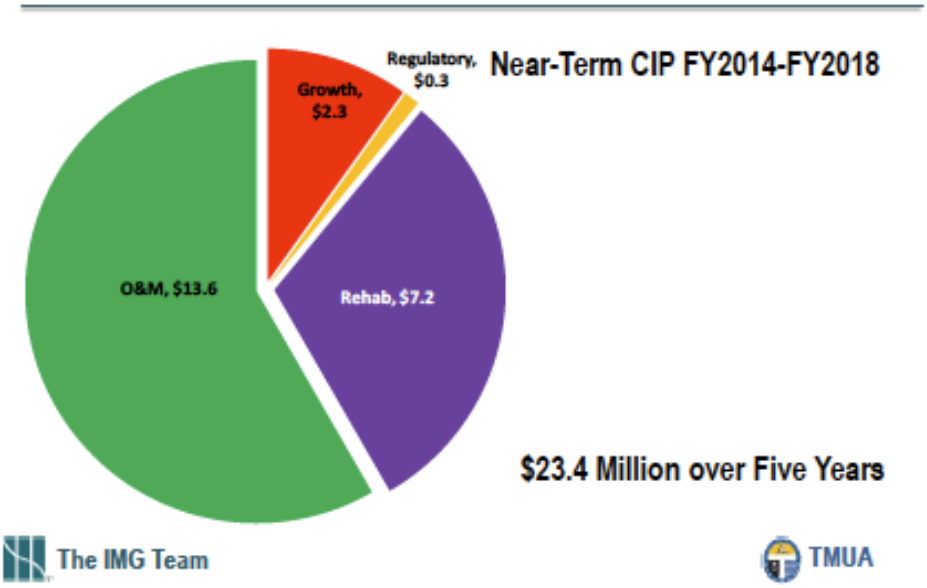
3.3 Southside WWTP Near-Term CIP Needs

The near-term needs for improvements at the Southside WWTP identified projects including:

- Dewatering facility improvements at the 71st Street dewatering facility.
- Influent bar screen replacement at the 71st Street Lift Station.
- Extension of a plant effluent water system line to Cherry Creek Lift Station.
- Construction of an influent lift station pipeline to Cherry Creek Lift Station.
- Replacement of critical equipment components identified by the SAMS at:
- Southside WWTP
- 71st Street Dewatering Facility
- Cherry Creek Lift Station

The near-term project needs for the Southside WWTP through the year 2018 are summarized in Figure 1-6.

Figure 1-6
Southside WWTP Near-Term CIP



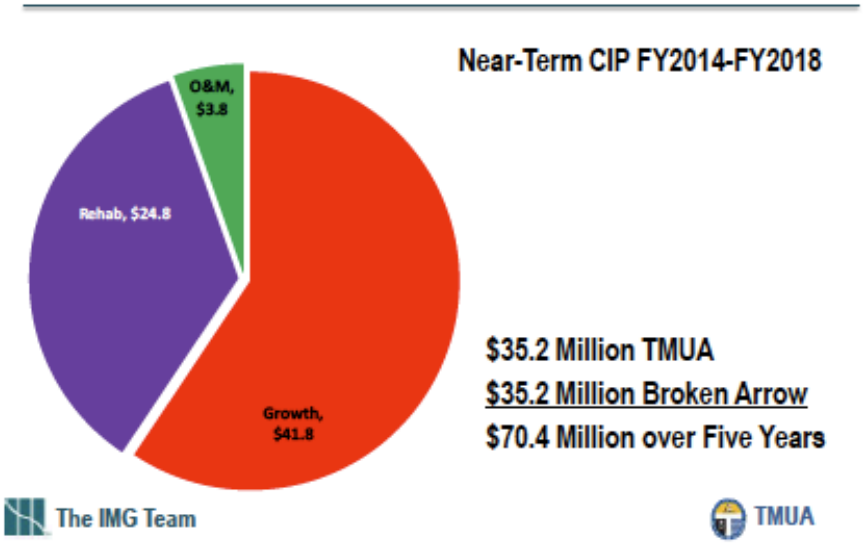
3.4 Haikey Creek WWTP Near-Term CIP Needs

Haikey Creek WWTP had the greatest near-term needs of all TMUA/RMUA WWTPs. This is due to Haikey Creek WWTP experiencing the largest number of capacity-related issues. The near-term needs for improvements at the Haikey Creek WWTP identified projects including:

- Aeration basin repairs and modifications.
- Construction of primary clarifiers.
- Rehabilitation and repair to the grit facility.
- Construction of anaerobic digesters.
- Construction of an additional final clarifier.
- Construction of a dedicated waste activated sludge (WAS) storage tank.
- Conversion of the disinfection system to liquid sodium hypochlorite.
- Construction of odor control systems.
- Rehabilitation of the existing dewatering facility.
- Increasing pumping capacity, replacement of the bar screen, and improved odor control at the Haikey Creek Lift Station.
- Replacement of critical equipment components identified by the SAMS.

Figure 1-7 summarizes project needs for the Haikey Creek WWTP through the year 2018.

Figure 1-7
Haikey Creek WWTP Near-Term CIP



3.5 Area-wide Near-Term CIP Needs

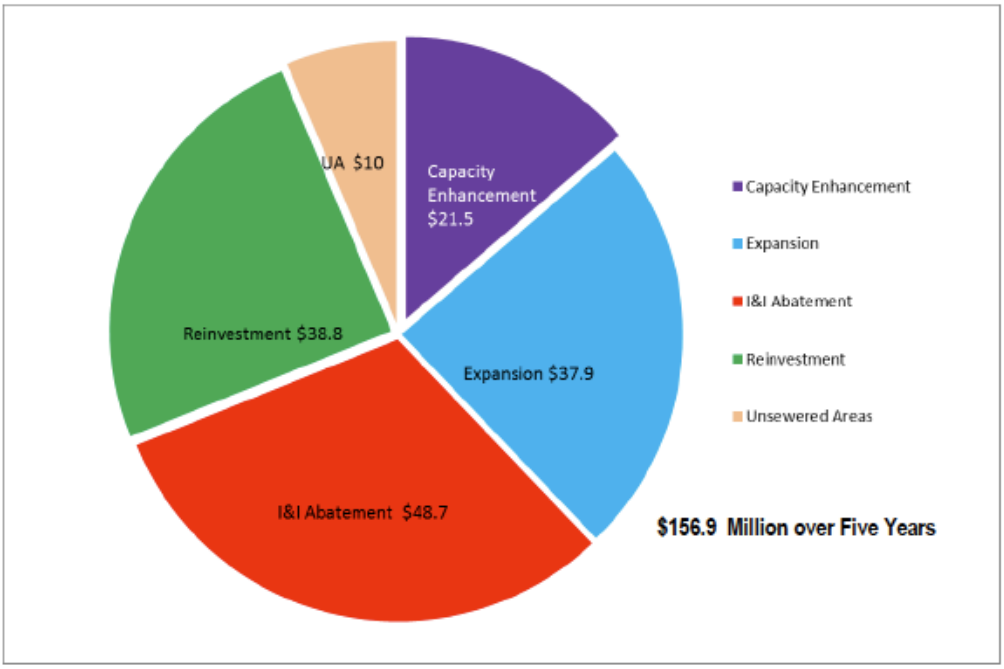
In addition to the near-term CIP needs at each WWTP, areawide projects were also identified that were common to all WWTPs that, when implemented, may benefit from economies of scale by administering fewer, large projects as opposed to multiple, smaller projects, or that would benefit TMUA by offering consistence of a single-service provider across all facilities. These areawide projects include:

- Instrumentation and control improvements to the SCADA systems at all WWTPs.
- Replacement or repair of roofs on buildings at all WWTPs.
- Rehabilitation or replacement of electrical components at all WWTPS.
- Recurring projects for sewer rehab in each sewershed. Areawide projects at the WWTPs identified for the near term from FY2014 through FY2018 are estimated to require $3.8 million in funding.

3.6 Collection System Near-Term CIP Needs

Over the next 5 years, the TMUA will need to spend $156.9 M on its wastewater collection system. A high percentage of these expenditures will be for I&I Abatement (31%) and infrastructure reinvestment (25%). These expenditures will generally be made in the older portions of the system, where I&I is the highest and where the piping infrastructure is approaching the end of its useful life.

Figure 1-8
Collection System Near-Term CIP

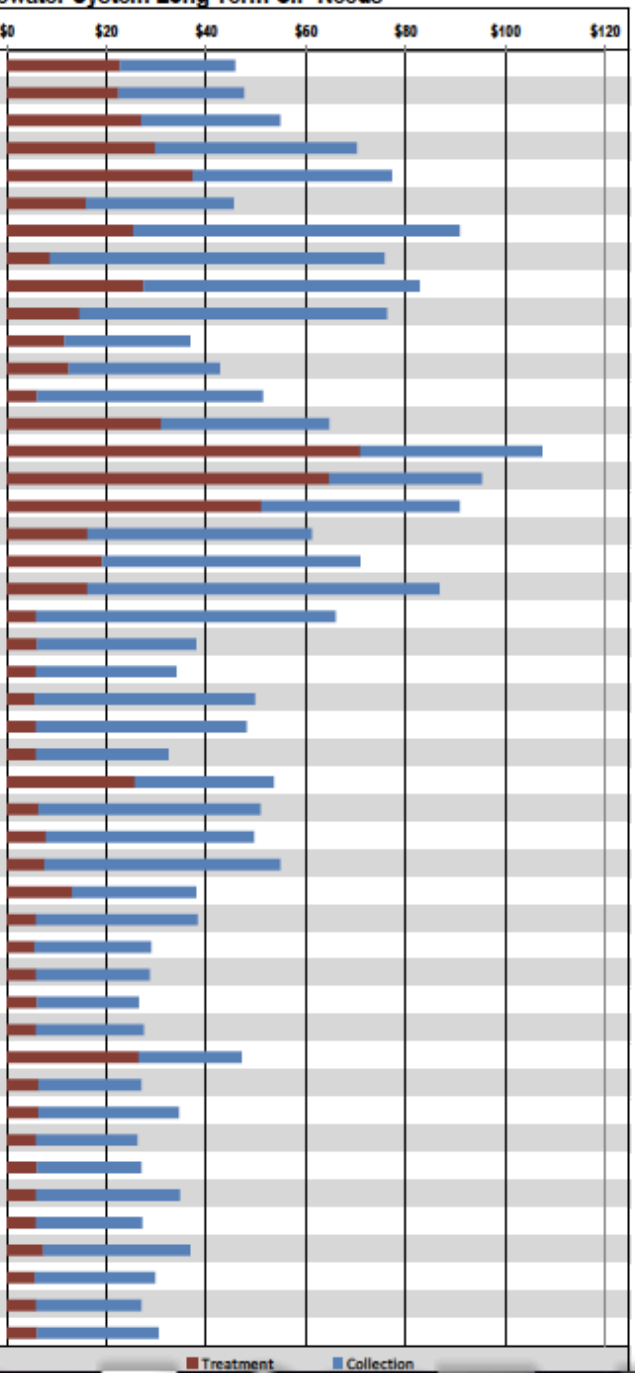


3.7 Summary of Wastewater System Capital Improvements Plan through year 2060

The anticipated annual needs for both the collection system and the wastewater treatment facilities were tabulated and combined into a comprehensive Wastewater System Capital Improvements Plan through the year 2060. The long-term needs are shown in Table 1-4. The results of this analysis show that an equivalent annual cost is $36 million for the collection system and $15 million for the treatment facilities. The amount shown for "Treatment" in Tables 1-4 and 1-6 includes costs for asset management implementation of $1.69 million in 2014, $2.17 million in 2015, and $0.96 million in 2019 for a total of $4.82 million over three years.

Table 1-4
Overall Wastewater System Long Term CIP Needs

Year	Treatment	Collection	Total
2014	$22.6	$23.2	$45.8
2015	$22.4	$25.2	$47.6
2016	$26.9	$27.9	$54.9
2017	$29.8	$40.5	$70.3
2018	$37.1	$40.1	$77.3
2019	$15.8	$29.7	$45.6
2020	$25.5	$65.3	$90.8
2021	$8.6	$67.1	$75.7
2022	$27.4	$55.4	$82.8
2023	$14.7	$61.6	$76.3
2024	$11.6	$25.1	$36.8
2025	$12.4	$30.3	$42.7
2026	$5.9	$45.4	$51.3
2027	$31.0	$33.6	$64.6
2028	$71.0	$36.5	$107.5
2029	$64.7	$30.7	$95.4
2030	$51.2	$39.7	$90.9
2031	$16.2	$45.1	$61.2
2032	$19.1	$51.9	$71.0
2033	$16.2	$70.8	$86.9
2034	$5.8	$60.2	$66.0
2035	$6.0	$32.1	$38.1
2036	$5.7	$28.2	$33.9
2037	$5.7	$44.1	$49.7
2038	$5.8	$42.3	$48.1
2039	$5.7	$26.8	$32.5
2040	$25.6	$27.9	$53.5
2041	$6.2	$44.7	$50.9
2042	$7.9	$41.7	$49.6
2043	$7.4	$47.3	$54.8
2044	$13.2	$24.9	$38.1
2045	$5.7	$32.7	$38.3
2046	$5.7	$23.4	$29.0
2047	$5.7	$23.1	$28.8
2048	$5.9	$20.4	$26.3
2049	$5.9	$21.5	$27.4
2050	$26.5	$20.5	$47.1
2051	$6.2	$20.6	$26.8
2052	$6.4	$28.2	$34.6
2053	$5.7	$20.6	$26.3
2054	$6.1	$20.7	$26.9
2055	$5.7	$29.0	$34.7
2056	$5.9	$21.3	$27.2
2057	$7.4	$29.4	$36.7
2058	$5.7	$24.1	$29.7
2059	$5.7	$21.2	$26.8
2060	$6.0	$24.5	$30.5
	$741.0	$1,646.6	$2,387.6

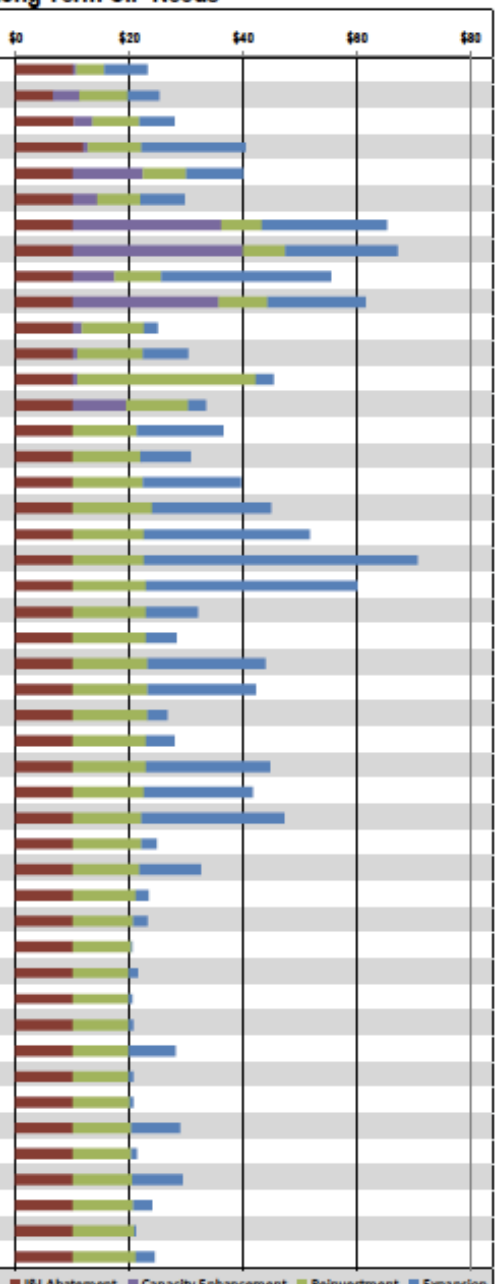


A table listing collection system needs distributed to four categories is provided below. Note that specific I&I abatement projects are not identified beyond 2020 and specific capacity enhancements beyond 2027.

Beyond those dates, an annual amount is budgeted for I&I abatement, but not for capacity enhancements.

Table 1-5
Wastewater Collection Long Term CIP Needs

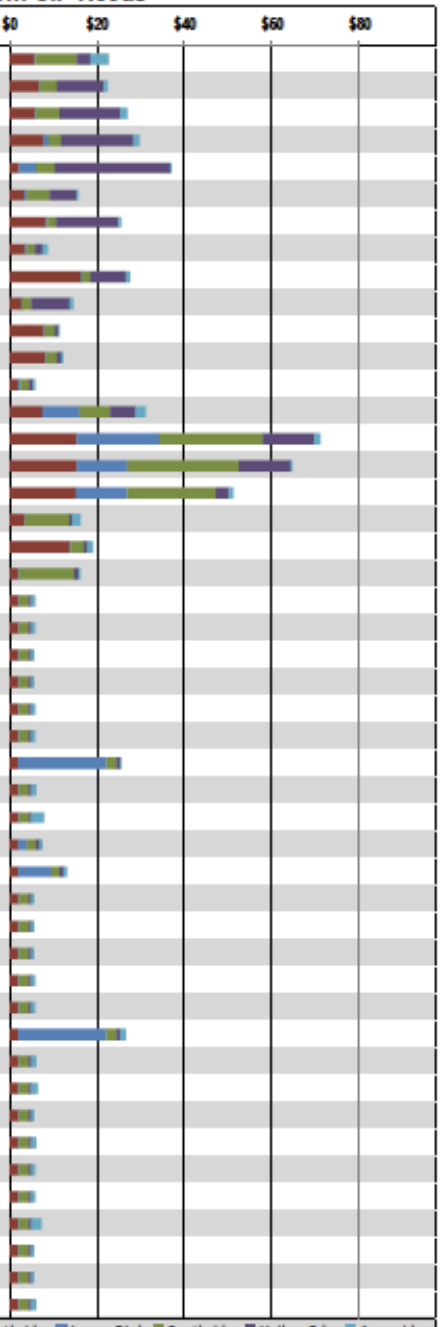
Year	I&I Abatement	Capacity Enhancement	Reinvestment	Expansion	Total
2014	$10.0	$0.5	$5.0	$7.6	$23.2
2015	$6.6	$4.7	$8.4	$5.5	$25.2
2016	$10.3	$3.1	$8.3	$6.2	$27.9
2017	$11.9	$0.9	$9.4	$18.4	$40.5
2018	$10.0	$12.3	$7.7	$10.1	$40.1
2019	$10.0	$4.3	$7.7	$7.8	$29.7
2020	$10.0	$26.2	$7.2	$22.0	$65.3
2021	$10.0	$30.1	$7.4	$19.6	$67.1
2022	$10.0	$7.5	$8.1	$29.8	$55.4
2023	$10.0	$25.8	$8.7	$17.2	$61.6
2024	$10.0	$1.6	$10.9	$2.6	$25.1
2025	$10.0	$0.8	$11.5	$8.0	$30.3
2026	$10.0	$0.8	$31.6	$3.0	$45.4
2027	$10.0	$9.5	$10.9	$3.3	$33.6
2028	$10.0	$0.0	$11.3	$15.3	$36.5
2029	$10.0	$0.0	$11.9	$8.8	$30.7
2030	$10.0	$0.0	$12.4	$17.3	$39.7
2031	$10.0	$0.0	$14.0	$21.0	$45.1
2032	$10.0	$0.0	$12.7	$29.2	$51.9
2033	$10.0	$0.0	$12.7	$48.1	$70.8
2034	$10.0	$0.0	$13.0	$37.3	$60.2
2035	$10.0	$0.0	$13.1	$9.1	$32.1
2036	$10.0	$0.0	$13.1	$5.2	$28.2
2037	$10.0	$0.0	$13.2	$20.9	$44.1
2038	$10.0	$0.0	$13.2	$19.2	$42.3
2039	$10.0	$0.0	$13.3	$3.5	$26.8
2040	$10.0	$0.0	$13.1	$4.8	$27.9
2041	$10.0	$0.0	$13.0	$21.7	$44.7
2042	$10.0	$0.0	$12.6	$19.2	$41.7
2043	$10.0	$0.0	$12.3	$25.1	$47.3
2044	$10.0	$0.0	$12.1	$2.9	$24.9
2045	$10.0	$0.0	$11.7	$11.0	$32.7
2046	$10.0	$0.0	$11.2	$2.2	$23.4
2047	$10.0	$0.0	$10.7	$2.5	$23.1
2048	$10.0	$0.0	$10.3	$0.1	$20.4
2049	$10.0	$0.0	$9.9	$1.6	$21.5
2050	$10.0	$0.0	$9.8	$0.7	$20.5
2051	$10.0	$0.0	$9.9	$0.7	$20.6
2052	$10.0	$0.0	$9.9	$8.2	$28.2
2053	$10.0	$0.0	$9.9	$0.7	$20.6
2054	$10.0	$0.0	$10.1	$0.7	$20.7
2055	$10.0	$0.0	$10.3	$8.7	$29.0
2056	$10.0	$0.0	$10.4	$1.0	$21.3
2057	$10.0	$0.0	$10.5	$8.9	$29.4
2058	$10.0	$0.0	$10.7	$3.4	$24.1
2059	$10.0	$0.0	$10.9	$0.3	$21.2
2060	$10.0	$0.0	$11.1	$3.4	$24.5
Total	$468.7	$127.9	$526.0	$524.0	$1,646.6



The costs for the treatment of wastewater received from the collection system and treated at each of the four WWTPs can also be broken down by facility. This breakdown is shown in Table 1-6.

Table 1-6
Wastewater Treatment Long Term CIP Needs

Year	Northside	Lower Bird	Southside	Haikey Crk.	Areawide	Total
2014	$5.5	$0.3	$9.8	$3.1	$4.0	$22.6
2015	$6.6	$0.3	$4.0	$10.7	$0.9	$22.4
2016	$5.8	$0.3	$5.5	$13.7	$1.7	$26.9
2017	$7.8	$1.2	$2.7	$16.8	$1.3	$29.8
2018	$2.2	$4.0	$4.3	$26.2	$0.5	$37.1
2019	$3.3	$0.7	$5.5	$6.0	$0.5	$15.8
2020	$8.4	$0.3	$2.2	$14.3	$0.5	$25.5
2021	$3.5	$0.3	$2.2	$1.7	$0.9	$8.6
2022	$16.2	$0.3	$2.2	$8.2	$0.6	$27.4
2023	$2.7	$0.3	$2.2	$8.8	$0.9	$14.7
2024	$7.9	$0.3	$2.2	$0.8	$0.5	$11.6
2025	$8.1	$0.4	$2.3	$0.9	$0.7	$12.4
2026	$2.1	$0.3	$2.2	$0.8	$0.5	$5.9
2027	$7.7	$8.2	$7.2	$5.8	$2.1	$31.0
2028	$15.3	$18.8	$23.7	$11.8	$1.5	$71.0
2029	$15.3	$11.7	$25.5	$11.8	$0.5	$64.7
2030	$15.3	$11.7	$20.1	$3.4	$0.8	$51.2
2031	$3.3	$0.3	$10.1	$0.8	$1.8	$16.2
2032	$13.7	$0.3	$3.2	$0.8	$1.3	$19.1
2033	$2.0	$0.3	$12.7	$0.8	$0.5	$16.2
2034	$2.0	$0.3	$2.2	$0.8	$0.6	$5.8
2035	$2.0	$0.3	$2.2	$0.8	$0.8	$6.0
2036	$2.0	$0.3	$2.2	$0.8	$0.5	$5.7
2037	$2.0	$0.3	$2.2	$0.8	$0.5	$5.7
2038	$2.0	$0.3	$2.2	$0.8	$0.7	$5.8
2039	$2.0	$0.3	$2.2	$0.8	$0.6	$5.7
2040	$2.0	$20.2	$2.2	$0.8	$0.5	$25.6
2041	$2.0	$0.3	$2.2	$0.8	$1.1	$6.2
2042	$2.0	$0.3	$2.2	$0.8	$2.7	$7.9
2043	$2.0	$2.0	$2.2	$0.8	$0.5	$7.4
2044	$2.0	$7.4	$2.2	$0.8	$0.9	$13.2
2045	$2.0	$0.3	$2.2	$0.8	$0.5	$5.7
2046	$2.0	$0.3	$2.2	$0.8	$0.5	$5.7
2047	$2.0	$0.3	$2.2	$0.8	$0.5	$5.7
2048	$2.0	$0.3	$2.2	$0.8	$0.8	$5.9
2049	$2.0	$0.3	$2.2	$0.8	$0.7	$5.9
2050	$2.0	$20.2	$2.2	$0.8	$1.4	$26.5
2051	$2.0	$0.3	$2.2	$0.8	$1.0	$6.2
2052	$2.0	$0.3	$2.2	$0.8	$1.2	$6.4
2053	$2.0	$0.3	$2.2	$0.8	$0.5	$5.7
2054	$2.0	$0.3	$2.2	$0.8	$1.0	$6.1
2055	$2.0	$0.3	$2.2	$0.8	$0.6	$5.7
2056	$2.0	$0.3	$2.2	$0.8	$0.7	$5.9
2057	$2.0	$0.3	$2.2	$0.8	$2.2	$7.4
2058	$2.0	$0.3	$2.2	$0.8	$0.5	$5.7
2059	$2.0	$0.3	$2.2	$0.8	$0.5	$5.7
2060	$2.0	$0.3	$2.2	$0.8	$0.9	$6.0
Total	$206.6	$115.5	$207.3	$166.9	$44.8	$741.0



Task 3b: Water Capital Needs Assessment

Task 3b: Water Capital Needs Analysis

1.0 Introduction

The Tulsa Metropolitan Utility Authority (TMUA) sources of supply, water treatment, transmission and distribution system facilities require timely capital improvements to keep pace with population/capacity needs, increasingly stringent water quality requirements, and to provide for rehabilitation/replacement of equipment which has exceeded its useful service life. In 2011, TMUA retained the Infrastructure Management Group (IMG) Team to prepare a comprehensive condition assessment and 50-year capital improvements program (CIP) for these facilities. Engineers and specialists from Tetra Tech and TBR Engineering inspected and assessed the suitability and condition of the TMUA water facilities to identify system deficiencies, mechanical and/or structural deterioration, operational constraints, and reliability concerns related to long-term water supply needs and compliance with water quality objectives.

These condition assessments were based upon numerous site visits and inspections of readily-accessible facilities; review of available plans, records, and reports; TMUA's 2011 Asset Management Database; and primary and secondary interviews with TMUA Operations and Engineering personnel. The results of the inspections and condition assessments, and the associated short-term and long-term CIP needs, were presented in a series of detailed Technical Memoranda that together comprise the Task 3 Report. Key findings, conclusions, and CIP recommendations from these efforts are highlighted in this Executive Summary.

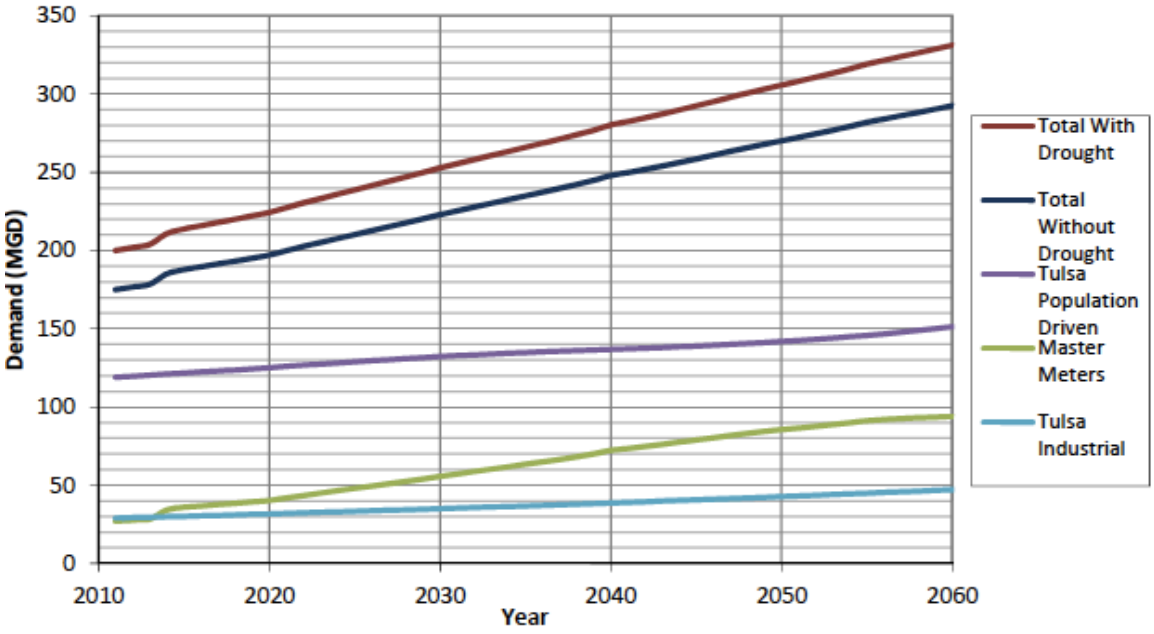
2.0 Population Projections and Future Water Demands

Population projections were updated for a 50-year planning window at eight distinct planning horizons. An annual growth rate of 1% was established for the Tulsa metropolitan area, based on research and analysis of historical growth. This annual growth was then distributed within the Tulsa metropolitan area based on a number of considerations, including growth trends, market analysis, infrastructure availability, and detailed population potential estimates prepared by INCOG. These population projections are discussed in detail in Technical Memorandum 2. System-wide maximum day demand projections for Tulsa were also updated using the population and growth projections, and by applying the projected growth to present-day baseline demands. It is noteworthy that Tulsa's record maximum day water production (207 MGD) occurred during this evaluation in August 2011, and coincided with the most severe drought conditions of the last 30 years. Failure to properly frame 2011 water demands within the context of these drought conditions would yield a skewed, overly conservative Capital Improvement Plan. It would be very expensive for TMUA to build and maintain water facilities to cover 100 percent of all drought conditions, nor is it common practice for U. S. water utilities to do so.

After extensive discussion with TMUA staff and Board members, a decision was reached in March 2012 to plan and provide for water treatment, transmission, and distribution system facilities which cover approximately 60 percent of projected drought conditions above and beyond population-based maximum day demands. In consultation with City Staff, the IMG Team established a drought-based demand factor of 14 percent, which corresponds to a current (2011) non-drought maximum day demand of 175 MGD. The overall maximum day water demand projections, including potential drought conditions defined at 14 percent are presented in Figure 2-1. These demands include projected water sales to Collinsville and Broken Arrow

under agreements already in place.

Figure 2-1
Maximum Day Water Demand Projections



These projected water demands are crucial to the planning effort because they dictate the timing of crucial improvements, including:

- ·Capacity-driven storage, pumping and distribution system pipeline improvements;
- ·Multiple water treatment capacity expansions at the AB JewellWater Treatment Plant;
- ·Raw water conveyance improvements in the Spavinaw and Oologah supply systems; and
- The third raw water flowline from Grand River/Salina Pumped Storage Project (SPSP) to AB Jewell Water Treatment Plant.

3.0 Regulatory Compliance and Water Quality Performance

The Spavinaw and Oologah source waters are challenging to treat and require diligent and dedicated operation to meet existing water quality regulations, Partnership for SafeWater (PSW) best practices, and aggressive taste and odor goals. Watershed and climatic conditions profoundly impact raw water particulates, natural organic matter (NOM), and trace concentrations of various potential contaminants. In addition, seasonal taste and odor events in the source waters regularly require extraordinary treatment practices to remove part per trillion concentrations of algae metabolites.

Water quality data show that TMUA consistently provides high quality water which meets or exceeds the requirements of all existing EPA and ODEQ rules and regulations, as well as aggressive Partnership for Safe Water (PSW) best practices. Multiple barrier treatment practices are successfully employed at TMUA to effectively remove or control turbidity, total organic carbon, disinfection by-products, hardness, alkalinity, Giardia, Cryptosporidium, and viruses at levels far below compliance requirements, while maintaining

effective disinfection and microbiologically stable water in the distribution system. The Tulsa water system currently meets or exceeds the requirements of all existing EPA and ODEQ rules and regulations, as well as Partnership for Safe Water (PSW) best practices. These findings are detailed in TM 3-DW.

TMUA will begin using monochloramines as an alternate secondary disinfectant in 2012 to further reduce formation of THMs and HAAs, and to ensure compliance with new Stage 2 D/DBP Rule requirements. This change may require supplemental monitoring to evaluate whether re-optimization of corrosion control treatment is necessary to maintain tap water lead concentrations below LCR action levels. It is likely that EPA will propose new regulations for NDMA or nitrosamines sometime in the next 5-10 years. TMUA staff is planning to carefully monitor NDMA formation during and after the implementation of monochloramine secondary disinfection.

Possible future DBP regulations which may impact TMUA include NDMA (or nitrosamines as a group) and more stringent rules for regulated and/or as yet unregulated "chlorinated DBPs." For this reason, TMUA should continue to evaluate long-term treatment technology alternatives and operational practices for reduction or removal of THMs, HAAs, and other DBP compounds and surrogate parameters.

4.0 Raw Water Facility CIP Needs

4.1 Overview

TMUA currently obtains raw water from the Spavinaw and Oologah water supply systems. The Spavinaw water supply system includes Lake Eucha, Lake Spavinaw, and the two flowlines that convey raw water to the Mohawk water treatment plant. The Oologah water supply system includes Lake Oologah and the two flowlines that convey raw water to the AB Jewell water treatment plant. Tulsa also has two contracts with the Grand River Dam Authority (GRDA), as summarized in Table 4-1.

Table 4-1
Summary of Existing TMUA Water Rights

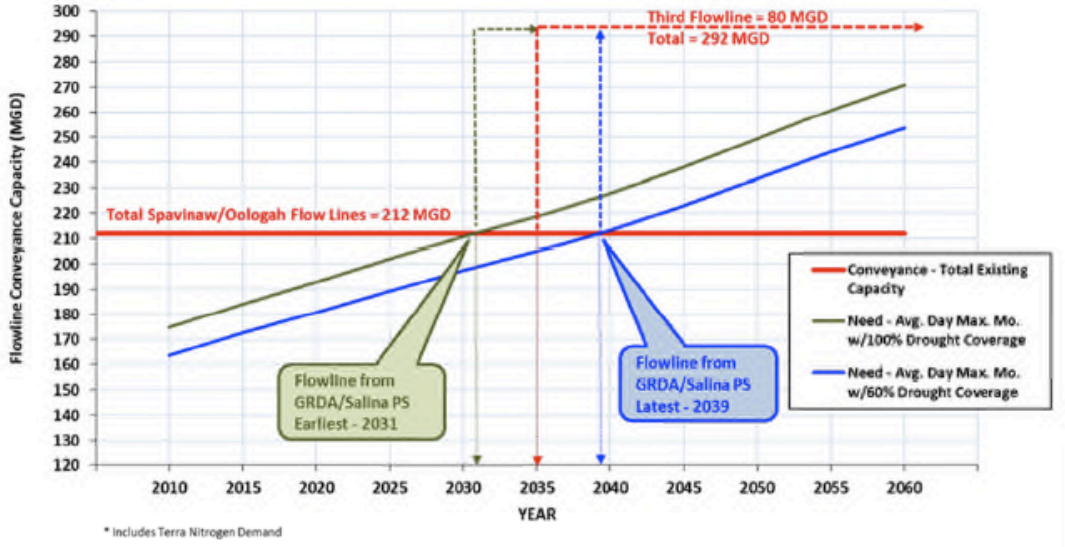
Source	Annual Average Available Yield/Commitments	Water Rights/Conditions
Spavinaw/ Eucha Lakes (Conveyance through Spavinaw Flowlines) Owner: City of Tulsa	Approximately 59 MGD annual average. City has commitment to supply Terra Nitrogen 7.2 MGD. Excluding this commitment, the available net yield is 51.8 MGD.	Water rights to all the flow in the Spavinaw Creek; Vested water rights of 161.6. MGD (Permit 22-33).
Oologah Lake (Conveyance through Oologah Flowlines) Owner: Federal government	128.3 MGD annual average (143,707 acre-feet). City has commitment to supply Public Service Company (PSO) 6.0 MGD. Excluding this commitment, net yield is 122.3 MGD.	Permit No 2-15; Maximum Rate of withdrawal = 141 MGD. Use Schedule: 2005 = 36%; 2015 = 45%; 2025 = 54%; 2035 = 63%; 2045 = 72%; 2055 = 81%; 2065 = 90%; 2070 = 100%
Hudson Lake (Pumped through Spavinaw Flowlines using the Grand River Pump Station) Owner: GRDA	31 MGD on an annual basis; or 94 MGD during the summer four months; (Used as a secondary source)	Contract dated 3/23/63; Recent contract dated 10/18/2000; Expires 10/18/2020; may be extended in additional 5-year periods by 6-months' notice from either party.
Grand River/Salina Pumped Storage Project (SPSP) (No conveyance facility currently exists) Owner: GRDA	80 MGD annual average.	Original contract dated 2/28/86; Effective for 30 years from the date of initial delivery of water.

The projected raw water conveyance capacity needs through the planning period 2060 are graphically depicted on Figure 4-1, which shows the future needs in terms of 60% and 100% drought coverage.

TMUA has adopted the 60% drought coverage for planning purposes, which means Tulsa's projected raw water conveyance needs will exceed current capacity by around 2039. This represents the latest that a third flowline to the AB JewellWTP would need to be in place and operational. Tetra Tech projects that the third flowline project as currently envisioned will require about 9 years for planning, environmental review, permitting, design, and construction. Therefore, the initial planning and environmental activities should begin by year 2029. The design and construction of a third flowline from the SPSP to AB Jewell WTP as currently envisioned represents an enormous future CIP investment of approximately $350 million in 2012 dollars.

Water rights from other nearby sources were also considered, although most of these have already been allocated either by permit or pending permit applications. The future availability of these allocated water rights may depend on the actual water usage current or prospective permit holders are able to maintain. Lack of usage by current permit holders or other circumstances may provide future opportunities for Tulsa to obtain additional water rights to Lake Oologah or Skiatook Lake, and TMUA should continue to monitor these circumstances and make use of such opportunities wherever possible.

Figure 4-1
Projected Flowline Capacity Needs



4.2 Source Water Protection and Watershed Land Management Programs

These ongoing programs are necessary to protect and preserve the quality and integrity of the City's water supply, implement TMUA Policy for Land Acquisition, monitor water quality in the Spavinaw/Eucha watersheds, identify and mitigate encroachments to the Spavinaw and Oologah flowlines, protect city assets and landowner rights, maintain water system security, and provide surveying (as required) to maintain clear easements and access along the flowlines. These programs also include ongoing efforts required to implement the court-mandated Master Agreement for the Spavinaw/Eucha watershed, which required specific actions by TMUA. Source Water Protection and related Land Management Programs represent an annual CIP requirement of approximately $1.2 million in 2012 dollars.

4.3 Oologah Flowline Bypass Pipeline at Bird Creek Pump Station No.1

This project includes 1.5 miles of new 48-inch raw water flowline extending east from Bird Creek Pump

Station No. 1 to connect more directly with the existing 72-inch Oologah flowline. This bypass connection will increase the Oologah flowline capacity to approximately 125 MGD, and represents a CIP requirement of approximately $10 million in 2012 dollars.

4.4 Terminal Storage Reservoirs

Improvements to Lynn Lane Lake were identified in a 2007 condition assessment report (Project TMUAW 05-36) and includes rehabilitation of the perimeter drainage, repair of the slope/splash walls, and repair of the walkway bridge. The report also identified a new concrete channel around the west and north perimeter to mitigate erosion. However, as part of the pre-design efforts for the projects, a reevaluation of sod erosion cover versus concrete lining for the perimeter drainage channel should be performed. Terminal storage reservoir improvements represent a CIP investment of approximately $3.4 million in 2012 dollars.

4.5 Flow Line and Tunnel Maintenance

This project is to address ongoing rehabilitation or repair of the existing flowlines and associated facilities which convey raw water from Lake Spavinaw and Lake Oologah to the terminal storage reservoirs. Collectively these flow line maintenance improvements represent an annual CIP investment of approximately $800,000 to $1 million in 2012 dollars.

4.6 Raw Water Pump Stations

Rehabilitation of the Oologah Pump Station, Spavinaw Pump Station and Mohawk Pump Station Nos. 1 and 2; and refurbishment of Bird Creek Pump Station No. 1;Woods Pump Station and Grand River Pump Station represent a CIP investment of approximately $5.6 million in 2012 dollars.

4.7 Eucha Dam Rehabilitation

In 2010, TMUA contracted with URS Corporation (URS) to conduct a comprehensive condition assessment for Eucha Dam. This study included structural stability analysis of the concrete dam elements and recommended additional field investigation to confirm several assumptions used in the analysis. Subject to such verification, the study recommended major structural improvements such as concrete anchoring systems, improvements to the radial spillway gates, various items to address OSHA requirements, and improvements to the electrical system. These improvements are currently included in the capital needs 2013-17 planning budget and total approximately $23.6 million. The final URS report is forthcoming, and approved recommendations from this study will be included in future CIP budgets.

5.0 Water Treatment Facility CIP Needs

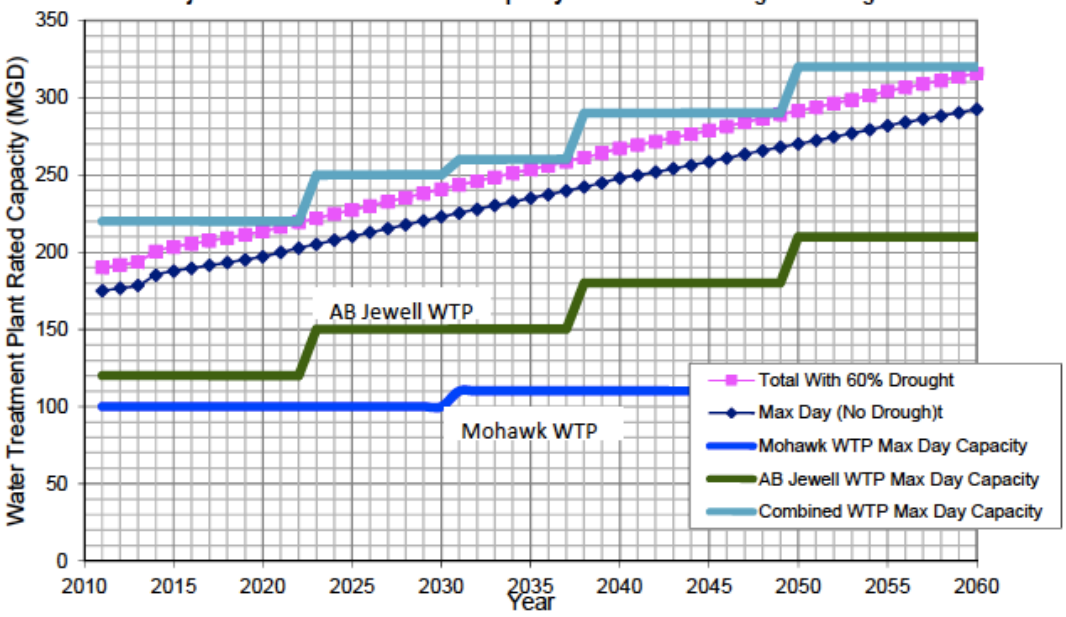
5.1 Capacity-Related Needs

The MohawkWTP was designed to provide a firm maximum day capacity of 100 MGD, although the facility can successfully operate at production rates up to 110 MGD until constrained by raw water limitations (see Technical Memorandum 5-DW). The 66-inch and 54-inch Spavinaw flow lines can deliver approximately 60-65 MGD of raw water by gravity to the MohawkWTP, and approximately 95 MGD with the coordinated use of the flow line pumping stations. The MohawkWTP High Service pumping station has a firm capacity of 115 MGD and under certain conditions is capable of delivering 125 MGD to the transmission system for limited periods.

The current rated capacity of the AB JewellWTP is 120 MGD, although past hydraulic studies and recent experience both suggest production is currently limited to 108-110 MGD. The AB Jewell WTP High Service pumping station has a firm capacity of 110 MGD, and under certain conditions may deliver up to 118 MGD to the transmission system. TMUA's 2012 CIP incorporated a plan to expand AB Jewell WTP maximum day capacity to 150 MGD by about 2020. In addition, Clarifier Nos. 1 through 3 will be rehabilitated and the capacity will be upgraded from 30 MGD to 40 MGD.

The timing of water treatment capacity needs was assessed based upon the updated maximum day demands outline above and detailed in Technical Memorandum 2. This analysis indicated that the 30 MGD expansion of AB Jewell WTP does not need to be in place to meet demands until 2023, as shown in Figure 5-1. Additional 30MGD expansions at AB Jewell would be needed by approximately 2037 and 2051 to keep pace with demand projections. These capacity target dates are based upon a production capacity of 110 MGD at Mohawk WTP during periods of highest demand, which would be sustainable for 20-40 days with enhancements to raw water conveyance capacity (Technical Memorandums 5-DW and 8-DW).

Figure 5-1
Projected Water Treatment Plant Capacity at 60 Percent Drought Coverage



5.2 Mohawk Water Treatment Plant Capital Improvement Needs

The short-term capital improvement requirements for TMUA's MohawkWTP were developed in Technical Memorandum 5-DW and are summarized below. Project level cost estimates and CIP needs were presented in Technical Memorandum 9-DW.

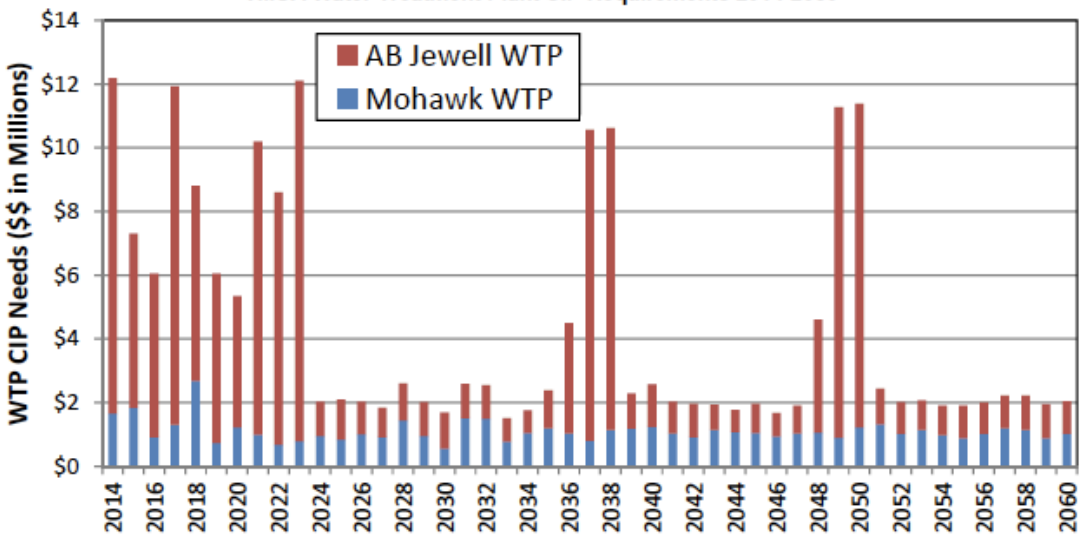
- Improved interconnections between Sequoyah and Mohawk Cells in Yahola Terminal Reservoir.
- A new building to enclose existing RawWater Pumps.
- New Stage 4 flocculator drives in all four basins.
- New mechanical effluent gate valves to replace existing stop log system.
- Replace existing Backwash Valves in lower filter gallery.
- Replace 60-inch high service header Check Valve.
- Install one (1) new VFD on Pump 9-P-6 in High Service Pump Station.

- Replacement of existing proprietary SCADA system with open-architecture PLC/SCADA system.
- Electrical improvements including transient level surge protection equipment and standby power generation.
- Structural/Architectural repair to various buildings, including brick re-pointing; crack repair in walls and floors; patch scaling and pop-outs; window replacement; and repair of roof leaks.
- Yard piping improvements including two new 66-inch isolation valves adjacent to Initial Mix
- Building, and construction of a second 66-inch raw water pipeline.
- HVAC system replacements in the RawWater Pumping Station and first floor of Chemical building; New exhaust fans in Mixing and Chemical Buildings.

5.3 Mohawk WTP SCADA System Improvements

The existing SCADA system at Mohawk WTP is a proprietary distributed control system (DCS). The proprietary SCADA hardware is in excellent condition, and TMUA Operations Staff are very satisfied with the current functionality, flexibility, and reliability. Nevertheless, the MohawkWTP SCADA system has been expensive to maintain and upgrade. It has cost TMUA more than $1.4 Million over a 15-year period to maintain and upgrade the proprietary system since the initial investment of $1.2 million in 1998. Proprietary upgrades and parts will continue to be expensive. The IMG Team does not believe that TMUA's interests are well-served by perpetuating the high costs associated with the proprietary SCADA system and recommends converting the existing control system hardware to an "open architecture" PLC-based control system. Providing and maintaining consistent SCADA systems at both Mohawk and AB JewellWTPs will be in the best long-term interests of TMUA and will ultimately lower operational costs.

Figure 5-2
TMUA Water Treatment Plant CIP Requirements 2014-2060



AB Jewell Water Treatment Plant Capital Improvement Needs
The short-term capital improvement requirements for TMUA's AB JewellWTP were also developed in Technical Memorandum 5-DW and are summarized below. Project level cost estimates and CIP needs were presented in Technical Memorandum 9-DW.

- Replace existing pumps in Raw Water Junction Chamber No. 1.
- Rehabilitate Clarifiers 2 & 3 and install high rate settling equipment.
- Expand capacity to 150 MGD, including filters and clarifiers, filter piping and controls, chemical feed systems, SCADA/I&C, yard piping, and electrical.
- Rehabilitate and replace Chemical Feed Systems identified by EMA study, including PAC slurry system, chlorine system, chlorine scrubbers, and various chemical storage tanks and feed systems.
- Replace East Clearwell including influent valves; cross-over valves; perimeter drain system; pressure relief system; and eliminate roof penetrations where practical.
- High Service Pumping Station / Pumps, motors and starters: Replace Pumps 3, 4 & 6 and equip with soft starts.
- Replace High Service Pumping Station header valves and surge tank isolation valves.
- Residuals Handling/Dewatering: construct at least two additional gravity thickeners; including pumping and chemical feed systems; Upgrades of Sludge PS 1 and 2; Modify existing lagoons to facilitate decant, cleaning and removal of settled solids; Modify the BFP sump drainage piping.
- Provide new Ethernet-based SCADA system based on results of evaluation.
- Integrate HSPS pump controls and sensors, and 30 MGD expansion equipment into SCADA.
- Electrical equipment improvements including replacement of 13.2 KV Distribution switchgear; reconfigured automatic transfer switch to supply two independent power sources; transient voltage surge suppression for added protection of VFDs and sensitive electrical equipment; and standby power generation.
- Structural repairs to address leakage and subsidence in RawWater Junction Chamber No. 1; replacement of stairs, handrails, platforms.
- Structural/Architectural repair to various buildings, including brick re-pointing; crack repair in walls and floors; patch scaling and pop-outs; window replacement; and repair of roof leaks.
- Yard Piping improvements including replacement of numerous isolation valves; new 84-inch and one 72-inch isolation valves in RawWater Junction Chamber No. 1; new bypass piping and 84-inch bypass valve for RawWater Junction Chamber No. 2; and reconstruction of storm water drains adjacent to the High Service Pump Station.
- Mechanical/HVAC improvements, including new air handling and HVAC units for the Admin building; replacement of east and west air handling units on Dewatering Building; and new air
- conditioning for outdoor electrical switchgear.

6.0 Distribution System CIP Needs

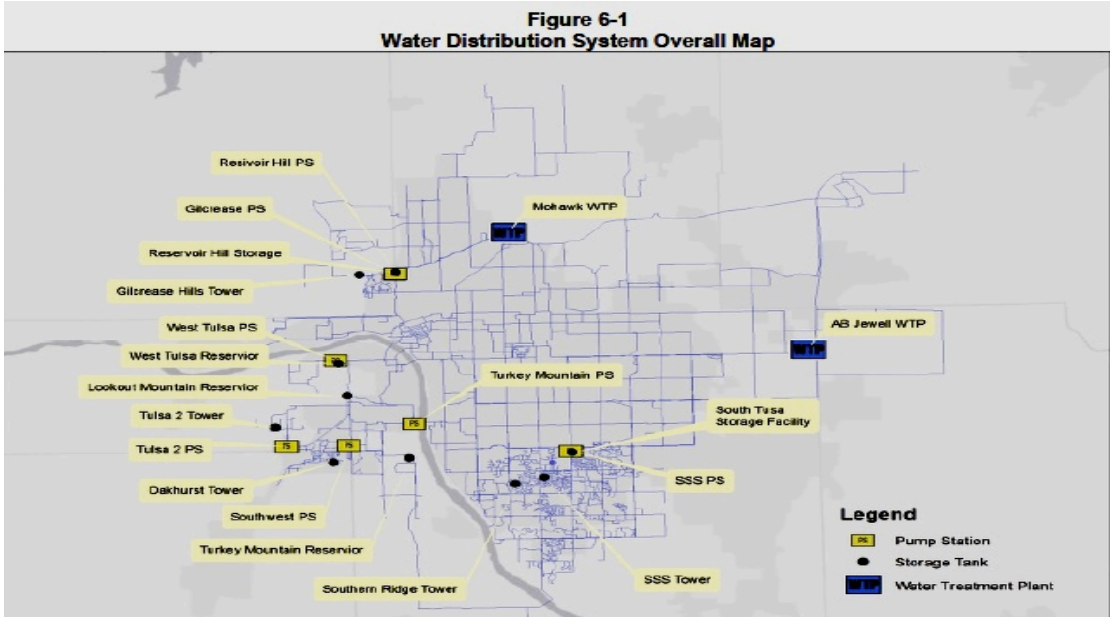
6.1 Overview

The IMG Comprehensive Water System Study included an evaluation of distribution system pipelines ,valves, pumping systems, and storage tanks. The focus of the distribution pipeline assessment was the updated hydraulic modeling work performed by TBR Engineering and supported and complemented by condition assessment data provided by TMUA staff. TMUA Engineering Services manages the historical data and statistical reports related to Tulsa's water distribution system pipelines. These reports were invaluable in systematically quantifying the pipe size, age, and type comprising the legacy and existing system. While this condition assessment is limited to pipelines 12 inches and larger, the IMG Team has used this opportunity to quantify the size, age, and pipe type for the entirety of the system as a function of miles of installed piping allowing for convenient updating of the digital statistical reports in the future. These data are described in detail in Technical Memorandum 6-DW.

TMUA's water transmission and distribution system consists of a complex network of about 2300 miles of water lines; storage tanks; pumping stations; 17,000 fire hydrants; 40,000 valves; and more than 145,000 customer service meters. The transmission and distribution system conveys treated water from TMUA's Mohawk and AB Jewell WTPs to the customer.

Pumping facilities in the Tulsa system are classified broadly into three categories: high service, zone transfer, and booster pumps. The high service pump stations located at the twoWTPs deliver finished water to the primary service zone. Zone transfer pump stations convey water from the primary service zone to higher elevation secondary service zones. Booster pump stations are used to increase water pressure within a zone. Elevated and ground-level tanks in the distribution system provide operational storage to meet periods of high demand and emergency needs. Six ground storage tanks, two subsurface concrete tanks, and four elevated storage tanks are currently provided within the system. Together, these active reservoirs provide about 102 million gallons (MG) of treated water storage capacity. An overall map of the TMUA distribution system is presented in Figure 6-1.

Figure 6-1
Water Distribution System Overall Map



6.2 Hydraulic Modeling of Distribution System

As described in Technical Memorandum 6-DW, a baseline 2011 scenario was fully developed based on the maximum day demand of 190 MGD (60% drought coverage) to assess the hydraulic performance of the existing system.

A 2015 extended period simulation (EPS) was created based on the projected maximum day demand of 203 MGD and was used to assess the hydraulic performance of the proposed 2015 system. The results of the baseline 2015 modeling showed that with proposed improvements the system will continue to be robust and perform satisfactorily. These improvements included:

- A proposed 4,100-foot extension of the existing 12-inch waterline west from near 111th and
- Memorial to Sheridan; and
- A new waterline to support Berryhill area annexation (approximately 20,000 feet of 12-inch).
- A 2020 EPS was created based on the projected maximum day demand of 213 MGD and was used to assess the hydraulic performance of the 2020 system and identify needed improvements. The following required improvements were identified:
- Upgrades to support Cherokee annexation:
- 31,000 LF of 48-inch waterline from near Mohawk to 76th Street North and Sheridan
    - (CherokeeWaterline).
- 31,680 LF of 24–inch waterline from 66th Street North and Harvard to 106th Street North and Sheridan.
- 5,280 LF of 12-inch waterline between Sheridan and Yale along 96th Street North.
- 5,280 LF of 12-inch waterline between 96th and 106th Street North along Yale.
- Upgrade to support Nickel Creek:
- 5,280 LF of 12-inch waterline between Union and Elwood along 91st Street South.
- Upgrade to support Spunky Creek:
- 10,560 LF of 12-inch waterline between 11th and 31st Street South along 255th East Ave.
- Upgrade to restore peak hour pressures:
- 11,000 LF of 16-inch waterline between 131th and 151th Street, west of Yale.

A 2025 EPS was created based on the projected maximum day demand of 227 MGD, and used to assess 2025 hydraulic performance and identify needed improvements. This included demands of 8.75 MGD for Broken Arrow and 1.5 MGD for Collinsville. The following required improvements were identified to meet 2025 demands:

- Upgrades to support Cherokee annexation:
- 10,560 LF of 24–inch waterline from 106th Street North to 116th Street North along
- Harvard and Sheridan.
- 10,560 LF of 12–inch waterline between Harvard and Sheridan along 116th Street North.
- 5,280 LF of 12-inch waterline between 106th and 116th Street North along Yale.
- Upgrade to support North and South Flatrock Creek:
- 31,680 LF of 12-inch waterline between N. Osage and 41st West Ave. along West 33rd and West 52nd Street North.
- Upgrades to support Salt and North Adams Creek:
- 10,560 LF of 12-inch waterline between 225th and 257th East Ave. along 11st Street South.

- Upgrades to avoid high AB JewellWTP pump discharge pressures:
- 36,500 LF of 72-inch waterline, west from ABJ to 177th, then south to 51st, then west to 129th (PHASE 1).
- Upgrades to maintain target peak hour pressures:
- 6,600 LF of 24-inch waterline between 101st and 111th Street along Memorial, then west ~ 1,300 LF.
- The cumulative system upgrades relative to the current (2011) water distribution system required to meet the needs of the anticipated 2025 water system include:
- 6.9 miles of 72-inch waterline
- 5.9 miles of 48-inch waterline
- 9.3 miles of 24-inch waterline
- 2.1 miles of 16-inch waterline
- 22.6 miles of 12-inch waterline

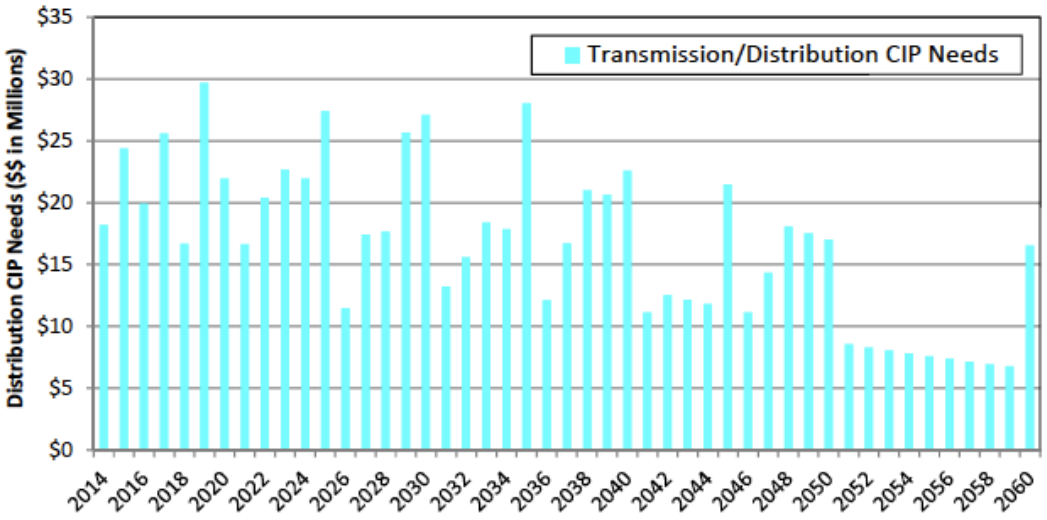
A 2030 EPS was created based on the projected maximum day demand of 241 MGD, and used to assess 2030 hydraulic performance and identify needed improvements. This included demands of 12.5 MGD for Broken Arrow and 1.5 MGD for Collinsville. The following required improvements were identified to meet 2030 demands:

- In support of Cherokee annexation:
- 10,560 LF of 24–inch waterline from 116th Street North to 126th Street North along
- Harvard and Sheridan.
- 10,560 LF of 24–inch waterline between Harvard and Sheridan along 126th Street North.
- 5,280 LF of 12-inch waterline between 116th and 126th Street North along Yale.
- To maintain Turkey Mountain Reservoir levels:
- 16,000 LF of 48-inch waterline between Turkey Mountain Pump Station and Reservoir.
- Spunky Creek Upgrades:
- 5,280 LF of 12-inch waterline between 21st and 31st Street South along 209th East Ave.
- 5,280 LF of 12-inch waterline between 209th and 225th East Ave. along 21st Street
    - South.
- Upgrades to avoid high AB JewellWTP pump discharge pressures:
- 21,120 LF of 72-inch waterline between 129th East Ave. and Sheridan along 51st Street South (PHASE 2).
- The cumulative system upgrades relative to the current (2011) water distribution system required to meet the needs of the anticipated 2030 water system include:
    - 10.9 miles of 72-inch waterline
    - 8.9 miles of 48-inch waterline
    - 13.3 miles of 24-inch waterline
    - 2.1 miles of 16-inch waterline
    - 25.6 miles of 12-inch waterline

6.3 Transmission and Distribution System Capital Improvement Needs

Additional details and project level cost estimated for required transmission and distribution system CIP improvements are provided in Technical Memorandums 6-DW, 7-DW, and 10-DW. The transmission and distribution system total CIP requirements for 2014-2060 are illustrated below in Figure 6-2.

Figure 6-2
TMUA Transmission/Distribution System CIP Requirements 2014-2060



7.0 Asset Management CIP Needs

IMG was also commissioned to perform a comprehensive assessment of assets and services across all TMUA divisions. The assessment was designed to evaluate operations and strategic business elements with the goal of identifying asset management strategies across the organization to better enable TMUA to prolong the life of assets, reduce long-term costs for operations and capital expenditures, create budgets that focused on critical activity, and provide a sound financial planning foundation for setting rates.

In order to identify methods of improving current asset management activities within TMUA, a utility wide gap assessment was performed to assess TMUA's current program relative to industry best practices established by USEPA guidelines for asset management. The results are presented in Table 7-1.

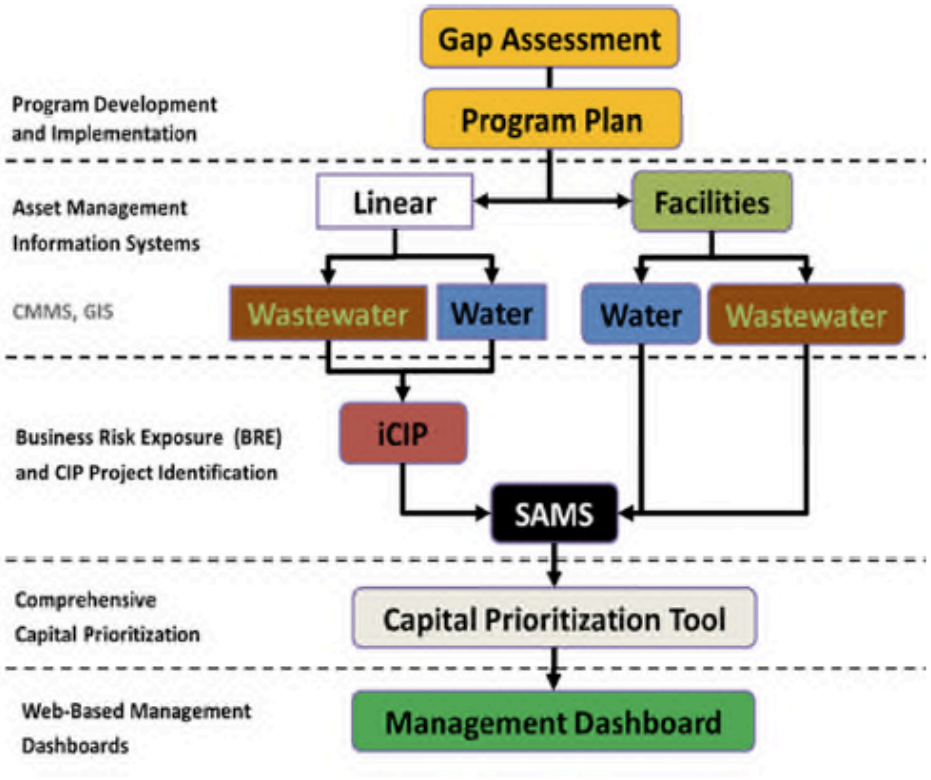
Table 7-1
Utility-Wide Gap Assessment Summary

Best Practice	Best Practice Description	Overall Utility Score
Current State of Assets	Do we know what we own, where it is, its condition, useful life, and value?	3
Sustainable Level of Service	Do we know the level of service our stakeholders and customers demand, our actual performance, and the physical limitations of the assets? Do we know what the regulators require?	3
Critical Assets	Do we know how and what assets fail, the probability, consequences, cost to repair, as well as other social or environmental costs?	4
Life Cycle Costs	Do we know what alternative strategies exist for O&M, personnel, and capital which are most feasible for us? What are the costs of rehabilitation, repair, and replacement of critical assets?	2
Funding Strategies	Have we established the appropriate rate structure to generate a reliable revenue stream adequate to annually reinvest in our assets?	2

Score Key:
1 - Reactive, out-of-date data and information.
2 – Historical, collect and review when something happens.
3 – Proactive, analyze and use knowledge to manage performance.
4 – Risk based, accumulate targeted info to manage risk profile.
5 – Collaborative, fully use knowledge engineering, share across partnerships.

Based on the results of the gap assessment, the Asset Management Program Implementation Plan illustrated in Figure 7-1 was developed.

Figure 7-1
Asset Management Program Overview



The proposed Asset Management Implementation Plan includes the following elements:

- Program Structural and Procedural Development to provide a structure for the overall program.
- Asset Management Information Systems Implementation to develop Computerized Maintenance Management Systems (CMMS) and Geographic Information Systems (GIS) across TMUA to act as a common platform for condition assessment, capital planning, and maintenance management data.
- Development and Implementation of Prioritization Tools to enhance the SAMS program and expand this program to all divisions in support of utility-wide planning.
- Management Tool Implementation to develop management dashboards providing progress tracking on multiple fronts and an overall perspective of TMUA performance.
- Staffing recommendations in support of the Asset Management program, including a utilitywide asset manager position and appropriate division support staff.

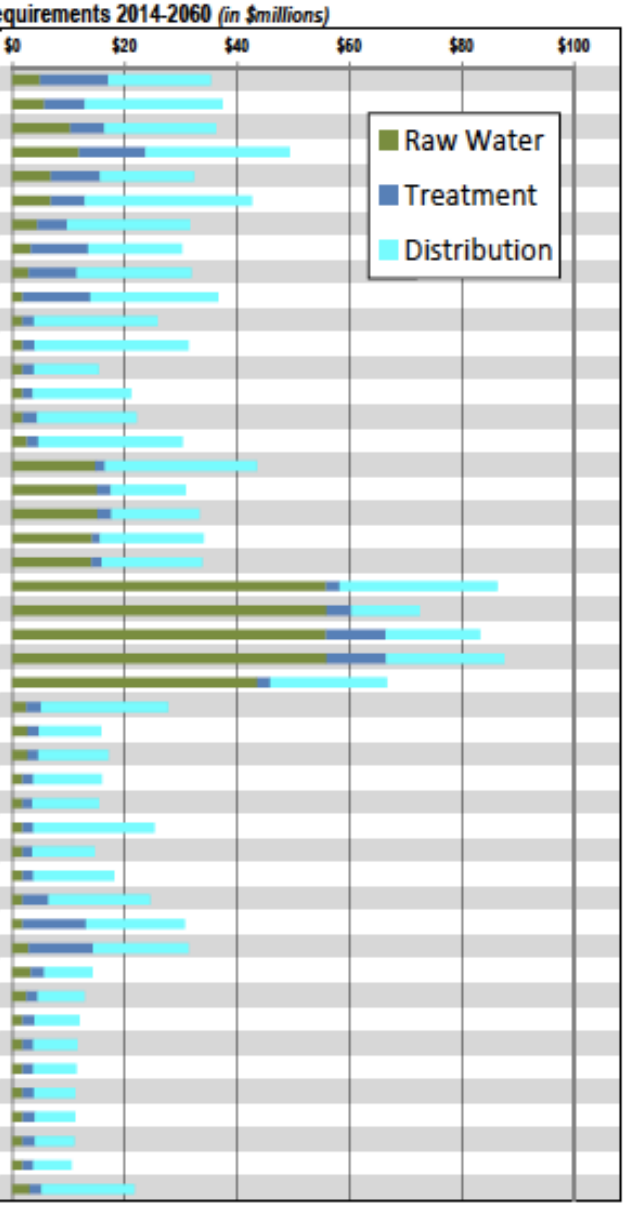
Technical Memorandum 11, Asset Management Approach, provides further information on asset management best practices and the recommended implementation time line.

8.0 Overall Water System CIP Requirements

An overall summary of all short-term and long-term CIP requirements for TMUA's water system facilities is presented below in Figure 8-1.

Figure 8-1
Overall Water System CIP Requirements 2014-2060 *(in $millions)*

Year	Raw Water	Treatment	Distribution	Total
2014	$4.9	$12.2	$18.2	$35.3
2015	$5.7	$7.3	$24.4	$37.4
2016	$10.3	$6.0	$19.9	$36.3
2017	$11.8	$11.9	$25.6	$49.3
2018	$6.8	$8.8	$16.7	$32.3
2019	$6.9	$6.0	$29.7	$42.6
2020	$4.4	$5.3	$21.9	$31.7
2021	$3.3	$10.2	$16.7	$30.2
2022	$2.8	$8.6	$20.4	$31.8
2023	$1.8	$12.1	$22.7	$36.6
2024	$1.9	$2.0	$21.9	$25.8
2025	$1.9	$2.1	$27.4	$31.3
2026	$1.8	$2.0	$11.5	$15.3
2027	$1.9	$1.8	$17.4	$21.1
2028	$1.9	$2.6	$17.7	$22.1
2029	$2.6	$2.0	$25.7	$30.3
2030	$14.8	$1.7	$27.1	$43.5
2031	$15.0	$2.6	$13.2	$30.8
2032	$15.1	$2.5	$15.6	$33.2
2033	$14.2	$1.5	$18.4	$34.1
2034	$14.1	$1.8	$17.9	$33.7
2035	$55.8	$2.4	$28.1	$86.3
2036	$55.9	$4.5	$12.1	$72.5
2037	$55.9	$10.6	$16.7	$83.1
2038	$55.9	$10.6	$21.0	$87.5
2039	$43.6	$2.3	$20.6	$66.5
2040	$2.5	$2.6	$22.6	$27.7
2041	$2.7	$2.0	$11.1	$15.8
2042	$2.6	$2.0	$12.5	$17.1
2043	$1.8	$1.9	$12.1	$15.9
2044	$1.9	$1.8	$11.8	$15.4
2045	$1.8	$2.0	$21.5	$25.3
2046	$1.9	$1.7	$11.1	$14.7
2047	$1.8	$1.9	$14.3	$18.1
2048	$1.9	$4.6	$18.0	$24.5
2049	$1.8	$11.3	$17.5	$30.6
2050	$3.0	$11.4	$17.0	$31.3
2051	$3.3	$2.4	$8.5	$14.2
2052	$2.5	$2.0	$8.3	$12.8
2053	$1.9	$2.1	$8.0	$12.0
2054	$1.9	$1.9	$7.8	$11.6
2055	$1.8	$1.9	$7.6	$11.3
2056	$1.9	$2.0	$7.4	$11.2
2057	$1.9	$2.2	$7.1	$11.2
2058	$1.8	$2.2	$6.9	$11.0
2059	$1.8	$1.9	$6.7	$10.5
2060	$3.1	$2.0	$16.5	$21.7



Task 4: Current and Future Market Opportunities

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Task 4: Current and Future Market Opportunities

1.0 Purpose

The purpose of Task 4 was to analyze existing and potential water and wastewater providers in and around the Tulsa area to explore opportunities for the TMUA to expand their services.

2.0 Scope of the Market Study

The scope of the study included the following tasks.

- Identify water and wastewater providers in Tulsa County and adjacent counties.
- Compile information on these providers including water rights, customer base, treatment plant size and condition, discharge violations, water quality violations, wastewater flows and water demands.
- Meet with INCOG, ODEQ and the OWRB to review the lists of providers and obtain additional information and input from these agencies.
- Screen these providers and develop a list of those who should be considered for further evaluation.
- Determine the size and preliminary routing of improvements required for the TMUA to serve or expand their services to these providers. Prepare maps showing these facilities.
- Estimate the capital and operational costs for these providers to expand or improve their own facilities.
- Determine capital and operational costs for the TMUA to furnish or expand service to these providers and compare these costs to the providers expanding or improving their own facilities.
- Prepare a report including the results of the above tasks and present to the water and sewer administration and TMUA Board.

3.0 Water Service Marketing Opportunities

3.1 Potential Water Customers

Water providers with water treatment plants in Tulsa County and the surrounding areas were compiled and a total of 13 plants were identified. An evaluation of the potential water customers was conducted considering the provider's need for additional service and/or capacity, the condition and age of their facilities, water quality violations and their proximity to the TMUA water distribution system.
Based on this review the following water systems were selected for further evaluation.

1. City of Collinsville
2. City of Claremore
3. City of Broken Arrow

3.2 Potential Wastewater Customers

Wastewater treatment plants in Tulsa County and the surrounding areas were compiled and a total of 19 wastewater treatment plants owned by 17 entities were identified. An evaluation of the potential wastewater customers was conducted considering the provider's need for additional service and/or capacity, the condition and age of their facilities, discharge violations, and their proximity to the TMUA wastewater collection system and/or wastewater treatment plants.

Based on this evaluation 5 wastewater providers, which includes 7 treatment plants, were selected for further evaluation as follows.

1. Bixby North WWTP (Aerated Lagoon)
2. Bixby South WWTP (Aerated Lagoon)
3. Collinsville WWTP (Aerated Lagoon)
4. Owasso WWTP (Activated Sludge)
5. Skiatook Bird Creek WWTP (Facultative Lagoon)
6. Skiatook Hominy Creek WWTP (Aerated Lagoon)
7. Sperry WWTP (Aerated Lagoon)
8. Glenpool WWTP (Aerated Lagoon)

4.0 Evaluation of Potential Water Customers

4.1 City of Collinsville

The City of Collinsville obtains raw water from Lake Oologah and treats the water at a 1.4 mgd water treatment plant east of Collinsville. The current peak day is 1.1 mgd and the customer base is expected to grow. The plant is over 40 years old and would likely be replaced rather than expanded. The 16" raw water line from Lake Oologah to the plant is in fair to poor condition.

Future alternatives for the City of Collinsville are to construct a new treatment plant or purchase treated water with a connection to the TMUA 36" line at Sheridan and 106th Street North. Water can be provided by the TMUA at a lower annual cost than the construction of new facilities.

4.2 City of Claremore

The City of Claremore operates a water treatment plant located northeast of Claremore south of the Claremore Lake Dam. The plant obtains water from Claremore Lake (safe yield of 2.0 mgd) and from Lake Oologah (3.0 mgd of water rights). The current average day demand is 3.60 mgd and is projected to be 7.63 mgd by 2060. The peak day demand is 5.48 mgd and is projected to be 11.60 mgd by 2060. The conventional treatment process train at the water treatment plant has a firm capacity of 4.1 mgd. A package unit at the treatment plant can produce 2.0 mgd but cannot meet water quality standards for TOC removal.

The City of Claremore completed a Water Master Plan in 2009. This plan evaluated 11 alternatives for increasing the water supply and water production capacity. The plan recommended the purchase of water rights and water storage in Lake Oologah from the City of Tulsa, a 4.0 mgd expansion of the Claremore Water Treatment Plant, the construction of a parallel raw water line from Oologah and the expansion of the Oologah raw water pump station. The Master Plan estimated the total cost of these improvements to be $23,400,000.

Future alternatives considered in this study were the expansion of the raw water supply and treatment facilities as recommended by the 2009 Master Plan verses the purchase of all treated water from the TMUA. As shown the expansion of the existing Claremore facilities can be completed for an annual cost of $1,450,000 less than the purchase of water from the TMUA assuming all of the transmission facilities are constructed by Claremore.

4.3 City of Broken Arrow

The City of Broken Arrow currently obtains their treated water from the Oklahoma Ordinance Works Authority (OOWA) south of Pryor, Oklahoma.

The City of Broken Arrow's contract with OOWA expires at the end of 2013. By the end of 2013 the City of Broken Arrow plans to complete a new 20.0 mgd water treatment facility, which will obtain raw water from the Verdigris River. In addition the City of Broken Arrow intends to purchase up to 6.0 mgd of treated water from the TMUA through a connection to TMUA 60 inch line at 41st Street South and Elm Place and a 24" line running south one mile to Broken Arrow's 5.0 MG tank at 51st Street South and Elm Place.

Within a few years the City of Broken Arrow will need to increase the amount of water purchased from Tulsa or proceed with a 20 mgd Phase II expansion of their water treatment plant. In order to obtain up to an additional 15 mgd from TMUA the construction of a 36" to 42" transmission line from the TMUA 60" line at 41st Street South and County Line Road (23rd Street) South 3 miles to the City of Broken Arrow's 36" transmission line on 71st Street South (Kenosha Ave) will be required.

5.0 Evaluation of Potential Wastewater Customers

5.1 Bixby North and Bixby South Wastewater Treatment Plants

The City of Bixby has two aerated lagoon treatment plants. The Bixby North WWTP, which has a capacity of 0.853 mgd and a current flow of 1.00 mgd, is located just north of the Arkansas River ½ mile west of Memorial Drive. The South Bixby WWTP, which has a capacity of 0.684 mgd and a current flow of 0.35 mgd, is located just south of the Arkansas River just west of Mingo Road.

The Bixby North WWTP is overloaded and has received Notice of Violations from ODEQ for exceeding BOD discharge limits. Bixby plans to eliminate both treatment plants in the next 5 to 7 years.

Alternatives evaluated for Bixby in this study include the construction of a new 3.0 mgd activated sludge plant, force main connections to the 36" TMUA force main along the north side of the Arkansas River, and force mains connecting directly to the RMUA Haikey Creek WWTP. A cost comparison of these alternatives shows that the connection to the RMUA Haikey Creek WWTP has the lowest annual cost.

5.2 Collinsville/Owasso Wastewater Treatment Plants

The City of Collinsville operates an aerated lagoon with effluent filtration and UV disinfection with a design flow of 0.95 mgd. Existing flow is 0.7 mgd. System growth is anticipated. Expansion of the plant over 1.0 mgd will require the construction of mechanical treatment plant with advanced secondary discharge limits to meet ammonia limit. The plant discharges to the Caney River.

The Owasso WWTP is located less than a mile north of the TMUA Northside WWTP ¼ mile south of the 76th Street North and discharges to Bird Creek. This plant was recently expanded to 4.20 mgd which is the maximum allowed by the 208 Water Quality Management Plan. The current flow to the plant is 2.80 mgd. Although the plant has a design flow of 4.20 mgd some of the treatment processes do not have redundant units. Owasso is under a consent order to provide redundant units by 2014.

Alternatives for Collinsville include the construction of a new 1.6 mgd activated sludge treatment plant or the transfer of all wastewater to the TMUA Northside Plant by force main.

The alternatives for Owasso are to provide the redundancy required by ODEQ or construct a pump station and force main to the TMUA Northside WWTP to provide this redundancy and to handle future flows above the plant capacity.

The cost of the Owasso pump station and Owasso's share of the 20" force main would be approximately $1,200,000 which would be significantly less than the construction of redundant units at the Owasso WWTP.

5.3 Skiatook/Sperry Wastewater Treatment Plants

The Town of Skiatook operates two wastewater lagoon systems. The Bird Creek WWTP is a 3 cell flow through lagoon system with a capacity of 0.28 mgd and is located east of Skiatook immediately south of State Highway 20. The plant is operating near capacity and has had multiple discharge violations.

The Hominy Creek WWTP is a three cell aerated lagoon with disinfection and with a capacity of 0.90 mgd and is located south of Skiatook. This plant is operating near capacity and has been cited by ODEQ for discharge violations.

Skiatook has increased their sewer customer base from 1,600 in 1980 to 2,870 in 2010 and is expected to continue to grow. Skiatook completed a Wastewater Master Plan that recommends combining all flows at the Hominy Creek WWTP site and the construction of a new 2.0 mgd advanced secondary plant by 2020.

The Town of Sperry operates an aerated lagoon system with a capacity of 0.132 mgd, which is located one mile north of Sperry on 126th North Avenue. Disinfection was added to the plant in 2010. The plant does not have significant permit violations. Sperry has 450 sewer customers and an average daily flow of 0.09 mgd. Sperry is expected to have slow growth.

The alternatives for Skiatook include the construction of a new 2.0 mgd activated sludge treatment plant discharging to Hominy Creek or the transfer of wastewater by force main to the TMUA Northside Collection System in the vicinity of 56th Street North and North Lewis Avenue.

The TMUA connection would require lift stations at the Hominy Creek and Bird Creek WWTP and a 16" force main south and east to the TMUA system. Existing lagoons at each plant would be used for flow equalization to reduce the size of the lift stations and force mains.

The Sperry WWTP would be connected to the Skiatook TMUA force main by the construction of a lift station at the Sperry WWTP and a 6" force main west for ½ mile. The existing lagoon would be used for flow equalization.

A cost comparison revealed that the cost of Skiatook and Sperry upgrading and operating their own facilities has a lower annual cost.

5.4 Glenpool Wastewater Treatment Plant

The City of Glenpool owns an aerated lagoon system with a capacity of 1.44 mgd and an average daily flow of 1.1 mgd. Effluent from the plant is pumped east 5 miles to the Arkansas River. The plant has failed toxicity tests for ammonia. Glenpool plans to temporarily meet the toxicity test (and fecal coliform limits) by the construction of a breakpoint chlorination facility.

A master plan being prepared for Glenpool is expected to recommend the construction of a new 2.5 mgd activated sludge plant within the next 5 to 10 years. This plant will be needed for projected growth and to comply with discharge permit limits.

The alternatives for Glenpool include the construction of this new mechanical wastewater treatment plant, connection to the TMUA collection system, or a connection to the RMUA Haikey Creek Wastewater Treatment Plant. Under both of these options a new raw sewage pump station would be constructed at the Glenpool WWTP and the existing lagoons converted to flow equalization.

5.5 Berryhill Area Service Opportunities

A comprehensive Wastewater System Study for the Bighart, Harlow, and Berryhill drainage basins was completed by Greeley and Hanson in July of 2010. Using this plan as a guide, a layout of recommendation of interceptors, pump stations, and force mains to serve the Berryhill area was developed. A total project cost for these improvements projects is estimated to be approximately $15,840,000.

6.0 Raw Water Market Opportunities

6.1 General

The TMUA has two raw water supply lines “flowlines” which provide raw water to the Mohawk and AB Jewell Water Treatment Plants. The Oologah flowline provides raw water from Oologah Lake, a US Army Corps of Engineers Reservoir. The Spavinaw flowline provides raw water from Spavinaw Lake, a reservoir owned by the City of Tulsa. A third “Grand River Flowline” is proposed from the Grand River Dam Authority (GRDA) Salina Pumped Storage Reservoir to a new terminal storage facility located south of 51st Street South and west of 305th East Avenue (Coweta Road).

6.2 Potential Raw Water Customers

Water treatment plants in the vicinity of the existing and proposed flowlines were identified. These water treatment plants, their approximate capacities and recommendations regarding raw water supply opportunities are presented in the table below.

Raw Water Supply Opportunities
TMUA Comprehensive Assessment

Facility Name	Plant Capacity	Current Water Service	Recommended for Possible Raw Water Supply/Pipeline	Comments
Rogers Co. RWD No. 3	12.0 mgd	Oologah	No	No Benefit to District
Collinsville	1.4 mgd	Oologah	No	Market Potable Water
Claremore	6.0 mgd	Claremore Lake/ Oologah	Yes	Current Water Supply is Limited
Rogers Co. RWD No. 5	4.5 mgd	Verdigris River/ City of Tulsa	Yes	Currently has Standby Connection to TMUA
Mayes Co. RWD No. 9	0.7 mgd	Salina Pump and Storage	No	No Benefit to District
Locust Grove	0.8 mgd	Hudson Lake	Yes	Existing Intake in Need of Replacement
OWWA	50 mgd	Grand River	Yes	Water Quality Improvement
Broken Arrow	20 mgd (1)	Verdigris River	Yes	Water Quality Improvement
Wagoner Co. RWD No. 4	8.0 mgd	Verdigris River	Yes	Water Quality Improvement
Coweta	2.5 mgd	Verdigris River	Yes	Water Quality Improvement
Wagoner Co. RWD No. 5	2.8 mgd	Verdigris River	No	Too Far from Flow Line

(1) Scheduled for completion in late 2013.

7.0 Opportunity Findings

7.1 Water Service Expansion

An excellent opportunity for the expansion of the TMUA water service is the City of Collinsville. As shown by the cost comparison treated water can be provided from TMUA to Collinsville for $4.07 per 1,000 gallons (including Collinsville's debt service on the transmission facilities) compared to a cost of $4.77 per 1,000 gallons if Collinsville improves their own facilities. In addition this service would extend the TMUA distribution system two miles north along Memorial Drive adjacent to the City of Tulsa's fence line. Furnishing additional treated water to the City of Broken Arrow as their future demands increase is another opportunity to expand TMUA's water service. The completion of the 20 mgd Phase I Broken Arrow Water Treatment Plant and the 24" Elm Ave. connection to the TMUA will meet Broken Arrow's peak day demands for only 5 to 10 years. The construction of the 36"/42" line along county road could provide Broken Arrow with an additional 15 to 20 mgd of water which would delay or eliminate the expansion of their water treatment plant.

The TMUA may also wish to pursue the expansion of their service to provide water the City of Claremore. Although the cost analysis shows the water would need to be sold to Claremore for $1.57/1,000 gallons to be equal to the cost of Claremore expanding their system some cost sharing of the transmission facilities by the TMUA and Claremore could make the project beneficial to both parties.

7.2 Wastewater Service Expansion

The best opportunity for the expansion of wastewater service is the City of Bixby. While connection to the TMUA system is approximately equal in annual cost of Bixby constructing their own treatment facilities, Bixby's connection to the RMUA Haikey WWTP has a significantly lower annual cost.

A second opportunity for the expansion of service is the City of Owasso. A connection to the TMUA Northside WWTP would be much less expensive than the expansion of the Owasso WWTP to provide redundant treatment units.

A final opportunity for the expansion of service is the City of Glenpool. In 5 to 10 years Glenpool will need to construct a new mechanical WWTP or connect to the RMUA Haikey Creek WWTP. A connection to the RMUA plant has the lowest annual cost.

8.0 Liabilities

8.1 Water Service Expansion

The greatest liability for the expansion of TMUA's water service is the abundance of water treatment capacity and water rights by area water providers.
Many of these water providers recently completed plant improvements for water quality and/or for capacity. None of the providers lack the available water rights to meet their needs for the foreseeable future or have significant water quality violations.

8.2 Wastewater Service Expansion

The greatest liability for the expansion of wastewater service is the cost of the service by TMUA. The current TMUA wholesale rate of $4.79 per 1,000 gallons for transportation and treatment and $4.00/1,000 gallons for treatment only makes the expansion of wastewater service unpractical for most providers in the area.

9.0 Summary of Findings

9.1 Water Service Expansion

- The TMUA should consider serving Collinsville and Broken Arrow (above 20 mgd) in their Comprehensive Water Plan. Further investigations into serving Claremore should also be considered.

- The TMUA should consider meeting with Collinsville, Broken Arrow and Claremore to discuss the possibilities of providing or expanding water service.

9.2 Wastewater Service Expansion

- The TMUA through their representation on the RMUA should enter into negotiations with Bixby for providing wastewater treatment at the Haikey Creek WWTP.

- The TMUA should meet with the City of Owasso to discuss the possible construction of facilities to transfer flows (above 4.2 mgd or in case of emergency) to TMUA Northside WWTP.

- The TMUA through their representation on the RMUA should meet with the City of Glenpool to discuss their future connection to the RMUA Haikey Creek WWTP.

9.3 Rate Opportunities

TMUA could consider evaluating their wholesale water and wastewater rates to determine if a different rate model could expand service *and* benefit customers within the City of Tulsa.

9.4 Raw Water Service Expansion

Prior to the design of the Grand River Flowline the TMUA should meet with OOWA, Broken Arrow, Coweta, Locust Grove, and Wagoner Co. RWD No. 4 to discuss their possible future connection to the flowline.

Task 5: Financial Condition, Planning and Reporting

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Task 5: Financial Condition, Planning and Reporting

1.0 Overview

Financial viability and sustainability requires a utility to understand the full life-cycle cost of its assets. Recognition of the costs requires maintaining effective balances between debt and assets as well as operating costs and revenues. In addition, revenues must be sufficient to maintain adequate reserves, support bond ratings and invest in future needs. The debt management plan will address the balance of debt and assets. The financial reporting will investigate the monitoring of operations. Supporting operations is the equitable recovery of costs which requires an analysis of costs allocation and associated rate design.

2.0 Debt Management

2.1 Overview

The water industry is facing massive capital investment to meet the needs of aging infrastructure, regulatory requirements and growth. According to Fitch Ratings' 2010 publication on Public Finance, forecast annual capital spend for the water industry is projected to be $273 per customer. Although this is a substantial amount, it is approximately 23 percent less than 2009; the drop primary attributed to deferral of growth related projects and budgetary pressure on local governments. Of more concern is the trend of asset reinvestment failing to keep pace with the level of annual depreciation. Continuation of this trend will result in future increases in debt to replace assets that reach their useful life sooner than planned. From 2009 to 2010, the debt burden relative to un-depreciated system assets increased from 39 percent to 43 percent. Given the capital investment need and the historical trend of utilities to debt finance major investments, the debt burden on customers is expected to increase significantly. This burden directly impacts the affordability of providing basic service to customers. A strong debt management plan will provide the base for financial sustainability for future customers.

2.2 TMUA's Debt Management Process

The debt management process at TMUA is a collaborative effort. The overlying policy is to direct cash into capital investment equal to depreciation. Both water and sewer funds are moving to achieve the reinvestment goal in their financial planning processes. The process begins with the identification of the capital improvement program. This process is led by the Engineering Department with support of the Operations. The outcome of this step in the process is a list of projects with cost estimates.

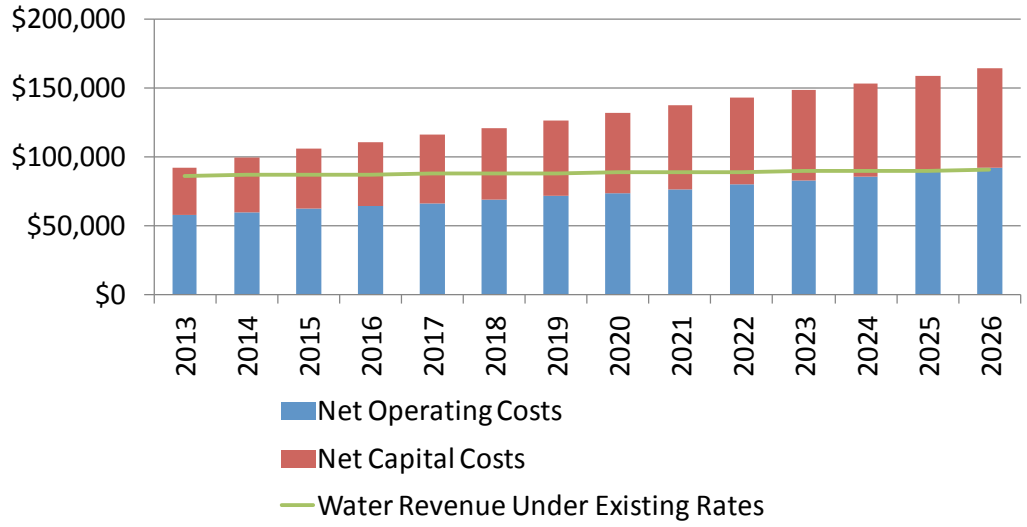
Debt management indicators that are currently monitored by staff include the following:

	Water	Wastewater	Industry Best Practices
Debt Service Coverage Ratio	175% - 200%	135% - 250%	150% - 200%
Debt Ratio	29.46%	35.09%	20% - 25%
Return on Investment / Assets	4.6%	2.9%	5%

2.3 Revenue Requirement

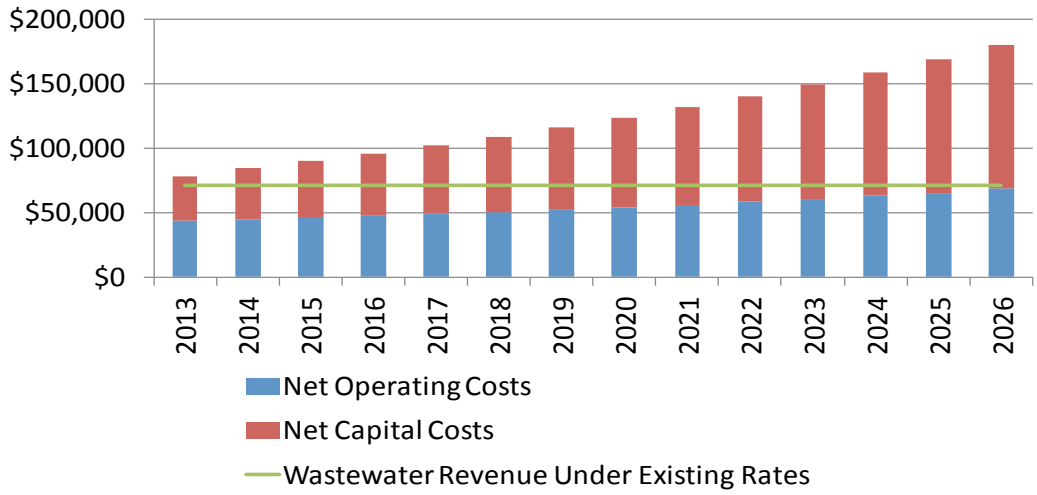
Implementation of the capital identified in Task 3 is the driving factor for future revenue adjustments. As demonstrated in the following graph, current water rates will just cover operating costs in 2026. By 2026, revenue will need to increase by 81.4% over the 14 year period to cover debt service payments associate with the capital investment.

Comparison of Water Revenue and Water Revenue Requirements



Because of the increased capital needs associated with the consent decree, increases in wastewater rates are more significant than water. As illustrated in the following graph, by 2026 wastewater rates will need to be adjusted by 153%over the study period to cover both the capital and operating costs.

Comparison of Wastewater Revenue and Revenue Requirements



3.0 Financial Management and Reporting

3.1 Overview

Financial reports are the documents and records that track and review how utility revenues are generated and spent. The purpose of financial reporting is to deliver this information to leadership and policy makers to aid in sound financial decision making. Financial reporting should answer certain basic financial questions:

- Are operating revenues adequate to cover operating expenses?
- Are existing utility rates affordable and fairly applied?
- How do assets stack up against liabilities?
- Where did the capital funds come from and how are they being spent?
- What's the cash flow for the current period?
- Is debt service coverage sufficient to issue additional bonds?
- Are the reserves being adequately funded?
- Where is the capital for future reinvestment and growth?

3.2 Revenues and Expenses

Indicators associated with revenues and expenses address reserves, total operating costs and transfers to general funds. The table below illustrates the comparison of Tulsa to the sample utilities provided in this study.

Common Financial Indicators

	Median	Average	Tulsa
Water Utility			
Days of Operating Reserves	86	125	25
O&M as a percent of Revenue	60%	62%	61%
General Fund Transfer as a percent of Revenue	2%	3%	7%
Sewer Utility			
Days of Operating Reserves	84	98	34
O&M as a percent of Revenue	61%	62%	60%
General Fund Transfer as a percent of Revenue	0%	2%	7%

Operating reserves are key to the day-to-day operations of the utility. The reserves provide funds for the fluctuation in revenue streams due to weather, economic conditions or other potential risks that would disrupt the cash flow. They also provide funds for fluctuation in expenses than do not parallel monthly revenue streams such as annually or quarterly insurance payments, chemical purchases or similar expenses. The level of reserves should reflect the risks the utility wishes to manage.

At a minimum, a utility should mitigate the risk of losing cash flow for one to two billing periods due to a natural disaster. In addition to managing cash flow, operating reserves also provide a positive indicator to

bond rating agencies. With the current economic conditions, rating agencies are looking for up to 6 to 12 months of revenues in reserves. TMUA ratios are based on the staff's understanding of funds readily available for unanticipated needs. The City's Finance Department has indicated additional funds are available to support the operating needs of the utility. There is a need for better communication between utility staff and finance to provide a common understanding of operating funds available to the utility.

Operation and maintenance costs are normally the most significant cost incurred by water and sewer utilities. Comparison of the portion of revenues that are allocated to operating costs versus other costs such as debt service payments, transfers to general funds and cash financed capital provides insight into the balance between operating costs and capital investment. Based on the analysis of the sample size used for this report, TMAU aligns with industry average of approximately 60 percent of the revenues are used to fund operating costs with the balance going to capital or a general fund.

Transfers to the General Fund have always been an expense incurred by municipally owned utilizes. They are identified as transfers or payment-in-lieu-of-taxes or other categories in many budget documents. The transfer is an attempt to recognize that if the utility were privately owned, the municipality would realize tax revenue or similar benefits. Since the economic downturn of 2008, municipalities have turned to utilities to help provide additional funding for general funds. The transfers are more common in water than sewer utilities. This is usually associated with the governance structure of the regional sewer utilities. TMUA's transfers are above average compared to the utilities analyzed for this study. However, they were not the highest . For water utilities, one entity transferred 9 percent and for sewer one transferred 10 percent.

3.3 Revenue Distribution

Revenue distribution illustrates where the revenue is generated between the customer classes. For this comparison, revenue from residential, commercial and industrial classes was compiled and distributed between the classes. Revenue from wholesale was analyzed separately. Generally speaking, residential customers comprise the largest portion of the revenue base. This is true for both water and sewer. Tulsa generates slightly more than the average utility from the commercial and industrial customers for the water utility and slightly less for the sewer utility.

Revenue Distribution

	Median	Average	Tulsa
Water Revenue			
Revenue Distribution			
Residential	74%	76%	63%
Commercial	21%	20%	22%
Industrial	1%	4%	15%
Wholesale as a Percent of Total	7%	8%	16%
Sewer Revenue			
Revenue Distribution			
Residential	65%	63%	69%
Commercial	23%	29%	28%
Industrial	0%	8%	3%
Wholesale as a Percent of Total	0%	3%	0%

For water service, TMUA's wholesale revenue is 16 percent of total billable revenue. This is higher than the average for the sample size. However, wholesale revenue is dependent upon local market, governance and need. For the sample used in this analysis, approximately 50 percent of the utilities provided wholesale service. The highest wholesaler provider, at 19 percent of billable revenue, actively pursued wholesale customers in order to utilize their excess capacity.

4.0 Cost of Service

4.1 Overview

Financial viability and sustainability begins with sound financial planning as addressed with the debt management plan and financial reporting. The major goal of cost of service allocations is to generate revenues quantified in financial planning activities while maintaining rate equity. Before equitable rates can be developed, it is necessary to determine costs of different functional areas and allocate those costs of service to customer classes in a sound, equitable manner. Cost allocations should be based on defensible, cost-causative allocation methodologies, as supported by the AWWA and WEF.

Cost of service allocations should take into consideration the functional aspects of system operations and cost components such as water usage and customer class maximum day and maximum hour demand factors, sewer flows and strength, and other customer related activities such as metering, billing and collection for the water, sewer and stormwater systems. Throughout the cost allocation process, City policy considerations, procedures, and all currently known federal, state, and local rules, regulations, and guidelines applicable to charges for water and wastewater service must also be considered.

AWWA and WEF rate manuals provide guidelines for allocation. The guidelines are not hard fast rules on how specific costs should be allocated. The basic premise is to allocate costs and design rates that reflect the cost of providing services. Over the years, the allocation of costs has evolved into a variety of bases or methods, but in most cases, the costs are allocated in a two step process. The first step is to allocate costs to appropriate cost components followed by the allocation of the costs to customers. Cost components can vary but most approaches recognize the characteristics of treating and delivering service such as flow or volume, peak usage, and strength of discharge. Just as important is the customer component.

4.2 Affordability

Utilities across the nation are struggling with keeping rates affordable while meeting their operating and capital investment needs. Recognizing the impact of regulatory needs, especially those associated with addressing consent decrees, EPA has suggested that utilities are able to charge up to two percent of gross median income for wastewater rates. Recently the US Conference of Mayors is challenging this concept; however, at the time of this report, two percent is an acceptable benchmark.

To illustrate how TMUA compares to major regional cities, a comparison of the typical bill as a percentage of gross median income for the regional communities in Black & Veatch's 2009 – 2010 Fifty Largest Cities Rate Survey was performed. Typical bills are based on 2009 – 2010 rates and income data is based on 2010 US Census Data. For perspective purposes, the percent of people below poverty levels is also shown. Many communities address the poverty level issues by setting up low-income assistance programs.

NOTE: Care should be taken when comparing costs to other communities. There is not a consistent US practice for funding of capital requirements. Some communities choose to subsidize the capital costs with other revenues source in order to keep utility rates affordable.

Water Affordability

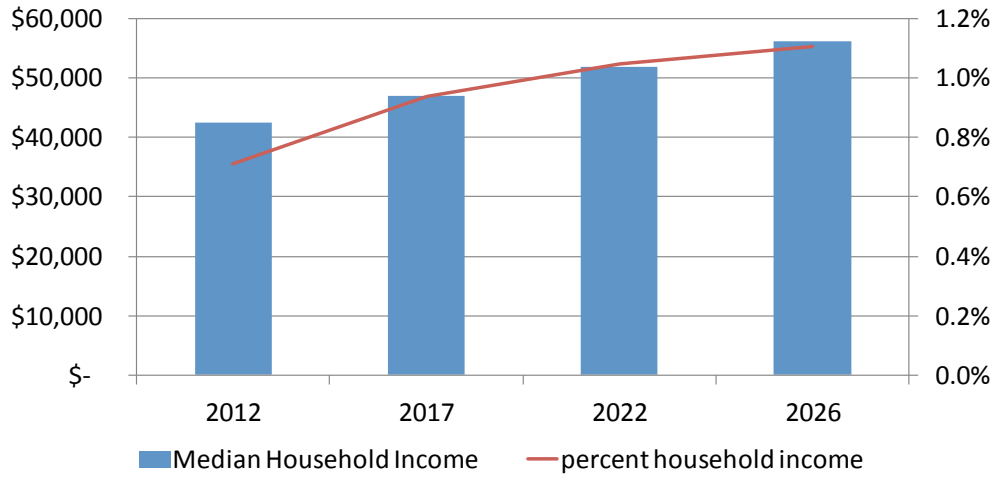
			Average Residential Water Customer		
City	State	Median Household Income	Typical Bill	Percent Household Income	Persons Below Poverty Level
Omaha	NE	$51,878	$14.34	0.33%	13.1%
Memphis	TN	$36,473	$13.10	0.43%	25.4%
Denver	CO	$45,501	$18.74	0.49%	19.2%
Arlington	TX	$52,094	$21.81	0.50%	14.3%
Nashville	TN	$45,063	$19.72	0.53%	17.8%
Dallas	TN	$41,682	$19.70	0.57%	22.3%
Oklahoma City	OK	$43,798	$23.15	0.63%	16.6%
Tulsa	OK	$39,289	$21.41	0.65%	19.3%
Fort Worth	TX	$49,530	$27.02	0.65%	17.0%
Colorado Springs	CO	$53,074	$30.56	0.69%	11.8%
Louisville	KY	$43,009	$24.99	0.70%	17.3%
Indianapolis	IN	$43,088	$26.41	0.74%	17.9%
Kansas City	MO	$44,113	$35.29	0.96%	18.1%
Atlanta	GA	$49,347	$43.61	1.06%	15.7%

Wastewater Affordability

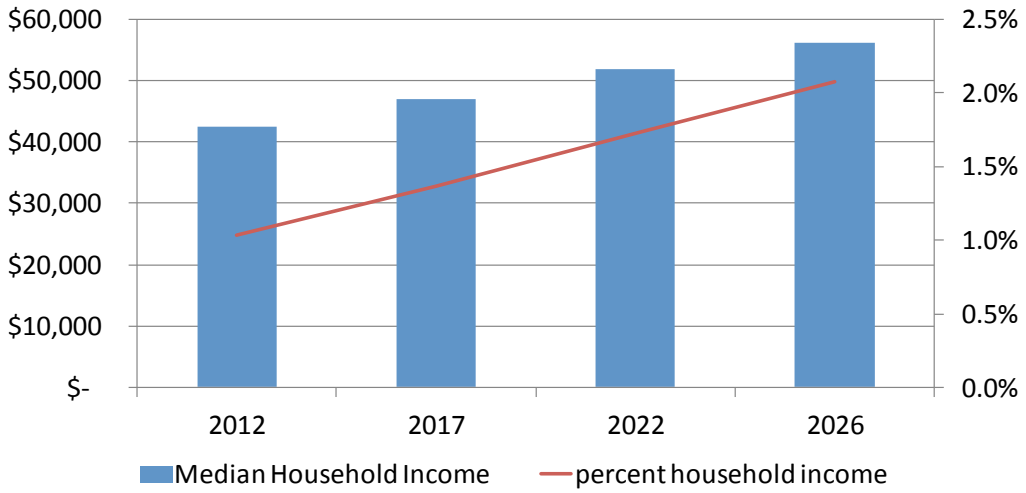
			Average Residential Wastewater Customer		
City	State	Median Household Income	Typical Bill	Percent Household Income	Persons Below Poverty Level
Memphis	TN	$36,473	$7.19	0.24%	25.4%
Denver	CO	$45,501	$14.63	0.39%	19.2%
Omaha	NE	$46,230	$16.71	0.43%	15.3%
Oklahoma City	OK	$43,798	$24.72	0.68%	16.6%
Arlington	TX	$52,094	$29.67	0.68%	14.3%
Indianapolis	IN	$43,088	$25.41	0.71%	17.9%
Louisville	KY	$43,009	$26.06	0.73%	17.3%
Fort Worth	TX	$49,530	$30.90	0.75%	17.0%
Colorado Springs	CO	$53,074	$37.66	0.85%	11.8%
Kansas City	MO	$44,113	$31.40	0.85%	18.1%
Tulsa	OK	$39,289	$28.31	0.86%	19.3%
Dallas	TX	$41,682	$34.92	1.01%	22.3%
Nashville	TN	$45,063	$39.39	1.05%	17.8%
Atlanta	GA	$49,347	$110.69	2.69%	15.7%

The previous tables reflect 2009 – 2010 timeframe. In order to illustrate the impact of funding capital requirements identified in Task 3, typical bills were estimated reflecting revenue adjustments identified earlier. The impact on affordability as a percent of gross median income is shown in the following graphs. Under current assumptions, wastewater rates could approach the two percent benchmark during the 2026 study period.

Projected Typical Water Bill as a Percent of Gross Median Income



Projected Typical Wastewater Bill as a Percent of Gross Median Income



Affordability should be reviewed on a regular basis. Long term calculations are very dependent upon assumptions used for income growth, customer growth, usage patterns and inflationary factors.

5.0 Alternative Water Rate Structures

The majority of a utility's revenue is generated through the rates or charges for service. Because pricing policies support social, economical, political and environmental goals, rate structures must be responsive to the philosophy and objectives of the utility and the community it serves. The cost of service approach used by TMUA reflects the utility's functional costs and customer demands. The analysis provides the information on unit costs associated with the various functions. The objective of the rated design is to take the unit costs and structure them in a manner that responds to the objectives of the community.

TMUA Alternative Water Rates

Water rate structures should be responsive to the philosophy and objectives of the utility and the community it serves. TMUA has identified the following goals for utility rate design.

- Revenue Stability
- Conservation
- Economic Development

The best water rate structures to meet these goals include the current rate structure which is a uniform charge per customer class, an inverted rate structure and a seasonal rate structure. The impact of each rate structure on the typical residential bill is shown in the following tables.

Impact of Alternative Water Rate Structures

	Existing 2012	Approved 2013	Uniform 2014	Inverted 2014	Seasonal 2014
Service Charge					
¾" meter size or Less	$4.50	$4.50	$5.11	$5.11	$5.11
Volume Charge - $/Mgal	$2.75	$2.97	$3.56		
First 7 Mgal - $/Mgal				$5.42	
Next 33 Mgal - $/Mgal				$6.24	
Over 40 Mgal - $/Mgal				$8.14	
Winter - $/Mgal					$4.69
Summer - $/Mgal					$6.13
Typical Bills					
5 Mgal Usage	$18.25	$19.35	$22.91	$32.21	$32.95
8 Mgal Usage	$26.50	$28.26	$33.59	$49.29	$49.66

As demonstrated in the table, changing the rate structure has minimal impact on the typical residential water bill. The reasoning behind this is that the alternative structures are designed to send pricing messages to users outside the average. Both inverted and seasonal rates target high demand high peaking water users.

Task 6: Strategic Options Analysis and Recommendations

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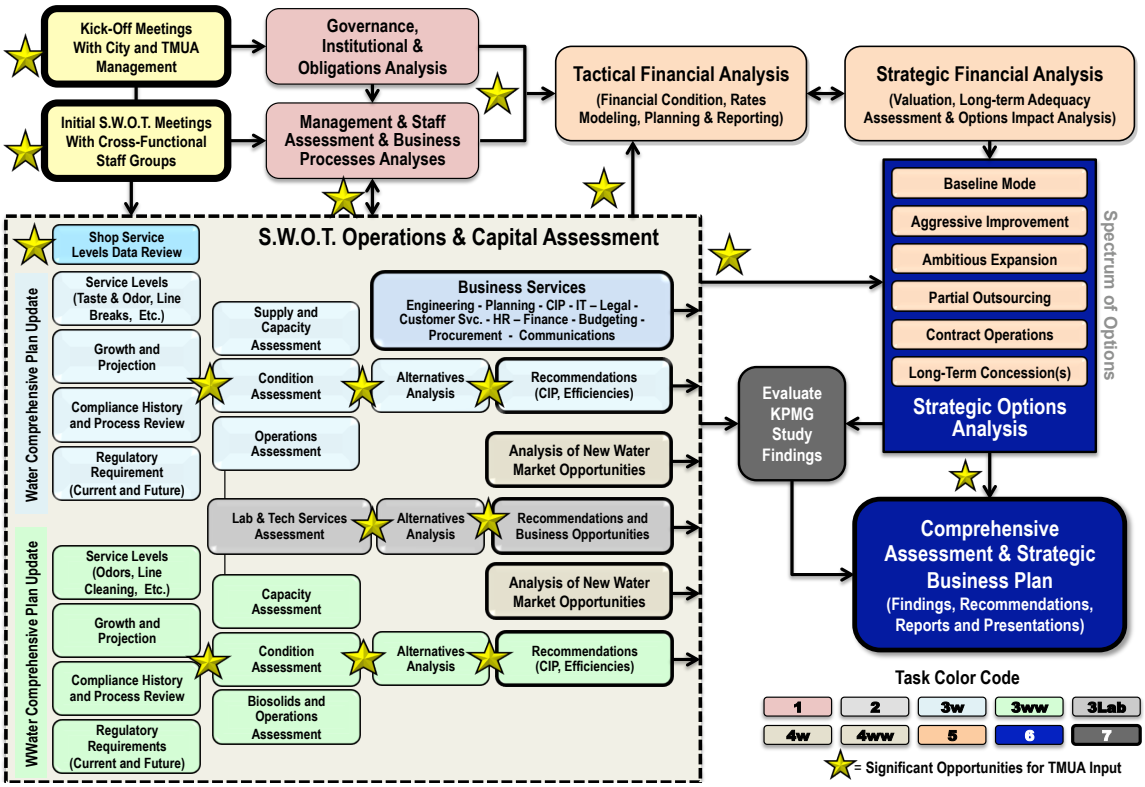
Task 6: Strategic Option Analysis and Recommendations

1.0 Introduction: Strategic Options in Context

The Strategic Options Analysis is the key decision-making component of the Comprehensive Assessment. It responds to the question of how TMUA should respond – structurally and programmatically -- to the preceding evaluations, which are summarized in the diagram below.

TMUA Comprehensive Assessment Flowchart



In Tasks 1, 2 and 3, the IMG Team concluded that Tulsa's core water and wastewater utilities operations were relatively lean in terms of staffing and unit costs, but their performance suffers from a number of lingering and potentially serious problems that are largely outside of that staff's and the TMUA board's control:

- a fragmented organizational and management structure,
- critical support processes and staff that lie outside of the utilities' direct control,
- high inter-departmental charges (compared to peers) and questionable allocation of shared staff,
- uncoordinated work order systems and underdeveloped asset management systems,
- weak or missing performance reporting systems that are also not linked to a long-term strategy,
- unreliable and politically-driven rate-setting that hampers TMUA's ability to act strategically,

- the absence of an executive information system to support board and management decisions.

Taken together, these problems diminish the TMUA Board's ability to fulfill its statutory mandates. They also make Tulsa's utilities more vulnerable to service crises, cultural deterioration, and staff and board succession issues. This report describes IMG's analysis of the strategic options that TMUA can pursue, and concludes with IMG's recommendations for solving these problems and ultimately reducing the growth of water and wastewater rates.

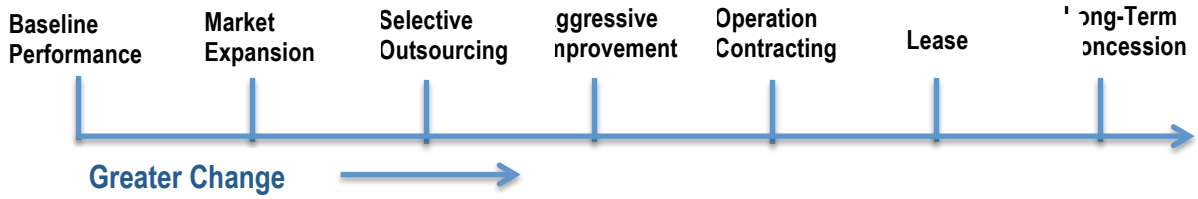
2.0 Enterprise Motivation and Unity of Purpose

Utilities that suffer from fragmentation and inadequate business systems find it difficult to know their own performance, let alone continually improve it. They tend to compensate with higher-than-necessary operating safety margins, inefficient and ad hoc "work arounds", longer service processing times (e.g., for IT, hiring, purchasing, and customer response), and less-informed investment decisions. These problems leave management – and especially the governing board – unable to establish meaningful efficiency goals and drive the organization toward them. Over time, water and wastewater rates are higher than they would have been had the agency functioned in a more aware and unified fashion.

3.0 Options Analysis

3.1 Overview

n Task 6, IMG evaluated several performance improvement and rate reduction options shown in the spectrum diagram below.

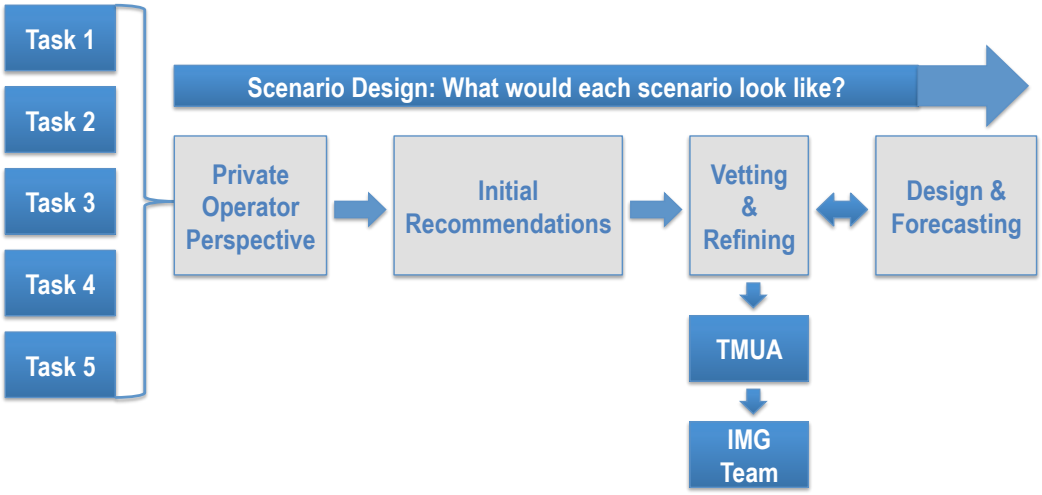


This report will consider each strategic option in the order given above, from the scenario that requires the least change (Baseline Performance) to the scenario that would require the most change (Concession). It is important to note that not all options are mutually exclusive. For example, TMUA could pursue the Aggressive Improvement, Market Expansion and Selective Outsourcing options at the same time. However, the Concession option is mutually exclusive from TMUA's perspective as it could not be combined with other options.[1]

[1] The concessionaire would likely pursue Market Expansion and Partial Outsourcing as part of its effort to gain greater efficiencies and boost profits, but TMUA would not be making this decision.

3.2 Scenario Design

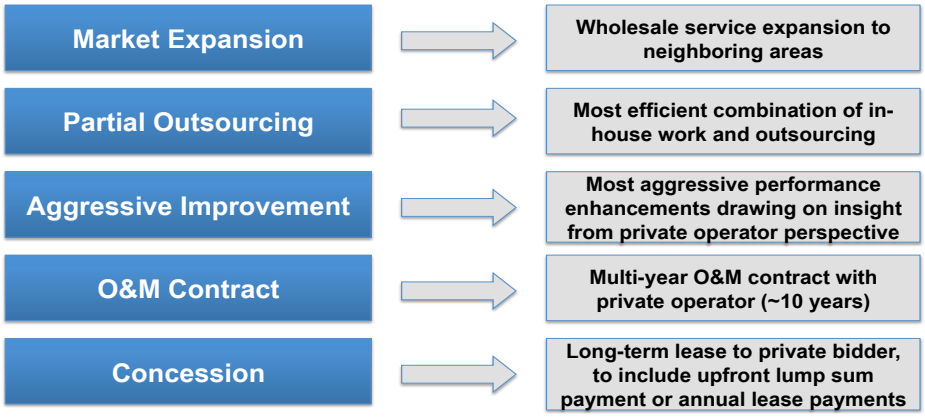
IMG took a comprehensive, bottom-to-top approach to designing and forecasting the various strategic scenarios. The key objective of scenario design was to determine what each scenario might look like for TMUA. This was an iterative process that drew upon analysis from preceding tasks, added a private operator perspective to the shaping of recommendations and scenarios, sought approval and incorporated feedback through the vetting process, and continued to refine the scenarios throughout the forecasting process, as shown below.



4.0 Strategic Options & Results

4.1 Overview

Per the scope of the Comprehensive Assessment, IMG considered five strategic options as alternatives to the Baseline Performance option, which are summarized below:



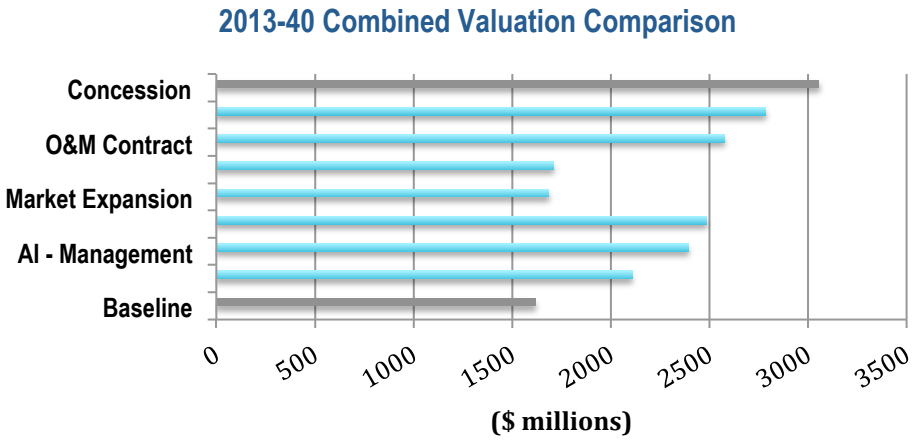
Using these key metrics, the following table summarizes the results from IMG's scenario analysis:

Option	Valuation	Average Annual Revenue Growth	Average Monthly Water Bill	% Change in Average Monthly Water Bill
Baseline	$1,619.0	4.97%	$166.0	-
Market Expansion	$1,686.2	4.90%	$165.6	(0.72%)
Partial Outsourcing	$1,709.9	4.87%	$164.6	(1.37%)
AI - Base	$2,108.0	4.50%	$149.4	(10.45%)
AI - Management	$2,394.2	4.33%	$142.4	(14.63%)
AI - Upside	$2,495.6	4.28%	$140.2	(15.95%)
O&M Contract	$2,576.6	4.24%	$138.2	(17.17%)
Lease	$2,785.7	4.09%	$132.4	(20.64%)
Concession	$3,056.5	3.96%	$127.7	(23.47%)

4.2 Valuation Results

The Concession option, as shown, appears to create the most value of any of the scenarios, although there is more uncertainty in this scenario by far than in any other. The valuation of the Water utility in the Concession scenario would be $1.135 billion, and the valuation of Wastewater would be $1.921 billion, totaling a combined valuation of $3.057 billion. This compares to the Baseline combined valuation of $1.619 billion, an Aggressive Improvement valuation of $2.394 billion, and an O&M contract valuation of $2.577 billion. However, if the savings generated by the concessionaire are discounted at the concessionaire's higher cost of capital (estimated to be 8.0%), which appropriately accounts for the concessionaire's higher cost of debt and cost of equity, then the combined valuation of the Concession scenario is only $1.627 billion, slightly higher than the Baseline valuation of $1.619 billion. Accordingly, it is likely that most of the value that a concessionaire would create in the Concession scenario would flow to the concessionaire's debt and equity holders, leaving very little value-add for ratepayers.

The Concession option would create significant value via cost savings, but not all of that value-added could be passed on to ratepayers because of the concessionaire's higher cost of capital. In order to maintain an apples-to-apples comparison of value-added, IMG used the same discount rate the valuation metric for each scenario. The results of this apples-to-apples comparison are shown in the table below:



4.3 Concession Option Benefits to City versus Ratepayers

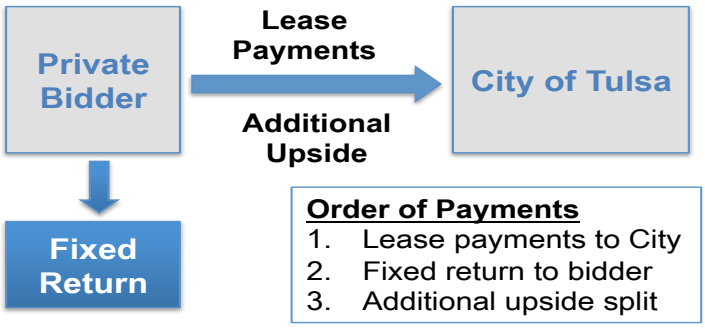
Value – as we have defined it here – can accrue to the concessionaire, their bondholders and investors, the City or the ratepayers. IMG determined that a concessionaire would be willing to pay a maximum lump sum of $1.1 billion to the City in exchange for the right to run the utilities and collect the associated revenues. This lump sum amount is lower than the Concession option *valuation* because, in a 50-year lease, the concessionaire would only be willing to pay for the cash flows from the 50-year period, which means that it would not pay for the portion of the valuation that accounts for the utilities' terminal value.[2] The following is a sensitivity table detailing maximum lump sum estimates given a range of discount rates:

Discount Rate	Max Lump Sum ($ millions)
7.0%	$1,281.0
7.5%	$1,173.2
8.0%	**$1,078.2**
8.5%	$994.3
9.0%	$920.0

The narrow range for potential lump sum payments is from $994.3 million to $1,173.2 million. However, the estimates for the concession option are the least certain of all of the scenarios analyzed because of (1) the length of the contract and (2) the larger number of factors that can change.

It is important to note that Tulsa could accept the full amount of this lump sum payment up-front, or it could negotiate to have the concessionaire make annual lease payments to the City that are equivalent to the present value $1.1 billion amount, *or* the gain could be used to reduce rates (i.e., instead of making annual payments to the City, rates could be reduced by an identical amount).

Annual Lease Payment Scenario



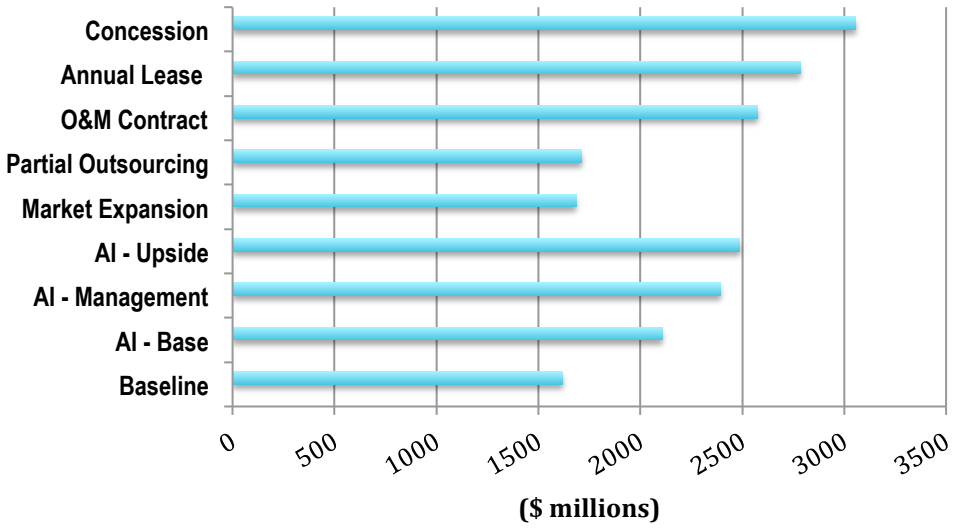
[2] According to IMG's analysis, the concessionaire would be willing to pay $1.627 B for the utility if it were to own it outright forever. However, in the case of a 50-year lease, the concessionaire is receiving a stream of cash flows with a finite life and does not own the assets (e.g. the concessionaire cannot liquidate the assets at any point). Given the finite time period and the limitations of the lease, the concessionaire is only willing to pay a maximum of $1.1 B, the present value of the projected cash flows over the period. Basically, the concessionaire will not pay for the terminal value of the utility: it will not pay for the present value of the cash flows in perpetuity (beyond 50 years), nor will it pay for the present value of liquidating the assets at the end of the term (the two alternative methods for calculating terminal value). Indeed, the present value of the terminal value in the valuation is $512 million, which accounts for the primary difference between the $1.627 B valuation and the $1.1 B lump sum payment.

4.4 Comparing Options

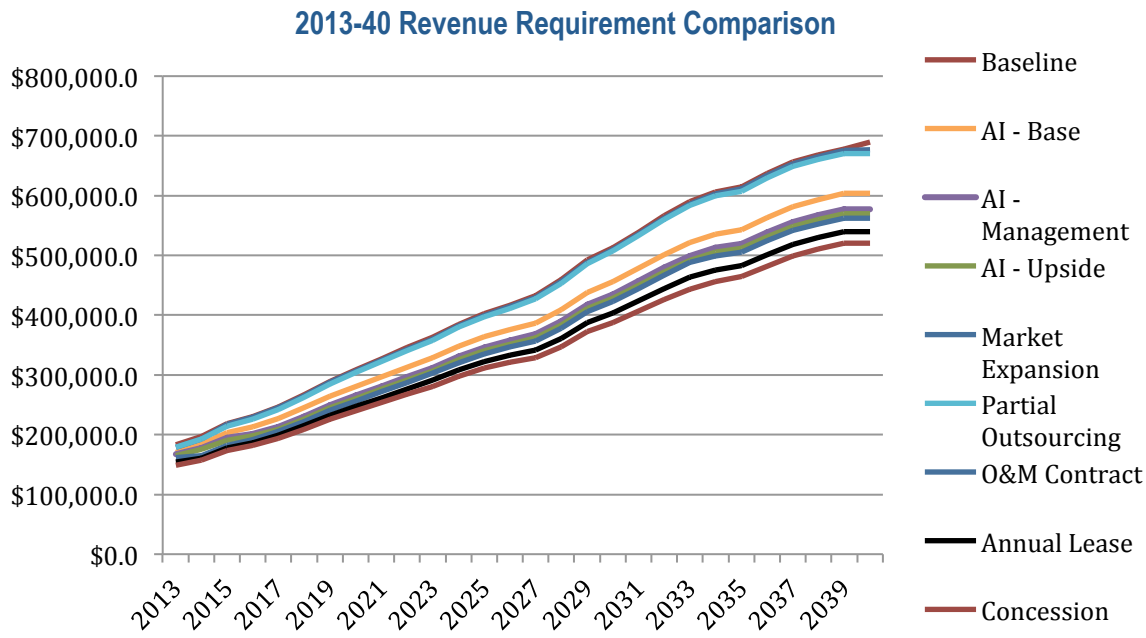
As described in the previous section, the following table shows the quantitative results of each scenario by detailing three key metrics: TMUA valuation in the given scenario, average annual revenue requirement growth rate, and percent change in average monthly water/wastewater bill (from Baseline).

Option	Valuation	Average Annual Revenue Growth	Average Monthly Water Bill	% Change in Average Monthly Water Bill
Baseline	$1,619.0	4.97%	$166.0	-
Market Expansion	$1,686.2	4.90%	$165.6	(0.72%)
Partial Outsourcing	$1,709.9	4.87%	$164.6	(1.37%)
AI - Base	$2,108.0	4.50%	$149.4	(10.45%)
AI - Management	$2,394.2	4.33%	$142.4	(14.63%)
AI - Upside	$2,495.6	4.28%	$140.2	(15.95%)
O&M Contract	$2,576.6	4.24%	$138.2	(17.17%)
Lease	$2,785.7	4.09%	$132.4	(20.64%)
Concession	$3,056.5	3.96%	$127.7	(23.47%)

Market Expansion and Partial Outsourcing both have smaller valuations and minimal effects on the ratepayers' average monthly bill over the 2013 to 2040 time period, while Aggressive Improvement, O&M Contract and Concession each create a significant amount of value that can lead to rate reductions. Accordingly, IMG's analysis going forward will focus primarily on the three more aggressive options.



Driven by significant capital savings, the Concession scenario generates the most value in an apples-to-apples comparison (i.e. using the same discount rate). However, when accounting for the concessionaire's higher cost of capital, it is likely that only a negligible amount of the value will pass to ratepayers (see Section 5.5.2 above). Meanwhile, the Aggressive Improvement and O&M Contract are the two scenarios that generate the most value that can be passed directly to ratepayers in the form of lower water bills.



The 2040 revenue requirement is $577.8 million for the Aggressive Improvement Management Case scenario and $562.6 million for the O&M contract. While the O&M option offers significant value to ratepayers, TMUA must consider whether the premium over the Aggressive Improvement scenarios is sufficient to warrant seeking a strategic option that requires TMUA to relinquish significant amounts of control to a private operator.

Because both an O&M contract and a concession agreement require significant change and ceding of control by the public utility, and involve greater uncertainty when it comes to accounting for transaction costs, IMG typically advises public clients to only consider these public-private partnership options if they respectively offer at least a 20% premium on top of what the public utility can accomplish on its own. Here, the O&M Contract option only offers a 7.6% premium over the Aggressive Improvement Management Case option, and the Concession option, when factoring in the concessionaire's higher cost of capital, offers significantly less value to TMUA ratepayers than the Aggressive Improvement option. Accordingly, TMUA can generate most of the value that would come from an O&M Contract scenario on its own, without exposing itself to the hidden costs of a major transaction, and it can ultimately generate more value for ratepayers than the Concession scenario.

5.0 Recommendation: The TMUA Performance Improvement Initiative

5.1 Choosing Among the Improvement Options

The Assessment evaluated several privatization options along with an "aggressive improvement" option. IMG concludes that three options could significantly reduce water and sewer rates in the future:

- contract operation,
- long-term lease concession, and
- an internal aggressive improvement option.

IMG's experience is that internal improvement initiatives usually wane after the threat of privatization abates, and the utility eventually returns to something like its old performance level after a few years. However, the TMUA-City relationship is relatively unique among municipal utilities because it utilizes an asset lease and operating contract, one that could readily emulate a government – contractor performance relationship.

No major City has ever privatized its existing water or sewer utility via a long-term lease-type concession. IMG believes that this is because the politics of relinquishing direct control of water or sewer are so daunting, not because the economics are unappealing. We doubt Tulsa could overcome the many hurdles in the path of a concession. This is unfortunate because we believe that the utility's best opportunity for reducing its costs (and rates) like in better management of its assets, reduction of unit costs for support services, and the optimization of its internal capital-operations relationship; i.e., exactly the costs that a long-term concessionaire is likely to reduce most.

As for 5-10 year operations and maintenance contracting, this is the right solution for many cities but not, we think, the City of Tulsa. Unlike most systems that have privatized their operations, Tulsa has relatively low unit costs, low hourly labor rates and reasonably good labor productivity *for its core water and sewer operations services* (not including support services like human resources, customer service, purchasing, engineering services, etc.). While it is possible that this is a temporary phenomenon reflecting the City's broad pay and hiring freezes and cost cutting, IMG believes that the operating savings from contract operation would be in the 10-15 percent range rather than the 20-30 percent range routinely associated with privatization. As noted before, we believe that most of the utility's cost reduction opportunity lie with reducing unit support costs, improving its asset and capital improvement management programs, and in optimizing the interface between capital and operations. This is not what an operations and maintenance contract is designed to do.

This leaves the Aggressive Improvement Option. This option would utilize the unique City-TMUA/TUB contractual relationship to capture the benefits of privatization without the associated transaction costs and the loss of public control over water and sewer; that is, improved internal performance becomes a *contractual* matter rather than simply an internal service goal. Performance tracking and enforcement is made possible – and durable -- by new performance management systems, asset management systems, and support service contracts.

5.2 The Improvement Initiative: Becoming an Enterprise

This Utility Enterprise Initiative ("the Initiative"), as we describe it here, is designed to cause the utility to incorporate the most publicly-valuable aspects of private contract operation and capital investment, along

with the best practices of the water and sewer industries, to reduce future rate increases by at least 20 to 30 percent compared to current projections. Future performance improvements would be implemented in accordance with a long-term business strategy, measured against a long-term baseline from year to year, and enforced through specific annual action plans agreements between the City and the TMUA.

The City and TMUA would need to recognize that the performance improvement initiative will require their full mutual cooperation. TMUA would serve as the originating entity for the implementation process, including establishment of goals, timelines, action items, products and deliverables, and procurement of technical assistance. The City would support TMUA's efforts in this regard, and TMUA would in turn honor the City's requisite workflow processes. The City will provide or approve staff, financial and institutional support required to implement the initiatives, including TMUA-initiated use of water and sewer funds. Staff support may include resources of the Water and Sewer Department, Department of Finance, and Department of Engineering Services.

The components of the Initiative would unify and enhance the utility's management, operations, capital programming and support services, all to the benefit of Tulsa's ratepayers. They would do so by amending selected utility business processes and by implementing new performance reporting, asset management and executive information systems.

Components of the Initiative

These components are highly synergistic, and failure to implement one or more of the components would significantly diminish the benefits of the entire Initiative.

1. Greater TMUA Budget Input

- **Comprehensive Assessment Finding:** Task 1 of the Comprehensive Assessment -- which covered governance, performance management, the TMUA/TUB-City relationship, and executive management of the utility – found that the City's utility operating budget was developed and approved with little input from TMUA. This compares unfavorably with other cities with utility governing boards. In those cities, the boards typically have both strategic control and final approval over all utility finances.

- **Consequences:** The lack of formal, direct, and determinant input into the utility budgeting process significantly hinders the TMUA's and TUB's abilities to fulfill their statutory missions, to cause the utility services to be provided as efficiently and effectively as possible, to plan and act strategically, and to hold down water and sewer rates over the long term.

- **Recommended Action:** Accordingly, the first component of the Initiative would be to provide more formal and direct input by TMUA in the creation, deliberations and approval of the annual utility operating budgets and work of the Water and Sewer Department. Specifically, we recommend that a TMUA representative be a part of a new, permanent Utility Budget Working Group that would also include representatives from Finance, Water and Sewer Services, and Engineering Services. While the City would be responsible for establishing the budget proposal details, this permanent Working Group would refine and finalize the utility budget and submit it for review and approval by the full TMUA board.

2. Greater TMUA Utility Executive Consultation

Comprehensive Assessment Finding: The Public Works Department was reorganized in 2010 so as to create a separate Water and Sewer Department along with an Engineering Services Department. Various utility support services, such as customer care, were consolidated under the City's own administrative functions. Before the reorganization the TMUA was not involved in the selection of the Public Works director because that person's responsibilities extended well beyond water and sewer. However, with the creation of a utility-only department, the importance of that department's leadership to TMUA was made much clearer.

Consequence: The leadership of the Water and Sewer Department (and to some extent that of the Department of Engineering Services) is a critical contributor to TMUA's mission success, yet TMUA's board is only peripherally involved in the selection, evaluation and compensation of that leadership. Nor does the leadership report directly to the TMUA. This disconnected relationship will make it a challenge to implement the aggressive performance improvements included in the Initiative.

Recommended Action: Implement a formal, consistent and direct means for TMUA input into the selection, hiring, evaluation and compensation of the most senior executives in the Water and Sewer Department. For the senior-most executive of the Water and Sewer Department, the selection, hiring, firing, evaluation and compensation would require the consensus of the TMUA board. Specifically, we recommend that the City's Human Resources Department create a standing Working Group that includes a TMUA board member that is devoted to the selection and annual evaluation of the top management of the Water and Sewer Department. We further recommend that TMUA should also have at least some rolein the selection and evaluation of the senior-most member of some key support services departments, such as Department of Engineering Services and Customer Service.

3. Strategic Business Plan

Assessment Finding: Task 1 of the Comprehensive Assessment found that neither TMUA nor the City had a strategic business plan for the utility that could provide steady guidance for mitigating rate increases and improving service.

Consequence: The absence of a long-term business strategy places Tulsa at the bottom of large- and mid-size utilities in terms of performance management systems. It is unusual and even threatening for an agency with long-lived infrastructure assets to have no quantified long-term performance goals or a multi-year financial and operating strategy for achieving them. Accordingly, the absence of a quantified strategic plan threatens both "rate creep" (whereby costs and rates grow steadily over time) and the institutional will to implement improvements defaults from lack of direction and ownership.

Recommended Action: TMUA should develop a Strategic Business Plan that includes specific, long-range and measureable goals for consistently improving the performance of the utility, along with a roster of related action items and milestones suitable for routine reference and regular updating by the TMUA board. The Plan should include higher-level strategic performance goals, medium-term tactical goals, and a multi-year roster of action items associated with achieving those goals. An Annual Utility Performance Agreement (described below) should be developed in accordance with and in support of this Strategic Business Plan. Progress toward the goals should be reported via the utility performance measurement systems and the governance information systems described in the sections below.

4. Annual Utility Performance Agreement

Comprehensive Assessment Finding: Tulsa's utilities lack even the most basic system-wide performance reporting system. Such systems are considered fundamental to the success of contemporary water and sewer utilities, and their absence in Tulsa was a surprising finding of the Comprehensive Assessment, especially after the KPMG study identified the absence of performance measurement as a critical weakness in the City's governance.

Consequence: The absence of a performance measurement system hampers the utility's ability to set meaningful goals, track performance against goals over time, and to accurately evaluate the performance of its management team and individual divisions within the Water and Sewer Department, the Department of Engineering Services, and other support service agencies.

Recommended Action: TMUA should develop and – in consultation with the Water and Sewer Department -- update annually thereafter, a Utility Service Performance Agreement (USPA) proscribing the performance expectations, goals and major action items to be achieved by the Water and Sewer Department during the year. The USPA should be referenced in the amended City-TMUA lease and contract agreements cited above. The performance expectations and major action items embodied in the USPA should be based upon the TMUA Strategic Business Plan (see above).

5. Arms-length, Businesslike Support Contracts

Comprehensive Assessment Finding: Utility support services account for a large portion of the utility's operating costs, yet TMUA has almost no control over either the service level or the amount of the charges.

Consequence: Support services are critical to both the efficiency and effectiveness of core water and sewer services. Moreover, they influence the morale of utility staff who, according to interviews undertaken as part of the Assessment, often feel limited in their own performance by the lack of control and responsiveness they perceive by the support services. Moreover, there is indirect evidence that TMUA is paying considerably more for these support services (relative to the core water and sewer operating costs) than their peers in other cities.

Recommended Action: TMUA should work with the City to create enforceable, demonstrably-competitive, unit-priced, and terminable contracts for support services provided to the utility by City departments, including but not limited to IT, finance, human resources, purchasing, customer service and engineering services. These contracts should mirror those with private vendors in nearly all respects.

TMUA should regularly benchmark the terms of these support contracts with private sector quotations and other data, and to utilize that information in establishing the terms of the contracts with the relevant City departments. TMUA should also cooperate with the City if the City were to offer any of these services for managed competition or outsourcing.

6. Full-Time TMUA Board Coordinator

Comprehensive Assessment Finding: TMUA does not have sufficient staff support and information to provide fully effective governance and fulfillment of its statutory responsibilities.

Consequence: This insufficiency also makes it difficult for the board to connect the issues and activities of the utility across and between its semi-monthly meetings and to act strategically on behalf of ratepayers. Moreover, the Performance Improvement Initiative will require even more routine oversight from the board. Current staff arrangements are not up to the task.

Recommended Action: TMUA should hire – via direct TMUA employment or a professional service contract -- a full-time coordinator, and perhaps additional administrative support for the coordinator, to consolidate and interpret for the TMUA board the information generated by the performance and asset management systems. The coordinator would also implement and monitor the new service and support contracts, to prepare relevant briefing materials for TMUA board meetings (including consolidation of materials provided by City departments), and to provide routine administrative support to the TMUA board.

This coordinator should be an administrative position, not a management or executive position, and is not intended to diminish or displace the responsibilities and authority of utility management.

7. Operational Performance Improvements

Comprehensive Assessment Finding: Tulsa's utility operations are relatively lean, but could still benefit from practices employed by private contract operators.

Consequence: The utilities are performing below the performance level associated with private contract operators by as much as 10 percent or more (in terms of total operating cost).

Recommended Action: TMUA should identify which operations and maintenance practices of global private contract operators could be implemented in its plants and field operations, and what would be the cost and time required to implement those practices. It should also evaluate the risks and benefits of implementation. In cooperation with utility staff, it should review the roster of identified opportunities and make its selections, and then begin working to implement the changes (along with the appropriate new technology and risk management systems) over the appropriate time frames.

8. Capital Improvement Program Performance Optimization

Comprehensive Assessment Finding: CIP developed in Task 3 of the Assessment is consistent with identified needs and current investment policies, but different (and more costly) than would be employed by a private concessionaire.

Consequence: Capital spending and future rates are higher than they would be under a private concessionaire.

Recommended Action: In consultation with utility staff, TMUA should revisit the recently-developed CIPs and the roster of possible changes identified in Task 6 of the Assessment. The Task 6 roster of hypothesized improvements should be expanded, detailed and refined in light of the other performance improvement initiatives – particularly the operational improvements and asset management system – included in the Initiative. This will be used to modify the prevailing CIPs as appropriate.

9. Improved Asset Management System

Comprehensive Assessment Finding: Tulsa lacks an adequate asset management system of the type typically employed by high-performing municipal utilities in the U.S.

Consequence: The lack of a unified asset management system means that maintenance is less organized, less focused, less predictable, and more costly than necessary. It also means that Capital Improvement Program is less precise and efficient, and more costly in both the short and long term, than it should be. The result (based on the experience of other cities) is that future rate increase will be notably higher – perhaps much higher – than they should be.

Recommended Action: TMUA, the Water and Sewer Department, and the Department of Engineering Services should cooperate to establish a best-in-class utility asset management system ("AMS"). This system would provide the functions necessary for TMUA to maximize the utilities' value to the public, minimize future rate increases, and contain long-term liabilities. As trustee of the utility's assets, TMUA should have approval over the design, implementation and future enhancements of the system.

Building on the work and recommendations of the TMUA Comprehensive Assessment, the AMS program should include the following key components:

a. **Software and Databases:** The underlying software and databases for maintenance management in each of the operating divisions should be updated. Updating of these systems would constitute the majority of the Asset Management Program, and should yield significant benefits in terms of maintenance efficiency, record keeping, and long-term tracking of asset condition. The information and tools provided would aid system managers in shifting emergency maintenance to preventive maintenance, thereby lowering costs and improving service. The systems to be updated would include the following:

- **Water Treatment Plant Maintenance Management System.** Presently, the water treatment plants are operating under different maintenance software packages. The data from these systems would be merged into a single system with modern management capabilities, and the data will be augmented with additional condition information collected as part of the Comprehensive Plan.

- **Asset Management Information System – Sewer Operations and Maintenance.** The existing maintenance management system for the sewer system was developed in-house by City staff. While this application has served the utility well, it needs to be upgraded to newer software with additional tools and storage capabilities. A key example is the need to link the maintenance management data with the City's Geographical Information System. Such a link would improve crew efficiency in locating and identifying pipes, as well as tracking the condition of each pipe.

- **Asset Management Information System – Transmission, Storage, and Distribution.** Like Sewer Operations, the water transmission and distribution system information systems are in need of update and linkage with the Geographic Information System. This linkage would provide greater capabilities in identifying leaky pipes and identifying pipes that are at greater risk of bursting, so that they can be fixed before there is a problem.

b. **Risk Benefit Capability:** The existing Strategic Asset Management System (SAMS) should be expanded to include cost-based risk-benefit analytical capabilities that would support business-case development and prioritization of identified projects. This would provide TMUA with the information necessary to minimize the overall risk and impact of failure within a given budget.

c. **Management Dashboard**: A linked Management Dashboard system should be implemented to automatically calculate key performance indicators using real-time data from the new Asset Management Information Systems. These performance indicators would be the primary measures of system performance and would drive utility budgeting and planning. By tracking these indicators on a regular basis, system managers would be empowered to allocate scarce resources where they are most needed to provide efficient, reliable service to Tulsa water and sewer customers.

The first steps in the AMS implementation would be to improve the asset condition databases, especially for underground assets, and to select the appropriate AMS software. This should be accomplished during the first year, with risk-benefit and dashboard components implemented in the second year as databases and condition report formats are continually improved.

10. Implement a Utility Performance Reporting System

Comprehensive Assessment Finding: Tulsa utility lacks even the most basic performance reporting system, a shortfall shared with most other City departments. Almost all high-performing utilities in the U.S. have a robust performance measurement and reporting system.

Consequence: This hampers every aspect of its performance, from operations to human resources. It also makes meaningful strategic planning and long-term rate reduction strategies nearly impossible.

Recommended Action: Implement a utility-wide performance measurement and reporting system, including performance data for core water and sewer services and the utility support services provided by other City departments. The system would provide timely, accurate and useful performance information that is readily shared with senior utility management and staff, City administrators, and TMUA. It would also satisfy the information requirements of the TMUA Strategic Business Plan, the Annual Utility Performance Agreement, and the support service contracts.

The performance measurement system should begin with a very limited set of basic, aggregate measures for which data can be reliably compiled and reported using existing databases and systems. These initial, limited-scope reports should be made available to senior management and the TMUA board. As the requisite IT, work order and financial systems are installed, new measures should be added and the results published more frequently. The reports should then be more broadly shared with utility staff, including directly to (and tailored to) shop-level managers and work teams.

11. Instruments for Long-Term Rate Predictability

Comprehensive Assessment Finding: The unpredictability of rate approvals hampers the ability of TMUA to act strategically.

Consequence: Over the long term, rates are and will be higher than they should be because TMUA's investments and spending will be based on short-term -- rather than long-term -- budget considerations. For

example, lower spending on maintenance and major repairs in the short term usually results in higher capital costs and higher repair costs in the long term.

Recommended Action: The City and TMUA should cooperate in seeking from the Tulsa City Council a formulaic means or other means that provide TMUA with greater long-term rate and revenue predictability, thereby allowing TMUA to act strategically to reduce long-term rates, assure quality service and preserve utility assets.

12. Clear Financial Reserves Management Authority

Comprehensive Assessment Finding: Unlike most efficiently-managed utilities, TMUA does not accrue and maintain adequate reserves for financing capital improvements. Moreover, its working capital account is dangerously underfunded and far below levels maintained by its peers.

Consequence: TMUA suffers from higher-than-necessary capital financing costs and is less nimble in making support short-term cost-saving capital investments. Its lack of working capital puts the utility at significant financial risk in the event of an emergency spending requirement or sudden revenue shortfall.

Recommended Action: In order to permit more timely investment, reduced capital financing costs, and greater flexibility to make investments that would help TMUA to reduce long-term rates and improve TMUA's financial condition, the City and TMUA should cooperate in developing a new policy for the accumulation of, and TMUA control of, capital funding reserves.

13. New Bottom-Line Performance Measurement Tools

Comprehensive Assessment Finding: Like most municipal utilities, Tulsa (and TMUA) lacks a bottom-line performance measure comparable to profit or enterprise value in a private corporation.

Consequence: Private water and sewer utilities (and private operators) use profit and value to measure both short-term and long-term performance and motivate managers and staff. If TMUA is to function at the same level as a private operator or concessionaire, it too must have a bottom-line measure by which to set its performance goals and judge its progress toward them. Moreover, it needs enterprise-like measures to ensure that its cost-reduction decision making in the short term is not sacrificing long-term asset value and threatening larger rate increases on future utility users.

Recommended Action: TMUA should implement and make routine use of a long-term water and sewer rate models for water and wastewater. It should also create and implement a new Enterprise Value Model so that TMUA and the City can regularly track and forecast the economic value of the utility (which for infrastructure enterprises is a function of asset condition, long-term liabilities, and customer rates) resulting from its on-going capital investment and operating decisions. For the first time, the utility would have a private-sector-like bottom-line indicator of its performance.

14. Governance Information Reporting Mechanism

Comprehensive Assessment Finding: TMUA lacks the routine information required for it to govern strategically and to connect the activities of past meetings and presentations with current and future utility activities.

Consequence: Board members are unable to track the utility's performance (both bottom line and for individual service components) over time and against its strategic goals. Moreover, they are barely able to distinguish high-priority information from low-priority information, and decisions with high long-term consequence from low consequence. Finally, they not readily able to connect the information provided from previous meetings with decisions that need to be made in current meetings.

Recommended Action: TMUA should implement real-time, past-and-forward-looking governance information reporting that accomplishes the following:

(1) consolidates the performance data from the new systems described herein,
(2) tracks TMUA issues and goals across and between board meetings,
(3) is readily understandable to individual board members and senior City officials, and
(4) allows the TMUA board to monitor progress and take informed actions toward the utilities' strategic business goals.

Typical board reports, distributed in advance of the semi-monthly meetings, would be 2-4 pages, noting the utility's performance against its annual and strategic goals, as well as the critical information they need to track the most important utility initiatives across multiple meetings.

6.0 Recommended Implementation Timeline

The recommendations could be implemented according to the following timeline, with notable changes to utility and TMUA operating practices occurring with 6 months after implementation begins, and measureable benefits to ratepayers arriving beginning in 2014 and growing each year thereafter.

3rd Quarter 2012:

- TMUA Improvement Strategy Policy
- Rate Covenants Policy
- Financial Reserves Policy
- Long-term Rate Model
- First Governance Reports
- Operational Improvements Identified

4th Quarter 2012

- Basic Performance Reports
- Utility Executive Consultation
- Board Coordinator
- Initial Draft of Strategic Business Plan
- Initial Support Service Agreements
- Initial AMS Software Selection

- Operational Improvements Selected
- CIP "Privatized" Amendments Identified

1st Quarter 2013

- Initial AMS Database Updating
- First Automated Performance Reports
- Working EVM Model
- Utility Budget Working Group
- First Annual Utility Performance Contract (Draft)
- CIP "Privatized" Amendments Selected

2nd Quarter 2013

- Governance Reports Incorporating Performance Data
- Approval of Rate Covenants
- Consensus Approval of Utility Budget
- Final Support Service Contracts
- Final Strategic Business Plan, With Full Goals and Measures
- Final Annual Utility Performance Agreement
- Final "Privatized" CIP

3rd Quarter 2014

- Usable EVM With Basic AMS Data
- Governance Reports Incorporating Initial AMS Data
- First Review of Actual Performance to Strategic Goals Evaluation

4th Quarter 2014

- First Executive Performance Review Using Measurement and EVM Data
- Completion of AMS Databases
- First Enterprise Risk Reporting AMS
- Fully Developed Automated Performance Reporting System
- First Annual Updating of Strategic Plan

1st Quarter 2015

- Final Phase of AMS Implementation
- Fully Functional Governance Information System Incorporating AMS
- Fully Functional AMS Dashboard
- Draft of Second Annual Utility Performance Agreement

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Task 7: Review of KPMG Study's Utility-Related Elements

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Task 7: Review of KPMG Study's Utilities-Related Elements

1.0 Overview

Task 7 of the Comprehensive Assessment is a review of the KPMG Report entitled *Managing for Change: Opportunities for Municipal Efficiency and Effectiveness*. The IMG Team was asked to review the Report's methodology, analyses, conclusions and recommendations with regard to the water and sewer utilities. Additionally, the Report's results were compared to the findings of the first six tasks and final recommendations of the Comprehensive Assessment.

The KPMG study was a systematic, high-level, line-item-based assessment of the City of Tulsa's organizational structure, staffing levels and business processes, of which water and sewer services (then a part of the Public Works Department) constitutes roughly a quarter. It was performed with the aim of better focusing the City's management and financial resources on its core services, and to recommend a structure and process for continuing improvement.

The study employed a review of the City's organizational chart, a budget line item analysis that tracked expenditures and Full-Time-Equivalent (FTE) staff levels in each department, and a survey that asked staff to identify their department purpose, mandates, priorities, goals, measures, customers, dependencies and opportunities for improvement. KPMG then sorted the data, identified a range of possible cost-reduction opportunities (with a emphasis on "possible"), and associated each opportunity with as basic implementation option such as elimination, consolidation, load-sharing, revenue improvement and outsourcing.

Aside from its recommendation for consolidation, elimination and automation of a small set of utility services, KPMG's preferred option for the utility was system-wide privatization via a long-term lease.

2.0 Comparison of Scope and Methodology

2.1 Overview

The Comprehensive Assessment scope of work was much broader and deeper than that of the KPMG study with regard to the utility. Moreover, the Assessment included asset condition evaluation, physical plant needs analyses, and capital improvement planning (together accounting for most of the Assessment's budget) that were not directly related to the Assessment's performance evaluation elements.

While the KPMG study relied on budget data and survey results for its conclusions, the Comprehensive Assessment's performance evaluation relied more heavily on direct analysis of the utility's business processes and comparing them with those of its top-performing peers and the practices of private contract utility operators. KPMG relied upon general municipal program expertise, while the IMG Team relied upon utility-specific expertise, industry performance data and its experience working with private utility operators.

2.2 Findings

- **Benefit:** The KPMG study's coverage was impressive in light of its budget. It covered over 1,500 city services, of which roughly 120 were related to core water and sewer utility functions and another 200 to utility-related support services such as finance, human resources and purchasing. Its greatest benefit to the City was in providing a high-level guidebook for reducing costs, while also

motivating the City to make major institutional changes and establish a permanent performance improvement structure. It accurately identifies the lack of performance management systems as a major impediment to utility performance improvement.

- **Methodology:** KPMG had to choose between three alternative approaches for conducting such a broad-ranging review on a limited budget: an interview-based method, a process-based method, and a budget line-item-based method. It chose the latter, and because it did so its analysis provides exceptional detail for budget and labor hour quantities. Using its experience from other cities, KPMG then selects among several basic improvement options and associates them with each potential cost-saving opportunity.

- **Deficiencies:** Unfortunately, the dependence upon high-level data and the apparent absence of both utility expertise and face-to-face interviews resulted in numerous examples of false precision and unsupported conclusions. Moreover, it is difficult to identify the amount of potential savings from the recommendations, either for an individual service and for the utility as a whole. Finally, KPMG virtually ignored TMUA in its assessment of the utility despite the responsibilities and powers vested in the TMUA by its indenture and TUB by its charter.

- **KPMG's Recommendations:** KPMG's most common recommendations for the utility-related services and core utility services were, respectively, consolidation and privatization. While these recommendations might be reasonable (and in many cases, IMG's more thorough analyses concluded that they were), they were not supported by either quantitative analysis or logical process evaluation. Moreover, the consolidation of common services (i.e., those administrative and technical services that the utility might share with other City departments) appears to have diminished (at least temporarily) the service levels that utility managers had come to expect while increasing the utility's fully-loaded unit costs to a level well in excess of its peers. Finally, the blanket privatization recommendation for core utility functions is barely connected, if at all, to the deficiency findings elsewhere in the KPMG report.

2.3 Conclusions

The KPMG study has already yielded changes to the City's governance processes, and the establishment of the Mayor's Management Review Office portends more to come. Many of these changes appear to have had a positive effect on the City's budget and operational performance. However, the consolidation of support services and the isolation of engineering services have placed the water and sewer utility in a dependent position without direct control over processes that are critical to its performance. In the absence of City-wide or utility-wide performance measurement and reporting system, this could lead to steadily-deteriorating performance, including insufficient attention to the utility's long-lived assets.

KPMG's line-item approach listed numerous opportunities for utility improvement, but the sole material recommendation for improvement was the utility-wide long-term privatization option. IMG concludes that however valid that recommendation may or may not be, it is not sufficiently supported by the analyses in the report. Rather, it appears to be based upon KPMG's initial conclusion that utility services are not core to the Tulsa City government's goals, and therefore those functions should logically left to the private sector.

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