# BENEFIT/ COST ANALYSIS

*Smart Water Meter System*

**U.S. Department of Housing and Urban Development**

October 2015

## Revision Sheet

| Release No. | Date | Revision Description |
|---|---|---|
| Rev. 0 | | |
| Rev. 1 | | |
| Rev. 2 | | |
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**Benefit/Cost Analysis**
**Authorization Memorandum**

I have carefully assessed the Cost/Benefit Analysis for the [Project Name]. This document has been completed in accordance with the requirements of the HUD's National Disaster Resilience Competition (NDRC) NOFA, particularly Appendix H.

MANAGEMENT CERTIFICATION - Please check the appropriate statement.

_____ The document is accepted.

_____ The document is accepted pending the changes noted.

_____ The document is not accepted.

We fully accept the changes as needed improvements and authorize initiation of work to proceed. Based on our authority and judgment, the continued operation of this system is authorized.

| | |
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| _____ | _____ |
| NAME<br>Project Leader | DATE |
| _____ | _____ |
| NAME<br>Operations Division Director | DATE |
| _____ | _____ |
| NAME<br>Program Area/Sponsor Representative | DATE |
| _____ | _____ |
| NAME<br>Program Area/Sponsor Director | DATE |

**BENEFIT/COST ANALYSIS**

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# 1.0 GENERAL INFORMATION

## 1.1 Purpose

The purpose of the Benefit/Cost Analysis is to illustrate that the benefits resulting from the installation of a smart water meter system in Moore far outweigh the costs associated with installing, operating and maintaining this system. These benefits arise not only during and after disaster events such as tornadoes and droughts, but these benefits are also present during normal operation.

## 1.2 Scope

The Benefit/Cost Analysis examines and explores the history of Moore's water infrastructure, the effect disasters (tornadoes and droughts) have on the system, and the benefits a new smart water meter system may offer the City of Moore. The analysis explores the benefits to vulnerable populations – low to moderate income households, elderly, and disabled, as well as benefits to water conservation and the City of Moore.

## 1.3 Project overview

Poe & Associates assisted the City of Moore in the preparation of this Benefit/Cost Analysis for a new smart water meter system. This system will assist the City of Moore in its quest to proactively become a more resilient City, better prepared and able to mitigate hazards resulting from disasters like tornadoes and droughts. The new smart water meter system will also improve the efficiency and conservancy of the current water system to better serve the community as a whole in the present and in the future.

## 1.4 Project references

Previously Developed Documents

Phase I Application, Department of Housing and Urban Development for the National Disaster Resilience Competition, Exhibits A – F

Disaster Recovery Program Action Plan, Submitted to the U.S. Department of Housing and Urban Development by Moore, Oklahoma on March 22, 2014

Infrastructure Recovery and Implementation Plan (IRIP) for May 20, 2013 Tornado Area, March 2015, Volume 1 and II, City of Moore, Completed by Cardinal Engineering, TDA Consulting and TAP Architecture

Additional Sources

Than, Ker. National Geographic Society, copyright 1996-2015. "More Midwest Twisters: Why Is Oklahoma Tornado Vexed?" http://news.nationalgeographic.com/news/2013/05/130601-oklahoma-tornadoes-supercell-natural-disasters-science/

OWRB, 2013. Hydrogeology and Simulation of Groundwater Flow in the Central Oklahoma (Garber-Wellington) Aquifer, Oklahoma, 1987 to 2009, and Simulation of Available Water in Storage, 2010-2059. U.S. Department of Interior, U.S. Geological Survey. Scientific Investigations Report 2013-5219. Found at: http://www.owrb.ok.gov/studies/reports/reports_pdf/garberwellington.pdf , 25 September 2015

National Weather Service Weather Forecase Office. http://www.srh.noaa.gov/oun/?n=events-20150325-swokc-moore

Sensus. “Water 20/20: Bringing Smart Water Networks Into Focus”. Copyright 2012.

Sensus. “AquaSense: FBA – Financial Benefits Analysis. A comprehensive analysis of utility revenue enhancements and cost reductions”. September 29, 2013.

HUD Documentation
Community Planning and Development, National Disaster Resilience Competition, Benefit Cost Analysis: Appendix H

Community Planning and Development, Benefit Cost Analysis: Data Resources and Expert Tips, Resilience Webinar Series

## 1.5 Acronyms and abbreviations

BCA – Benefit/Cost Analysis
Qualified Disaster – May 20, 2013 tornado
Qualifying Disaster – tornado or drought with similar effects and outcomes to the May 20, 2013 tornado.
The City – Moore,Oklahoma

## 1.6 Points of contact

### 1.6.1 Information

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### 1.6.2 Coordination

Coordination will be necessary between the City of Moore, Veolia Water, the City’s engineer, the smart water meter supplier, and the contractor.

# 2.0 BCA NARRATIVE DESCRIPTION

On May 20, 2013 a massive EF5 tornado left a path of devastation and destruction through the City of Moore, killing 24 people and injuring over 300 people. The massive storm damaged or destroyed 90 businesses, 2,400 homes, two schools, a school administration building, and a regional hospital (City of Moore Disaster Recovery Program Action Plan, page 9). In additional to these structure damages and casualties, the City's water infrastructure was damaged and/or compromised for several days following the disaster event, putting tens of thousands of residents, some more vulnerable than others, at a severe risk. Entire sections of the City were without water and the sections of the City that did have water had limited supply and/or pressure due to line breaks and leaks.

As a result of this disaster, the City of Moore is proactively taking steps to mitigate future hazards through resiliency. One way to do this is through the installation of a smart water meter system. This system will allow the City to "mitigate the loss of water in the tornado and drought-prone region by repairing the water infrastructure, installing a new smart water meter system, building a 'green' hazard education center, and continuing efforts to raise building code standards for commercial and multi-family properties".

To accomplish the desired resilience using the smart water meter system, the system will require the replacement of approximately 26,000 residential water meters and 2,500 commercial water meters. While this will require significant labor initially, after installation and implementation, the system will require significantly less operations and maintenance hours from City staff. This will save the City in various costs to maintain and operate the system and it will also save the City man hours, allowing staff members to be utilized elsewhere. There is also an advantage to residents with the new smart water meter system. Residents will have user friendly tools available to make smart choices about water consumption and conservation.

The costs associated with the new smart water system will be calculated over a 20 year projected life. The number of residential water meters to be replaced is estimated to be 26,000. The number of commercial water meters to be replaced is estimated to be 2,500. The capital cost for equipment for this system is $17,012,000. The installation for this system is estimated to be $1,932,500. This results in a total initial cost for the smart meters of $18,944,500.

The total current operating cost for the City of Moore's water system over 20 years is estimated to be $16,188,240. The total proposed operating costs of the new smart water meter system are estimated to be $1,031,703. This results in an operating cost savings over 20 years of $15,156,537. The operating cost savings are mainly a result of automated meter reading and reduction in labor costs. The total operational benefits of the new smart water meter system will total $50,498,372.

The timeline to install the approximate 28,500 smart water meters throughout the City of Moore is 12 months. The estimated useful life of the smart water meter system is 20 years with a payback period of eight years, five months. These new smart water meters are anticipated to result in a meter revenue increase for the City of Moore, totaling $35,341,835. This is mainly due to more accurate readings of low water flow and replacement of old meters.

A key component and tremendous value of the new smart water meters can quickly be realized through reduction of expected casualties and property damage of future tornado disasters. The City of Moore experienced four major tornadoes from 1999 to 2015. Two (1999, 2013) of these tornadoes were EF5. It is reasonably assumed that the City of Moore will experience tornadoes over the next 20 years. For analysis purposes it is projected that in 2019 and in 2033 EF5 tornadoes will affect Moore. The U.S. Department of Housing and Urban Development Value of Statistical Life and Abbreviated Injury Scale (AIS) Monetization chart (located in Section 2.10.4 of this BCA) was utilized to calculate anticipated benefits of the new smart water meter system.

The 1999 tornado resulted in 40 deaths, 665 injuries and $1.2 billion in damages. The 2013 tornado resulted in 24 deaths, an estimated 337 injures, and to date the total estimated damages are $500 million. It is reasonable to assume that approximately 5 percent of the casualties and damages resulted from secondary events immediately following the tornado. These events would include fires, gas leaks, water line breaks, and flooding.

Following this logic:
In 2019, we assumed 40 fatalities multiplied by $6,600,000.00 per fatality multiplied by 5% to arrive at $13,200,000 in avoided losses due to death. We assumed 675 injuries multiplied by $2,000,000 per injury multiplied by 5% to arrive at $67,500,000 in avoided losses due to injury. For property damage, we multiplied $1,200,000,000 by 5% to arrive at $60,000,000 in avoided losses due to property damage.

In 2033, we assumed 24 fatalities multiplied by $6,600,000 per fatality multiplied by 5% to arrive at $7,920,000.00 in avoided losses due to death. We assumed 337 injuries multiplied by $2,000,000 per injury multiplied by 5% to arrive at $33,700,000 in avoided losses due to injury. For property damage, we multiplied $500,000,000 by %5 to arrive at $25,000,000 in avoided losses due to property damage.

Summarizing, for the combined 2019 and 2033 projected events, $122,320,000 in losses due to death and injury are avoided. Additionally, $85,000,000 in losses due to property damage is avoided due to installation of the smart meters.

The assumptions made above are extremely conservative. The City of Moore experienced EF4 tornadoes in 2003 and 2010. It was decided not to include the damages from these storms in our projections.

## 2.1 PROCESS FOR PREPARING BCA

After initial meetings with the City of Moore, the HUD funding specialist, the hired grant writer, and the smart water meter vendor, the entire team gathered data and historical information and evidence to compile the Benefit/Cost Analysis for the proposed smart water meter system.

## 2.2 FULL PROPOSAL COST -

The full proposal cost for installation of the new smart water meter system is $18,944,500. This cost will be a combination of federal, state, and local funds.

## 2.3 Current situation and problem to be solved

On May 20, 2013 a massive EF5 tornado left a path of devastation and destruction through the City of Moore, killing 24 people and injuring over 300 people. The massive storm damaged or destroyed 90 businesses, 2,400 homes, two schools, a school administration building, and a regional hospital (City of Moore Disaster Recovery Program Action Plan, page 9). In additional to these structure damages and casualties, the City's water infrastructure was damaged and compromised for several days following the

disaster event, putting tens of thousands of residents, some more vulnerable than others, at a severe risk. Entire sections of the City were without water and the sections of the City that did have water had limited supply and/or pressure due to line breaks and leaks and damage to the Draper Water Treatment Plant.

In the last 122 years, 16 tornadoes have struck the City of Moore (NDRC Phase 1 Application). In the last 16 years alone, six tornadoes have hit Moore with four of those tornadoes being of EF4/EF5 magnitude. In the City of Moore, the mentality is that it's not a matter of *if* another storm will hit, it is a matter of *when* another storm will hit. Since 1999, four significant tornadoes have struck the City of Moore – 1999, EF5; 2003, EF4; 2010, EF4; and 2013, EF5. Considering this history, it is reasonable to assume that more tornadoes of significant levels (EF4-EF5) will strike Moore in the expected 20 year life cycle of the Benefit/Cost Analysis (BCA).

The smart water meters offer tremendous benefit to the City during and after tornadoes by maximizing the control of the water system to support fire suppression. Unfortunately, gas leaks and fires often ensue shortly after a tornado passes through a City. Moore experienced this in both 1999 and 2013. This smart water meter system will greatly reduce the potential of fires spreading due to lack of water supply or water pressure. In both storms the City was left with the added responsibility immediately following the disaster of shutting off water meters in damaged areas. When all hands were needed on deck to immediately mobilize city resources for recovery efforts, assisting residents that just lost everything and helping emergency personnel from all over the state that showed up to offer assistance, the City was forced to also focus on getting personnel out to shut off water meters. The effort forced the City to send personnel out into disaster areas to turn off water meters because the only alternative was to leave leaking, damaged meters on and continue losing gallons upon gallons of water.

The city lost revenue due to water shut off in areas that were not directly impacted by the disaster. Businesses lost revenue because they were either not able to open due to no water or because residents didn't leave their homes because they had no water. Residents lost revenue because without water they could not go to work.

These populations include the youngest and oldest residents, low income families, as well as residents with medical conditions requiring water to take medication or for other medical reasons. These vulnerable populations are limited in the ways of coping with a lack of water. Some of these residents are not mobile due to age and medical conditions, others are too young to care of themselves (the newborn of the mother that can't afford to leave the area, but also needs water for formula), low income residents that may not have a car to go far to find water or that cannot afford to go buy water to live on for a few days until water at their house is turned back on. It's also worth noting that some elderly residents are on a fixed income also overlapping them in to the low to moderate income category.

Should the City of Moore be fortunate enough to not experience another tornado in the next 20 years, the installation of smart water meters would still bring significant financial and water savings during normal operation and especially during periods of drought. These benefits will be immediately felt through more accurate meter readings.

Existing Climatological Vulnerabilities

Tornadoes are a part of the region's climate because of the City's location in the mid-latitudes between the Gulf of Mexico and the Rocky Mountains. Tornadoes are a product of severe thunderstorms, and a growing body of research ties the increased frequency of severe weather events to a weakening of the jet stream (Exhibit D – Need / Extent of Problem, page 24). In the last 122 years, 16 different tornadoes have struck the City of Moore; in the last 16 years, six tornadoes have struck, of which four have been of EF4 or EF5 level (NDRC Phase I Application).

> National Geographic Article:
> Tornado Alley occupies a unique geographic position where warm humid air from the Gulf of Mexico, hot dry air from Arizona and New Mexico, and cool dry air from Canada meet, explained NSSL's Karstens.
>
> While tornadoes can differ in their size, strength, and location, they all share certain characteristics. They are spawned from a type of rotating storm called a supercell thunderstorm.
>
> And they are all driven by atmospheric instability and by a phenomenon known as wind shear. This happens when "wind near the ground blows in one direction, but aloft it blows in another direction. This creates shear in the airflow," Karstens explained. "If you produce an updraft within that flow, the updraft will acquire the properties of the air, and the atmosphere begins to spin and rotate."
> *(http://news.nationalgeographic.com/news/2013/05/130601-oklahoma-tornadoes-supercell-natural-disasters-science/)*

Recent climate assessments, discussed above, note that climate change will continue to have a profound effect on drought frequency and severity, negatively impacting the fresh water supply of the City and the region. The Regional Raw Water Supply Study states that there is not enough water available from existing resources to meet the needs of the participating water providers through the year 2060. (NDRC Phase I Application, page 24).

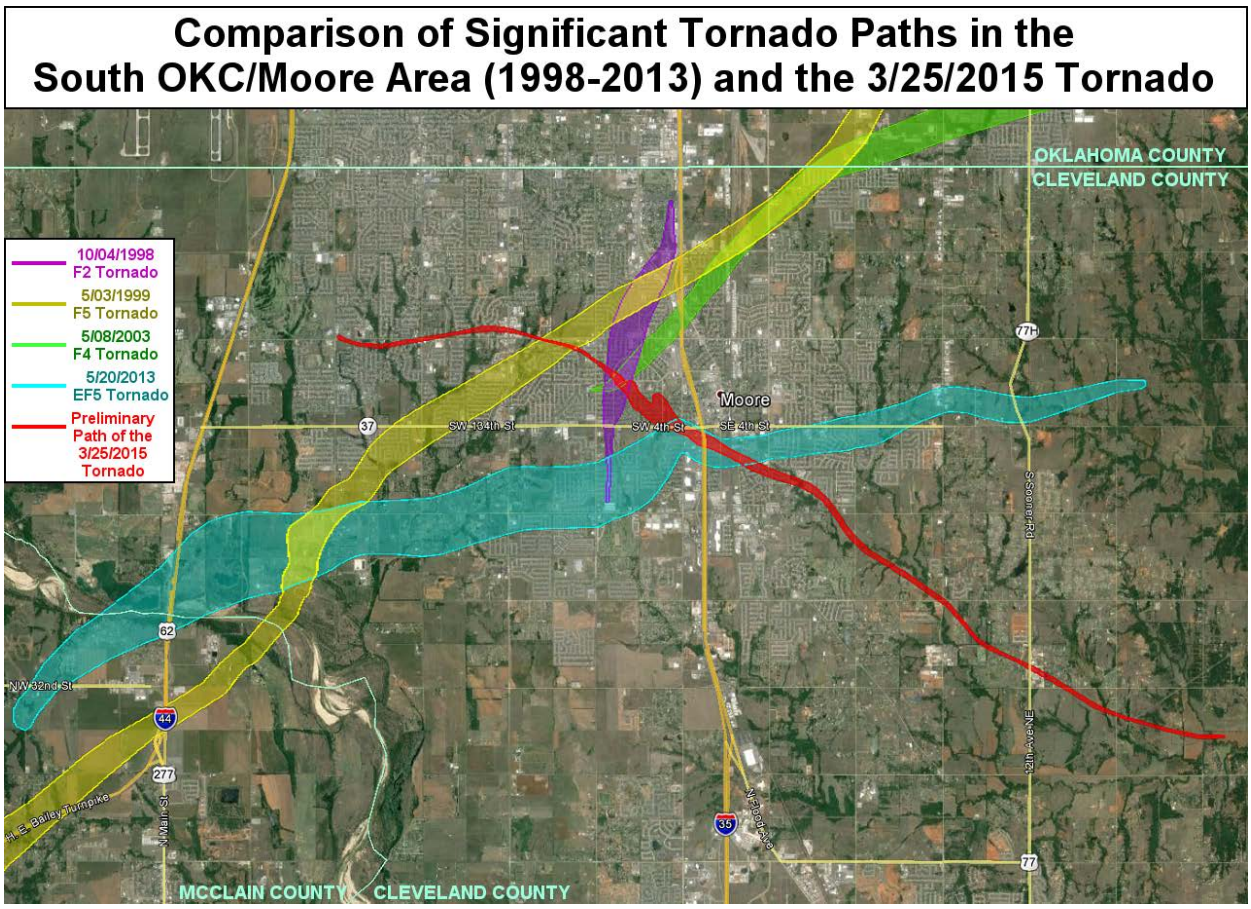
There is an ongoing threat as illustrated from some of the information above that storms will continue to hit Oklahoma and history would lead us to believe that very significant storms will hit Moore. In the last 16 years, six tornadoes have struck the City. While drought conditions have improved in the State overall, the City of Moore is still on required odd/even water rationing to try to help conserve water.

While Moore's population tends to be young right now with a median age in 2012 of 32 (City of Moore Disaster Recovery Program Action Plan, page 32), assuming this population remains in the City, it will only increase the elderly population of the City as time passes and potentially at the time of another disaster even like the May 20, 2013 tornado.

Social Conditions / Challenges

Moore has a population of just over 55,000. Research has shown that approximately 23% of all households in Moore are considered to be of moderate to low income. From 2000 to 2010, Moore's population grew over 32% (City of Moore Disaster Recovery Program Action Plan).

The path of the destruction caused by the massive tornado was 17.5 miles long and as wide at 1.3 miles at times according to the City's HUD Disaster Recovery Program Action Plan (page 16). With a path this large, a variety of populations and demographics were affected by the disaster and are still placed in an increased risk situation should another large storm affect their area.




*(http://www.srh.noaa.gov/oun/?n=events-20150325-swokc-moore)*

Environmental Conditions

The City of Moore is located over the Central Oklahoma (Garber-Wellington) Aquifer. Moore has 24 active wells in the Central Oklahoma Aquifer according to http://sdwis.deq.state.ok.us/DWW/JSP/WaterSystemDetail.jsp?tinwsys_is_number=716896&tinwsys_st_code=OK&wsnumber=OK2001412 .

The Oklahoma Water Resources Board in conjunction with the U.S. Department of Interior, U.S. Geological Survey has completed a study on the Hydrogeology and Simulation of Groundwater Flow in the Central Oklahoma Aquifer, which can be reviewed at

http://www.owrb.ok.gov/studies/reports/reports_pdf/garberwellington.pdf. The aquifer is located in central Oklahoma encompasses approximately 3,000 square miles. Since the aquifer underlies the Oklahoma City Metropolitan area is it utilized either solely or partially by all of the communities in Central Oklahoma with the exception of the City of Oklahoma City. These communities include but may not be limited to Moore, Edmond, Norman, Yukon, Mustang, Bethany, Guthrie, Purcell, Midwest City, Del City, Choctaw, Noble, Piedmont and multiple Rural Water Districts. These communities have a population of approximately 1.2 million people. As areas develop, groundwater withdrawals will increase, which may result in decreases in long-term aquifer storage.


This region is continually becoming more concerned with water conservation, especially during extended drought periods. To preserve this critical resource, the OWRB issues temporary use permits in the amount of 2 ac-ft/ac/year. The study found, in the first scenario considered, that the pumping rate at all cells that reduced the saturated thickness in one-half of the cells to or below 15 feet after 50 years was between 1.1 and 1.5 ac-ft/ac/year. In the second scenario studied, the aquifer would be 50 percent depleted after between 35 and 41 years of pumping 2 ac-ft/ac/year. This analysis indicates that this pumping rate of 2 ac-ft/ac/year is not sustainable for more than 41 years if every landowner with a potential well in each acre in the Central Oklahoma aquifer exercised their temporary right to pump at that rate (OWRB, 2013). In order to encourage conservation, this study will lead to the reduction of the equal proportionate share for these communities from 2 ac-ft/ac/year to near 1 ac-ft/ac/year.

The Oklahoma Department of Environmental Quality indicates that in some regions of the aquifer, concentrations of dissolved arsenic, chromium, selenium and uranium occasionally exceed the Federal Drinking Water Standards. Public Water Supply wells are tested regularly for these contaminates. https://www.deq.state.ok.us/factsheets/water/Uranium.pdf .


Land-Use, Housing Development and Affordability

The City of Moore has experienced increased population growth and extensive retail business growth in recent years. This growth increases the vulnerability of extensive damage should another tornado pass through Moore. Specifically, the I-35 corridor has almost fully developed with high property value retail businesses and this I-35 corridor has been the target of the largest tornadoes to hit Moore.

## 2.4 Proposed project description

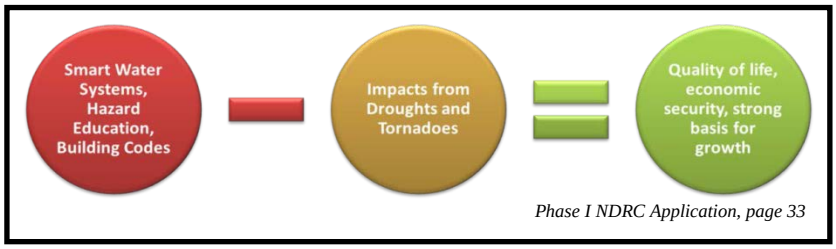
The key project objective is to help the City of Moore recover from the Qualified Disaster while also taking proactive steps to mitigate future hazards through resiliency. Moore's Phase 1 Application outlined several Phase 2 projects that will "mitigate the loss of water in the tornado and drought-prone region by repairing the water infrastructure, installing a new smart water meter system, building a 'green' hazard education center, and continuing efforts to raise building code standards for commercial and multi-family properties" (NDRC Phase I Application).

To accomplish the desired resilience using the smart water meter system, the system will require the replacement of approximately 26,000 residential water meters and 2,500 commercial water meters. While this will require significant labor initially, after installation and implementation, the system will require significantly less operations and maintenance hours from City staff. This will save the City in various costs to maintain and operate the system and it will also save the City man hours, allowing staff members

to be utilized elsewhere. There is also an advantage to residents with the new smart water meter system. Residents will have user friendly tools available to make smart choices about water consumption and conservation. One of these tools is another Phase 2 project – the resiliency center planned for the new Central Park. Within this center, residents will have the ability to learn about the functions of the smart water meter system, all of its benefits during normal operation and after a disaster event, as well as how the system promotes water conservation. All of these tools offer residents, particularly the vulnerable populations, ways to conserve water and save money.

The overall recovery goal of Moore is to "invest in both physical and social resilience projects to address the unmet needs in infrastructure and environmental degradation that is a direct result of the Qualified Disaster" (NDRC Phase 1 Application, page 3). With severe climate patterns that exist over the entire region, and with Moore's recent disaster history, the City wants to be proactive and become a resilient community, helping mitigate consequences of future hazards including severe weather and drought conditions.

The design philosophy associated with this application and the associated projects and partners is a "More Resilient Moore" (NDRC Phase 1 Application, page 33).



*Phase I NDRC Application, page 33*

A critical element to this philosophy and what this project focuses on is the Moore's critical water infrastructure. The City's water supply was greatly compromised with the Qualified Disaster and in the days following. To be more resilient, Moore desires to take a proactive step to implement a new smart water meter system.

Immediately following the May 20, 2013 tornado the City estimates it lost 7.5 million gallons of water. The City then spent the next week manually shutting off meters, losing significant amounts of water each day (NDRC Phase 1 Application, page 3). There was also the issue of water being shut off to entire sections of the City because leaks needed to be located, but there was no easy way to do this. The lack of water supply compromised the most vulnerable populations of Moore – low to moderate income, elderly, and disabled.

The new smart meter system will help mitigate these hazards to the vulnerable populations of Moore. Should the City be fortunate enough to not experience another tornado in the next 20 years, the smart water meters will still make the City more resilient through conservation, proactively preparing to cope with future drought conditions.

The smart water meter system will be installed and implemented throughout the entire City and is designed to serve all 55,000 residents of Moore. The main components and benefits of the smart water meter system that will achieve a "More Resilient Moore" include resiliency, conservation, and economic revitalization. Through environmental, social, and economic value systems, Moore has a unique opportunity to take a bad situation (the Qualified Disaster) and turn it into a positive that will benefit the City and its most vulnerable populations for many years.

The main component of this proposal installs smart water meters throughout the City of Moore. These smart water meters offer tremendous flexibility and secondary cost savings immediately following a tornado. Most prominent is the ability of the smart meters to maintain fire suppression water pressures in various sub-sections of the City. In addition to disaster benefits the smart meters also offer daily

monetary savings through accurate water consumption readings and leak detection, as well as automated conservation tools during drought conditions.

In 2014 the City of Moore adopted several new residential building codes. These included requiring roof sheathing, hurricane clips or framing anchors, continuous plywood bracing and wind-resistant garage doors (cityofmoore.com); all of these changes will allow homes to be built to withstand 135 mph winds. Adding the installation of smart water meters to the already implemented new residential building codes will only assist in making the resiliency of the City stronger. This, in turn, will protect households throughout the City, particularly the most vulnerable households.

While experts have been unable to pinpoint why Moore in particular seems to get hit with such severe weather and tornadoes, most can agree that severe weather and strong storms will continue to affect Oklahoma. With that knowledge, Moore has decided to take steps necessary to protect residents of the City, benefiting the vulnerable populations of the City – the low to moderate income, the elderly, and the disabled. In terms of water supply and consumption, the risk associated with a lack of water supply is a valid concern. Should another disaster hit Moore or should a prolonged period of drought affect the City, the smart water meters offer the City a way to proactively minimize the risks and vulnerabilities associated with these circumstances.

The timeline to install the approximate 28,500 smart water meters throughout the City of Moore is 18 months to two years. The estimate useful life of the smart water meter system is 20 years with a payback period of 10 years, two months.

## 2.5 Risks if proposal is not implemented

The smart water meter system offers tremendous benefits to the City of Moore for both a disaster event, during significant drought periods, and during normal operating periods. For this reason, if the City is unable to install this new smart water meter system, the entire City could suffer now, in five years, and all the way through the projected 20 year life cycle.

The smart water meters offer the City a tremendous amount of benefits after a qualifying disaster. After the tornado on May 20, 2013 the City was burdened with significant water loss as water mains leaked and water lines and meters were broken. The City was unable to shut off most of the leaks for at least a day because it was not only difficult to located the leaks, personnel had to physically go to each meter to shut it off. Even when the meters were shut off, entire sections of the City were without water as line breaks were located and repaired. Without the smart water meter system, this type of situation will continue happening after disaster events, increasing risks and costing the City revenue and resources.

Additionally, without the installation of the smart water meter system secondary impacts along the I-35 corridor will occur. In the last 10 years, the I-35 corridor through Moore has grown and populated with commercial retail business that is vital to Moore's economy. A compromised water system, as well as an aging, insufficient system puts this area at an increased risk of secondary impacts from tornadoes and droughts.

The absence of the smart water meter system also affects the City's ability to fight fires that many times follow tornadoes due to lightning strikes and/or broken gas lines. The smart water meters could allow the City to shut down water in surrounding areas to increase pressure and supply allowing firefighters to fight ensuing fires quickly and more efficiently.

The ability to conserve water is another benefit of the smart water meter system. Without the smart water meter system, Moore not only continues to lose water during normal times from old, leaking meters, but the City would also continue to lose water during drought periods as residents use their irrigation systems.

The entire City would remain underserved without a smart water meter system. Whether this is during normal operation, after a tornado, or during droughts, the citizens of Moore are underserved by the current water system. The City estimates that during a normal year, it loses approximately 11.5% of its water and in 2013, the year of the Qualifying Disaster the City estimated it lost 27.3% of its water. These loses affect the entire City, especially the most vulnerable populations.

The low to moderate income families that struggle to pay their utility bill due to various economic hardships will continue to have their water shut off, putting them at an increased risk. The smart water meter system would offer the City the option to provide these households with a trickle flow so they would have water for basic functions.

And lastly, without a smart water meter system the City will continue to suffer revenue loss from under billed customers, as well as revenue loss following a disaster event that causes water outages, leaks, and losses. The current system also requires the City to employ meter readers. With the smart water meter system these employees can be utilized in other valuable City departments.

## 2.6 Categories of Costs and Benefits

The costs associated with the new smart water system will be calculated over a 20 year projected life. The number of residential water meters to be replaced is estimated to be 26,000. The number of commercial water meters to be replaced is estimated to be 2,500. The capital cost for equipment for this system is $21,427,000. The installation for this system is estimated to be $1,932,500. This results in a total cost for the smart meters of $23,359,500.

These new smart water meters are anticipated to result in a meter revenue increase for the City of Moore, totaling $35,341,835. This is mainly due to more accurate readings of low water flow and replacement of old meters. The operating cost savings of the new smart water meters are estimated to be $15,131,481. The operating cost savings are mainly a result of automated meter reading and reduction in labor costs. The operational benefits of the new smart water meter system will total $50,473,316.

A key component and tremendous value of the new smart water meters can quickly be realized through reduction of expected casualties and property damage of future tornado disasters. The City of Moore experienced four major tornadoes from 1999 to 2015. Two (1999, 2013) of these tornadoes were EF5. It

is reasonably assumed that the City of Moore will experience tornadoes over the next 20 years. For analysis purposes it is projected that in 2019 and in 2033 EF5 tornadoes will affect Moore. The U.S. Department of Housing and Urban Development Value of Statistical Life and Abbreviated Injury Scale (AIS) Monetization chart (located in Section 2.10.4 of this BCA) was utilized to calculate anticipated benefits of the new smart water meter system.

The 1999 tornado resulted in 40 deaths, 665 injuries and $1.2 billion in damages. The 2013 tornado resulted in 24 deaths, an estimated 337 injures, and to date the total estimated damages are $500 million. It is reasonable to assume that approximately 5 percent of the casualties and damages resulted from secondary events immediately following the tornado. These events would include fires, gas leaks, water line breaks, and flooding.

Following this logic:
In 2019, we assumed 40 fatalities multiplied by $6,600,000.00 per fatality multiplied by 5% to arrive at $13,200,000 in avoided losses due to death. We assumed 675 injuries multiplied by $2,000,000 per injury multiplied by 5% to arrive at $67,500,000 in avoided losses due to injury. For property damage, we multiplied $1,200,000,000 by 5% to arrive at $60,000,000 in avoided losses due to property damage.

In 2033, we assumed 24 fatalities multiplied by $6,600,000 per fatality multiplied by 5% to arrive at $7,920,000.00 in avoided losses due to death. We assumed 337 injuries multiplied by $2,000,000 per injury multiplied by 5% to arrive at $33,700,000 in avoided losses due to injury. For property damage, we multiplied $500,000,000 by %5 to arrive at $25,000,000 in avoided losses due to property damage.

Summarizing, for the combined 2019 and 2033 projected events, $122,320,000 in losses due to death and injury are avoided. Additionally, $85,000,000 in losses due to property damage is avoided due to installation of the smart meters.

These assumptions made above are extremely conservative. The City of Moore experienced EF4 tornadoes in 2003 and 2010. It was decided not to include the damages from these storms in our projections.

**The new smart water meters will result in a tremendous benefit cost ratio of 9.14**

And furthermore this new system achieves a greater than one benefit cost ratio (1.52 as shown in appendix) regardless of whether a tornado occurs over the next 20 years.

## 2.6.1 Lifecycle Costs

Initial Investment Cost (from Executive Summary)
The costs associated with the new smart water system will be calculated over a 20 year projected life. The number of residential water meters to be replaced is estimated to be 26,000. The number of commercial water meters to be replaced is estimated to be 2,500. The capital cost for equipment for this system is $17,012,000. The installation for this system is estimated to be $1,932,500. This results in a total initial cost for the smart meters of $18,944,500.

Operations Cost

The total current operating cost for the City of Moore's water system over 20 years is estimated to be $16,188,240. The total proposed operating costs of the new smart water meter system are estimated to be $1,031,703. This results in an operating cost savings over 20 years of $15,156,537.

The costs of the present method of meter reading and billing were provided as input by the City of Moore. Meter reading cost reductions are a result of improvement of meter reading efficiency, reduction of call backs, and elimination of any manual data processing.

Current annual meter shop and field service costs were used to project 20 year repairs costs of $2,000,040 if the current system is left in place. This cost is included in the total $16,188,240 operation cost. Because of the unique design of the new smart water meters a dramatic reduction in the number of meters requiring maintenance in the next 20 years will be drastically reduced.

It is important to note that the smart water system improvements being proposed are less tangible, but no less important. The elimination of intrusive demand and final reads, estimated bills, and the reduction of response time to customer inquiries will result in substantially fewer complaints and higher customer satisfaction.

Maintenance Cost

The annual operating costs for the new smart water system, including repairs to the smart meters and shut-off valves, smart meter communication system and repairs and/or modifications to the system's computer hardware and software is $144,359. The City of Moore will also need to budget for a yearly hosting fee for the smart water meter system. This cost is estimated to be $44,750 for the first year with a 3 percent cost increase per year through the 20 year project life.

The City of Moore is committed to the long term performance of the smart water meter system. This is easily obtained as this system clearly indicates a reduction in annual operating costs as compared to the current system. (*The above information was obtained from manufacturer)*

## 2.6.2. Benefits

Resiliency value

Reduction of expected property damages due to a future or a repeat disaster can be accomplished by utilizing the remote shut off feature of the smart meter system. According to the manufacturer, portions of the system can be partially or fully turned off by remote means directly following a tornado to provide increased pressure in other areas to increase fire flow for fighting fires.

Reduction of expected casualties from a future or a repeat disaster can be accomplished by utilizing the remote shut off for facilities that have underground structures that may be used for shelters during a tornado, such as basements, that may be susceptible to flooding should a water main break on the downstream side of the meter.

These smart meters will help reduce the vulnerability associated with a large-scale outage by shutting down areas where major damage occurs. This will help limit the amount of water loss and redirect the water that would have been lost to those areas that did not experience significant damage. By doing so the system's water storage is maintained, thus limiting the amount of extra water pumped or purchased from the supplying community.

Environmental Value

By implementing smart water meters into a conservation program to further reduce water usage, the water meter system can realize a benefit from reduced energy usage. Reduced energy may come from ground water well pumps operating less often, less chemicals being used to treat water, distribution system pumping stations operating less often, and less water being treated by Moore's wastewater treatment plant. This reduction in usage will also result in less ground water being pumped from the Garber Wellington aquifer and less water being purchased from the City of Oklahoma City. The Moore and Oklahoma City area recently experienced multiple years of drought conditions. Reduced water usage will benefit the Garber Wellington aquifer by reducing demand on the ground water source.

In addition to reduced energy usage and water usage, smart water meter systems have the ability to be expanded to measure water quality parameters such as temperature and pH. Real time monitoring of parameters such as temperature and pH can give system owners and operators an early warning to water quality problems and future compliance problems thereby allowing proactive instead of reactive decision making.

Community Development/Social Value

The installation of smart water meters throughout the City of Moore will offer tremendous social and community development values. First and foremost will be the opportunity to prevent secondary casualties and injuries through fire suppression. Fire suppression will also reduce exposure to airborne pollutants, which could affect all citizens. The smart water meters are an integral part of the City of Moore's resiliency plan to prepare and upgrade the readiness for future disasters. Other parts of this plan include a resiliency center in Central Park and the climatological assessment in partnership with the University of Oklahoma. All of these integral parts of Moore's resiliency plan improve the community's identity, cohesiveness, and recreational value. Specifically, the resiliency in Central Park offers a great iconic gather place, which will educate all citizens in disaster preparedness.

Economic Revitalization

Installation of controllable smart meters in the City of Moore will provide economic revitalization due to three important factors: water conservation, disaster mitigation, and increased revenues.

First, the importance of water conservation in the upcoming decades will be of utmost importance. The installation of smart meters will help the City of Moore increase awareness of water conservation as well as provide a level of control on water usage that did not exist before. The benefit of this project will be an increased level of reliability that during drought situations, the City of Moore will be able to control their distribution system to ensure that consumers and businesses will have enough water. This may be accomplished by enabling the trickle meter on residences to prevent overconsumption, and/or shutting off

irrigation and landscaping water meters. The overall effect of this is beneficial to Moore's economy twofold: first, businesses looking to relocate or expand will appreciate the reliability of the water distribution system, particularly businesses that have a strong emphasis on potable water. Second, residential customers will benefit from the same increased reliability that may translate into cost savings on homeowners insurance due to increased reliability for fire protection as well as leak detection to avoid catastrophic home damages that are often associated with leaks. The installation of remote controlled smart meters shows a progressive approach to water conservation that will be attractive to both new businesses as well as people, creating economic revitalization for the City of Moore.

Second, the proposed meter infrastructure improvements will create economic revitalization by disaster mitigation. In the event of a tornado, a water system attack, or another large storm event, the distribution system can be remote controlled to keep people and businesses in water as well as provide fire protection. This will be accomplished by shutting down valves to areas that have been directly impacted, causing water loss to be minimized and system pressures to be maximized. The resiliency that this creates will have a ripple effect in creating a water system that has clear advantages to others in the area. Knowing that their water supply is less vulnerable to disasters creates an economic incentive to relocate or expand to Moore in comparison to surrounding cities. In the event of a disaster, the City of Moore will have decreased water loss, which corresponds to increased revenue that can be used in other important areas, from economic development to parks and recreation.


Finally, the proposed smart meter project will result in increased revenues to both the City of Moore initially and the consumer in the long run. New smart meters will provide both more accuracy in water metering as well as more efficient reading of the meters. Due to these factors the City of Moore will be able to repurpose and reinvest up to 5% of their current operating and capital budgets to perform network upgrades. This money could be used to fix old leaky waterlines, upgrade distribution pumps to be more efficient, or perform a variety of other improvements. These improvements in the long run will reduce operating and maintenance costs of the water distribution system and as a result, post-pone or delay water rate increases. Ultimately, the City could pass this cost savings along to the consumer by means of a rate decrease, which would provide the citizens of Moore with more discretionary income. The use of additional discretionary income as well as capital improvements to the water system will provide Moore with the economic revitalization that it needs.

In conclusion, installation of controllable smart meters will lead to economic revitalization for the City of Moore through three elements: water conservation, disaster mitigation and increased revenues. These three factors will make Moore an attractive prospect for potential residents and buyers and ultimately will result in a more efficient, resilient system that will be less impacted by future utility rate increases.

The City's median age in 2012 was 32 (Disaster Recovery Program Action Plan, pg. 32), which is a fairly young median age for a City of Moore's size. With such a young population and progressively thinking City leaders, Moore is surely a desired location for various types of businesses. Adding to this appeal, the City of Moore has committed to becoming a more resilient community, better prepared to handle future disaster events like the EF5 tornado on May 20, 2013.

The City of Moore has grown tremendously since 2000. According to the 2010 Census Report, Moore's population increased by 32 percent, with additional growth estimated from 2010 to 2015 (www.census.com). To remain a growing and thriving community, the City is constantly exploring incentives to entice businesses to locate in Moore city limits. The new smart water meter system, with its education component in the proposed resiliency center in Central Park could be a huge incentive to those businesses. The City's commitment to becoming a "More Resilient Moore" successfully illustrates to businesses that Moore is a progressive City, investing in the future growth and resiliency of the City. Current and future businesses in Moore can take comfort in these actions and assurances that not only has Moore grown the last 15 years despite some tests from Mother Nature, the City and its leaders fully intend to continue growing for many years to come.

## 2.7 BCA for Smart Water Meters Project

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| **Costs and Benefits by category** | **Page # in Factor Narratives or BCA Attachment** | **Qualitative Description of Effect and Rationale for Including in BCA** | **Quantitative assessment (Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)** | **Monetized effect (if applicable)** | **Uncertainty** |
| **Life cycle costs** | | | | | |
| Meter Revenue Increase | | | | $35,341,833 | 2 |
| Operating Cost Savings | | | | $15,156,537 | 3 |
| Water Conservation Savings | 12 | Automated shut-off capabilities during irrigation reduction periods | ++ | | |
| Equipment Cost | | | Estimates from manufacturer | ($17,012,000) | 1 |
| Installation Cost | | | Estimates from manufacturer | ($1,932,500) | 3 |
| Hosting Cost | | | Estimates from manufacturer | ($912,500) | 1 |
| Repair Cost | | | Estimates from manufacturer | ($144,259) | 3 |
| | | | | | |
| **Resiliency Value** | | | | | |
| Reduction of Expected Casualties | | | Preventable secondary casualties and injuries calculated at 5% of past storm damage using FEMA values for injuries and fatalities | $122,320,000 | 4 |
| Reduction of Expected | | | Preventable secondary | $85,000,000 | 3 |

| | | | | | |
|---|---|---|---|---|---|
| Property Damages | | | damages calculated at 5% of past storm damage | | |
| Reduced Vulnerability of Water Infrastructure to Large Scale Outages | 11 | Water system can sectionalized to provided water where needed | ++ | | |
| | | | | | |
| **Environmental Value** | | | | | |
| Reduced Water Use | 12 | Smart meters will assist in achieving reduced water usage goal in accordance Garber Wellington Aquifer Plan | + | | |
| Improved Water Quality | 12 | Automated real time sampling will best ensure water quality including temperature, pH and biological indicators | + | | |
| | | | | | |
| **Community Development Value** | | | | | |
| Reduction in Exposure to Contamination | 12 | Improved fire suppression will reduce airborne contaminates from fire | ++ | | |
| Benefit to low and moderate income persons | 12 | Ability to provide zone water pressures and provide trickle service during time of cut-off | + | | |
| | | | | | |
| **Economic Revitalization** | | | | | |
| Direct effects on local or regional economy net | 12-13 | Water meters reduce disaster event water | + | $27,000 | |

| | | | | | |
|---|---|---|---|---|---|
| opportunity costs | | loss by 50% reducing income loss, allowing money to be spent elsewhere in the community | | | |
| Increased Value of Property | 12-13 | Reliability of water system will result in increased attractiveness to new businesses and homeowners | + | | |

**Benefit Cost Ratio = 9.14**

### 2.7.1 Net Present Value

$145,274,000.51

### 2.7.2 Benefit/Cost Ratio

BCR = 9.14

### 2.7.3 Payback Period

2019

## 2.8 Risk to ongoing benefits

To be able to examine the risks and uncertainties associated with the positive and negative effects of the smart water meter system, it is necessary to first have a complete understanding of the multitude of benefits that this new metering system will offer the City of Moore. The main benefits of this smart water meter system include being able to quickly shut off certain areas after a disaster when leaks are detected, the ability to monitor and detect leaks quickly so unnecessary amounts of water are not wasted, the advantage of being able to shut down certain meters rather than having to shut down entire sections of the city, and the ability to monitor and manage water consumption to mitigate water scarcity during extended periods of drought.

As with any change and the possible benefits of change comes a great amount of uncertainty in terms of how the system will function, not only in normal operation, but also during times of crisis. The smart water meter system has a lot of potential to mitigate hazards immediately following a Qualified Disaster as well as mitigating the effects of severe drought periods. To combat these risks and uncertainties, the City and the new smart water system offer tremendous tools to users to better understand the system and to better utilize all of the cost saving components of the system. These tools include several aspects that will promote conservation: the customer portal, the education center in the resiliency center, and the ball valve that allows meters to be turned to a trickle flow. However, most of these tools are dependent on user participation, which presents an added risk and vulnerability to the system. The City will need to adequately communicate the importance of these conservation measures to residents and encourage participation. Without buy-in and participation by the community, the city will be hard pressed to benefit regarding water conservation.

If severe climate events continue to present challenges as some predict, it will continuously challenge the smart water meter system because there will be a continuation of severe weather in the region as well as periods of severe drought. One of the uncertainties associated with the system during these events is whether the smart water meter system will function as flawlessly as described. The potential effects after a tornado will have more immediate impacts for the most vulnerable populations in Moore. If the City is unable to remotely shut off leaking meters or to selectively shut down certain areas of the City, the City will suffer immediate losses similar to those after the May 20, 2013 tornado. After that storm, the City lost millions of gallons of water because water meters had to be turned off manually and it was difficult to locate where leaks existed; and vulnerable populations were made more vulnerable because large areas of the City lost water as the City shut down the system while trying to locate and fix leaking water lines.

Regarding conservation, there is less of an immediate risk to costs, but more of a long term risk if the smart water meter system does not function properly. The conservation aspect of the smart water meter system offers residents a way to monitor their water consumption and take steps to reduce that consumption, promoting prolonged conservation. The City has the ability to shut off irrigation meters during periods of drought and water rationing. If residents choose not to utilize the cost saving, conservation abilities of the system, when a severe drought hits the area, this will become glaringly evident as the City will struggle with water supply and availability. Along the same lines, if the City is unable to shut off irrigation system meters, the City will have to dispatch personnel to manually shut down these meters if it is decided this is an absolutely necessary action to conserve water. If the City decides not to manually shut down these meters, then there is a risk of increasing the scarcity of water supply in the City during a difficult drought period.

To counteract the risks and uncertainties discussed above, the City must be proactive upon installation of the new smart water meter system to make sure the system functions as it should. The City will have a period of time after installation and before any potential crisis that it can test the system to make sure all of the parts and pieces of the function as they should. The City also needs to have a contingency plan ready so they can easily and quickly deal with any issues that may arise with the new smart water meter system during a disaster event. This preparedness will help the City to react quickly should any of the discussed risks actually occur after installation. It will also be of the utmost importance for the City to communicate with all residents the importance of this new system and all of the benefits it offers. To be fully functional and effective, the residents, as well as the City, will have to excited about system's potential and the benefits and revitalization it can offer to the entire City of Moore and its residents and business owners.

## 2.9 Challenges with implementation

As with any public project, obtaining consensus from shareholders and elected officials will be of utmost importance for the new smart water meter system. If stakeholders are not convinced of the benefits associated with the smart water meter system, they are unlikely to support the project. This could have a very negative effect of delaying the implementation schedule while the City tries to gain public support and consensus for the project.

In a similar regard, if City government officials and elected officials in Moore are not convinced of the benefits of the smart water meter system and they feel there will not be support should the new smart water meter system be implemented, these officials are likely to delay the project schedule. Issues may include government oversight, utility rate structure, and equipment dependability. These are not issues and risks that cannot be pre-emptively minimized. The easiest way to gain public and political consensus is to involve these entities in the project as early as possible. People like to be involved in decisions that affect their community. If they are educated on the subject and involved as much as possible in the implementation process, they will be less likely to negatively affect the implementation schedule.

The technical risks associated with the smart water meter system will involve the installation and implementation of the entire metering system. This will include public involvement efforts before the meters are installed to inform the public about the project and gain consensus. Technical risks will also include the proper installation of 28,500 meters throughout the City, as well as implementation of the client portal and FlexNet system so the City can use the new metering system as it is intended to be used.

Once the smart water meters are installed and the new metering system is implemented, there may be some procedural (legal) risks associated with adjusted billing to customers. With a more accurate metering system, there is the possibility that customers may see a dramatic increase or decrease in their monthly bill. There is a potential risk should residents become dissatisfied with a higher monthly water bill. As long as the change in billing is accurately documented through the new FlexNet system, this risk is easily documented.

Public outreach and information sharing is anticipated in the near future to provide a successful implementation of this new smart water meter system.

## 2.10 Basic Assumptions and Definitions

### 2.10.1 Analysis Period

The analysis period used for all costs and benefits discussed within this document was a 20 year life cycle cost of the smart water meters.

### 2.10.2 Price level

In completing the Benefit/Cost Analysis for the proposed smart water meter system, the 2015 constant prices were used and no inflation costs were factored in to either the benefits or costs of the project.

### 2.10.3 Discount Rate

The base-discount rate used for Benefit/Cost Analysis of the smart water meter system was the recommended base-case discount rate from the OMB Circular A-94, which is 7 percent.

### 2.10.4 Value of statistical life and other immaterial damage valuation

## Value of Statistical Life and Abbreviated Injury Scale (AIS) Monetization

| AIS Code | Description of Injury | Fraction of VSL | Economic Value |
|---|---|---|---|
| AIS 1 | Minor | .0020 | $13,000 |
| AIS 2 | Moderate | .0155 | $102,000 |
| AIS 3 | Serious | .0575 | $379,000 |
| AIS 4 | Severe | .1875 | $1,237,000 |
| AIS 5 | Critical | .7625 | $5,032,000 |
| AIS 6 | Fatal | 1.0000 | $6,600,000 |

# Qualitative Material

## Smart Water Meter System

On May 20, 2013 a massive EF5 tornado left a path of devastation and destruction through the City of Moore, killing 24 people and injuring over 300 people. The massive storm damaged or destroyed 90 businesses, 2,400 homes, two schools, a school administration building, and a regional hospital (City of Moore Disaster Recovery Program Action Plan, page 9). In additional to these structure damages and casualties, the City's water infrastructure was damaged and/or compromised for several days following the disaster event, putting tens of thousands of residents, some more vulnerable than others, at a severe risk. Entire sections of the City were without water and the sections of the City that did have water had limited supply and/or pressure due to line breaks and leaks.

As a result of this disaster, the City of Moore is proactively taking steps to mitigate future hazards through resiliency. One way to do this is through the installation of a smart water meter system. This system will allow the City to "mitigate the loss of water in the tornado and drought-prone region by repairing the water infrastructure, installing a new smart water meter system, building a 'green' hazard education center, and continuing efforts to raise building code standards for commercial and multi-family properties".

To accomplish the desired resilience using the smart water meter system, the system will require the replacement of approximately 26,000 residential water meters and 2,500 commercial water meters. The smart water meter system offers tremendous benefits to the City of Moore for both a disaster event, during significant drought periods, and during normal operating periods.

The installation of smart water meters throughout the City of Moore will offer tremendous social and community development values. First and foremost will be the opportunity to prevent secondary casualties and injuries through fire suppression. Fire suppression will also reduce exposure to airborne pollutants, which could affect all citizens. The smart water meters are an integral part of the City of Moore's resiliency plan to prepare and upgrade the readiness for future disasters. Other parts of this plan include a resiliency center in Central Park and the climatological assessment in partnership with the University of Oklahoma. All of these integral parts of Moore's resiliency plan improve the community's identity, cohesiveness, and recreational value. Specifically, the resiliency in Central Park offers a great iconic gather place, which will educate all citizens in disaster preparedness.

The reduction of expected property damages due to a future or a repeat disaster can be accomplished by utilizing the remote shut off feature of the smart meter system. According to the manufacturer, portions of the system can be partially or fully turned off by remote means directly following a tornado to provide increased pressure in other areas to increase fire flow for fighting fires. Reduction of expected casualties from a future or a repeat disaster can be accomplished by utilizing the remote shut off for facilities that have underground structures that may be used for shelters during a tornado, such as basements, that may be susceptible to flooding should a water main break on the downstream side of the meter.

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By implementing smart water meters into a conservation program to further reduce water usage, the water meter system can realize a benefit from reduced energy usage. Reduced energy may come from ground water well pumps operating less often, less chemicals being used to treat water, distribution system pumping stations operating less often, and less water being treated by Moore's wastewater

treatment plant. This reduction in usage will also result in less ground water being pumped from the Garber Wellington aquifer and less water being purchased from the City of Oklahoma City. The Moore and Oklahoma City area recently experienced multiple years of drought conditions. Reduced water usage will benefit the Garber Wellington aquifer by reducing demand on the ground water source.

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Installation of controllable smart meters in the City of Moore will provide economic revitalization due to three important factors: water conservation, disaster mitigation, and increased revenues. The City's median age in 2012 was 32 (Disaster Recovery Program Action Plan, pg. 32), which is a fairly young median age for a City of Moore's size. With such a young population and progressively thinking City leaders, Moore is surely a desired location for various types of businesses. Adding to this appeal, the City of Moore has committed to becoming a more resilient community, better prepared to handle future disaster events like the EF5 tornado on May 20, 2013.

The installation of smart meters will help the City of Moore increase awareness of water conservation as well as provide a level of control on water usage that did not exist before. The benefit of this project will be an increased level of reliability that during drought situations, the City of Moore will be able to control their distribution system to ensure that consumers and businesses will have enough water. This may be accomplished by enabling the trickle meter on residences to prevent overconsumption, and/or shutting off irrigation and landscaping water meters. The overall effect of this is beneficial to Moore's economy twofold: first, businesses looking to relocate or expand will appreciate the reliability of the water distribution system, particularly businesses that have a strong emphasis on potable water. Second, residential customers will benefit from the same increased reliability that may translate into cost savings on homeowners insurance due to increased reliability for fire protection as well as leak detection to avoid catastrophic home damages that are often associated with leaks. The installation of remote controlled smart meters shows a progressive approach to water conservation that will be attractive to both new businesses as well as people, creating economic revitalization for the City of Moore.

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could pass this cost savings along to the consumer by means of a rate decrease, which would provide the citizens of Moore with more discretionary income. The use of additional discretionary income as well as capital improvements to the water system will provide Moore with the economic revitalization that it needs.

Installation of controllable smart meters will lead to economic revitalization for the City of Moore through three elements: water conservation, disaster mitigation and increased revenues. These three factors will make Moore an attractive prospect for potential residents and buyers and ultimately will result in a more efficient, resilient system that will be less impacted by future utility rate increases.

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