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December 19, 2014

Mary Alice Page-Allen
Town of Oak Creek
129 Nancy Crawford Blvd.
PO Box 128
Oak Creek, CO 80467

Re: Town of Oak Creek Water Meters Feasibility Study

Dear Mary Alice:

We are pleased to present you with this report detailing viable options for the implementation of an Automatic Meter Reading (AMR) system and the installation of AMR-compatible water meters within the Town of Oak Creek's water service area. Both mobile and fixed network solutions have been considered. All options have been evaluated with respect to the Town's priorities, anticipated direction, and current constraints. Water meter installations are planned to occur in conjunction with the Town's proposed phased water main replacement project where possible, with the central commercial district (Main Street) encompassing the first phase. Anticipated costs for each phase of the water meter installation project will be included in the capital improvement projections of the Town's 2014 Water Financial Plan, Cost of Service, and Rate Design Study (COS/RDS) being prepared by NMPP Energy.

BACKGROUND

The Town of Oak Creek acts as both a water and electric utility for its nearly 900 residents. Although all electric services are metered, the majority of the 357 residential and 54 commercial water services in Oak Creek are unmetered. (Several water services – approximately 44 residential and 13 commercial – have meters installed. In addition, about 13 meters have been issued to customers but are not yet installed). The Town currently reads its electric meters manually and the service area is fairly small – hence the consideration of a mobile solution for water meter reading. A fixed network system is also desirable for water meter reading for its ease of use, availability of notifications, and access to data.

BENEFITS OF METERING

There are numerous potential benefits of metering to both the Town and its customers. As you discuss the following alternatives and evaluate metered billing versus your current billing structure, please remember that although the benefits of metering are multi-faceted, customer education is essential for the success of any compulsory metering program. While many customers generally perceive fairness with metered billing, a change in billing structure can be disconcerting to some. A shift from flat-rate billing to a base rate plus volumetric pricing would incentivize water conservation and reduction of waste. Customers may have difficulty putting their usage into perspective – quantifying it so to speak – in terms of the new rates. A pilot period during which water usage is reported to residents but still billed at a flat rate might enable customers to understand their usage prior to the change in billing. Also, if they are made aware of the potential for system expansion, residents may appreciate that encouraging water conservation system-wide potentially reduces or delays the need for expensive capital improvement projects due to capacity and storage issues. Benefits to the Town would include the ability to better monitor the water system as a whole for non-revenue water losses, more fairness in billing, and the ability to recover operational and capital improvement costs using a justifiable rate structure as the outcome of the ongoing COS/RDS.

AMR/AMI BASICS

Systems of the size of Oak Creek are considered part of the industry's "submetering" market that is served by some of the data collection networks used by larger utilities along with third-party reading solutions that make these technologies scalable to smaller systems, and/or web-hosted software/server systems. These solutions generally provide for relatively affordable entry into a network and lower overall software maintenance or read costs.

Reading Options

Multiple options exist with respect to reading water meters: manual, touch-read, mobile, fixed network, and hybrid systems. The Town is currently conducting manual reads of the existing meters in place. The next option, touch-read (or walk-up), involves installing a small remote-read module on the outside of each home or meter pit lid, which is read by someone who must approach each meter individually. This requires that the Town provide this service at monthly or quarterly intervals as required for billing purposes. Touch-read is basically an antiquated method but provides a meter-reading option with a smaller initial investment. The third option, mobile (also known as drive-by), uses remote-read modules at each residence to transmit data using radio frequency (RF). The signal can be read by someone driving in the vicinity – many signals are read simultaneously. This option requires an investment in mobile reading equipment and the reading software may be either PC-based or hosted, depending upon the manufacturer. There are generally annual software support charges and optional equipment support charges (insurance) for these types of systems, but no charges to acquire readings. Fixed networks, also generally called Advanced Metering Infrastructure (AMI), utilize either RF technology or cellular signals to transmit data to a network or hosted system/server. Those using RF require data collection units (DCUs) or gateways that receive signals from individual meters or

endpoints and in turn transmit these to the network. This can be accomplished using either a licensed or unlicensed frequency. Readings for a system of this size using RF and a network are generally obtained using a third-party service. Systems using cellular to transmit data do not require data collectors; the endpoints themselves 'talk' to a network utilizing a cellular data channel (different than a cell phone signal) where channels from multiple carriers are queried prior to each transmission and the strongest one is used. Both fixed network options described in this report utilize hosted (web-based) software and a remote server. Fixed network systems, in addition to the up-front investment, require a monthly service charge – usually per meter per month – in order to obtain readings and other data. These charges vary greatly by system. Lastly, a hybrid system using radio frequency can be constructed utilizing a combination of mobile and fixed network reading technologies. Some hybrid systems are migratable to full fixed network and are appropriate for a utility that wishes to move to a fixed network in phases or over time.

Typical AMR/AMI Costs

Equipment and other up-front costs:

- Meters (per above quantities), including encoders or appropriate register for AMR (alternate meter options may be presented)
- Meter transmission units (MTUs), if applicable (not required for "under the glass" meters)
- Data collection units (DCUs), antennae, power to DCU (electric or solar) if applicable
- Programming, if applicable
- Radiofrequency (RF) license, if applicable
- Mobile receiver, if applicable
- Handheld, PC, tablet, and/or other device as required for readings or investigations
- Server (required for fixed network that is not hosted)
- Set-up fee
- Initial software costs (usually included in set-up fee)
- Training and start-up costs
- Other required equipment

Typical operating costs:

- AMR monthly fee (generally per meter per read)
- Cellular data plan, phone service, or other monthly fee, as applicable
- Power
- Required software support contract
- Optional equipment maintenance contract (insurance)
- Potential repairs to mobile equipment (if insurance is not purchased)

EXISTING INFRASTRUCTURE

We understand that most of the existing meters that have been either issued or installed are the Sensus SRII model but that there are potentially some Sensus SRIs and iPERLs as well. The ages of these vary. There is the potential for registers on the SRII models to be replaced with new registers compatible with some reading systems; however,

depending upon the meter's age, this may or may not be feasible. The SRI and iPERL meters have built-in registers that are not replaceable. Where installed, existing meters are inside the structure. The Town does not currently own any touch read or mobile reading equipment.

PREFERENCES AND SYSTEM REQUIREMENTS

The Oak Creek Public Works Department (Department) wishes to see each new meter installation in a meter pit at the property line, due mainly to accessibility reasons. Meter pits will be located in a landscaped area where possible; those in driveways or commercial areas will utilize a traffic-rated cover. Frost lids will be utilized on the meter pits due to cold temperatures. It is assumed that all meters can transmit a mobile signal using the appropriate lid (with AMR plug, etc.) on the meter pits. For a fixed network system, however, it is advisable to utilize a "through-the-lid" adapter, external flush-mount antenna, or other equipment in combination with a recessed lid that will enable full signal strength. Only data collection systems fully compatible with meter pits without the use of an external post for a transmitting device were considered as part of this study. The Department has a preference for legacy-material (metal) meters but will also consider composite meters. As part of this study, the compatibility of all existing meters with any proposed reading system and the need for register/encoder upgrades will be researched. We understand that existing meters may be replaced as part of this project, depending upon funding availability.

The Town is utilizing Caselle Clarity software for utility billing. We understand that all reading systems presented herein are capable of exporting in a format compatible with this software; this should be confirmed when a system is chosen. We understand that the Department would fully utilize the utility-level notifications such as tamper-detection, leak-detection, and reverse flow offered by fixed network systems. Although the Town may not provide customer access to data when the transition is first made to metered services, this service may be provided in the future.

For the purposes of requesting quotes, the following meter inventory was utilized based upon information provided by the Department's director, Tom Holliday:

	Quantity	Size
Residential	357	¾"
Commercial	40	¾"
	4	1"
	2	1 ½"
	6	2"
	1	8"

ANALYSIS

Considerations have been given to the following:

- service area layout and topography

- existing infrastructure, including service line deficiencies and meter location constraints
- the desire of the Department to have a physical shut-off at the property line
- phasing requirements/possibilities, including the possibility of migration from mobile to fixed
- initial and ongoing costs
- data collection and billing efficiencies, including integration with the Town's billing software
- ability to detect tampering, leaks, and reverse flow
- potential to set utility and/or customer alarms and notifications
- level of technology and the potential for future upgrades
- system dependability
- vendor support

Automatic Meter Reading options for the water system have been evaluated independently of electric utility requirements, however, AMR systems capable of reading both water and electric meters have been investigated since the possibility exists for reading the 542 residential and 76 commercial electric meters with the same system. Both Master Meter and Itron currently offer mobile systems that can read both electric and water meters provided the electric meters are replaced at some point as well.

The potential for migratability from a mobile system to fixed network and for use of a hybrid reading system (mobile and fixed network) were also considered in this evaluation. Reference Table 1 for information on the upgradability of various mobile systems. It should be noted, however, that some migration options complicate the overall system to the point where it may not be advisable. A utility with as few customers and as small a service area as Oak Creek will most likely benefit from choosing the preferred system initially, as the option to migrate becomes a more cost-effective tool for larger utilities with a sizable customer base and infrastructure of various technologies in place that may make a one-time transition to a fixed network cost-prohibitive. Regarding a hybrid system, it again appears that the Town of Oak Creek may have no foreseeable reason to move in this direction as this will be the Town's first investment in AMR equipment. However, depending upon the timing of funding and infrastructure construction, this option should be maintained for flexibility in a range of approaches to phasing – from an entirely mobile system to a full fixed network.

Quotes were solicited from three manufacturer representatives, each of whom offers numerous meter and reading options. Costs, along with a summary of system features, and advantages and disadvantages are included in Table 1.

Table 1
TOWN OF OAK CREEK – SUMMARY OF METERING AND READING OPTIONS

Regional Representative	**Mountain States Pipe and Supply**			**Neptune Technology Group**		**National Meter and Automation, Inc.**	
AMR System Type	**Mobile**	**Mobile**	**Fixed Network**	**Mobile**	**Fixed Network**	**Mobile**	**Fixed Network**
AMR Manufacturer / Network	**Master Meter Mobile Bundle**	**Itron Mobile Bundle**	**Aclara Network**	**N_SIGHT R900 System**	**N_SIGHT R900 System**	**Itron Mobile Bundle**	**Orion AMI / Beacon AMA**
AMR technology	**RF** – unlicensed frequency 900 mHz	**RF** – unlicensed frequency 900 mHz	**RF – licensed frequency** 450 mHz	**RF** – unlicensed frequency 900 mHz	**RF** – unlicensed frequency 900 mHz	**RF** – unlicensed frequency 900 mHz	**Cellular Data Channel**
AMR configuration	Integrated meter / transmitter uses RF to send data to mobile AMR unit (PC-based)	Meter uses Itron 100W+ communication module for meter pits and 100-R+ communication module for remote applications and RF (50 channels) to send data to Itron mobile AMR unit (PC-based)	Meter uses MTU/RF to send data to DCU, which uses cellular to send data to Aclara Network	Integrated meter / transmitter uses RF to send data to R900 mobile AMR unit	Integrated meter / transmitter uses RF to send data to gateways, which use Ethernet or cellular to send data to R900 Network	Meter uses Itron 100W+ communication module for meter pits and 100-R+ communication module for remote applications and RF (50 channels) to send data to Itron mobile AMR unit (PC-based)	Endpoints capture readings and meter status from the encoder and broadcast data over secure cellular data channels to a remote server
Reading Method / Software	**MasterLinx** software suite	**MVRS** reading software	**Pathway Reads** (3rd party)	**N_SIGHT R900** software	**N_SIGHT R900** software	**MVRS** reading software	**Beacon AMA** (Advanced Metering Analytics) software **EyeOnWater** for consumers
Meter Manufacturer	**Master Meter**			**Neptune Meter**		**Badger Meter**	
Meter Model No. & Type	**Multi Jet with Under-the-Glass 3G** (direct magnetic drive linkage – no intermediate gearing exposed to water) (all sizes except 8”); 8” Octave Ultra Sonic with 3G XTR	**Multi Jet** with Acculinx Register (direct magnetic drive provides linkage between measurement element and register – no intermediate gearing exposed to water) (all sizes except 8”); 8” Octave	**Multi Jet** with Acculinx Register (direct magnetic drive provides linkage between measurement element and register – no intermediate gearing exposed to water) (all sizes except 8”); 8” Octave	**T-10 E-Coder** R900i (all sizes except 8”) with option for 2” Tru/Flo Compound meter; 8” HP Turbine E-Coder R900i	**T-10 E-Coder** R900i (all sizes except 8”) with option for 2” Tru/Flo Compound meter; 8” HP Turbine E-Coder R900i	**Badger** M25, M35, M55, M120, M170 (disk, direct magnetic drive for sizes up to 2”); T3500 (turbine, magnetic drive coupling for 8”); all with HR-LCD Encoder Register	**Badger** M25, M35, M55, M120, M170 (positive displacement – disk and direct magnetic drive for sizes up to 2”); T3500 (turbine, magnetic drive coupling for 8”); all with HR-LCD Encoder Register
Utility Level Notifications & Datalogging	✓ Revenue impact alerts (with any reading) ✓ Reverse / backflow ✓ Zero-consumption ✓ Leak detection ✓ Tamper detection ✓ Water theft ✓ Meter malfunction ✓ Leak management zones ✓ System-wide synchronized reads ✓ Water balancing capabilities Datalogging interval is user-defined. Stores up to 4,000 datalogged points or **167 days of hourly reads**	✓ Revenue impact alerts (with any reading) ✓ Reverse / backflow ✓ Zero-consmption ✓ Leak detection ✓ Tamper detection ✓ Water theft ✓ Meter malfunction Up to **40 days of hourly datalogging** (water meters only)	✓ Revenue impact alerts (daily) ✓ Reverse / backflow ✓ Zero-consumption ✓ Leak detection ✓ Tamper detection ✓ Water theft ✓ Meter malfunction No alarms, but enhancements to alarm capability may be forthcoming. Currently, the utility needs to login to view notifications. Data is sent from MTU to DCU 2-4 x/day; DCU sends data to network at night; **data is always accessible**	✓ Revenue impact alerts (with any reading) ✓ Reverse / backflow ✓ Zero-consumption ✓ Leak detection ✓ Tamper detection ✓ Water theft ✓ Meter malfunction Up to **96 days of hourly datalogging** (fully retrievable only at meter)	✓ Revenue impact alerts (every 15 min) ✓ Reverse / backflow ✓ Zero-consumption ✓ Leak detection ✓ Tamper detection ✓ Water theft ✓ Meter malfunction Up to **96 days of hourly datalogging**	✓ Revenue impact alerts (with any reading) ✓ Reverse / backflow ✓ Zero-consumption ✓ Leak detection ✓ Tamper detection ✓ Water theft ✓ Meter malfunction Up to **40 days of hourly datalogging** (water meters only)	✓ Revenue impact alerts (with each transmission) ✓ Reverse / backflow ✓ Zero-consumption ✓ Leak detection ✓ Tamper detection ✓ Water theft ✓ Meter malfunction ✓ Fully customizable alarms Hourly readings; up to 120 days of hourly datalogging for redundancy; **data is always accessible**

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Regional Representative	**Mountain States Pipe and Supply**			**Neptune Technology Group**		**National Meter and Automation, Inc.**	
AMR System Type	**Mobile**	**Mobile**	**Fixed Network**	**Mobile**	**Fixed Network**	**Mobile**	**Fixed Network**
AMR Manufacturer / Network	**Master Meter Mobile Bundle**	**Itron Mobile Bundle**	**Aclara Network**	**N_SIGHT R900 System**	**N_SIGHT R900 System**	**Itron Mobile Bundle**	**Orion AMI / Beacon AMA**
Customer Level Information	No customer access to usage information.	No customer access to usage information with MVRS but this would be available with migration to fixed network	No customer access to usage information.	No customer access to usage information.	No customer access to usage information unless the optional Neptune IQ data analytical software (hosted suite) is purchased and maintained each year.	None with MVRS but should the town ever decide to go fixed network, it would be available.	Enhanced customer access to real-time and historic usage information using any smart phone, tablet, or computer.
Upgradability / Migratability	3G Under the Glass is **migratable from mobile to fixed network** (FixedLinx) with the addition of booster modules for each meter. 4G Under the Glass technology should be available spring of 2015 which will also be upgradable to fixed network, possibly without booster modules (4G has more power for transmissions.)	**Migratable from mobile to Itron fixed** (not to Aclara).	n/a	**Fully migratable to fixed network**	n/a	**Migratable from mobile to Itron fixed** (not to Beacon).	n/a
Support for Hybrid System (mobile plus fixed network)	Yes; see upgradability information.	Yes.	No.	Yes.	Yes.	Yes.	No.
Support for Electric Reads	Yes.	Yes.	No.	Possible.	No.	Yes.	No.
ADVANTAGES / DISADVANTAGES							
Advantages	+ **WEB-HOSTED OPTION** Option of PC-based or web-hosted software + **WIRELESS** - Connection-free design; no wires or connection points means less maintenance + **AUTO ACTIVATION** - Plug and play design; register automatically activates after installation (after flow of 50 gal) and begins transmitting data	+ **PC-BASED SOFTWARE** Itron's MV-RS is a PC-based meter reading software designed for water, electric, gas, or a combination + **AUTO ACTIVATION** - Plug and play design; register automatically activates after installation (after 1 hour) and begins transmitting data	+ **WEB-HOSTED** - Cloud-based software	+ **WIRELESS** - Connection-free design; no wires or connection points means less maintenance	+ **WIRELESS** - Connection-free design; no wires or connection points means less maintenance	+ **PC-BASED SOFTWARE** Itron's MV-RS is a PC-based meter reading software designed for water, electric, gas, or a combination + **AUTO ACTIVATION** Plug and play design; register automatically activates after installation (after 1 hour) and begins transmitting data	+ **WEB-HOSTED** Hosted software suite and remote server; automatic software upgrades + **WIRELESS** - Connection-free design; no wires or connection points means less maintenance; utilizes existing cellular infrastructure

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AMR Manufacturer / Network	**Master Meter Mobile Bundle**	**Itron Mobile Bundle**	**Aclara Network**	**N_SIGHT R900 System**	**N_SIGHT R900 System**	**Itron Mobile Bundle**	**Orion AMI / Beacon AMA**
	+ **24/7 MONITORING** - Active sensor technology monitors 24/7 for small leaks, meter tamper, water theft, and zero consumption (from disabled or removed meters) With any read, consumption data and alarms from the monitored period is transmitted to the office using a cell phone or integral cellular card on the mobile unit. + **USER-DEFINED DATALOGGING** 4000 data points maximum, programmable down to 1-minute intervals; customize data query for evidence in billing disputes + **REPORTS** – Default reports are in a user-friendly format; spreadsheet manipulation is generally not required. + **SECURE** – Data is transmitted using over-the-air encryption + **TAMPER-RESISTANT** - No external batteries or antenna to tamper with; meter adjusting port and register are concealed to prevent tampering and removal of the register (high resolution encoder, antenna, and battery are contained within a stainless steel housing)	+ **24/7 MONITORING** - Monitors 24/7 for small leaks, meter tamper, water theft, and zero consumption (from disabled or removed meters/ERTs) With any read, consumption data and alarms from the monitored period are known + **REPORTS** – Reports available; also route management software	+ **24/7 MONITORING** - Monitors 24/7 for small leaks, meter tamper, water theft, and zero consumption (from disabled or removed meters/MTUs); Consumption data and notifications are always available upon login + **REPORTS** Basic service provides daily reading and data storage; enhanced service includes consolidated reports + **SECURE** Data is transmitted over a licensed frequency	+ **24/7 MONITORING** - Monitors 24/7 for small leaks, meter tamper, water theft, and zero consumption (from disabled or removed meters/MIUs) With any read, consumption data and alarms from the monitored period are known + **REPORTS** Standard / customizable management reports; imports and exports route information from billing system + **SECURE** Multi-level security + **TAMPER-RESISTANT** Fully integrated meter and transmitter	+ **24/7 MONITORING** - Monitors 24/7 for small leaks, meter tamper, water theft, and zero consumption (from disabled or removed meters) With any read, consumption data and alarms from the monitored period are known + **REPORTS** Numerous reports: consumptive, historical, conservation, notification, etc. + **TAMPER-RESISTANT** Fully integrated meter and transmitter	+ **24/7 MONITORING** - Monitors 24/7 for small leaks, meter tamper, water theft, and zero consumption (from disabled or removed meters/ERTs) With any read, consumption data and alarms from the monitored period are known + **REPORTS** – Reports available; also route management software	+ **24/7 MONITORING** - Monitors 24/7 for small leaks, meter tamper, water theft, and zero consumption (from disabled or removed meters) Consumption data – real-time and historical and alarms are always accessible on the web-hosted software + **REPORTS** Numerous reports: consumptive, historical, conservation, notification, etc.; configurable as needed; customizable dashboards to view information; ability to set unique alert conditions/alarms; integration with billing and GIS systems

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AMR Manufacturer / Network	**Master Meter Mobile Bundle**	**Itron Mobile Bundle**	**Aclara Network**	**N_SIGHT R900 System**	**N_SIGHT R900 System**	**Itron Mobile Bundle**	**Orion AMI / Beacon AMA**
	+ **BATTERY** 20-year battery life + **UTILITY PRESENCE** Public Works maintains both a presence and "eyes in the field" by utilizing vehicles for reads + **COMPATIBILITY WITH EXISTING WATER METERS** Interpreter registers are available to replace the registers on existing Sensus SRII meters to provide 3G AMR capability to currently-metered residences; makes use of the existing life in installed meter assets where appropriate based upon existing meter age + **POTENTIAL TO TIE-IN ELECTRIC METERS** 3G Mobile can be used with electric meters, would require electric meter replacement; reads for both water and electric could then be accomplished using the same mobile equipment	+ **BATTERY** 20-year battery life. + **UTILITY PRESENCE** Public Works maintains both a presence and "eyes in the field" by utilizing vehicles for reads + **POTENTIAL TO TIE-IN ELECTRIC METERS** Itron Mobile can be used with electric meters, would require electric meter replacement; reads for both water and electric could then be accomplished using the same mobile equipment + **WATER METER COMPATABILITY** – The Itron 100W+ is compatible with water meters from all major manufacturers such as Badger, Elster AMCO, Hersey, Master Meter, Neptune, and Sensus	+ **BATTERY** 20-year battery life	+ **BATTERY** 20-year battery life. + **UTILITY PRESENCE** Public Works maintains both a presence and "eyes in the field" by utilizing vehicles for reads + **POTENTIAL TO TIE-IN ELECTRIC METERS** – Itron Mobile can be used with electric meters, would require electric meter replacement; reads for both water and electric could then be accomplished using the same mobile equipment	+ **BATTERY** Long-life Lithium battery	+ **BATTERY** 20-year battery life. + **UTILITY PRESENCE** – Public Works maintains both a presence and "eyes in the field" by utilizing vehicles for reads + **POTENTIAL TO TIE-IN ELECTRIC METERS** Itron Mobile can be used with electric meters, would require electric meter replacement; reads for both water and electric could then be accomplished using the same mobile equipment + **WATER METER COMPATABILITY** The Itron 100W+ is compatible with water meters from all major manufacturers such as Badger, Elster AMCO, Hersey, Master Meter, Neptune, and Sensus	+ **WATER METER COMPATABILITY** Orion Cellular transmitter is compatible with Badger, Sensus, Elster (not pulse), Hersey, & Nepture. Not sure about Master meter.

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		+ **LEAK SENSOR** Itron 100W+ Leak Sensor units **(additional purchase)** can be utilized by the Town to acoustically monitor the distribution system as/where needed for leaks; Leak Sensor is connected to a 100W ERT module, which transmits information that can be read by the mobile unit; pipe conditions are sampled 64 times daily; the eight quietest analyses are stored daily, with up to 20days stored		+ **LEAK SENSOR** – Leak Sensor units **(additional purchase)** can be utilized by the Town to acoustically monitor the distribution system as/where needed for leaks; Leak Sensor is connected to a R900 MIU, which transmits information that can be read by the mobile unit	+ **LEAK SENSOR** – Leak Sensor units **(additional purchase)** can be utilized by the Town to acoustically monitor the distribution system as/where needed for leaks; Leak Sensor is connected to a R900 MIU, which transmits information that can be read by the mobile unit	+ **LEAK SENSOR** Itron 100W+ Leak Sensor units **(additional purchase)** can be utilized by the Town to acoustically monitor the distribution system as/where needed for leaks; Leak Sensor is connected to a 100W ERT module, which transmits information that can be read by the mobile unit; pipe conditions are sampled 64 times daily; the eight quietest analyses are stored daily, with up to 20days stored	+ **LEAK SENSOR** CellularLeak sensor and other features such as remote shut off will be added in future releases of the product. + **FULL CUSTOMER ACCESS TO DATA** Full, detailed customer access to data (with provided login information from the utility) via any connected device (smartphone, tablet, or computer); includes water conservation suggestions based upon usage history, etc.

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AMR Manufacturer / Network	**Master Meter Mobile Bundle**	**Itron Mobile Bundle**	**Aclara Network**	**N_SIGHT R900 System**	**N_SIGHT R900 System**	**Itron Mobile Bundle**	**Orion AMI / Beacon AMA**
Disadvantages		– **WIRED AT METER** Wired connection from meter to communication module – **DATALOGGING IS NOT USER-DEFINED** Four basic use cases for data are available: ▪ Reading from any hour within the last 40 days ▪ Set of 24 consecutive hourly readings ▪ Set of 40 daily readings ▪ Set of 40 days of hourly interval data – **REPORTS** Default reports generally require spreadsheet manipulation	– **WIRED AT METER** Wired connection from meter to communication module. – **MONTHLY READ CHARGES** Ongoing monthly read costs as per meter charges – **NO POTENTIAL TO TIE-IN ELECTRIC METERS** Even with replacement, electric meters could not be tied into this system – **LIMITED ALARM CAPABILITY** When used in conjunction with Pathway Reads, Aclara currently has limited alarms and notifications for the utility although enhancements are proposed	– **LIMITED POTENTIAL TO TIE-IN ELECTRIC METERS** With replacement, electric meters could not be tied into this system but they would have to give bubble up reads through an ERT; this would basically require an Itron system for electric and the Neptune system for water, but both water and electric could possibly be read by the Ranger 3 mobile equipment		– **WIRED AT METER** Wired connection from meter to communication module – **DATALOGGING IS NOT USER-DEFINED** Four basic use cases for data are available: ▪ Reading from any hour within the last 40 days ▪ Set of 24 consecutive hourly readings ▪ Set of 40 daily readings ▪ Set of 40 days of hourly interval data – **REPORTS** Default reports generally require spreadsheet manipulation	– **MONTHLY READ CHARGES** Ongoing monthly read costs as per meter charges – **NO POTENTIAL TO TIE-IN ELECTRIC METERS** Even with replacement, electric meters could not be tied into this system

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AMR Manufacturer / Network	**Master Meter Mobile Bundle**	**Itron Mobile Bundle**	**Aclara Network**	**N_SIGHT R900 System**	**N_SIGHT R900 System**	**Itron Mobile Bundle**	**Orion AMI / Beacon AMA**
	– **UPGRADABILITY** Migration to fixed network can be accomplished with 3G with booster modules or possibly with the upcoming 4G product without booster modules, but this is not as clean as starting with a fixed system in terms of equipment and maintenance – **NO CUSTOMER ACCESS TO DATA** 3G Mobile solution does not provide customer access to data	– **SECURITY ADD-ONS REQUIRED** Itron Security Manager (ISM) required for enhanced security functions including those that enable transmissions using authentification of commands and encryption of data – **NO CUSTOMER ACCESS TO DATA** this mobile solution does not provide customer access to data	– **NO CUSTOMER ACCESS TO DATA** 3G Mobile solution does not provide customer access to data	– **NO CUSTOMER ACCESS TO DATA** this mobile solution does not provide customer access to data	– **SERVER REQUIRED** Requires server for all data. – **CUSTOMER ACCESS TO DATA REQUIRES A SIGNIFICANT UP-FRONT INVESTMENT** initial costs for the hosted web presentment software for this capability are high	– **SECURITY ADD-ONS REQUIRED** Itron Security Manager (ISM) required for enhanced security functions including those that enable transmissions using authentification of commands and encryption of data – **NO CUSTOMER ACCESS TO DATA** this mobile solution does not provide customer access to data	

Table 1
TOWN OF OAK CREEK – SUMMARY OF METERING AND READING OPTIONS

Regional Representative	**Mountain States Pipe and Supply**			**Neptune Technology Group**		**National Meter and Automation, Inc.**	
AMR System Type	**Mobile**	**Mobile**	**Fixed Network**	**Mobile**	**Fixed Network**	**Mobile**	**Fixed Network**
AMR Manufacturer / Network	**Master Meter Mobile Bundle**	**Itron Mobile Bundle**	**Aclara Network**	**N_SIGHT R900 System**	**N_SIGHT R900 System**	**Itron Mobile Bundle**	**Orion AMI / Beacon AMA**
INITIAL COSTS							
AMR Equipment - FIXED (includes DCU's/ gateways, set-up fees, programming, etc.)	n/a	n/a	$ 27,386	n/a	$ 27,339	n/a	$ 8,500
AMR Equipment – MOBILE (includes handheld and misc. equipment)	$ 21,500	$ 16,250	n/a	$ 24,822	n/a	$ 18,150	n/a
PC (required for mobile options)	included in AMR equipment	$ 1,000	n/a	$ 1,000	(estimated server cost) $ 5,000	$ 1,000	n/a
Meters (priced for pit set; adjustment necessary for inside set)	$ 91,493	$ 70,207	$ 73,933	$ 117,016	$ 117,016	$ 66,249	$ 61, 329
Endpoints (where not integrated with meter encoder register)	*integrated*	ERT modules (includes thru-the-lid pit adapters) $ 32,963	MTUs (pit mount) $ 49,200	*integrated*	*integrated*	ERT modules (thru-the-lid pit adapters not included) $ 36,924*	Cellular Endpoints $ 42,340
TOTAL INITIAL COST	**$ 112,993**	**$ 120,420**	**$ 150,519**	**$ 142,838**	**$ 149,355**	**$ 122,323**	**$ 112,169**
					(additional optional cost for hosted software for customer access – initial plus 1st year) **$ 35,000**		
ANNUAL COSTS							
Software Support	$ 1,500 /yr	$ 840 /yr	n/a	$ 850 /yr	$ 850 /yr	$ 840 /yr	n/a
Equipment Maintenance (optional - insurance)	$ 1,700 /yr	$ 1,050 /yr	n/a	$ 1,562 /yr	n/a	$ 1,050 /yr	n/a
Read Costs	n/a	n/a	$ 2,460 /yr ($ 0.50/meter/month)	n/a	n/a	n/a	$ 4,380 /yr ($ 0.89/meter/month)
Cellular Data Plan/Phone/Internet (assume $ 40/mo)	n/a	n/a	$ 480 /yr	n/a	$ 480 /yr	n/a	$ 480 /yr
Power (assume $100/DCU/yr))	n/a	n/a	$ 200 /yr	n/a	$ 200 /yr	n/a	n/a
Vehicle Costs (assumed)	$ 1,000 /yr	$ 1,000 /yr	n/a	$ 1,000 /yr	n/a	$ 1,000 /yr	n/a
TOTAL ANNUAL COST (range with optional equipment maintenance purchase)	**$ 2,500 - $4,200 /yr**	**$ 1,840 - $ 2,890 /yr**	**$ 3,140 /yr**	**$ 1,850 - $ 3,412 /yr**	**$ 1,530 /yr**	**$ 1,840 - $ 2,890 /yr**	**$ 4,860 /yr**
					(additional annual cost for hosted software for customer access – starting 2nd year) **$ 3,500 /yr**		

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INSTALLATION							
Meter Pits (high end number – assumes all meters in pits – can be reduced with installations in structures where possible)	$ 900,000	$ 900,000	$ 900,000	$ 900,000	$ 900,000	$ 900,000	$ 900,000
Meter Pits & In-Structure Installations (assumes most meters can be installed in heated, interior space – assumes 25% of residential meters - approx. 90 meters - installed in pits)	$ 450,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000
TOTAL INSTALLATION COST	**$ 450,000 - $ 900,000**	**$ 450,000 - $ 900,000**	**$ 450,000 - $ 900,000**	**$ 450,000 - $ 900,000**	**$ 450,000 - $ 900,000**	**$ 450,000 - $ 900,000**	**$ 450,000 - $ 900,000**

COST OF SERVICE/RATE DESIGN STUDY

We understand that the Town of Oak Creek is still working with NMPP Energy on the COS/RDS and is proceeding with the rate design portion of this work. The ultimate goal of this study is to design rates that will adequately recover costs to obtain, treat, store, and distribute treated drinking water and meet fire flow demands while appropriately charging customers for their specific usage characteristics. NMPP Energy's report should assist the Town in moving from non-metered fixed-fee billing to volumetric rate billing. The cost of service analysis should generate a cash flow projection, identify class-specific costs to be recovered through rates, and estimate rate increases for the near future. Rate design is generally based upon three things: the revenue the Town needs to generate as a water utility, the volume of water the Town expects to sell, and the number and sizes of meters. A discussion is also necessary on how to allocate costs to specific utility functions; for example, fixed/capacity-related costs versus volume-related costs. Volume projections are extremely important in determining potential revenue since an over-projection can lead to an under-collection of revenue. We realize that the Town has limited historical data on metered services but does have information on treated water volumes. CDC can assist the Town of Oak Creek in providing projected water treatment volumes or other data to NMPP as required for completion of its analysis.

RECOMMENDATIONS

Based upon the above information and analyses, this report should be finalized following discussions with the Town Board and direction for proceeding with the conclusions herein for:

- Development of a phased approach for procuring a hybrid Automated Meter Reading (AMR) system utilizing a combination of mobile and fixed network reading technologies, for migrating to a full fixed network (AMI) over time.
- Establishment of policies for installation of meters in below-grade vaults (pits), or in structures at the Town's discretion.
- Completion of a customer-by-customer site assessment of individual requirements and constraints for design of the meter installations.
- Acquisition of funding, including upcoming potential grants from the Energy and Mineral Impact Assistance Fund and the Community Development Block Grant programs, for design, procurement and installation of the meters in conjunction with the Town's phased water main replacement project.
- Review of specific manufacturer options for metering and reading to be incorporated into design of the meter installations.
- Coordination of Water Meters Feasibility Study with Rate Design Study for adequately recovering costs of service through metered uses.

We are available to research potential metering solutions further pending direction from the Oak Creek Town Board. In the meantime, please feel free to contact us with any questions you might have regarding the various options and recommendations outlined above.

Sincerely,
CIVIL DESIGN CONSULTANTS, INC.

Randy W. Sackett, P.E.

Tammy Lake, P.E.

cc: Tom Holliday, Public Works Director