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Ms. Amy Zimmerman, P.E.
Engineering Section
Water Quality Control Division
4300 Cherry Creek Drive South
Denver, CO 80246-1530

October 29, 2014

RE: Arabian Acres Metropolitan District
Distribution System Improvement Project Preliminary Engineering Report

Dear Ms. Zimmerman,

The Arabian Acres Metropolitan District, located in unincorporated Teller County, Colorado, is submitting the attached Preliminary Engineering Report to the Colorado Department of Public Health and Environment for improvements to its distribution system. The existing system is in unsatisfactory condition and improvements are required to reduce water loss and improve water consumption accountability. The District proposes to implement the five following items:

- Item #1: Replace and upgrade existing distribution piping and valves.
- Item #2: Installation of flow measurement devices and isolation valves at each tap.
- Item #3: Install flow measurement devices at each well.
- Item #4: Drill new groundwater supply well.
- Item #5: Upgrade telemetry system.

Attached are one hard copy and one electronic copy of the Preliminary Engineering Report for your review. Please feel free to contact me at (303) 477-5915 with any questions.

Sincerely,
AQUAWORKS DBO, INC.

Adam Sommers, P.E., AICP

cc. Richard Markovich, CDPHE – Grants & Loans Unit
Arabian Acres Metropolitan District
Attachment

Preliminary Engineering Report

Distribution System Improvement Project

October 2014

AquaWorks DBO, Inc.
3252 Williams Street
Denver, CO 80205
(303) 477-5915

Arabian Acres Metropolitan District
141 Union Blvd #150
Lakewood, CO 80228

Unincorporated Teller County, Colorado
PWSID# CO 0160075

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ABBREVIATIONS

(Not all may be included in this report)

ADD	average daily demand
AMR	automatic meter reading
AWDBO	AquaWorks DBO, Inc.
AWWA	American Water Works Association
CDPHE	Colorado Department of Public Health and Environment
cf	cubic feet
CPDWR	Colorado Primary Drinking Water Regulations
cy	cubic yards
EPA	Environmental Protection Agency
ft	feet
gpd	gallons per day
gpm	gallons per minute
GWUDI	groundwater under direct influence (of surface water)
LS	lump sum
MCL	maximum contaminate level
MG	million gallons
MGD	million gallons per day
mg/L	milligrams per liter
min	minutes
N/A	not applicable
NaOCl	sodium hypochlorite
NS	not sampled
NSF 61	National Sanitary Foundation Standard 61
O&M	operation and maintenance
PER	Preliminary Engineering Report
ppm	parts per million
RTU	remote telemetry unit
SRF	state revolving fund
TDS	total dissolved solids
TSS	total suspended solids
WTP	Water Treatment Plant
WQCD	Water Quality Control Division

1. EXECUTIVE SUMMARY

The Arabian Acres Metropolitan District (District) provides potable water service to Arabian Acres subdivision and Trout Haven Estates Filings 1, 3, 4, and portions of Filing 2. The District currently serves 140 residential and 5 commercial taps with a population of approximately 392 people.

The District has faced considerable challenges over the past few years. These challenges include providing reliable service with the approximately 38 year old, poorly maintained distribution system that leaks considerably and lacks adequate flow measurement for production and consumption. Additionally, the District is in unsatisfactory financial condition due to the high cost to purchase water hauled from offsite to make up for the water loss. The intent of this PER is to begin planning improvements to the distribution system that will decrease distribution water loss, measure water production, and improve water consumption accountability. This PER will be the first step to apply for several grants and loans.

This document recommends implementation of the following improvements:

- Item #1: Replace and upgrade existing distribution piping and valves.
- Item #2: Installation of AMR flow measurement devices at each tap.
- Item #3: Install meter pits and flow measurement devices at each well.
- Item #4: Drill new groundwater supply well(s).
- Item #5: Upgrade telemetry system for better water storage volume reporting.

The improvements will allow the District to provide reliable, long-term potable water service to the users. Until the District can lower water loss to an industry acceptable level, it will continue to spend a considerable percentage of its revenue hauling water and responding to leaks and line breaks.

The conceptual engineer's opinion of probable costs for this project is $1,000,000. This opinion of cost includes replacing and upgrading 10% of the distribution system for Item #1 and Item #2 to Item #5 from the list of improvements. This balances financial limitations with the most cost effective alternatives. Improvements can be completed approximately 12 months from the time funding is available.

2. PLANNING CONDITIONS

2.1 PLANNING AREA

2.1.1 OVERVIEW

The Arabian Acres Metro District currently services most of Arabian Acres (229 lots) and some of Trout Haven Estates (169 lots). Not all lots are developed and have a tap from the District. This includes 140 residential taps and five commercial taps over a service area of approximately 0.85 square miles. It is anticipated that the boundaries of the current service area will remain unchanged for the next 20 years. Growth within the service area over that time is anticipated to be minimal. The District has seen stagnant growth over the past few years. The full development of the total 398 lots is not probable because many homes are located on more than one lot.

Consumers in the District are predominantly single-family residences. Due to limited availability of water, the potential for water service outages, and the high cost for the District to haul water, the residents have become very efficient water users.

There are six commercial taps that serve the Lost Dutchman Resort & Event Center that has commercial operations between Memorial Day and Labor Day. The District estimates that 7% of its total water use is from the commercial taps.

The water quality is generally good and the District has not had any recent water quality compliance issues with the CDPHE.

The project is located in unicorporated Teller County. The nearest incorporated town, Woodland Park, is approximatly 11 miles away. The center of the District is located at 38° 55′ 04″N, 105° 13′ 37″W.

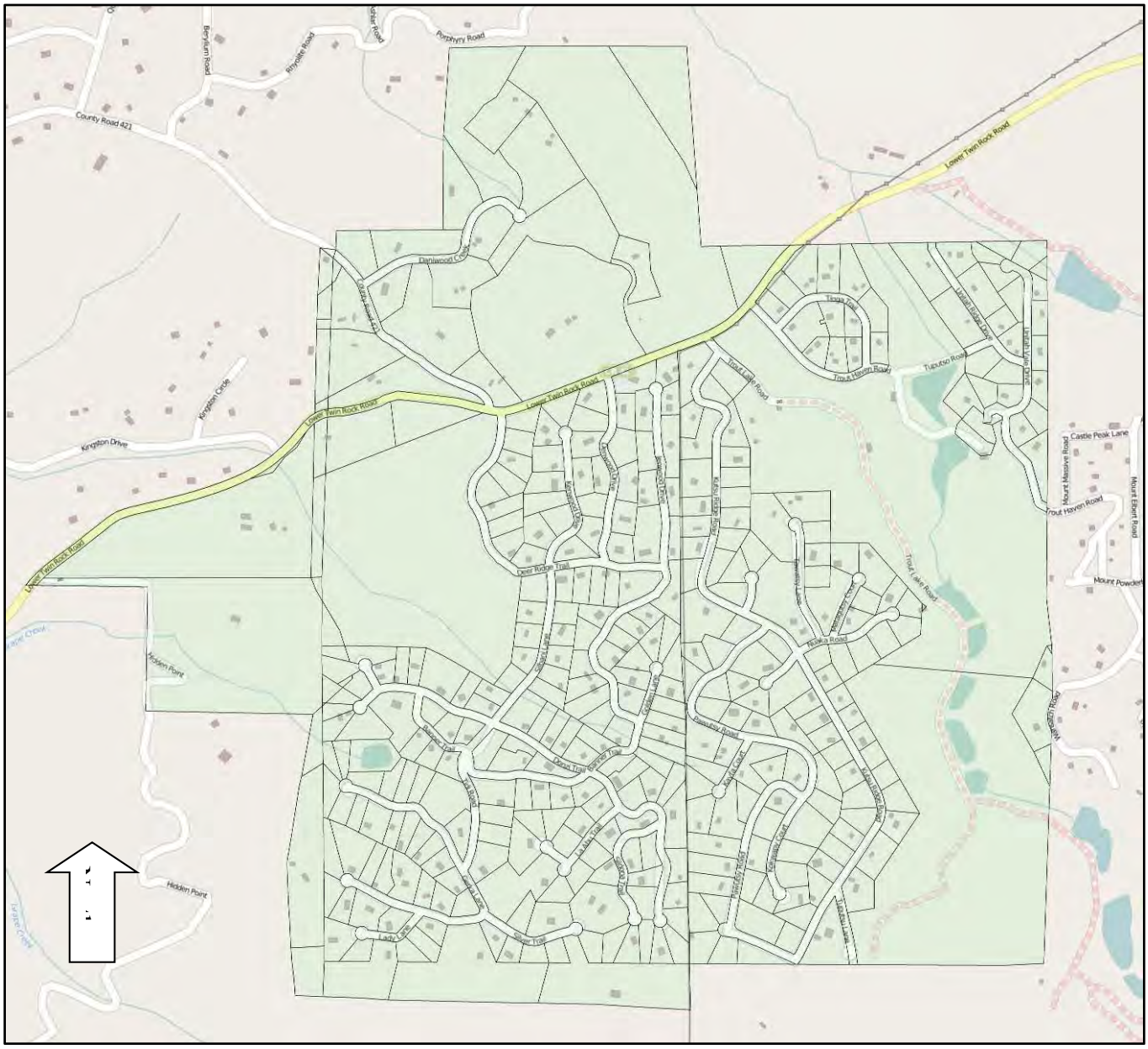
The District hired an engineering consultant who completed a PER in 2011 which investigated the problems with the distribution system and recommend improvements to fix the deficiencies. The District was satisfied with the findings of the report, but desired additional information and updated costs so it hired AquaWorks to provide incremental recommendations. AquaWorks DBO used the PER as the basis of this report and added the additional information as required.

The following is a vicinity map showing the location of the District with respect to other municipal areas.

Figure 1: Vicinity Map

The following map shows the planning area and the lots served.

Figure 2: Planning Area Map



2.1.2 CLIMATE & GEOGRAPHY

The climate in the area is typical for the mountainous areas of Colorado. The prolonged duration of extreme cold temperatures experienced during the winter months require special consideration when designing infrastructure including adequate bury depths for underground pipes to prevent freezing. Elevations in the District area vary from approximately 8,800 to 9,200 feet ASL. There

are a series of hydraulically connected lakes located on the east side of the District. The District's service area does not contain any mapped FEMA 100-year floodplains.

Figure 3: USGS Topo

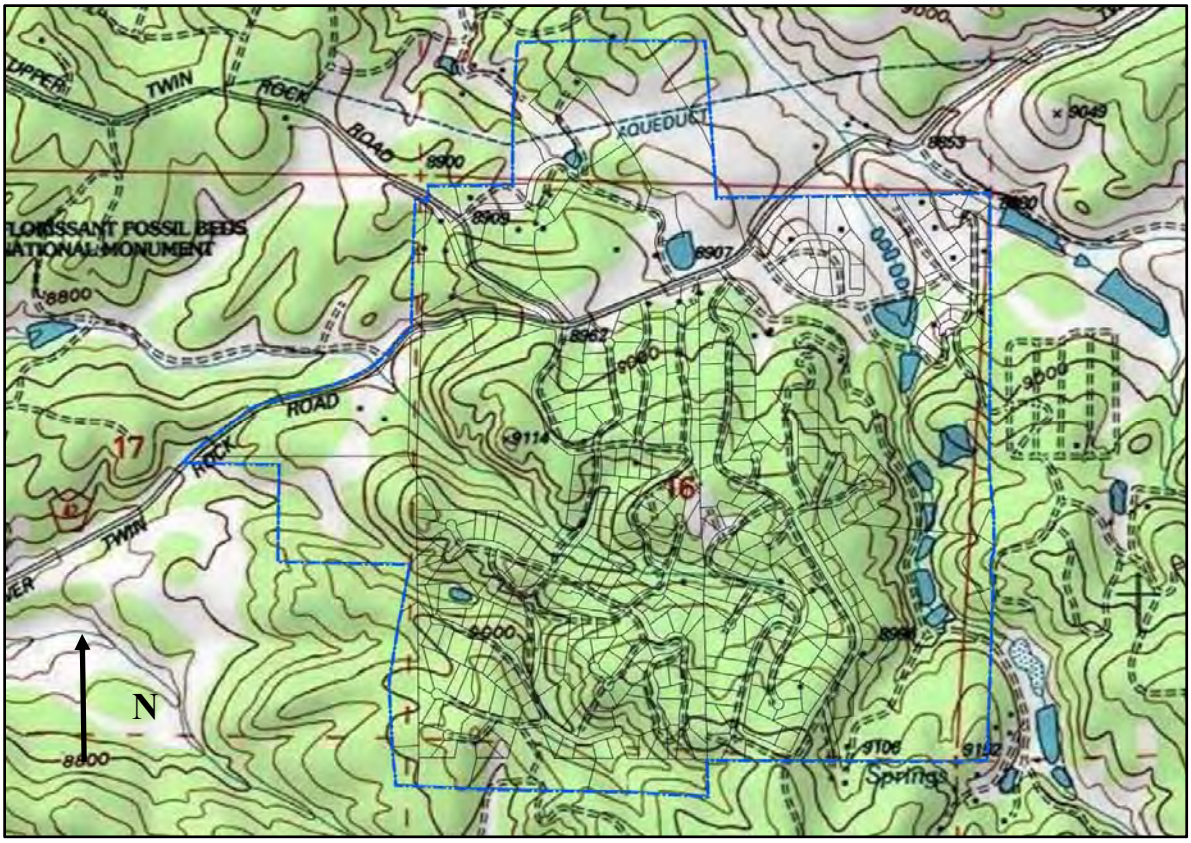
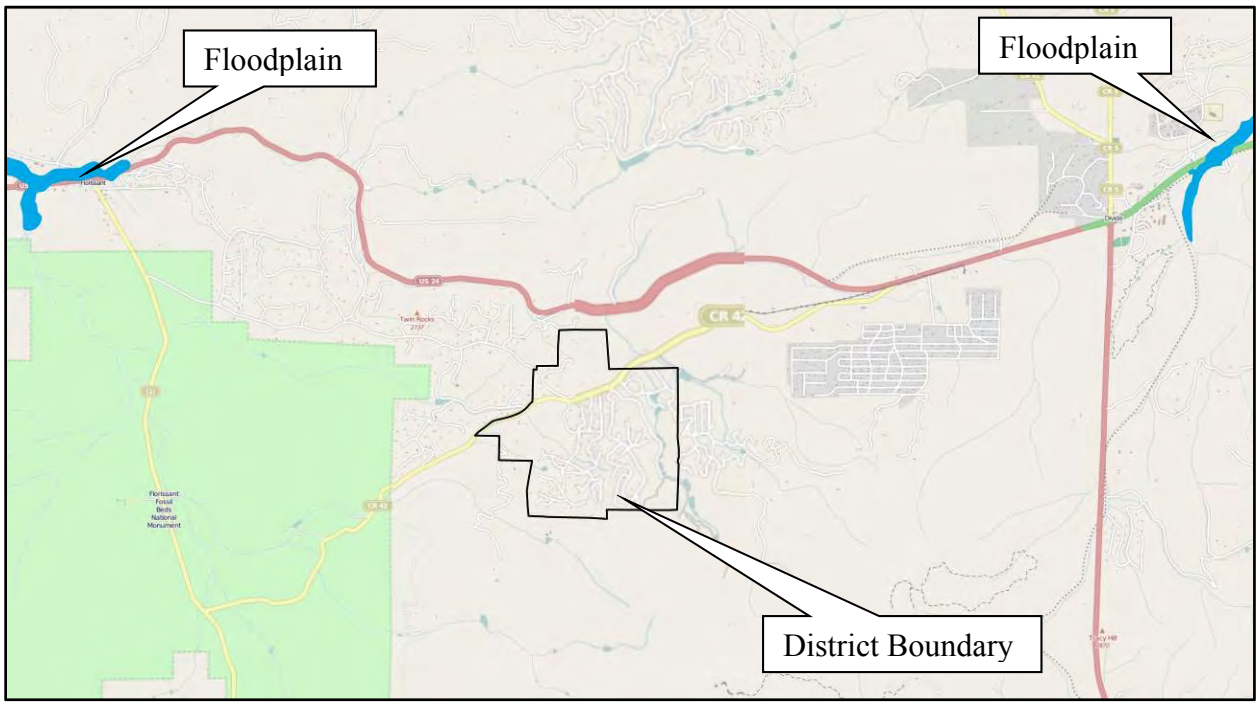


Figure 4: Floodplain Map



2.2 LOCAL AND REGIONAL GOVERNMENT COORDINATION

This project does not call for any new treatment facilities or increases to capacities of existing facilities. As such, consultation with local and regional governmental agencies such as Teller County or Pikes Peak Area Council of Governments will not be required for this project.

2.3 GROWTH AREAS AND POPULATION TRENDS

The District currently has 145 active taps (140 residential and 5 commercial). Applying a standard rate of 2.7 people per tap yields 392 people equivalents within the District. This appears to be a realistic estimate based upon general observations by the District's manager.

The total number of buildable lots within the District is 389 (229 for Arabian Acres Subdivision and 169 for Trout Haven Estates). Build out of the full 389 lots is not realistic because many of the homes are on more than one lot. The District anticipates there could be about 196 homes in Arabian Acres and 108 for Trout Haven Estates for a total of 304 homes.

Table 1: Population Growth Estimate

	Taps:	Persons Per Tap:	Estimated Population:
Current	145	2.7	392 persons
Potential Build-Out	304	2.7	820 persons

While the ultimate build out of the District could be as large as 304 taps, reaching that size within the 20-year planning period is unlikely. There has been stagnant growth within the District for the past few years and there is no indication of upcoming projects that would add significant growth. It is probable that a small number of homes would be connected to the system each year.

2.4 WATER PRODUCTION QUANTITY

Water produced by the District for the years of 2006-2010 was very steady. The District permits only indoor water use with the exception of limited watering for livestock. There is currently no livestock in the District. The seasonal increases that other water providers may experience in summer months from outdoor irrigation uses does not occur for this District.

Table 2: Historical Usage (2006-2010)

Year	Residential (140 Taps)	Commercial (5 Taps) based on avg use=7% of total	Total Gallons
2006	4,594,107	345,793	4,939,900
2007	4,452,468	335,132	4,787,600
2008	4,575,042	344,358	4,919,400
2009	4,241,265	319,235	4,560,500
2010	4,331,010	325,990	4,657,000

Water production data for 2011- May 2014 was provided to AquaWorks DBO for this report. While flow data for every month is not available, there is enough monthly data to draw complete conclusions about water generation during that time. For most months, water production ranges from the high 300,000 gallons per month and up to the mid 500,000 thousand gallons per month. There are a number of months where the flow rate exceeds 600,000 gallons per month.

The water production rates provided for 2011- May 2014 allow the District to draw two conclusions. The average water produced each month is generally growing over time. The service area has not had any significant population growth so it is reasoned that the increased production rate is to compensate for the increase in the system's minor leaks. This could be from the minor leaks getting bigger or an increase in their numbers. The isolated months where water production exceeds 700,000 gallons per month shows that there are major leaks that occur and are repaired. Due to the atypical amount of water loss, water production rate alone is not a reliable indicator of water demand. Therefore, the District must aggregate two methods to estimate current and future demand.

2.4.1 PROJECTED DEMANDS

Projected consumption demands are calculated based on removing water loss from consideration because the recommended alternatives, once implemented, will result in lower water losses. The following calculations estimate future water demands on a daily and hourly basis. Both empirical and theoretical rates were evaluated. The theoretical rates were used to estimate peak flows as they are more conservative.

Table 3: Existing and Projected Demands

Item:	Current:	Projected:	Notes:
Taps	145	304	
People	392	820	
Historic Production (GPD)	13,000		Based on Water Production (2006-2010)
Historic Use Per Person (GPD)	33		Historic Production / People
Estimated Use Per Person (GPD)	50	50	Estimated for Type of Homes within District
Estimated District Demand (GPD)	19,600	41,000	Use for Basis of Design (More Conservative Than Historic Records)
Peak Daily Flow (GPD)	29,400	61,500	Daily Demand X 1.5 Peaking Factor
Average Hourly Flow (GPM)	11	23	Daily Demand / 24 Hours / 60 Minutes
Peak Hourly Flow (GPM)	27	57	Average Hourly Flow x 2.5 Peaking Factor

3. DESCRIPTION OF EXISTING FACILITIES

3.1 SERVICE AREA FEATURES

Principal distribution system components are shown on the attached Distribution System Map included in the Appendix. Elements shown include two water treatment plants (Control Buildings A and B), a 38,200 gallon water storage/disinfection tank, 9 wells, and distribution lines. Air relief valves, isolation valves, and blow off hydrants are also part of the distribution system but are not shown on the attached Distribution System Map.

3.2 FACILITIES LAYOUT AND DESCRIPTION

3.2.1 RAW WATER QUANTITY

There are currently nine wells installed in the District. Water from the wells is treated in two locations. Control Building A treats Wells 1, 2, 6, 7, and 8. Control Building B treats Wells 3, 4, 5, and 9. Control Building A feeds a 38,200 gallon disinfection/water storage tank with a 2 inch line. Control Building B discharges to a 12 inch PVC pipe loop approximately 90 feet long prior to the distribution system entry point. One of the recommended alternatives includes adding SCADA capabilities to improve the well call-to-run signal timing.

Table 4: Well Summary

Well #	Well Depth (Feet)	Control Building	Initial Rating (GPM)	Approx. Current Yield (GPM)
1 (Permit# 044597-F)	120	A	3	Control Building A " Approximate Current Yield of 13.5 GPM (19,400 GPD)
2 (Permit# 74381-F)	300	A	2	
6 (Permit# 053350-F)	300	A	4	
7 (Permit # 054114-F)	400	A	1.5	
8 (Permit# 055182-F)	380	A	3	
3 (Permit# 051210-F)	20	B	5	Control Building B Approximate Current Yield of 12.2 GPM (17,500 GPD)
4 (Permit# 051408-F)	200	B	1.5	
5 (Permit# 68439-F)	600	B	0.75	
9 (Permit #77155-F)	600	B	5	

Water production rates of the existing wells have decreased over the years, at times making it difficult for the system to provide enough water to the residents. The problem results from the wells needing to produce extra water to make up for the distribution losses or occasional peak flow demands from the commercial taps. Current well production capacity based on current yields from Control Buildings A and B is about 25 GPM or 36,000 GPD. If the current production rate continues and water losses are minimized there would be an adequate supply volume for the

District's estimated demand of 19,700 GPD. However, if funds are available, it would benefit the District to install additional production to offset the continued well capacity reduction, allow existing wells to rest more often, replace wells if they are reclassified to GWUDI, or accommodate increased water demand by the service area. Allowing the wells to rest or drilling new wells would be less expensive than making the upgrades necessary to meet the surface water treatment rule.

The wells are not individually metered, which does not meet CDPHE requirements or water augmentation plan reporting. The District evaluated installing flow measurement devices in the Alternatives Analysis of this document.

A water rights evaluation was not completed with this report. However, the District's compliance to its allocated water rights was examined by JDS Hydro in 2011. JDS Hydro did not note any nonconformance to the District's water rights allocation.

With the exception of drilling new groundwater wells, none of the recommended alternatives of this document increase water consumption or production capabilities (production rates will go down based on water savings). JDS Hydro concluded that drilling a new wells is consistent with the District's water rights plan and that up to 17 wells can be developed within the District. The District will confirm with its water attorney that drilling a new groundwater well is allowable under its current plan before beginning work drilling new wells.

3.2.2 TREATMENT AND STORAGE

Control Buildings A and B treat the raw water with a calcium hypochlorite solution. Soda ash is injected to prevent corrosion in the distribution system. The facilities consist of the buildings, flow measurement, and chemical metering pumps. The pumps are not flow paced and turn on and off based upon the active wells. This treatment process meets the needs of the District and will continue unchanged. Unlike Control Building A, Control Building B uses bag filters to treat the raw water.

Modifications to the treatment buildings will not be needed if additional wells are brought on line. The District could program their SCADA system to cycle production through wells, preventing them from being active at the same time and exceeding the capacity of the treatment facility.

There is the potential that the CDPHE could reclassify some of the existing wells as GWUDI. If

this happens the District can evaluate the well characteristics and petition to maintain the groundwater classification based on items such as well depth, groundwater flow path, turbidity, temperature, conductivity, bacteria & coliform testing, and a microscopic particulate analysis consistent with CDPHE Safe Drinking Water Program Policy DW-003.

The existing storage tank holds 38,200 gallons and is adequately sized to store and disinfect water for the current population for the wells feeding Control Building A. Disinfection calculations are included in Section 5.2 of this report. Additional volume may be needed to serve the potential build out of the District. Since significant growth is not anticipated, it is not recommended to build an additional tank at this time. Installing a level sensor to monitor tank level and tying the level to the well call-to-run signals will help improve the production and treatment operations.

3.2.3 DISTRIBUTION NETWORK

The existing distribution lines consist of a patchwork of different sized pipes and materials. The pipes range from 2 inch to 6 inch and the materials include polyethylene, copper, and PVC. The system has approximately 37,600 linear feet of piping.

The original system was installed between 1972 and 1979. There were upgrades made between 1990-1996, 1999-2000, and 2009-2010. The as-built records of these improvements are not thorough or complete. It is suspected that the installation methods and bury depths are not adequate. This is supported by the disproportionate amount of line break and water loss. Also, many piping connections are glued rather than connected with mechanical joints to accommodate settlement. The District anticipates that most of the distribution network will need to be replaced.

The network is not adequately looped, resulting in dead endings of lines, freezing from stagnant water, lack of proper mixing, and requires the shutdown of an entire line segment when repairs are required upstream. The distribution system improvements will include additional line segments adding loops to the system and creating redundancy.

Pressure reducing valves are installed in the network to reduce line pressure where required and these perform as though they were correctly installed.

Manual read flow meters are installed inside each home. While service lines and any water loss in them is the homeowner's responsibility, the District cannot charge the homeowners for lost water in the service line because the meter is installed downstream of the service line. The District

would like to rectify this issue and has evaluated options in the Alternatives Analysis.

3.2.4 WATER LOSS

The volume of water loss, the difference between the amount of water treated and the amount sold, continues to be a significant problem for the District. There are two types of leaks contributing to the problem. There are line breaks that drain a large amount of water over a period of days, weeks, or months until the leak is found. The District found 11 major leaks over the past year. The second type of leaks are smaller breaches in the system that leak water, often going undetected indefinitely. Due to the age of the system, lack of proper bury depth, and improper installation techniques, the frequency of new leaks is increasing.

The following is a summary of water lost between 2006 and 2010:

Table 5: Water Loss (2006-2010)

Year	Water Loss
2006	35.76%
2007	52.59%
2008	52.17%
2009	48.54%
2010	33.79%

The District's records for 2010 to the present are incomplete. There was a change of management in 2012 and the previous management did not keep adequate logs. The available records are not fully reliable. For example, the records of water produced versus water sold are not separate from each other. The District is not comfortable reporting the water loss past 2010 and it estimates that water loss from 2010 to the middle of 2014 is in the range of the 2006-2010 percentages.

Distribution systems of this size typically have water losses of 5-10%, even with newer piping. The District water losses often exceed the acceptable rates resulting in operational and financial problems. The water losses often make the District unable to meet the demand of its users.

If implemented, the recommended alternatives would alleviate the water loss problems. The new HDPE water lines will be more leak resilient. Solving the distribution system water loss problem will help solve many of the District's financial problems.

3.3 FINANCIAL STATUS AND USERS

The District is not in satisfactory financial condition. Its existing infrastructure is aged and frequent emergency repairs drain reserves. On occasion, the District is required to haul water at a significant expense, selling the water for a lot less than they pay for it. The District has outstanding debt at $371,000 ($195,000 in outstanding account payables, NRWA loan of $100,000, and two private party notes of $38,000 each). An additional item that worsens the financial situation is the alleged embezzlement of approximately $300,000 by the District's previous manager including the forensic accounting and auditing costs. The alleged embezzlement is being investigated by law enforcement agencies and the amount that can be recovered is unknown.

The District has implemented above average rates and charges to generate enough revenue for debt repayment and operational expenses. Specifically, there is a $100 per month supplemental operations fee for each residential tap. For a family of three, each using 50 GPD, the monthly fee is $213. As such, the above average monthly fee is a burden for many residents and the opportunity to raise additional revenue is very limited. Money is not being reserved for capital expenses.

The District completed an income survey in 2014 and determined the median household income is $52,000, disqualifying it from acquiring a principal forgiveness loan.

The District has "Debruced" from the Tax Payer Bill of Rights, allowing them to accept state grants and loans without having to seek voter approval to generate the additional revenue.

The District prepares annual budgets. The 2104 budget is attached. Its finical records are audited annually.

3.4 TECHNICAL, MANAGERIAL, AND FINANCIAL (TMF) CAPACITY

The District has contracted with a third party management company to manage the day-to-day administration of the District's activities. The District's Manager, Special District Management Services, specializes in the management of special districts such as Arabian Acres. They provide services including, but not limited to, account payable/receivable, coordination with the Board of Directors, administration of public meetings, oversight of consultants, and financial planning. They also coordinate responses when required to make repairs to the treatment and distribution systems.

The District contracts with Lynn Willow as the Operator in Responsible Charge. Mr. Willow has

a “C” Water Treatment Certificate (#26174) and a Small Systems Water (#20621) Certificate.

The District submitted a TMF Capacity Worksheet in 2009 as part of a previous funding application process as noted by their previous engineering consultant. The CDPHE indicated in an inspection report dated September 8, 2010 that all TMF issues had been satisfactorily addressed. In the event that all items have not been resolved, the District asks the CDPHE to advise it of the items that need to be completed.

Once implemented, the recommendations of this report will help the District treat and supply potable water more reliably and at a lower cost, improving its overall financial health.

The District is currently listed in the CDPHE Grants & Loans Unit 2014 Intended Use Plan. The project description includes new water treatment facilities; improvement/expansion of water treatment facility; consolidation of water treatment facilities; connect to existing facility; construction or rehabilitation of distribution and/or transmission lines; water supply facilities; and water meters. The estimated project cost in the plan is for $3,110,000 and is adequate to cover the items in this report.

4. PROJECT PURPOSE AND NEED

4.1 HEALTH AND COMPLIANCE

The EPA's Safe Drinking Water Information System listing for Arabian Acres Metropolitan District was reviewed during the development of this report. There is one incident in March 2006 where the District exceeded the MCL for coliform. This incident is likely attributable to improper disinfection practices for an isolated period since there is only one record. There are other events listed on the EPA's website, but they related to monitoring and reporting violations and are not health related. Therefore, due to the lack of any documented raw or treated water issues, the District has concluded that it does not have any water quality or treatment limitations.

Line breaks and distribution leaks could result in potential health and compliance issues. Breaches in the system present the opportunity for the sanitary casing of the distribution lines to be compromised and allow foreign matter to infiltrate into the system and ultimately to the users.

Individual service lines do not have any backflow prevention devices. Installing check valves or backflow prevention would reduce the potential of contaminates syphoning from individual users and flowing back into the distribution system.

Installing water flow measurement devices and sample taps at each well will allow the District to meet the requirements of the Colorado Primary Drinking Water Regulations.

All of the District's wells are classified as groundwater sources. In the future, these sources may be reclassified by the CDPHE as GWUDI. The reclassification is a possibility due to the depth of the existing wells (ranging from 20 feet to 600 feet). In the event that this happens, the District would be required to meet the surface water treatment rule and add the additional filtration step. It is unlikely the District could afford implementing this incremental treatment step, resulting in compliance activities. Developing more groundwater sources could allow the District to discontinue using a source in the event it is reclassified as GWUDI.

4.2 SECURITY

The security practices implemented by the District are consistent with other districts its size. Treatment facilities and well heads are secured with locks. The ORC and residents monitor for tampering or other security breaches. A formal Vulnerability Assessment for the service area has

not been conducted. The District does not possess any product such as technically enhanced, naturally occurring radioactive material or chemicals that could be a danger if acquired by outside parties. It does not have anything of particular value to vandals like a significant amount of copper wire.

4.3 OPERATION AND MAINTENANCE (O&M)

A number of design elements and conditions of the existing distribution system make it difficult to operate and maintain. First is the propensity for the system to leak, resulting in an unacceptable amount of water loss. The leaks have a lot of causes including: 30 plus year old pipes, incorrect installation, not enough bury depth to prevent freezing, and some improper pipe materials used. Two types of leaks cause problems for the District. The first type includes line breaks that result in an acute amount of water loss over a period of time lasting days, weeks, or months until the leak can be located and repaired. Locating the leaks can be difficult because the lines are primarily constructed of polyethylene. The second type of leaks are the smaller variety that can result in considerable water loss over a greater length of time. These leaks are harder to locate as they may not cause visual ponding of water on the surface or noticeable pressure drops at individual taps.

Other traits of the distribution system make it difficult to operate. Specifically, the system is not adequately looped, resulting in a dead ending of the water, increasing water age, increasing the chances of the line freezing, and requiring long line segments to be taken out of service when an upstream location fails and/or requires servicing. It is not uncommon for residents to be without water service for a period of days or weeks because of failing lines.

The District believes that the water loss experienced, both through line breaks and leaks, is the most significant operational challenge. Once repairs and upgrades are made to reduce water loss, it will spend less of its limited financial capacity purchasing water and performing spot repairs.

Individual wells are not metered, which does not meet the requirements of Paragraph 2.13 of the CDPHE's Design Criteria of Potable Water Systems. This section requires that all water supplies must have a means of measuring flow from each source. The operator has the limited ability to determine how much each well generates, making reporting water use for their augmentation plan problematic. Additionally, each well does not have an individual sample tap installed, limiting the ability to sample for individual well raw water characteristics.

An additional limitation contributing to the District's O&M challenges is the lack of ability to monitor water use at each tap. The manual read water meters are located inside homes. Many of these meters are original and the level of accuracy is not known. The cost of leaks in the service lines is covered by the District because the District is responsible for any water loss before the meters. The operator may not notice a leak in the area until the monthly manual reading can be compared to the previous reading.

Adding more robust and reliable tank-level monitoring to the water storage tank will improve the O&M functions of the District. The operator is not automatically alerted if atypical volumes of water exit the tank.

Adding additional well(s) would provide the District a greater ability to provide the required volumes of water, specifically if there are continued water losses experienced throughout the system.

4.4 GROWTH

Opportunity for growth in users within the existing District boundaries is discussed in Section 2.3 of this report. The Selected Alternatives in this report are recommended to address deficiencies with the existing system not future growth so the proposed alternatives would be eligible for inclusion in the loan when the District submits the SRF application.

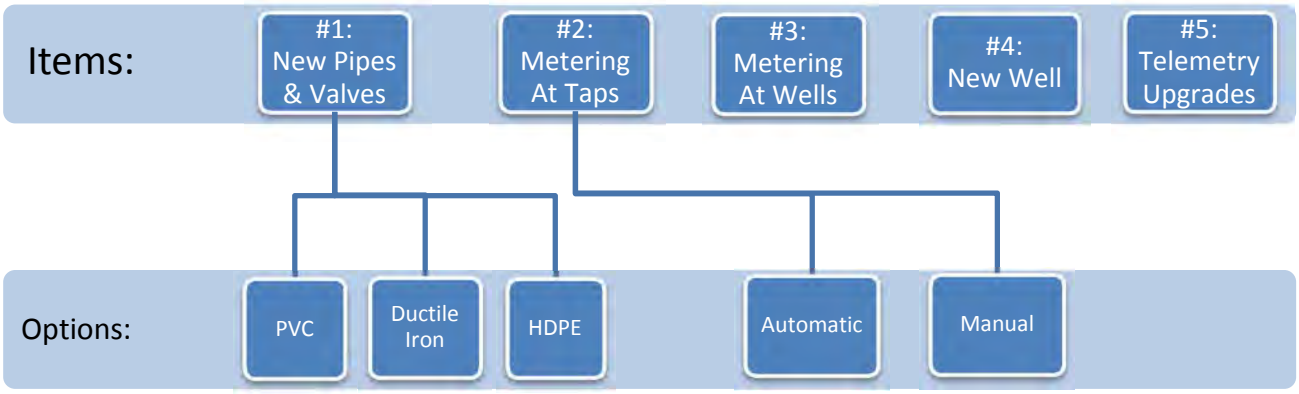
The Selected Alternatives included with this report will not impede or encumber future growth, if and when it takes place.

5. ASSESSMENT OF ALTERNATIVES

An analysis of potential alternatives was conducted for this project. Consolidation with other utilities is not feasible due to the rural location of the District, geographic features, water right issues, and status/water supply availability of other area potable water providers.
The following alternatives and options were evaluated:

- Item #1: Replace and upgrade existing distribution piping and valves.
  - Polyvinyl Chloride (PVC) Piping
  - Ductile Iron Piping
  - High Density Polyethylene (HDPE) Piping
- Item #2: Installation of flow measurement devices and isolation valves inside homes.
  - Manual Read Meters
  - Automatic Read Meters
- Item #3: Install flow measurement devices at each well.
- Item #4: Drill new groundwater supply well.
- Item #5: Upgrade telemetry system including storage tank level measurement device.

Figure 5: Alternative Assessment Items & Options



5.1 DESCRIPTION

The following are general descriptions of the five items and the material/equipment options for the proposed project. Advantages and disadvantages of each item and option are listed in a summary table.

5.1.1 ITEM #1: REPLACE AND UPGRADE EXISTING DISTRIBUTION PIPING AND VALVES

The piping installed in the District does not consist of a uniform material, it has reached the end of its design life for many segments, and is having issues with freezing temperatures because of improper bury depth. The poor condition causes leaking lines and other issues within the distribution system. This results in revenue loss, reduced efficiency, excess energy and chemical use, and poor water management. The District needs to replace many of the line segments with pipes that will provide long-term service to the community.

Three common types of piping for this project were evaluated for the replacement of the existing pipe: HDPE (High Density Polyethylene), DI (Ductile Iron), and PVC (Polyvinyl Chloride). Each has advantages and disadvantages in terms of cost, service life, required accessories, ease of installation, durability, and strength. A list of advantages and disadvantages is included in Table 7.

In terms of pipe performance for water loss, all three options, if installed properly, will adequately prevent against water loss. HDPE has the longest service life and will be less likely to leak after a 40-year time frame. PVC can leak due to damage sustained during installation. DI can leak from corrosion. HDPE does not have these drawbacks.

PVC and DI require concrete thrust blocks and mechanical joints to mitigate the effects of settlement and pipe movement. DI also requires cathodic protection. HDPE does not require either of these because the heat fused joints are fully restrained, facilitating installation of the pipe.

Reducing water loss will result in a direct economic benefit to the District. Therefore, it is advisable to install the pipe material that is least likely to leak. HDPE has properties that would be most resistant to leakage in the long term.

The District needs to replace the existing isolation valves and blow off hydrants with this project and so these costs are included with the budget. The incremental cost difference between 3" and 4" main distribution lines is not substantial when factoring the additional expense into the entire project cost. This report recommends 4" pipes in order to accommodate future growth.

5.1.2 ITEM #2 – INSTALLATION OF FLOW MEASUREMENT DEVICES AND

ISOLATION VALVES AT EACH TAP

The District currently determines water consumption based off bi-monthly readings of manual flow meters installed in individual homes. The current metering approach is not satisfactory. Many of the manual read meters are old and their accuracy has decreased. The operator must visit each home each month, which is a time consuming task. Additionally, manual meters cannot automatically alert the system's operator of any unusual flow patterns. Therefore, the District looked at replacing the existing manual meters with two options. The first is installing manual meters in pits outside near the curb. The second option is installing automatic meters in pits outside near the curb.

Option #1: Manual Remote – Read Meter. This would consist of installing meter pits outside of the home, in between the curb stop and the residence. The meters would have a pole mounted remote read next to the pit. The operator would be required to manually record the meter readings each meter read cycle for manual entry into the billing software. New service lines would be installed between the main and the new meter pit when needed. Curb stops will be replaced if necessary.

Option #2: Automatic Meter Read System. This would consist of automatic flow recording meters installed in the meter pits. The meters could be read with two options. The operator can acquire flow information by driving through the District with a hand-held computer. Alternatively, there are networked systems on the market that, through an antenna system, constantly monitor and report flow data to the office-based computer. The District has priced out both approaches. Information gathered with an AMR system should be able to be imported into billing software without much manual re-creation of data. New service lines would be installed between the main and the new meter pit when needed. Curb stops will be replaced if necessary.

Any future taps to the system would be required to install flow measurement meters pits consistent with the ones being installed with this project so new properties can integrate seamlessly into the existing system.

The District recommends keeping the existing flow meters inside the homes as unofficial backup flow measurement devices. Keeping the manual meters could help the operator determine if a leak is occurring in the service line by comparing the readings of the outdoor and indoor meters. The District does not believe that it advisable to spend money to remove the meters when the meters could be valuable in the future.

5.1.3 ITEM #3 – INSTALLATION OF FLOW MEASUREMENT DEVICES AT EACH WELL

The District can only measure flow in Control Buildings A and B. The wells feeding these sources are not metered and do not meet CDPHE and water augmentation plan requirements. The District proposes installing a metering pit with a 1 inch flow meter, isolation valves, and sample tap in each well. The flow meters would be integrated into the AMR system for the individual taps allowing the District to electronically monitor and report the amount of raw water generated. A preliminary drawing of the metering pit is included in the Appendix.

A minimum of 7 of the 9 wells will require a new metering pit. Well #5 was constructed in 2010 and has a flow meter and sample tap. The flow meter at Well #5 may need to be upgraded so it can be integrated into the AMR system.

5.1.4 ITEM #4 - DRILL NEW GROUNDWATER SUPPLY WELL

The District is producing enough water to keep up with demand, however this may change once winter arrives and lines are subject to freezing, a common cause for the line breaks and water loss. It has to purchase water from haulers at $57.25 per 1,000 gallons who truck it onsite. This expensive process is hurting the financial condition of the District. The District will need to continue hauling until it can reduce the amount of water loss in the system or new raw water production capacity is created. The District's goal to be able to meet the current demand by reducing the water loss in the distribution system. Reducing water loss to 5% of production volume yields enough water making capacity as long as well production capabilities do not continue to decrease.

If replacing the failing lines with new leak resistant infrastructure is not adequate to meet the water demands, the District will need to drill new well(s) and/or add storage to meet current demand.

Once the District determines that a new water source is required, it will need to retain the services of a hydrogeologist to determine the best location to drill the new well. The new well will need to be drilled deep enough so that the raw water will not be classified as groundwater under the influence of surface water. Doing so will prevent the District from having to install filtration to meet the surface water treatment rule.

The purpose of the new supply well, if required, is to serve the existing demand, not to accommodate future growth.

5.1.5 ITEM #5 – UPGRADE TELEMETRY SYSTEM

The District has a telemetry system; however, the reliability and functionality are limited. Often, pressure readings are not precise, resulting in the system's operator not knowing the correct water level in the tank. The District will apply to install a tank level sensor to connect to the existing Mission Control autodialer system. The Mission system will be programed to send an alarm condition to the District's operator if unanticipated conditions, such as large drops in the water tank level, indicating a downstream breach.

5.2 DESIGN CRITERIA

The designs of the proposed infrastructure will meet CDPHE standards, specifically State of Colorado Design Criteria for Potable Water Systems and Colorado Primary Drinking Water Regulations. All project components that come into contact with water will be NSF 61 rated. Included in the Appendix are data sheets for the equipment proposed with the project.

The proposed changes do not affect the flow rate of the treatment system and will not adversely impacting the system's ability to disinfect the raw water. The water leaving Control Building A is able to meet the CDPHE log-disinfection requirements as shown below. The water leaving Control Building B may not meet the new CDPHE disinfection requirements and needs to be further investigated. If required, the District can add additional pipe length to the existing loop. A preliminary budget is included in the engineer's opinion of cost. The calculations are based on the system demand of 27 GPM being supplied evenly by both Control Buildings (13.5 GPM each) and a chlorine residual of 1.0 entering the tank.

Table 6: Log Disinfection Calculations – Control Building A

	Item	Number	Unit
1	Peak Hourly Flow (distribution demand flow rate)	13.5	GPM
2	Temperature	8	C
3	BF—Baffling Factor	0.1	Unbaffled inlets and outlets
4	pH	6.3	s.u.
5	Minimum Tank Volume (80% capacity of WTP Tank)	30,560	Gallons
6	TDT—Theoretical Detention Time (Volume/Flow)	2,263.7	Minutes
7	Actual Detention Time (TDT x BF)	226.4	Minutes
8	Chlorine Residual Concentration (minimum)	1	mg/L
9	Concentration Time (Ct Calc)	226.4	minutes mg/L
10	Ct—99.9 Giardia Inactivation—CPDWR, 5 CCR 1003-1	98.87	mg-min/L
11	Giardia Log Inactivation	6.87	log
12	Virus Log Inactivation	133.16	log

Table 7: Log Disinfection Calculations – Control Building B

	Item	Number	Unit
1	Peak Hourly Flow (distribution demand flow rate)	13.5	GPM
2	Temperature	8	C
3	BF—Baffling Factor	1	Pipe Flow (12" x 90')
4	pH	6.3	s.u.
5	Minimum Tank Volume (based on 90' long 12" pipe)	529.5	Gallons
6	TDT—Theoretical Detention Time (Volume/Flow)	39.2	Minutes
7	Actual Detention Time (TDT x BF)	39.2	Minutes
8	Chlorine Residual Concentration (minimum)	1	mg/L
9	Concentration Time (Ct Calc)	39.2	minutes mg/L
10	Ct—99.9 Giardia Inactivation—CPDWR, 5 CCR 1003-1	98.87	mg-min/L
11	Giardia Log Inactivation	1.19	log
12	Virus Log Inactivation	23.07	log

5.3 ENVIRONMENTAL IMPACTS

The proposed project will result in net improvements to the environment. There will be lower water loss, resulting in less chemical use and less power required to treat and pump the finished water. Vehicle trips by the water haulers will be reduced or eliminated. The groundwater will not be drawn down, decreasing water supply volume.

It is anticipated that there will be unavoidable impacts during the implementation of the project, consistent with the construction of similar small public works projects. The District will do its part to decrease these impacts to the lowest level by implementing measures such as following the best runoff management practices, limiting the time that the construction activities can take place to daytime hours, and reducing potential impacts to wildlife.

5.4 LAND REQUIREMENTS

Most of the improvements involve removing and replacing existing infrastructure. Existing rights-of-way and easements were not reviewed with this report; however, additional land will not be required as long as the existing infrastructure is located in property dedicated to the District. Meter pits serving individual homes will be located in the District right-of-way, allowing the District to maintain the meters without having to obtain permission from individual land owners. The flow meter vaults for each well are relatively small and would be able to be located within the limits of property dedicated to the District.

5.5 CONSTRUCTION PROBLEMS

There are no major construction issues that are apparent at this time. The District would need to restrict access to individual roads while lines are being replaced. This is anticipated to be a minor inconvenience. Service to individual homes would need to be stopped while lines are being replaced and meter pits are being installed. The District will work to minimize the disruptions.

5.6 OPERATIONAL ASPECTS

The proposed improvements will make the District's infrastructure easier and less expensive to operate. The District will not have to constantly look for and repair leaks in their system (there were 11 line leaks/breaks in the past year). It will not have to haul water to make up for water loss in the distribution system. Installing an AMR system will save considerable time over the current process of reading individual meter manually.

5.7 COST ESTIMATES

There is limited variability between the pricing of the different options. For example, the pipe material for the HDPE is slightly more than PVC per lineal foot; however, this increase is offset by the savings achieved eliminating thrust restraints and mechanical joints. There is a cost difference between the manual read meters and the AMR system. The estimated price difference is $140 per tap.

A preliminary engineer's opinion of cost for all recommended components of the project is included in Section 6.4 – Costs.

5.8 ADVANTAGES/DISADVANTAGES

The following table summarizes the advantages and disadvantages of each proposed improvement item and any applicable material/equipment options:

Table 8: Advantages and Disadvantages

Advantages	Disadvantages
Item #1: Replace and Upgrade Existing Distribution Piping and Valves:	
Reduce Water Loss Occurring in Distribution System	Considerable Cost to Replace Lines & Valves
Extend Service Life of Distribution System	Temporary Disruption of Water Service & Access Roads
Polyvinyl Chloride (PVC) Piping	

Commonly Used - Contractors Familiar with Material	Prone to Water Loss & Breaking Over Service Life
Replacement Parts are Commonly Available	Susceptible to Fatigue/Failure Over Service Life
Lightweight- Facilitates Installation and Transportation	Damage During Installation Can Significantly Affect Strength
	Difficult to Locate Magnetic Tape Not Used or Not Mapped Properly
	Thrust Restraints and Mechanical Joints Required
	Brittle at Freezing Temperatures
Ductile Iron Piping	
Strong Material	Heavy (Higher Installation & Transportation Costs)
Difficult to Damage During Installation	Highly Vulnerable to Corrosion – needs cathodic protection
Used in Water Distribution Decades	Thrust Blocks and Mechanical Joints Required
	Hydraulic Properties Change Over Time as Plaque Builds Inside Pipe
	Higher Maintenance Costs Over Service Life
High Density Polyethylene (HDPE) Piping	
Highly Resistant to Stressful Environmental Conditions – high strain allowance virtually eliminates breakage due to freezing pipes	Higher Initial Pipe Material Cost
Low Life Cycle Costs (Less Maintenance & Water Loss)	Specialized Installation Equipment Required
100+ Year Service Life Expected if Properly Installed	Certified Installer Required
Strong & Lightweight - Resilient During Installation	Cannot be Direct Tapped
Joint Restraints and Thrust Blocks Not Required	
Heat Fused Joints are Resilient Against Leaks – joints stronger than pipe	
Highly Corrosion Resistant	
Higher Max Pressure Rating than PVC	
Absorbs Impacts Better than PVC	
Service Lines Less Likely to Leak if Installed Properly	
Item #2: Installation of Flow Measurement Devices and Isolation Valves in Curbside Meter Pits	
Ability to Locate Leaks in Homes or Service Lines	Temporary Disruption of Service
Ability to Fully Bill Water Consumed	Expense to Purchase and Install Equipment
Can Accurately Compare Water Produced vs Water Sold	

Ability to Bill Customers for Water Lost in Service Lines	
Manual Read Meters	
Low Capital Cost	Time Consuming to Read Meters
Operator Could Observe Unusual Problems During Visit	No Additional Information About Water Use Generated (Peaking Rates)
Easy to Operate	Unable to Automatically Alert Operator for Unusual Water Use
Less Equipment Could Result in Fewer Equipment Problems	Unable to Automatically Export Water Use Data to Billing Software
Automatic Read Meters	
Faster to Gather and Bill Water Consumption Data	Higher Cost for Equipment and Installation
Easier to Register Alarm Conditions Such as Leaks	Must Train Operator and Billing Staff on System
Able to Acquire Different Types of Data	Need to Replace Battery Occasionally
Item #3: Install Flow Measurement Devices at Each Well	
Monitor Flows at Individual Locations	Expensive to Purchase and Install Equipment
Conform to CDPHE Requirements	Will Require Well to be Temporarily Out of Service
Can Sample Raw Water at Each Well	
Can Tie Flow Meters into AMR System	
Item #4: Drill New Groundwater Supply Well	
Greater Confidence in Water Supply Volumes	Expense to Drill Well and Tie to System
Would Potential Have More Capacity to Make Up for a Well Classified as GWUDI	Uncertainty About Well Water Quantity and Quality Until Completion
Ability to Select Which Wells to Use	
Item #5: Upgrade Telemetry System	
Will Aide Operator With Managing Tank Levels	Cost to Purchase and Install Equipment
Can Send Alarms Automatically to Operator	Requires Someone Knowledgeable to Install
Will Make it Easier to Identify Leaks in System	

6. SELECTED ALTERNATIVE

6.1 JUSTIFICATION OF SELECTED ALTERNATIVE

The District has reviewed the Alternatives and has determined that it would like to include all of the items presented in the Assessment of Alternatives with the proposed project and the following options:

- Item #1: Replace and upgrade 10% of existing distribution piping and valves.
    - High Density Polyethylene (HDPE) Piping
- Item #2: Installation of flow measurement devices and isolation valves at each tap in meter pits at curbs.
    - Option #2: Automatic Read Meters
- Item #3: Install flow measurement devices at each well.
- Item #4: Drill new groundwater supply well(s).
- Item #5: Upgrade telemetry system.

The District recognizes that replacing 100% of the existing distribution system is not financially feasible at this time. The distribution system is approximately 37,600 feet long and replacing over 7 miles of pipe would be prohibitively expensive. Its goal is to replace 10% of the system with this project.

Regarding the specific material and equipment choices, the District elects to use the HDPE piping for the distribution system. There is a slightly greater capital expense for the pipe material, but this is offset by the savings achieved during installation and the longer service life. It is anticipated that most of the distribution piping will need to be replaced. In the event that the piping is found to be installed properly (correct material, bury depth, adequate bedding, etc.) these lines will not be replaced. For the choice of metering systems, the District elects to proceed with the automatic system. There is higher capital costs for the automatic meters over the manual readers will be offset by the life cycle cost savings achieved in operator meter reading time and the ability to quickly locate leaks.

6.1 TECHNICAL DESCRIPTION

The proposed improvements will be constructed to CDPHE and District standards. The Assessment of Alternatives section of this report provides descriptions of the equipment and the

advantages and disadvantages of their implementation.

Included in the Appendix are data sheets for each of the recommend Alternatives, which provide greater technical detail and descriptions such as listing NSF certifications.

6.2 ENVIRONMENTAL REVIEW OF SELECTED ALTERNATIVE

The completed Environmental Assessment checklist for the items proposed in this report is included in the Appendix.

The proposed project involves replacing components of a problematic distribution system, resulting in a net benefit to the environment. The upgrades will reduce water loss, potentially eliminate water hauling, and decrease energy and chemical consumption. Since it is extremely unlikely that any long-term incremental impacts to the environment will occur as a result of this project, the District believes it qualifies for a Category Exclusion from the Environmental Assessment requirements.

6.3 GREEN PROJECT RESERVE

The Green Project Reserve program is not currently available. The District will not be applying for the program.

6.4 COSTS

The following engineer's opinion of probable cost has been prepared for this project:

Table 9: Conceptual Engineer's Opinion of Probable Costs

Item:	Description	Quantity:	Unit	Unit Cost:	Item Cost:
1	**Replace and Upgrade Distribution Piping and Valves**				
	Remove Existing Line and Install 4" HDPE Pipe	37,600	Feet	$50	$1,880,000
	Install 4" Ball Valves	100	Valve	$1,500	$150,000
	3/4" Water Service Taps w/ 30' of 3/4" HDPE Lateral	145	Each	$500	$72,500
	Combo Air Relief/Vac Assembly	5	Each	$5,000	$25,000
	Flush Hydrant Assembly	10	Each	$2,000	$20,000
	Install Additional Pipe Loop for Disinfection Volume at Control Building "B"	90	Feet	$ 150	$13,500
	Cost to Replace 100% of System				$2,161,000
	Cost to Replace 10% of System				$216,100
2	**Install AMR System and Isolation Valves**				

	145 3/4" Automatic Meter Read Meters w/Beacon Reporting	1	Each	$67,184	$67,184
	Installation of Meter Pits	1	Each	$300,000	$300,000
3	**Install Flow Measurement Devices at Each Well**				
	Flow Measurement Devices (1") and Concrete Vault	8	Each	$3,000	$24,000
	Installation of Meter Pits	8	Each	$4,000	$31,370
	Flow Measurement Devices (2") at Each Control Building	2	Each	$4,000	$8,000
4	**Drill New Groundwater Supply Well**				
	Allowance for Well Drilling, Pumps, Controls, Testing, & Metering Vault	1	Each	$60,000	$60,000
5	**Upgrade Telemetry System**				
	Level Sensor and Wiring and Programming	1	Each	$7,500	$7,500
	Subtotal:				$714,154
	Contractor Overhead & Profit:	10.0%			$71,415
	Design Engineering & Permitting:	10.0%			$71,415
	Bidding, SRF Administration, & Construction Engineering Consulting:	5.0%			$35,708
	Contingency:	15.0%			$107,307
	Grand Total (Includes 10% of Item #1):				$1,000,000

6.5 PROJECT IMPLEMENTATION

The following milestones highlight the anticipated schedule. The final schedule is dependent upon a number of factors that are not all under the control of the District, such as application review times, availability of funding, and weather.

Table 10: Implementation Schedule

Date	Item
Third Quarter of 2014	Submit Preliminary Engineering Report to CDPHE
Fourth Quarter of 2014	Submit Remaining TMF Components to CDPHE
Second Quarter of 2015	Submit SRF Loan Application
Third Quarter of 2015	Commence Work on Final Design
Fourth Quarter of 2015	Obtain Final Design Approval from CDPHE and Bid Project
First Quarter of 2016	Commence Construction

Third Quarter of 2016	Complete Construction

The most critical item affecting the project schedule will be qualifying for funding. The District has limited financial capabilities and is not in a position to accrue more debt or raise rates. The availability of these funding opportunities is not currently known.

The District will properly advertise for and hold a public meeting to review with the service area the recommendations of this report, long-term objectives, disruptions to service, and potential rate changes after the CDPHE has had the opportunity to review this PER.

The District is currently using soda ash for pH and corrosion control. It the District's preference to use a polyphosphate such as the Aqua Mag blended phosphate produce instead of the soda ash. A data sheet for the Aqua Mag product is included in the Appendix. The District would like obtain approval from the CDPHE prior to making the change in chemicals. The District requests the CDPHE inform it of the requirements needed to permit this change in chemical type.

REFERENCES

Colorado Department of Public Health and Environment, Water Quality Control Division (August 9, 2010). *Colorado Primary Drinking Water Regulations.*

Colorado Department of Public Health and Environment, Water Quality Control Division (September 1, 2013). *Design Criteria for Potable Water Systems.*

Colorado Department of Public Health and Environment, Water Quality Control Division. *New Water System Capacity Planning Manual.*

JDS-Hydro Consultants, Inc. (May 2011). *Arabian Acres Metropolitan District Water System Improvements Preliminary Engineering Report (PER).* Colorado Springs.

Engle, David (December 9, 2013). *The Right Pipe for the Job.* Water Efficiency, The Journal for Water Resource Management.

Lindeburg, M. R. (2003). *Civil Engineering Reference Manual* (9th Edition). Belmont, CA: Professional Publications.

United States Environmental Protection Agency (2014). *Envirofacts Warehouse.* Retrieved May 14, 2014 from http://oaspub.epa.gov/enviro/sdw_report_v2.first_table?pws_id=CO0160175&state=CO&source=Groundwater_under_infl_of_surface_water&population=250&sys_num=0

APPENDIX – SUPPLEMENTAL INFORMATION

- CDPHE Preliminary Engineering Report Checklist
- Environmental Determination Checklist
- Annual Budget (2014)
- Schedule of Fees & Charges (December 1, 2013)
- U.S. Fish & Wildlife Wetlands Map
- Data Sheets
    - HDPE Piping – Plastic Pipe Institute
    - Networked Automatic Meter Read System & Quotation
    - Browns-Hill Level Sensor Quotation (with Mission M-800 and Waterpilot transducer)
    - Aqua Mag Blended Polyphosphate
- Map of Existing Distribution System

CDPHE PRELIMINARY ENGINEERING REPORT CHECKLIST

Drinking Water Preliminary Engineering Report Guidance & Review Checklist Form

Name of Project: Distribution System Improvement Project

Applicant Name: Arabian Acres Metropolitan District **Phone Number:** (303) 987-0835

Address: 141 Union Blvd. Suite 150, Lakewood, CO 80228

Email: PItaliano@sdmsi.com

Consultant Name: AquaWorks DBO, Inc. **Phone Number:** (303) 477-5915
c/o Adam Sommers, P.E.

Address: 3252 Williams Street
Denver, CO 80205

Email: adam@aquaworksdbo.com

Type of Project: Drinking Water

WQCD District Engineer: Amy Zimmerman **Phone Number:** (303) 692-3545
WQCD Project Manager: Richard Markovich **Phone Number:** (303) 691-4051

Section (Suggested Outline)	Necessary Elements (Guidance)	Addressed on Page # (Applicant)	Complete (Reviewer)
(1) Executive Summary	**Summarize the system needs, selected alternative, and the public health benefits of the proposed project**.		

(2) Planning Conditions	**This section should contain an overview of the significant regional features defining the context of the report and proposed project. Displaying much of the information in map and tabular formats is highly recommended for ease of review and discussion.**		
(2.1) Planning Area	Include map(s) of current and projected service area for the 20-year planning period; identify environmental features such as streams, lakes, wetlands, and floodplains for the entire planning area. *This documentation does not require field surveys and may be obtained from existing data sources such as the National Wetlands Inventory, FEMA and USGS.*	5	
(2.2) Local and Regional Government	If the proposed project is within or near an urban growth boundary, address conformance with the boundary and any other planning limitations such as tap or water quantity/supply	10	

Section (Suggested Outline)	Necessary Elements (Guidance)	Addressed on Page # (Applicant)	Complete (Reviewer)
Coordination	limitations.		
(2.3) Growth Areas and Population Trends	Summarize population projections for the project planning area for a 20-year period; compute and compare recent growth rates with projected growth rates; estimate increases in equivalent residential units (EQRs); identify specific areas of concentrated growth; and reference sources of this information.	10	
(2.4) Drinking Water Supply	Briefly summarize projected drinking water demands (average day, peak day and peak hour) for the project planning area for the 20-year planning period. Summarize flow reduction measures such as water conservation plan measures. Address the supply source(s) and primary water quality parameters of concern.	10	

(3) Description of Existing Facilities	**This section should provide a description of the existing treatment and distribution facilities**.		
(3.1) Service Area Features	On the planning area map, identify the locations of existing drinking water treatment plants, water sources, major distribution lines, and storage facilities.	13	
(3.2) Facilities Layout and Description	Provide a process flow schematic layout and narrative description of existing treatment facilities including design capabilities and remaining useful life as compared to state design criteria. Describe present adequacy of water supply, storage, and distribution capabilities of any existing central facilities. Include current population and per capita flows (gpcd). Note the quantity of unaccounted for water (e.g., distribution system losses).	13	
(3.3) Financial Status and Users	Discuss the financial status of the drinking water system including O & M costs, existing debt, required reserve accounts, rate structure and other capital improvement programs. Also include a tabulation of volumes used by types of users (e.g., residential, commercial, industrial) for the most recent typical fiscal year.	17	
(3.4) Technical, Managerial and Financial (TMF) Capacity	Highlight TMF Capacity issues of concern as indicated by the TMF guidance for the State Revolving Fund program.	17	

(4) Project Purpose and Need	**This section should document the applicable reasons for considering modifications to the existing facilities.**		
(4.1) Health and	*Include a discussion of the system's current compliance status with the "Colorado Primary Drinking Water Regulations" and*	19	

Section (Suggested Outline)	Necessary Elements (Guidance)	Addressed on Page # (Applicant)	Complete (Reviewer)
Compliance	*its potential for acute or chronic health risks. Evaluate any other current or future drinking water quality and quantity issues including secondary MCLs.*		
(4.2) Security	Summarize results of most recent vulnerability assessment.	19	
(4.3) Operation and Maintenance (O&M)	*Identify applicable O&M issues such as operational constraints, water loss, and adequate controls.*	20	
(4.4) Growth	Summarize quality and quantity concerns; considerations for consolidation and phased capacity; reasons for projected future growth during planning period; support by additional revenues and local and regional planning efforts. Note: projects designed solely to serve future development and population growth are not eligible for State Revolving Fund financing.	22	

(5) Assessment of Alternatives	**This section should contain a description of the reasonable alternatives (no action, blending, optimizing the current facilities, and interconnecting with other existing facilities) that were considered in planning a solution to meet the identified needs. If alternatives for upgrades or new treatment facilities alternatives are considered, include the EPA Best Available Technology (BAT) for contaminant(s) removed. Complete assessments should be grouped by alternative and should include information requested in (5.1) through (5.8) below:**		
(5.1) Description	Describe and compare all feasible water treatment technologies, including new technologies that have been thoroughly tested and installed or piloted with successful operating and compliance track records, water supply sources, and the facilities, including distribution facilities (storage, transmission and pumping), associated with each alternative.	22	
(5.2) Design Criteria	State the design parameters, including the need to meet primary drinking water standards, used for evaluation purposes of each alternative. The parameters must comply with state regulatory requirements (Ref. WQCD Policy State of Colorado Design Criteria for Potable Water Systems.) Address treatment residuals management and ultimate disposal methods and costs in detail.	26	
(5.3) Environmental Impacts	Describe direct and indirect impacts unique to each alternative on floodplains, wetlands, wildlife habitat, historical and archaeological properties, etc., including any projected permits and certifications.	27	
(5.4) Land Requirements	Identify all necessary sites and easements, as well as permits and certifications, required for each alternative, and specify if the properties are currently owned, to be acquired, or leased by the applicant.	27	
(5.5) Construction Problems	Discuss concerns such as subsurface rock, high water table, limited access, or other conditions that may affect cost of construction or operation of a facility for each alternative.	28	
(5.6)	Discuss, in general terms, the staffing requirements,	28	

Section (Suggested Outline)	Necessary Elements (Guidance)	Addressed on Page # (Applicant)	Complete (Reviewer)
Operational Aspects	certification level requirements (including distribution), and the expected basic operating configuration and process control complexities for each alternative.		
(5.7) Cost Estimates	Provide cost estimates for each alternative, including breakdowns for construction, non-construction, and annual operations and maintenance, as well as a present worth analysis for each alternative. A reasonable discount rate should be used for determining the present worth of the uniform series of O&M values (in today's dollars) and the salvage value.	28	
(5.8) Advantages/ Disadvantages	Describe, in a narrative format, how each alternative affects the applicant's current and future needs with respect to technical, managerial, and financial concerns; how each alternative complies with regulatory requirements; and how each alternative satisfies public and environmental concerns. Summarize, in a matrix rating system, the advantages and disadvantages of each alternative for clarity.	28	

(6) Selected Alternative	**This section should contain the detailed description of the chosen alternative.**		
(6.1) Justification of Selected Alternative	Demonstrate the recommended alternative is the most favorable based on monetary and non-monetary considerations covered in section 5 above. Address whether or not the technology is addressed in the CDPHE design criteria. If the EPA-BAT technology is not selected please include rationale.	31	
(6.2) Technical Description	Describe the major features – water source(s); schematic flow diagram of unit treatment processes; unit process sizes (including clearwell); treated water storage capacity; residual handling; treatment and distribution system operator requirements; design criteria – design flow, reserve capacity, process loading rates, treatment log removals, disinfection log removals; any other information pertinent or unique to treatment. Include a bulleted list of all project components and identify which are eligible or ineligible for State Revolving Fund assistance. For more information on determining eligibility please see the "State Revolving Fund Eligibility Assessment Guidance Document." Also be sure to highlight components of the project designed specifically for any of the following purposes: water conservation, source water protection, or beneficial use of sludge.	31	
(6.3) Environmental Review of Selected Alternative	To facilitate the environmental determination process, we require the Environmental Assessment Checklist be completed for the selected alternative and included as an appendix to the PER. This document can be found on the CDPHE WQCD Grants and Loans Unit website : http://www.colorado.gov/cs/Satellite/CDPHE-WQ/CBON/1251599775930	32	

Section (Suggested Outline)	Necessary Elements (Guidance)	Addressed on Page # (Applicant)	Complete (Reviewer)
(6.4) Green Project Reserve	Describe any green components incorporated into the selected alternative. The components should be categorized as one or more of the following four EPA definitions: Green Infrastructure, Water Efficiency, Energy Efficiency or Environmentally Innovative. Reference: April 21, 2010 EPA Procedures for implementing Certain Provisions of EPA's Fiscal Year 2010 Appropriation Affecting the Clean Water and Drinking Water State Revolving Fund Programs, Attachment 2: 2010 Clean Water and Drinking Water State Revolving Fund 20% Green Project Reserve: Guidance for Determining Project Eligibility. This document can be found on the CDPHE WQCD Grants and Loans Unit website: http://www.colorado.gov/cs/Satellite/CDPHE-WQ/CBON/1251599775925	32	
(6.5) Costs	Provide detailed project-related capital costs, operation and maintenance budget – staffing, training, materials, electricity, lab expenses, residual disposal, compliance monitoring etc.; replacement costs; projected increase in and total average monthly user charges; 20-year cash flow projection spreadsheet. If some components are ineligible for funding (see Section 6.2), identify specific costs associated with the eligible and ineligible components.	32	
(6.6) Project Implementation	Hold a public meeting with 30-day notice period and summarize outcome; financing recommendations; legal arrangements, intergovernmental agreements; project schedule and/or time required for completion of design and construction – substantial and final completion. Note that a separate Technical, Managerial, and Financial (TMF) Capacity Review process will be required as part of the State Revolving Fund Program. Design approval, a monitoring plan, and vulnerability assessment are additional steps in the implementation process.	33	

Prepared By: Adam Sommers, P.E.	Date: October 29, 2014
Reviewed By: _____	Date:_____

ENVIRONMENTAL DETERMINATION CHECKLIST

1. **Brief project description, including identification of selected alternative:**

The Arabian Acres Metropolitan District provides potable water service to 140 residential and 5 commercial taps (392 people). The condition of the distribution system is not satisfactory and the District is experiencing considerable water loss in the distribution lines. It lacks property metering for both raw water generation and treated water sold. As such, the District proposes completing the five following Items to increase the longevity of the system, reduce water loss, reduce environmental impacts, improve water use accountability at each tap, and decrease power consumption:

- Item #1: Replace and upgrade existing distribution piping and valves.
    - High Density Polyethylene (HDPE) Piping is the Preferred Material
- Item #2: Installation of flow measurement devices and isolation valves at each tap.
    - Automatic Read Meters are Preferred over Manual Read Meters
- Item #3: Install flow measurement devices at each well.
- Item #4: Drill new groundwater supply well.
- Item #5: Upgrade telemetry system.

2. **Describe if the project will improve or maintain water quality, and if the project addresses a TMDL, and/or Watershed Management Plan.**

Not Applicable

3. **Provide latitude and longitude of the proposed project (if a transmission / distribution / collection line identify the center point not the whole line):**

38° 55’ 08”N, 105° 13’ 15”W

4. **Provide discharge information:**

Not Applicable

5. **Provide NPDES/PWSID number:**

NPDES# CO-0160075

6. **Provide primary waterbody name and waterbody ID, secondary name (if available), and State designated surface water use:**

Not Applicable.

7. **Did your analysis consider how this project impacts community planning efforts in other areas (i.e. transportation, housing, etc.)?**

Due to the limited scope, adverse impacts to community planning efforts are not anticipated.

Y = Yes N = No PA = Possible Adverse

1. Physical Aspects - Topography, Geology and Soils

Y ___ N _√_ PA ___	a.	Are there physical conditions (e.g., steep slopes, shrink-swells soils, etc.) that might be adversely affected by or might affect construction of the WWTF facilities?
Y ___ N _√__ PA ___	b.	Are there similar limiting physical conditions in the planning area that might make development unsuitable?
Y ___ N __√_ PA ___	c.	Are there any unusual or unique geological features that might be affected?
Y ___ N _√__ PA ___	d.	Are there any hazardous areas (slides, faults, etc.) that might affect construction or development?

Discussion and References:

2. Climate

Y ___ N _√__ PA ___	a.	Are there any unusual or special meteorological constraints in the planning area that might result in an air quality problem?
Y ___ N _√__ PA ___	b.	Are there any unusual or special meteorological constraints in the planning area that might affect the feasibility of the proposed wastewater treatment alternative?

Discussion and References:

3. Population

Y ___ N _√__ PA ___	a.	Are the proposed growth rates excessive (exceeding State projections, greater than 6% per annum for the 20 year planning period)?
Y ___ N _√__ PA ___	b.	Will additional growth be induced or growth in new areas encouraged as a result of facilities construction?
Y ___ N _√_ PA ___	c.	Will the facilities serve areas which are largely undeveloped areas at present?

Discussion and References:

4. Housing, Industrial and Commercial Development and Utilities

Y ___ N _√__ PA ___ a. Will existing homes or business be displaced as a result of construction of this property?

Y ___ N _√__ PA ___ b. Will new housing serviced by this facility affect existing facilities, transportation patterns, environmentally sensitive areas, or be in special hazard or danger zones?

Y ___ N _√__ PA ___ c. Will new housing create strains on other utilities and services - policies, power, water supply, schools, hospital care, etc.?

Discussion and References:

5. Economics and Social Profile

Y ___ N _√__ PA ___ a. Will certain landowners benefit substantially from the development of land due to interceptor routing or WWTP location and size?

Y ___ N _√__ PA ___ b. Will the facilities adversely affect land values?

Y ___ N __√_ PA ___ c. Are any poor or disadvantaged groups especially affected by this project?

Discussion and References:

6. Land Use

Y ___ N _√__ PA ___ a. Will projected growth defeat the purpose of local land use controls (if any)?

Y ___ N __√_ PA ___ b. Is the location of the WWTP or other facilities incompatible with local land use plans?

Y ___ N __√_ PA ___ c. Will inhabited areas be adversely impacted by the project site?

Y ___ N __√_ PA ___ d. Will new development have adverse effects on older existing land uses (agriculture, forest land, etc.)?

Y ___ N __√_ PA ___ e. Will this project contribute to changes in land use in association with recreation (skiing, parks, etc.), mining or other large industrial or energy developments?

Discussion and References:

7. Floodplain Development

Y ___ N __√_ PA ___ a. Does the planning area contain 100 year floodplains?
If yes -

Y ___ N ___ PA ___ b. Will the project be constructed in a 100 year floodplain?

Y ___ N _√__ PA ___ c. Will the project serve direct or indirect development in a 100 year floodplain anywhere in the planning area?

Discussion and References:

8. Wetlands

Y _√__ N ___ PA ___ a. Does the planning area contain wetlands as defined by the U.S. Fish and Wildlife Service?

If yes -

Y ___ N _√__ PA ___ b. Will any major part of the treatment works be located on wetlands?

Y ___ N _√__ PA ___ c. Will the project serve growth and development which will directly or indirectly affect wetlands?

Discussion and References:

<u>According to the U.S. Fish and Wildlife Service map included in the Appendix, wetlands are in a few areas of the site, mostly limited to the areas around ponds and streams. It is unlikely that wetlands would be adversely affected as the improvements will take place in roadways or previously developed areas.</u>

9. Wild and Scenic Rivers

Y ___ N _√__ PA ___ a. Does the planning area contain a designated or proposed wild and scenic river?

If yes -

Y ___ N ___ PA ___ b. Will the project be constructed near the river?

Y ___ N ___ PA ___ c. Will projected growth and development take place contiguous to or upstream from the river segment?

Y ___ N ___ PA ___ d. Will the river segment be used for disposal of effluent?

Discussion and References:

10. Cultural Resources (Archeological/Historical)

Y ___ N __√_ PA ___ a. Are there any properties (historic, architectural, archeological) in the planning area which are listed on or eligible for listing on the National Register of Historic Places?

If yes -

Y ___ N _√__ PA ___ b. Will the project have direct or indirect adverse impacts on any listed or eligible property?

Discussion and References:

<u>A survey for archeological or historical resources was not conducted for the entire community. The District does not believe that there are any of these properties.</u>

11. Flora and Fauna (including endangered species)

Y ___ N ___ PA _√__	a.	Are there any designated threatened or endangered species or their habitat in the planning area?
Y ___ N _√__ PA ___	b.	Will the project have direct or indirect adverse impacts on any such designated species?
Y ___ N __√_ PA ___	c.	Will the project have direct or indirect adverse impacts on fish, wildlife or their habitat including migratory routes, wintering or calving areas?
Y ___ N ___ PA ___	d.	Does the planning area include a sensitive habitat area designed by a local, State or Federal wildlife agency?

Discussion and References:

A survey for protected flora and fauna was not conducted. It is not known if there is habitat for threatened or endangered species present in the community served by the District. Since work will take place in roadways or previously developed areas, adverse impacts are not expected.

12. Recreation and Open Space

Y ___ N _√__ PA ___	a.	Will the project eliminate or modify recreational open space, parks or areas of recognized scenic or recreational value?
Y ___ N __√_ PA ___	b.	Is it feasible to combine the project with parks, bicycle paths, hiking trails, waterway access and other recreational uses?

Discussion and References:

13. Agricultural Lands

Y ___ N _√__ PA ___	a.	Does the planning area contain any environmentally significant agricultural lands (prime, unique, statewide importance, local importance, etc.) as defined in the EPA Policy to Protect Environmentally Significant Agricultural Lands dated September 8, 1978?
Y ___ N __√_ PA ___	b.	Will the project directly or indirectly encourage the irreversible conversion of Environmentally Significant Agricultural Lands to uses which result in the loss of these lands as an environmental or essential food production resource?

Discussion and References:

14. Air Quality

Y ___ N _√__ PA ___	a.	Are there any direct air emissions from the project (e.g., odor controls, sludge incinerator) which do not meet Federal and State emission standards contained in the State Air Quality Implementation Plan (SIP)?

Y ___ N ___ PA ___	b.	Is the project service area located in an area without an approved or conditionally approved SIP?
Y ___ N _√__ PA ___	c.	Is the increased capacity of the project greater than 1 mgd?
Y ___ N _√__ PA ___	d.	Do the population projections used in the facilities plan exceed the Sate or areawide projections in the SIP by more than 5%?
Y ___ N ___ PA ___	e.	Does the project conform with the requirements of the SIP? (See EPA regulations under Section 316 of the Clean Air Act.)
Y ___ N ___ PA ___	f.	Is the project inconsistent with the SIP of an adjoining State that may be impacted by the Project?
Y ___ N _√__ PA ___	g.	Does the project violate national ambient Air Quality Standards in an attainment or unclassified area?
Y ___ N _√__ PA ___	h.	Will the facilities create an odor nuisance problem?

Discussion and References:

15. Water Quality and Quantity (Surface/Groundwater)

Y ___ N _√__ PA ___	a.	Are present stream classifications in the receiving stream being challenged as too low to protect present or recent uses?
Y ___ N ___ PA ___	b.	Is there a substantial risk that the proposed discharge will not meet existing stream standards or will not be of sufficient quality to protect present or recent stream uses?
Y ___ N _√__ PA ___	c.	Will construction of the project and development to be served by the project result in non-point water quality problems (sedimentation, urban stormwater, etc.)?
Y ___ N _√_ PA ___	d.	Will water rights be adversely affected by the project?
Y ___ N _√__ PA ___	e.	Will the project cause a significant amount of water to be transferred from one sub-basin to another (relative to the 7-day, 10 year flow of the diverted basin)?
Y ___ N _√__ PA ___	f.	Will stream habitat be affected as a result of the change in flow or stream bank modification?
Y ___ N _√__ PA ___	g.	Are stream conditions needed for deciding upon the required limitations inadequately specified in the 208 Plan? If so, have the wasteload allocations calculations been performed and approved by the State and EPA?
Y ___ N ___ PA ___	h.	Is an Antidegradation Review required?
Y ___ N _√__ PA ___	i.	Will the project adversely affect the quantity or quality of a groundwater resource?
Y ___ N __√_ PA ___	j.	Does the project adversely affect an aquifer used as a potable drinking water supply?
Y ___ N ___ PA ___	k.	Are there additional cost effective water conservation measures that could be adopted by community to reduce sewage generation?

Discussion and References:

16. Public Health

Y ___ N _√__ PA ___	a.	Will there be adverse direct or indirect noise impacts from the project?
Y ___ N _√__ PA ___	b.	Will there be a vector problem (e.g., mosquito) from the project?
Y ___ N _√__ PA ___	c.	Will there be any unique public health problems as a result of the project (e.g., increased disease risks)?

Discussion and References:

17. Solid Waste (Sludge Management)

Y ___ N ___ PA ___	a.	Will sludge disposal occur in an area with inadequate sanitary landfills or on land unsuitable for land application?
Y ___ N ___ PA ___	b.	Are there special problems with the sludge that makes disposal difficult (hazardous, difficult to treat)?
Y ___ N ___ PA ___	c.	Is the technology selected for sludge disposal controversial?

Discussion and References:

18. Energy

Y ___ N _√__ PA ___	a.	Are there additional cost effective measures to reduce energy consumption or increase energy recovery which could be included in this project?

Discussion and References:

The project as proposed will result in energy savings. Reduced water loss in the distribution system will require less distribution system pressure boosting.

19. Land Application

Y ___ N _√_ PA ___	a.	Has a new or unproven technique been selected?
Y ___ N _√__ PA ___	b.	Is there considerable public controversy about the project?
Y ___ N _√__ PA ___	c.	Will the project require additional water rights or impact existing water Rights?
Y ___ N __√_ PA ___	d.	Is the project multi-purpose?

Discussion and References:

20. Regionalization

Y ___ N __√_ PA ___ a. Are there jurisdictional disputes or controversy over the project?
Y ___ N _√__ PA ___ b. Is conformance with the 208 plan in question?
Y ___ N _√__ PA ___ c. Is the proliferation of small treatment plants and septic systems creating a significant health problem?
Y ___ N __√_ PA ___ d. Have inter-jurisdictional agreements been signed?

Discussion and References:

21. Public Participation

Y ___ N _√__ PA ___ a. Is there a substantial level of public controversy?
Y _√__ N ___ PA ___ b. Is there adequate evidence of public participation in the project?

Discussion and References:

The District is unaware of any public concerns with the location or technical components of the project. It anticipates that most residents would welcome a more reliable system that costs less to operate and maintain. Resistance to increasing user rates or taxes to pay for the project may be encountered by some members of the public in the event additional fees are required.

A public meeting, consistent with CDPHE Grants & Loans Unit requirements, will be advertised and held sometime in late 2014. The list of attendees and meeting minutes will be provided to the CDPHE when available.

22. Environmental Laws

Y ___ N _√__ PA ___ a. Does the project threaten to violate any State, Federal or local law or requirement imposed to protect the environment?

Discussion and References:

Prepared By: Adam Sommers, P.E. Consulting Engineer for the Arabian Acres Metropolitan District
Name, Title, and Affiliation

Date: October 29, 2014

Reviewed By (WQCD): _____
Name and Title

Date: _____

Environmental Determination: (Circle One) CE EA E

ARABIAN ACRES METROPOLITAN DISTRICT

2014 Budget Message

Introduction

The budget reflects the projected spending plan for the 2014 fiscal year based on available revenues. This budget provides for the general operation of the District, a business like enterprise for the distribution of treated water, and the annual debt service of the District's long term debt.

The District's assessed value decreased approximately .1% to $3,775,630 in 2013. The District's mill levy remains the same as 2013 at 24.000 mills certified in 2013 for taxes collected in the 2014 fiscal year. All of the property tax revenue is dedicated to Debt Service Fund.

The District was established in 2002 to supply water for domestic purposes. The District currently serves approximately 305 connected taps in the service area which is located in Teller County.

Budgetary Basis of Accounting

The District uses funds to budget and report on its financial position and results of its operations. Fund accounting is designed to demonstrate legal compliance and to aid financial management by segregating transactions related to certain functions. The various funds determine the total District budget. The District's Water Enterprise Fund is reported using the economic resources focus and the accrual basis of accounting. Revenues are recorded when earned and expenses recorded when the liability is incurred, regardless of the timing of the related cash flows. Property taxes are recognized as revenues in the year for which they are levied.

Fund Summaries

Water Operations Enterprise Fund accounts for the operations that are financed and operated in a manner similar to private business enterprise, where the intent is the costs of providing services to the public on a continuing basis financed primarily through user charges.

Debt Service Fund is used to account for property taxes and other revenues dedicated to pay the fiscal year's debt expense which includes principal payments, interest payments, and administrative costs associated with debt issues.

Summary of Debt Outstanding

Arabian Acres Series 2007 Debt Service Schedule

Debt Service Schedule

	Principal	Interest	Total
2013*		26,810.39	26,810.39
2014	45,000.00	67,805.00	112,805.00
2015	45,000.00	65,982.50	110,982.50
2016	50,000.00	64,137.50	114,137.50
2017	55,000.00	62,062.50	117,062.50
2018	60,000.00	59,752.50	119,752.50
2019-2023	355,000.00	253,740.00	608,740.00
2024-2028	455,000.00	160,250.00	615,250.00
2029-2030	360,000.00	30,750.00	390,750.00
	1,425,000.00	791,290.39	2,216,290.39

* Includes unpaid interest from Dec, 2013

Arabian Acres Metropolitan District
Assessed Value, Property Tax and Mill Levy Information

	2012 Adopted Budget	2013 Adopted Budget	2014 Adopted Budget
Assessed Valuation	$ -	$ 3,811,890	$ 3,775,630
Mill Levy			
General Fund	0.000	0.000	0.000
Debt Service Fund	0.000	24.000	24.000
Temporary Mill Levy Reduction	0.000	0.000	0.000
Refunds and Abatements	0.000	0.000	0.000
Total Mill Levy	0.000	24.000	24.000
Property Taxes			
General Fund	$ -	$ -	$ -
Debt Service Fund	-	91,485	90,615
Temporary Mill Levy Reduction	-	-	-
Refunds and Abatements	-	-	-
Actual/Budgeted Property Taxes	$ -	$ 91,485	$ 90,615

Arabian Acres Metropolitan District

GENERAL FUND
2014 ADOPTED BUDGET
with 2012 Actual, 2013 Adopted Budget and 2013 Amended

	2012 Actual	01/2013-10/2013 Actual YTD	2013 Adopted Budget	2013 Amended	2014 Adopted Budget
BEGINNING FUND BAL	-	-	-	-	-
REVENUE					
Water Fees	-	154,783	169,400	174,783	-
Interest	-	-	260	-	-
Other Revenue	-	650	250	650	-
POA Contribution		9,750		9,750	
NRWA Loan Proceeds		100,000		100,000	
Insurance Reimbursement		3,170		3,170	
Property Taxes		90,839	95,000	90,839	
Specific Ownership Taxes		5,651	6,000	6,000	
Tap Fees			8,000		
Total Revenue	-	364,843	278,910	175,433	-
Total Funds Available	-	364,843	278,910	175,433	-
EXPENDITURES					
Audit/Forensic Audit	-	16,366	1,500	22,000	
Bank Fees	-	-	30	-	
Director Fees	-	1,520	3,600	1,520	
Payroll Expense	-	4,156	10,080	4,156	
Payroll Taxes	-	788	1,720	788	
Election	-	-	-		
Telephone-Website	-	1,926	1,500	1,971	
SDA -Membership	-	1,882	1,600	1,882	
Insurance Liability and WC	-	4,412	3,800	4,412	
Legal	-	51,513	12,000	70,000	
District Mgt/Conract Admin	-	28,715	21,600	35,315	
Contract Operator	-	15,780	14,400	22,080	
Miscellaneous	-	3,476	-	4,000	
Locate Notification Fees	-	231	230	291	
Office Supplies	-	73	2,100	100	
Postage and Delivery	-	1,043	-	1,043	
Returned Checks	-	-	-	-	
Chemicals and Supplies	-	2,846	3,000	4,000	
Repairs and Mtce	-	7,705	15,000	12,000	
Water Testing	-	3,168	5,600	5,768	
Utilities	-	8,978	11,100	11,100	
Water Purchase	-	130,577	30,000	130,577	
County Treasuer's Fee	-	-	-		
Real Estate Taxes	-	905	350	905	
Loss due to Theft	-	-	-	206,000	
Capital Outlay	-	62,861	3,600	65,000	
Contingency	-	-	-		
NRWA Loan-Principal	-	8,686	-	11,569	
NRWA Loan-Interest	-	-	-		
Rupp Family Partnership Note	-	1,000	1,000	1,000	
2007 Bond Principal and Interest		33,903	120,000	95,995	
Paying Agent		250	250	250	
Total Expenditures	-	392,760	264,060	713,722	-

TRANSFERS AND OTHER USES					
Emergency Reserve	-	-	-	-	-
Total Expenditures Requiring Appropriation	-	392,760	264,060	713,722	-
ENDING FUND BALANCE	$ -	$ (27,917)	$ 14,850	$ (538,289)	$ -

Arabian Acres Metropolitan District

DEBT SERVICE FUND
2014 ADOPTED BUDGET

	2012 Actual	01/2013-10/2013 Actual YTD	2013 Adopted Budget	2013 Amended	2014 Adopted Budget
BEGINNING FUND BAL	-	-	-	-	-
REVENUE					
Property Taxes	-				90,615
Specific Ownership Tax					5,600
Interest	-				-
Transfer from Enterprise Fund					46,369
Total Revenue	-	-	-	-	142,584
Total Funds Available	-	-	-	-	142,584
EXPENDITURES					
2007 Bond Principal	-	-	-	-	45,000
2007 Bond Interest	-				94,616
County Teasurer's Fee	-				2,718
Paying Agent Fees	-				250
Total Expenditures	-	-	-	-	142,584
Total Expenditures Requiring Appropriation	-	-	-	-	142,584
ENDING FUND BALANCE	$ -	$ -	$ -	$ -	$ -

Arabian Acres Metropolitan District

ENTERPRISE FUND
2014 ADOPTED BUDGET

	2012 Actual	01/2013-10/2013 Actual YTD	2013 Adopted Budget	2013 Amended	2014 Adopted Budget
BEGINNING FUND BAL	-	-	-	-	-
REVENUE					
Water Fees	-		-	-	124,500
Supplemental Operations Fee					137,720
Insurance Reimbursements					
Interest	-		-		-
Tap Fees					
Other Revenue	-				-
Total Revenue	-	-	-	-	262,220
Total Funds Available	-	-	-	-	262,220
EXPENDITURES					
Audit					7,500
District Mgt					37,200
Contract Operator					28,200
Director Fees					-
Insurance-Liability, Property, etc					3,060
SDA Dues, Fees & Subscriptions					350
Locate Notification Fees					240
Office Supplies					600
Miscellaneous/Contintgency					100
Postage and Delivery					450
Legal					15,000
Repairs and Mtce					13,200
Election					4,500
Website					165
SCADA System					375
Chemicals and Supplies					6,000
Utilities					10,200
Water Purchase					7,625
Water Testing					2,880
Capital Outlay (Well Const)					40,000
Rupp Family Partnership Loan					
National Rural Water Loan					8,686
Previous Year's Unpaid Expenses					29,520
Total Expenditures	-	-	-	-	215,851
TRANSFERS AND OTHER USES					
Transfer to Debt Service Fund					46,369
					206,000
Total Expenditures Requiring Appropriation	-	-	-	-	262,220
ENDING FUND BALANCE	$ -	$ -	$ -	$ -	$ -

STATE OF COLORADO
COUNTY OF TELLER
ARABIAN ACRES METROPOLITAN DISTRICT

I, Sandy Zuniga, certify that I am a Director and the duly elected and qualified Secretary of the Arabian Acres Metropolitan District, and that the foregoing constitute a true and correct copy of the record of proceedings of the Board of Directors of said District, adopted at a special meeting of the Board of Directors of the Arabian Acres Metropolitan District held on November 21, 2013, at Teller County, Colorado, as recorded in the official record of the proceedings of the District, insofar as said proceedings relate to the budget hearing for fiscal year 2014; that said proceedings were duly had and taken; that the meeting was duly held; and that the persons were present at the meeting as therein shown.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed the official seal of the District this 21st day of November, 2013.

Sandy Zuniga, Secretary

ARABIAN ACRES METROPOLITAN DISTRICT

SCHEDULE OF FEES & CHARGES

December 1, 2013

Tap Fee: ..... $8,000.00 / SFE[1]

Water Usage Fees:

Metered Account Usage

0 – 5,000 gallons	$13.50 / K gal.
5,001 -9,000 gallons	$19.00 / K gal.
9,001 gallons and above	$50.00 / K gal.

Service Fees - Per Month:

Single Family Residential	
¾"	$52.50 / month
Commercial	
¾"	$115.50 / month
1"	$288.75 / month

Supplemental Operations Fee - Per Month:

Single Family Residential	
¾"	$100.00 / month
Commercial	
¾"	$220.00/ month
1"	$550.00/ month

Late Fees	$15.00/ billing period
Bad Check Fee	$45.00
Collections	Varies [2]
Tap Transfer Fee	TBA[3]
Turn-Off Fee	Varies[4]
Turn-On Fee	$50.00[4]
Revocation / Disconnection of Service Fee	$150.00[5]
Unauthorized Connection / Use Fee	up to $10,000.00
Inspection Fees (first half hour per year no charge)	Min. $50.00/hr.
Meter Reading (Customer requested, other than regularly scheduled reads)	$50.00
Plan Revision Fees	Varies[6]
Meter Testing / Certification Fee	$350.00[7]
Main Line Deposit	TBA[8]
Foreclosure Fee	TBD
Construction Water Fee	$250.00
Account Transfer/Real Estate Closing Fee	$250.00[9]
Copy Charges	$1.25 / page

1 Single Family Equivalent or "SFE" is the term used to describe a basic unit of measurement which equates the demand of metered connections larger than 5/8" to that of a single family 5/8" metered connection. See Section 1.7 (nn) of the Rules and Regulations ("R&R") currently in effect for information regarding the ratio of SFE to individual tap sizes.

2 $250.00 or 125% of actual cost for collections; whichever is greater.

3 To be assessed on a case by case basis, per Section 6.4 of the AAMD, R&R, as amended.

4 TURN-OFF FEE: No charge for one (1) Customer requested Turn-Off per calendar year (accounts not in arrears); each additional requested Turn-Off shall be $50.00. While the service is Turned-Off, both the monthly Service Fee and the Supplemental Operations Fee shall remain in effect.

TURN-ON FEE: No charge for one (1) Customer requested Turn-On per calendar year (accounts not in arrears); each additional requested Turn-On shall be $50.00.

5 Revocation/Disconnection of Service may or may not include the removal of the meter. During revocation/disconnection, both the Monthly Service Fee and the Supplemental Operations Fee shall remain in effect. Re-establishment of service shall require payment of all fees due and owing the District, including but not necessarily limited to the normally applicable Tap Fees associated with new customers (when a meter has been removed) at the time of service re-establishment.

6 $75.00, or 125% of actual engineering review costs, if any; whichever is greater.

7 Prior to the removal and testing of a meter per the customer's written request, customer shall pay the testing / certification fee. Based upon its findings, the District in its sole discretion, will take the following action:

a) If the meter has registered more water than actually passed through it, by greater than 2%; the current bill will be adjusted proportionately as a credit. In this case, the testing / certification fee shall be returned to the customer.

b) If the meter has registered less water than actually passed through it, by greater than 2%; the District may elect to adjust the current bill proportionately as a debit. In this case, the Meter Testing/certification Fee shall not be returned to the customer.

c) Should the meter fail to register in any period, the Customer shall be charged for the average period consumption determined over the preceding two (2) years or such amount as will most closely approximate actual usages, as determined by the District. In this case, the Meter Testing / certification Fee shall be returned to the customer.

8 To be assessed on a case by case basis, per Section 5.4.2 of the AAMD, R&R, as amended.

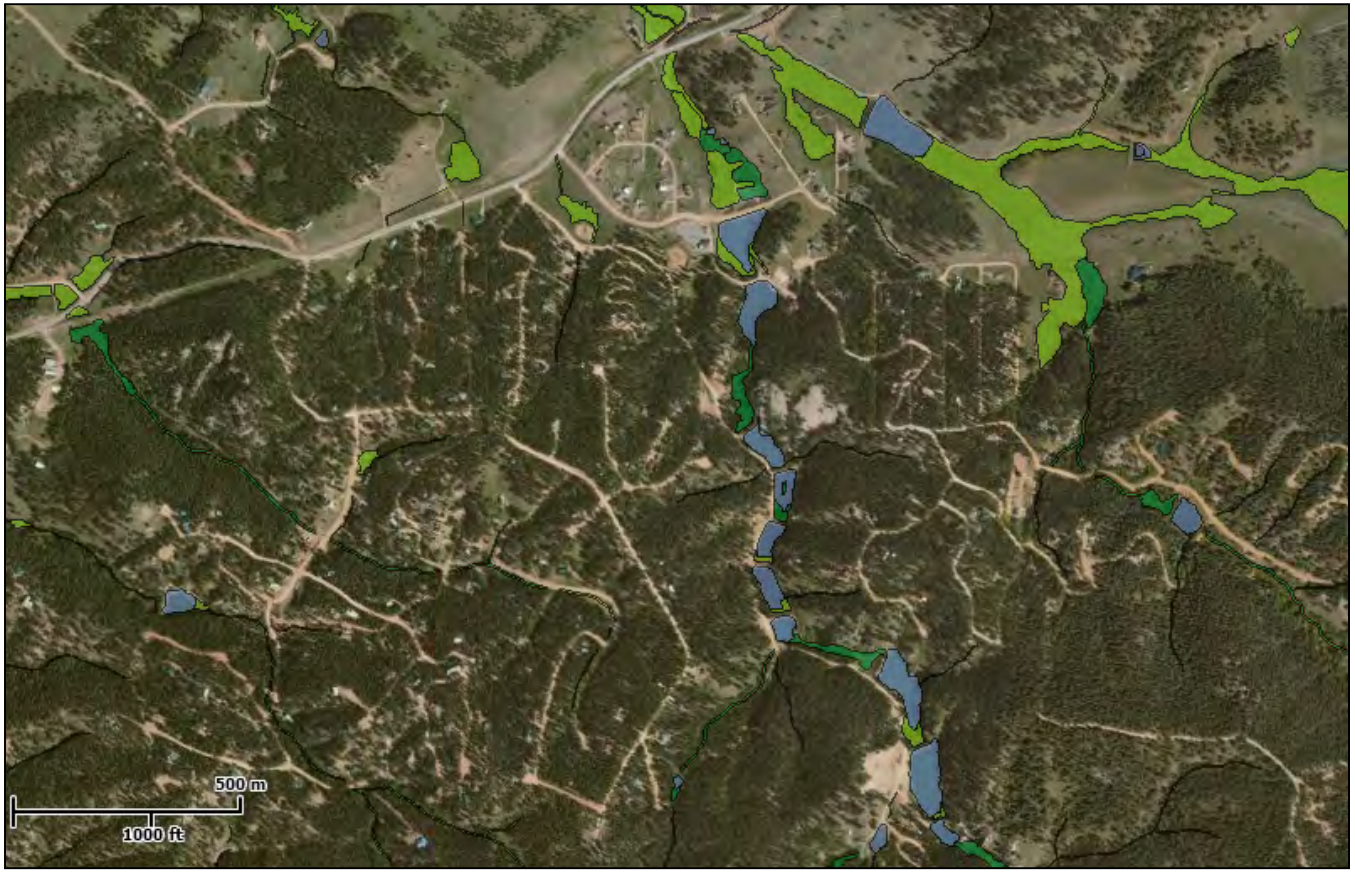
9 This fee is paid directly to District's Management Company via the Title Company and loan closing process, without additional cost to the District.

U.S. Fish and Wildlife Servic

National Wetlands Inventory

Arabian Acres Wetlands Map

May 27, 2014



Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

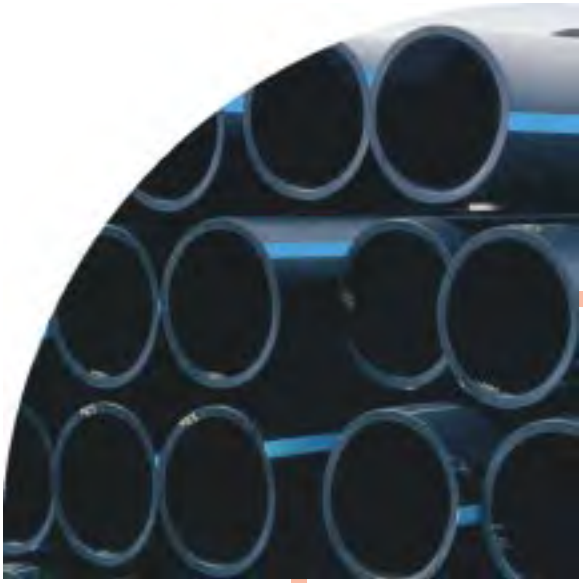
User Remarks:

HDPE

High-Density Polyethylene Pipe Systems

Meeting the challenges of the 21st century

PPI PLASTICS PIPE INSTITUTE



Smooth-wall High-Density Polyethylene pipe systems

Meeting the challenges of the 21st century

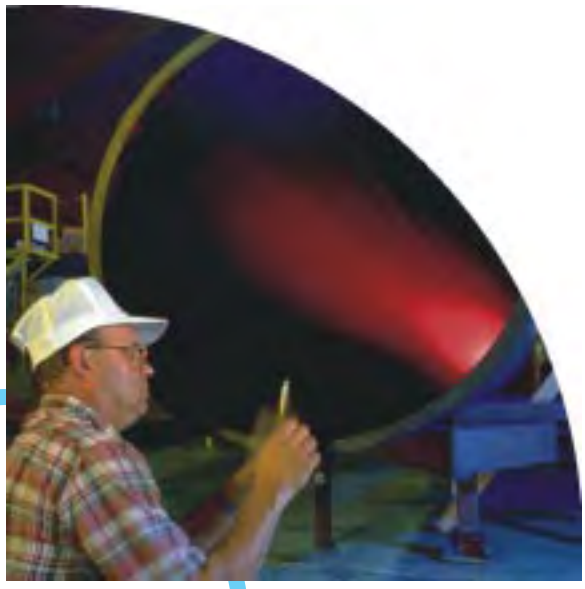
Piping made from polyethylene is a cost effective solution for a broad range of piping problems in municipal, industrial, marine, mining, landfill, duct and agricultural applications. It has been tested and proven effective for above ground, sur face, buried, sliplined, floating, and sub-sur face marine applications.

High-density polyethylene pipe (HDPE) can carry potable water, wastewater, slurries, chemicals, hazardeous wastes, and compressed gases. In fact, polyethylene pipe has a long and distinguished history of service to the gas, oil, mining and other industries. It has the lowest repair frequency per mile of pipe per year compared with all other pressure pipe materials used for urban gas distribution.

Polyethylene is strong, extremely tough and very durable. Whether you're looking for long service, trouble-free installation, fle xibility, resistance to chemicals or a myriad of other features, high-density polyethylene pipe will meet all your requirements.

HDPE

HDPE PIPE
SAVES BOTH TIME AND MONEY



Lower life cycle costs

- Corrosion resistance. Does not r ust, rot or cor rode.
- Leak tight. Heat-fused joints create a homogenous, monolithic system. The fusion joint is stronger than the pipe.
- Maintains optimum flow rates. Does not tuberculate, has a high resistance to scale or biological build-up.
- Excellent water hammer characteristics. Designed to withstand surge events.
- High strain allowance. Virtually eliminates breakage due to freezing pipes.
- Additional cost savings are achieved by lower instance of repairs.
- With no exfiltration or infiltration, potable water losses and groundwater nuisance treatment costs encountered in traditional piping systems are eliminated.

Reduced installation costs

- Material of choice for trenchless technology. Used in directional boring, plowing, river crossings, pipe bursting and sliplining.
- Fewer fittings due to pipe fle xibility. Allowable bending radius of 20 to 25 times outside diameter of pipe.
- Lighter equipment required for handling and installation than with metallic materials.
- Eliminates the need for thr ust blocking. Heat fused joints are fully restrained.
- Light weight and longer lengths allow for significant savings in labor and equipment.

Consider the following features of

HDPE pipe:

- **LEAK FREE.**
  Polyethylene pipe is normally joined by heat fusion. Butt, socket, sidewall fusion and electrofusion create a joint that is as strong as the pipe itself, and is virtually leak free. This unique joining method produces significant cost reductions compared to other materials.

- **CORROSION, ABRASION, AND CHEMICAL RESISTANT.**
  Polyethylene piping's performance in mining, dredging and similar applications proves it will outwear many more costly piping materials when conveying a variety of abrasive slurries. HDPE has excellent corrosion resistance and is virtually inert. It does not need expensive maintenance or cathodic protection. It offers better overall resistance to corrosive acids, bases and salts than most piping materials. In addition, polyethylene is unaffected by bacteria, fungi and the most "aggressive" naturally occurring soils. It has good resistance to many organic substances, such as solvents and fuels.

- **EXCELLENT FLOW CHARACTERISTICS.**
  Because polyethylene is smoother than steel, cast iron, ductile iron, or concrete, a smaller PE pipe can carry an equivalent volumetric flow rate at the same pressure. It has less drag and a lower tendency for turbulence at high flow. Its superior chemical resistance and "non-stick" surface combine to almost eliminate scaling and pitting and preserve the excellent hydraulic characteristics throughout the pipe service life.

- **LIGHTWEIGHT AND FLEXIBLE.**
  Polyethylene pipe is produced in straight lengths or in coils. Made from materials about one-eighth the density of steel, it is lightweight and does not require the use of heavy lifting equipment for installation. It reduces the need for fittings, is excellent in shifting soils and performs well in earthquake-prone areas. HDPE resists the effects of freezing and allows bending without the need for an excessive number of fittings. Since HDPE is not a brittle material, it can be installed with bends over uneven terrain easily in continuous lengths without additional welds or couplings.

- **DUCTILITY AND TOUGHNESS**. Polyethylene pipe and fittings are inherently tough, resilient and resistant to damage caused by e xternal loads, vibrations, and from pressure surges such as water hammer. Even in cold weather polyethylene pipe is tolerant to handling and bending.

- **MANUFACTURED UNDER AWWA, NSF, ASTM, AGA, EPA, DNR, DOT, API, FM, CSA AND OTHER NATIONALLY RECOGNIZED STANDARDS.** Polyethylene pipe is listed and approved by the standards or committees of the agencies listed above.

- **AVAILABLE IN DIAMETERS FROM ½ INCH TO 63 INCH.** Polyethylene pipe is available in a wide range of diameters and wall thickness, with flanges, elbows, tees, wyes, and valves, providing a total system solution. HDPE pipe is also available in Iron Pipe Size (IPS), Ductile Pipe Size (DIPS) as well as metric sizes. Plastic Pipe Institute members can provide pipe, fittings and other appurtenances.

- **APWA COLOR CODING BY APPLICATION.** Polyethylene pipe is available with color coding by application as developed by the utility location and coordination council of the American Public Works Association (APWA).

Case Histories

Pipe bursting project saves time and money

As part of its sewer rehab project, the city of Baytown, Texas, elected to use 36-inch HDPE pipe to replace 36-inch Reinforced Concrete Pipe (RCP) sewer lines. To burst more than 3700 feet of pipe in residential areas, the contractor used both static and pneumatic bursting systems. The pipe bursting method was recommended over three other procedures to avoid the major impact of bypass pumping and reduced flow capacity involved.

Sliplining polyethylene pipe rescues Colorado highway

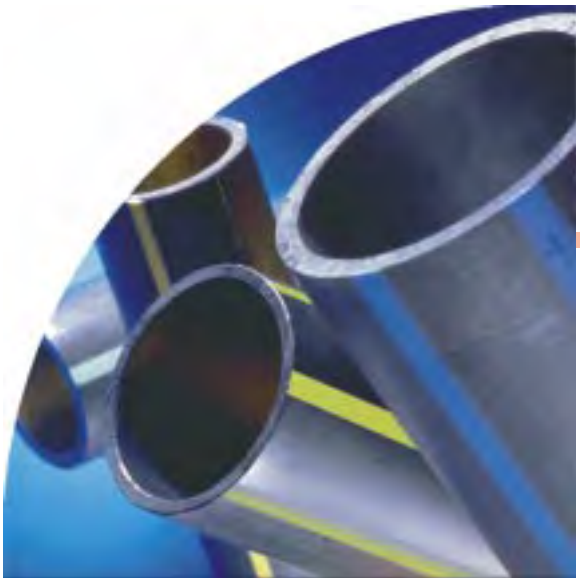
When a section of corrugated metal pipe culvert rusted and washed out, a busy Colorado highway was partially closed down to traffic. The Colorado Department of Transportation acted quickly to line the culvert with polyethylene pipe. Its light weight and durability were perfect for the project's high elevation and isolated location. The line pipe was inserted from the uphill side of the culvert and pulled into position, then the joints were assembled. Filling the annular void space between the existing Corrugated Metal Pipe (CMP) and the liner pipe with grout was challenging, but successful. The liner and direct bury portions are in place, with flow restored and traffic running normally on the highway above it.

HDPE restores city drinking water

A deteriorating cast iron water main in Henryetta, Oklahoma was leaking 300,000 gallons of water per day and threatening to shut off the city's water supply. Complicating factors included water temperature that changed 30 degrees in short time periods and steep slopes in the location of the leak. Reducing the number of pipe joints along the slope and accommodating the temperature differential, along with elevation problems, convinced city officials to select HDPE pipe. Fourteen-inch Iron Pipe Size (IPS) DR-11 water pipe was installed along the 1,400-foot section of line extending over the steep slope to the flatland below. The HDPE pipe solved the elevation and water temperature problems, and allowed for rapid installation that avoided shutting off the city's main water supply for an extended period of time.

Taking safe water to a rural community

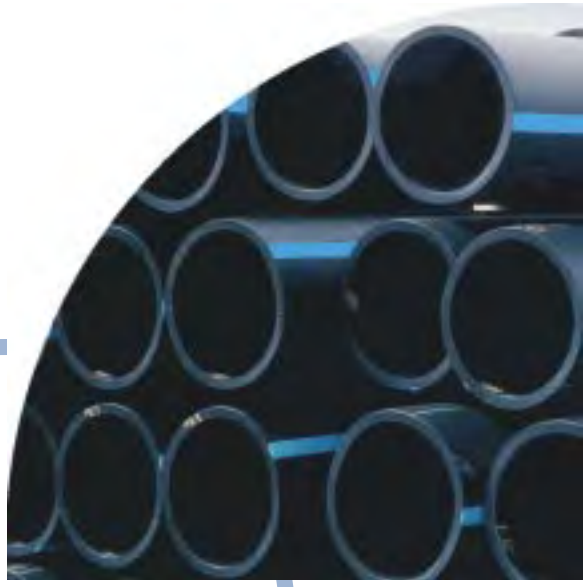
The cost of constructing long lengths of distribution piping deprives many rural residents of safe drinking water. Carlsbad Springs in Ontario, Canada studied a steady-flow water supply technology and chain trencher installations method, discovering they could save 66% over conventional water supply installations. Although high-density polyethylene pipe was not in the standards for watermain materials, an assessment of the material and appropriate jointing methods determined HDPE pipe was flexible, resistant to corrosion and smooth-walled. Carlsbad Springs installed approximately 33.5km (20.8mi.) of HDPE watermain ranging from 75mm to 200mm (3 inch to 8 inch) diameter. Using HDPE and chain trenching excavation, watermain installation costs were as low as $15 per foot for 6-inch diameter pipe.



Horizontal directional drilling solves overflow problems at San Rafael Canal

A nightmare situation faced the San Rafael, California Sanitation District. Few challenging environmental demands can compare with preventing tons of raw sewage from dumping into San Francisco Bay. A pipeline constr ucted in the 40s to transfer sewage and groundwater was rusting and cor roding, and had inside sedimentary buildup that decreased its capacity significantly. Without replacing the entire sewage system, the best solution was to install two new parallel polyethylene pipelines 15 feet below the bottom of the canal. Laying the pipe involved complicated directional drilling at a vertical curve with a series of tight maneuvers, with a compound cur ve around private property, and without disturbing the nearby wetlands. The project utilized 16-inch SDR - 11 and 26-inch SDR-11 HDPE pipe that met the criteria for pullback, ability to bend and to withstand the stress of horizontal directional drilling. Excavation and environmental impact were kept to a minimum, and the project was completed in four weeks, one-third the time required for the average trench-digging operation, at a total cost of $2.4 million.

THE PLASTICS PIPE INSTITUTE (PPI)



Since its founding in 1950, PPI has been the voice for its members who are involved in manufacturing and distributing polyethylene pipe systems. Members share an interest in educating industry about the benefits of HDPE pipe, and broadening market opportunities to use polyethylene piping systems for water and gas distribution, sewer and wastewater, oil and gas production, industrial and mining uses, power and communication duct, and ir rigation.

Members include

- Manufacturers of polyethylene pipe, fittings and valves
- Manufacturers of polyethylene piping materials
- Manufacturers of equipment and machinery used for fabricating, joining or installing polyethylene piping systems

For additional infor mation, visit the PPI web site at www.plasticpipe.org or contact our headquarters in Irving, TX at 469/499-1044, fax 469/499-1063.

PLASTICS PIPE INSTITUTE

www.plasticpipe.org

NATIONAL METER AND AUTOMATION, INC.

QUOTATION

7220 South Fraser Street
Centennial, CO 80112
Phone: 303.339.9100
Fax: 303.649.1017

DATE: August 15, 2014
QUOTED BY: Charla Dury/ Jon Watson
CUSTOMER EMAIL: adam@aquaworksdbo.com

BILL TO:
Adam @ Aquaworks DBO

SHIP TO:
Arabian Acres

SALESPERSON	PAYMENT TERMS	SHIPPING METHOD	SHIPPING TERMS	SUBJECT TO REVIEW
Jon Watson	Net 30 Days	Best Way	FOB - Centennial	3/31/15

QTY	Product Description	UNIT PRICE	AMOUNT
1	Beacon Initial Engagement fee (one time) REQUIRED Includes Beacon AMA portfolio setup and Interface creation (Beacon-Bill-Int) with customer's billing system	$ 6,000.00	$ 6,000.00
152	LF25 5/8" x 3/4" meter with HRE - LCD register	$ 130.00	$ 19,760.00
152	Beacon AMA Cellular radio device to include: Unlimited use of Customer Portal BEACON, Unlimited use of Customer portal EyeOnWater, Unlimited Use of installation tool app, Customer report delivery/app (iPhone/Android), Monthly file generation of RIPPLE consumer report, email alerts, text alerts, certified test data on Badger product	$ 240.00	$ 36,480.00
152	Rehrig 13" Composite lid	$ 22.00	$ 3,344.00
152	Installation fee per meter	$ 50.00	$ 7,600.00
	Notes:		
	These quoted prices are configured as a complete package deal ONLY.		
	Customer must agree to sign a ten (10) year contract up front, in order to initate all system benefits, features and pricing.		
	If Installed with a meter pit, composite covers MUST be used in EVERY installation.		
	If Customer decides to continue with the Beacon System after year 10, a new contract for years 11-20 must be signed. The up front cost for a new 10 year Beacon cellular transmitter (to include service fee) will be $275.00 per each device. This device can be installed on the existing Badger water meter in place of the previous (1-10 year) Beacon cellular transmitter.		
		SUBTOTAL	$ 67,184.00
Sales Tax:	Exempt	**SALES TAX**	-
Est. Lead Time:	6 to 8 weeks ARO Not to include Installation start date	**FREIGHT**	Add
		TOTAL	**$ 67,184.00**

THANK YOU FOR YOUR BUSINESS!!

Badger Meter | Making Water Visible®

Comprehensive Metering Line
Proven AMR/AMI Technology
Powerful Analytics

Water Utility Solutions

Today's Demanding Water Utility Management Challenges

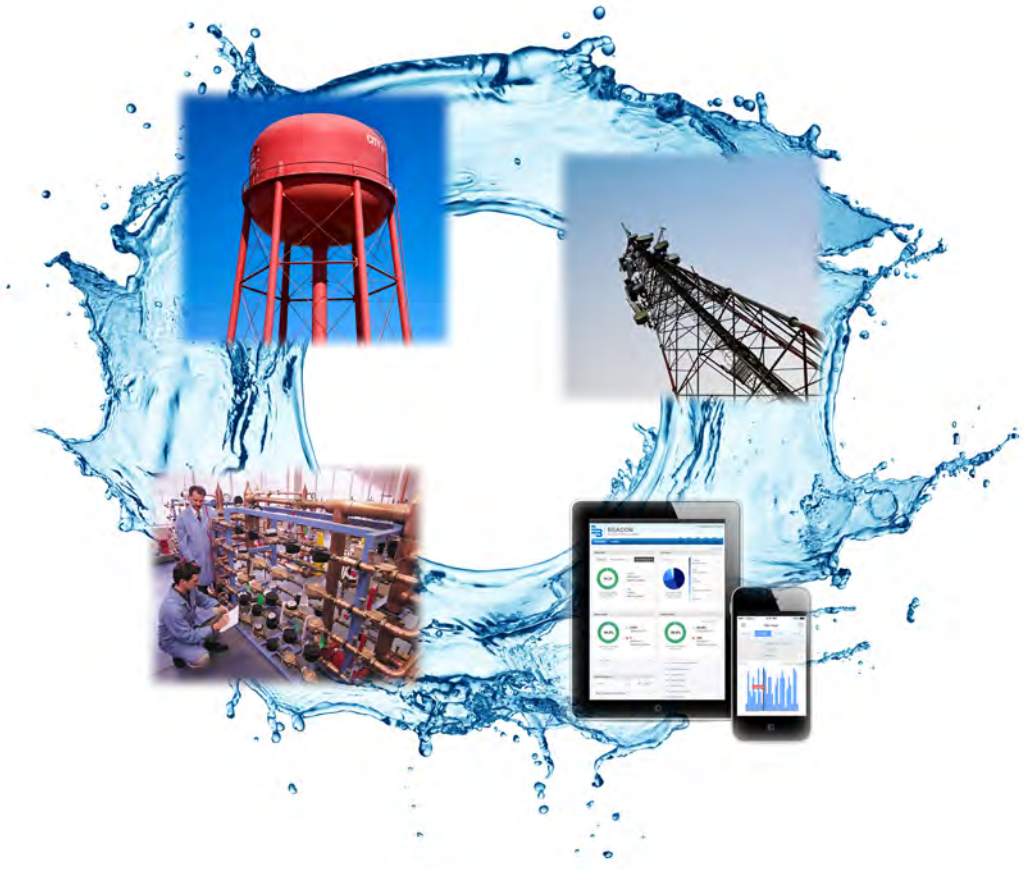
Today's business environment demands informed decision making and control over your water utility management. It's essential you efficiently manage your operations, conserve water and energy, provide superior customer service, and achieve regulatory compliance—all while continuing to control revenue and resources.

The more challenges you face, the more you need a reliable and knowledgeable partner who can supply you with durable and accurate metering hardware, and powerful yet adaptable technology solutions that give you greater visibility to timely, meaningful information.

All the Products, Technology and Expertise You Need in a Water Metering Partner

A leader in flow measurement technology since 1905, Badger Meter continues to be a key partner in helping public and private utilities and municipalities with their water management initiatives. Because we understand the challenges utilities encounter, we can provide the tools that help communities generate needed revenue, monitor and conserve their precious resources and serve their valued end water customers.

Today, our water utility solutions are top-rated and industry-leading. We offer a comprehensive metering line, proven AMR/AMI technology and the powerful analytics tools that truly help in Making Water Visible® for thousands of water utilities.



Choice Matters—Choose From Our Comprehensive Metering Solutions

We offer a comprehensive water meter product line for residential, commercial and fire service applications. All of our meters are regulation compliant and are available in a range of metering technologies, materials and sizes. Choose between our families of Recordall®, E-Series® or M-Series® meters. Choices include BiAlloy, Engineered Polymer or Stainless Steel in a wide range of sizing options. Your choice in a water metering solution counts—choose from the many Badger Meter offerings to find a solution that meets your specific needs.

Electronic Meters

For the latest in innovative metering technology, choose an electronic meter from Badger Meter. With no moving parts to impede the flow stream, electronic meters improve reliability, have greater extended low flow accuracy and keep maintenance to a minimum.

- E-Series Ultrasonic Meters
- M-Series Electromagnetic Meters

Electronic Meters

Mechanical Meters

For an accurate, cost-effective solution for your residential, commercial or fire service metering needs, choose one of our Recordall® mechanical meters. These time-tested meters are an ideal solution for measuring flow in a wide variety of applications.

- Recordall Disc Series Meters
- Recordall Compound Series Meters
- Recordall Turbo Series Meters
- Recordall Fire Service Meters and Assemblies
- Recordall Fire Hydrant Meters

Mechanical Meters

Encoders

Badger Meter high resolution encoders (HR-E LCD and HR-E) provide utilities with more than just a reading. Whether you choose the 9 digit LCD or the 8-dial HR-E encoder, the high resolution encoded output provides leak detection and other critical information to help utilities manage their water. High resolution encoders utilize the industry standard communication protocol, do not require programming or setting adjustments during installation or wire repair. And, through a unique sealing process that eliminates gaskets, Badger Meter encoders are built to withstand harsh environments including flooded pits.

- High Resolution LCD Encoders
- High Resolution Encoders

Encoders

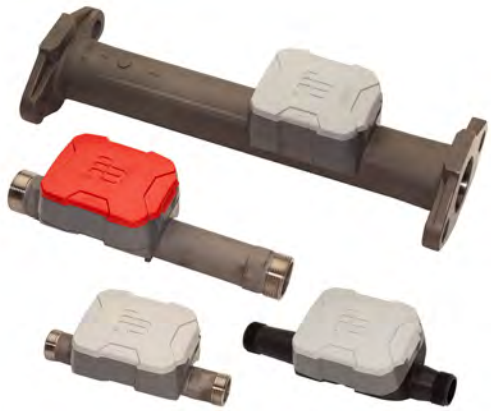
All of our meters and encoders are compatible with Badger Meter AMR/AMI systems as well as other approved technologies.

Our Comprehensive Metering Lines

E-Series® Ultrasonic Meters

E-Series Ultrasonic meters are designed to reduce maintenance, improve accuracy and durability, lower operating costs, and minimize water loss.

- Available in six sizes: 5/8...2 in.
- Simplified one-piece electronic meter and register integral to the meter body eliminates tampering.
- No moving parts eliminates mechanical wear.
- Delivers long-term sustained accuracy within ±1.5%.
- Complies with the lead-free provisions of the Safe Drinking Water Act.
- NSF/ANSI standards 61 and 372 certified.



M-Series® Electromagnetic Meters

M-Series meters improve accuracy, decrease system maintenance and help meet the demands of challenging fluid conditions.

- Non-intrusive, completely open-flow tube design virtually eliminates pressure loss.
- No moving parts to impede the flow stream; maintenance is kept to a minimum—even in less-than ideal fluid conditions.
- Complies with the lead-free provisions of the Safe Drinking Water Act.
- NSF/ANSI standards 61 and 372 certified.

Recordall® Disc Series Meters

Recordall Disc Series meters are an accurate, cost-effective solution for your residential metering needs. Our positive displacement meters utilize the industry-leading accuracy of nutating disc technology to drive revenue and reliability.*

- Available in both a lead-free bronze alloy (5/8…2 in.) and engineered polymer (5/8 in., 5/8 x 3/4 in., 1 in.).
- Delivers precision accuracy with extended flow ranges from 1/8…170 GPM.
- Exceeds AWWA C700 and C710 standards and complies with the lead-free provisions of the Safe Drinking Water Act.
- NSF/ANSI standards 61 and 372 certified.

Recordall® Compound Series Meters

Recordall Compound Series meters combine two metering technologies in one innovative package. A positive displacement chamber measures low flow, while a turbine chamber records high flow.

- High crossover accuracy.
- Extended flow range from 1/4...4500 GPM.
- Floating rotor design reduces friction and wear.
- Features a "screw-in" valve assembly for easy field maintenance.
- Exceeds AWWA C702 standards and complies with the lead-free provisions of the Safe Drinking Water Act.
- NSF/ANSI standards 61 and 372 certified.

** As referenced by the Water Research Foundation.*

Our Comprehensive Metering Lines

Recordall® Turbo Series Meters

Recordall Turbo Series meters are the smart choice for larger facilities.

- Low pressure loss for improved efficiency.
- Extended flow range from 2-1/2...19,800 GPM.
- Floating rotor design reduces friction and wear.
- Exceeds AWWA C701 standards and complies with the lead-free provisions of the Safe Drinking Water Act.
- NSF/ANSI standards 61 and 372 certified in sizes 1-1/2...10 in.

Recordall® Fire Hydrant Meters

Recordall Fire Hydrant meters are ideal for a temporary source of water.

- Rugged stainless steel screen.
- Optional check valve and flow rate control valve.

Recordall® Fire Service Assemblies

Recordall Fire Series meters (FSMA) and assemblies (FSAA) are ideal for dedicated and multi-use fire service applications.

- FSMA – Ideal for measuring high volume through a single supply line.
- FSAA – Ideal for when the fire service main also supplies water for secondary services.
- Complies with the lead-free provisions of the Safe Drinking Water Act.
- NSF/ANSI standards 61 and 372 certified.

High Resolution LCD Encoder (HR-E LCD)

High Resolution LCD encoders are fully electronic, solid-state, field programmable and utilize industry standard ASCII-communication protocol to provide high resolution encoded output. Status indicators/alarms can also be sent as part of the encoded output to endpoints capable of receiving extended messages. In addition, the HR-E LCD offers tamper resistant features such as encoder removal and magnetic tamper indicators to provide utilities with increased security.

- Factory programmed to customer specifications with field programming capabilities.
- LCD display automatically toggles between nine-and six-digit visual resolution, rate of flow and meter model.

High Resolution Encoder (HR-E)

The HR-E 8-dial encoder utilizes a non-contact field-proven light emitting diode technology to provide a high resolution 8-digit reading while at the same time eliminating friction and wear of traditional mechanical encoders.
The HR-E communicates using the industry standard ASCII- communication protocol to provide high resolution encoded output.

- High resolution 8-dial encoded output.
- Frictionless, non-contact wheel position encoding.

Capture the Advantages of Fixed Network, Migratable or Mobile Technology with ORION® Endpoints

Built on a century of water metering experience, the ORION® product family has provided comprehensive Advanced Metering Analytics (AMA) for interval meter reading and data capture using both one-way and two-way communications.

Badger Meter offers four Advanced Metering Infrastructure (AMI)/Automated Meter Reading (AMR) hardware solutions as part of the ORION product family. Select the solution that's right for your utility.

Fixed Network (AMI) Solutions

ORION Cellular and/or ORION Fixed Network (SE)

- **ORION Cellular:** Designed for maximum flexibility and rapid deployment, our two-way water endpoint eliminates utility-owned infrastructure by utilizing existing cellular infrastructure (part of our BEACON AMA solution).
- **ORION Fixed Network (SE):** This system collects meter readings and enhances operations via a two-way fixed network (AMI) system of gateways and endpoints.

Mobile Read Data Collection (AMR) Solutions

ORION Migratable (ME) and/or ORION Classic (CE)

- **ORION Migratable (ME):** This migratable two-way mobile (AMR) system can be easily upgraded to a two-way fixed network (AMI) system to grow with your needs.
- **ORION Classic (CE):** Our industry-leading, one-way mobile (AMR) system utilizes bubble-up (broadcast) technology and is built for reliability and flexibility.

Turn Data into Proactive Intelligence

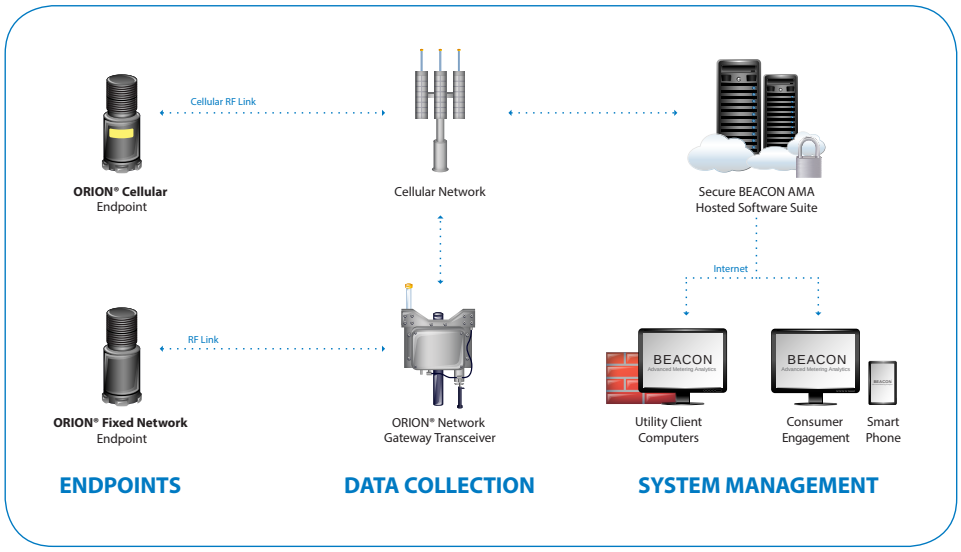
BEACON Advanced Metering Analytics (AMA) from Badger Meter brings a new level of utility-optimizing information to light. BEACON AMA combines the power of the intuitive BEACON AMA software suite with proven ORION® AMI technology to provide your utility management with greater visibility and control.

Configured by Badger Meter for your utility, BEACON AMA uses a managed solution approach and two-way communications—plus fixed and cellular networks—to deliver a simple, yet powerful end-to-end solution.

Built-in infrastructure management services and endpoint upgrades help you eliminate maintenance and technology concerns. Consumer engagement tools help you enhance customer service, increase satisfaction and reduce costs.

Better information. Better utility management. **Clearly Better.**

BEACON Advanced Metering Analytics (AMA)



BEACON Advanced Metering Analytics

There are many advantages and benefits to the BEACON AMA managed solution.

BEACON AMA Provides:

- **Increased Visibility Through Analytics**
  BEACON AMA combines the power of the intuitive BEACON AMA software suite with proven ORION® AMI technology to give you greater visibility and control over utility management. Features include:
    - Customizable dashboards to deliver information in a format matched to your requirements.
    - The ability to set unique alert conditions to define and monitor exceptions.
    - Consumer engagement tools, including website access and smartphone/tablet app to enable access to individual customer information.
    - Secure, hosted platform.
    - Automatic software upgrades.
    - Integration with your utility systems: billing, work order, inventory, Customer Relationship Management (CRM), and Geographic Information Systems (GIS).

Combines intuitive BEACON AMA software suite with proven ORION AMI technology

- **Enhanced Customer Service**
    - Advanced user profile and anomaly trending
    - Consumer engagement website and smartphone/tablet app
        - The BEACON AMA consumer engagement website and smartphone/tablet app provide your end water customers with easy access to their consumption data. Your customers will be able to view and track their usage activity to gain a greater understanding of their consumption patterns.

Your customers will be able to view and track their water usage with a consumer engagement website and/or smartphone/tablet app

- **Focus on Water Management**
    - BEACON AMA is available exclusively through our managed service offering, built to minimize your deployment and system maintenance costs. These savings allow you to focus your time and resources on managing your water delivery system.
- **Future-Proof Technology**
    - With BEACON AMA, you receive the hosted BEACON AMA software suite with regular updates, the latest ORION AMI endpoint technology and long-term support and maintenance—for an affordable one-time activation fee and an easy monthly per endpoint fee.

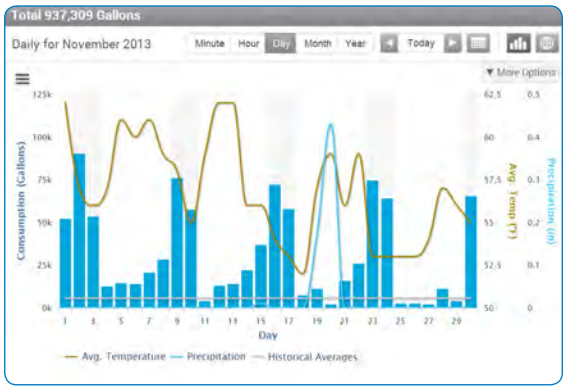
BEACON Advanced Metering Analytics Software Suite

The BEACON AMA software suite is designed to transform your data into proactive intelligence and enhance your overall operations. Here are a few examples of the benefits you can expect:

Enhanced Customer Service

With access to timely information, respond to customer needs more effectively—and resolve billing issues quickly.

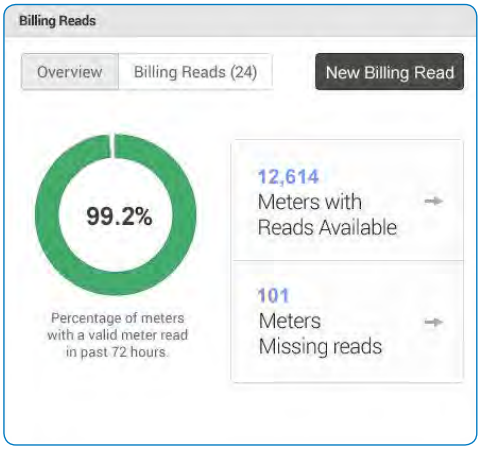
Analyze a consumption profile over selected time periods and rapidly respond to customer inquiries.



Simplified Revenue Management

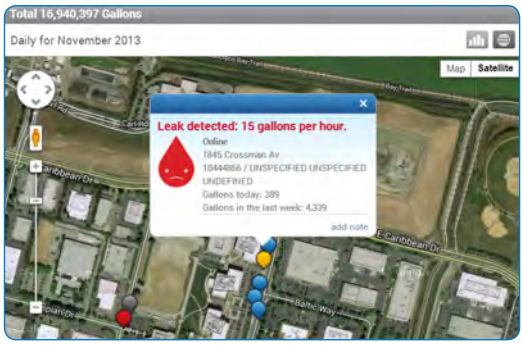
The system supports increased profitability by efficiently importing and exporting billing.

Improve your process—and access information easily on user-friendly, intuitive screens.



Faster Leak Detection

Set leak detection alerts and thresholds to quickly understand where problems are occurring.



Set threshold and leak detection alerts to monitor water use.

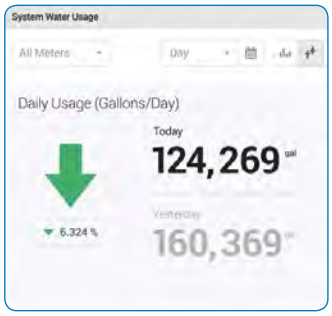
Making Water Visible to Utilities and End Water Customers

Allow end water customers to view and understand their usage profile through an easy-to-use consumer engagement website or smartphone/tablet app.

Consumers can use EyeOnWater Online (desktop), EyeOnWater App (smartphone/ tablet), EyeOnWater eSummary (email), or EyeOnWater Summary (printed) to easily gain access to their water useage data.

Better Tools for Government Regulation Compliance

Streamline regulatory compliance by configuring a variety of reports within the BEACON AMA software suite.



Easily compile data for ever-changing compliance reporting.

Backed by World-Class Service & Support

To protect your investments, Badger Meter offers the service and support you need to keep your utility operations running smoothly and efficiently. Our team of experts is ready to assist you.

Customer Service | 800-616-3837

From general product applications to order placement, our friendly and knowledgeable Customer Service team supports you every step of the way during the ordering process.

Technical Support | 800-456-5023

Our Technical Support team provides you with the resources and technical assistance necessary to maximize your Badger Meter investments. Assistance is available 24 hours a day, seven days a week.

Field Support

When you need installation and project management for your meters or metering infrastructure, discover what Badger Meter Field Support has to offer. An accomplished team of experts is ready to assist you. We specialize in project management to help you get the most from your Badger Meter system.

Training Support

Maximize your utility operations with the wide range of learning opportunities offered by Badger Meter. Courses are designed to arm you and your team with the skills and best practices needed to maintain and promote successful operations.

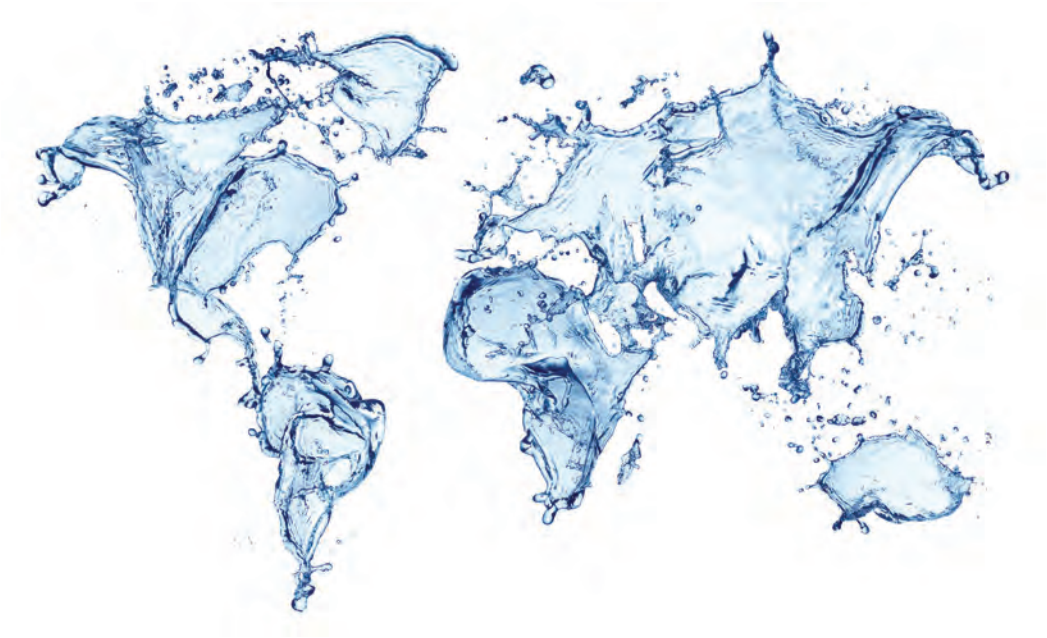
Website

For more information, visit our website at www.badgermeter.com.

One drop at a time.

At Badger Meter, we know it all adds up. That's why we continually improve our products to be even more accurate, more efficient and more effective at measuring and tracking your water flow. With industry-leading initiatives like Advanced Metering Analytics (AMA), Badger Meter provides the solutions you need to help boost profitability and conservation efforts.

When every drop counts, choose Badger Meter. We focus on **Making Water Visible** so you can optimize your operation.



Making Water Visible®

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INC-BR-00625-EN-02 (May 2014)

Badger Meter

BEACON Advanced Metering Analytics

Software At A Glance

BEACON At A Glance is the control center for your Utility, with a variety of modules that provide a snapshot view of current and historical activity, real-time status for any issues that may need attention and access to all BEACON major functions.

Simply click and drag a module to reposition it or use the **Add/Remove** link to add or remove a module. Available modules are described below.

Billing Reads

Process read data captured by the system into a billing file that can be passed to your billing software. Billing Reads shows meters that have a current billing read available and meters missing reads.

- Click the number of meters to display a list.
- To display a list of all previously run billing read files, click **Billing Reads**.
- To create a new billing read file, click **New Billing Read**.

Flow Health

Provides an overview of any flow issues in the water system. Select all the meters in the system or select a user specific group to view.

Click → to see a list of accounts currently reporting the condition.

Gateway Health

Number and % of gateways reporting with and without issues as well as a list of gateways with the reported issues.

Endpoint Health

Number and % of endpoints reporting with and without issues as well as a list of endpoints with the reported issues.

System Water Usage

Snapshot of the water usage in your system. Can be used to compare today's usage to yesterday's water usage in graph and number formats. Use the calendar to select the specific time period to view. Select all the meters in the system or select a user specific group to view.

Top Accounts By Usage

Displays the top accounts that are currently using the most water in the system by day, week or month. Up to 40 accounts can be selected. Columns can be sorted.

Click → to see account details.

Favorites

Users have the ability to mark specific accounts as favorites. Columns can be sorted. To mark a favorite, click ★ when viewing the account card on the Monitor page. Each user sees *only* the accounts he or she personally marked as a favorite.

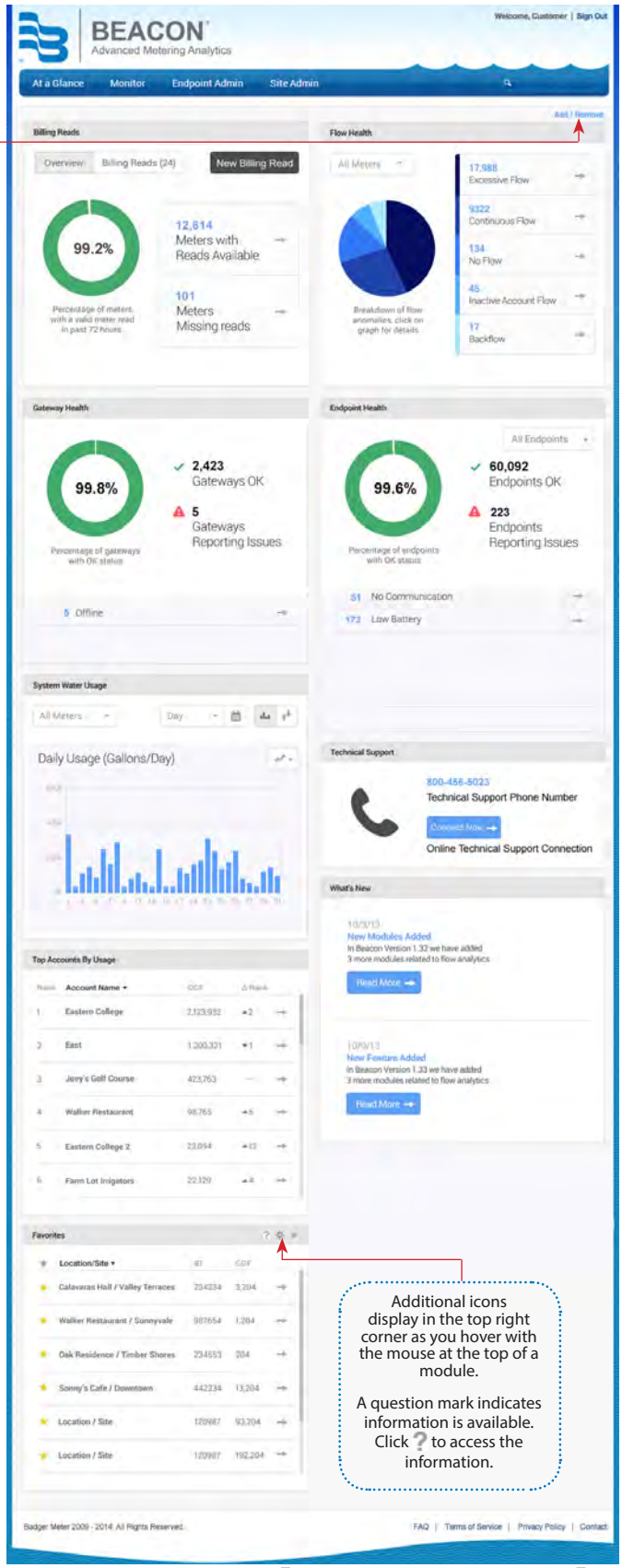
Click → to see account details.

What's New

Displays information on new and upcoming features for the BEACON AMA software.

Technical Support

Displays the phone number to call for Badger Meter Technical Support and a link when you need to connect online.



Additional icons display in the top right corner as you hover with the mouse at the top of a module.

A question mark indicates information is available. Click ? to access the information.

BEA-QS-00555-EN-01 (January 2014)

Quick Start Guide

www.badgermeter.com

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BEACON Advanced Metering Analytics

Software Suite

OVERVIEW

At the core of the Badger Meter BEACON Advanced Metering Analytics (AMA) managed solution is the innovative BEACON AMA software suite. In a secure hosted solution, the BEACON AMA software suite delivers powerful, easy-to-use data tools for the utility, including a consumer engagement website and smartphone/tablet applications (apps), that provide water intelligence for utilities and their customers.

Combined with proven ORION® AMI technology, the BEACON AMA software suite brings greater visibility and utility management control. Utilities can quickly and effectively implement the appropriate AMR/AMI technology, based on their unique reading data needs, all supported through the BEACON AMA software suite.

BEACON AMA SOFTWARE

With tools beyond meter reading and network management, BEACON AMA software offers targeted Advanced Metering Analytics. BEACON AMA software puts interval meter data to work to increase efficiency in day-to-day utility operations and address demands for actionable intelligence.

BEACON AMA software includes these features and benefits:

- **Problem solver** – User intuitive data tools place the power of water consumption data at your fingertips, allowing you to rapidly respond to customer inquiries and quickly resolve—and even eliminate—many billing issues.
- **Customized design** – A customizable dashboard delivers information configured to user security access level in a format matched to the utility's individual requirements, providing data management integrity, security and control.
- **Works with you** – Integration with utility systems—billing, work order, inventory, Customer Relationship Management (CRM) and Geographic Information Systems (GIS)—streamlines and improves utility operations without disrupting the current utility billing interface file transfer process.
- **Find out fast** – Alert conditions can be set to monitor and notify users of system exceptions, including continuous flow, for faster leak detection.
- **Innovation at your service** – Secure, hosted platform with automatic software upgrades ensures the latest technology and features are always available.

CONSUMER ENGAGEMENT TOOLS

With the BEACON AMA software suite, utility customers interested in managing their own usage patterns and consumption rates have access to their water usage data. The BEACON AMA software suite includes instructive consumer engagement tools consisting of a consumer engagement website, a smartphone/tablet mobile app, and email or mailable summary reports, which provide easy access to consumption data. With these tools, water consumers are able to view their usage activity, and gain a greater understanding and control of what they use and the value you provide.

EyeOnWater Online

The consumer engagement website, EyeOnWater Online, gives utility customers access to their water usage profiles in easy-to-understand consumption graphs. EyeOnWater Online provides a simple method for utility customers to establish alerts and create water budgets for better water usage management. Utilities can also communicate with their customers by posting notifications and alerts that are visible upon login to the consumer engagement website.

EyeOnWater Smartphone/Tablet App

The EyeOnWater app brings the power of EyeOnWater Online to your customer's smartphone or tablet. Alerts, notifications and water usage education are conveniently and readily available anytime using a mobile device.

EyeOnWater Email

EyeOnWater eSummary electronically delivers water usage information, including alerts, reports, billing and advertising, right to your customer's email inbox.

EyeOnWater Summary

The EyeOnWater Summary is a printable report of water usage information that utilities can include with customer billing statements.

SMARTPHONE INSTALLATION TOOL

The smartphone installation app is another unique tool in the BEACON AMA software suite. BEACONTool facilitates the installation of ORION Cellular endpoints with the convenience and ease of a mobile app.

TECHNICAL SUPPORT AND TRAINING

Configured for the utility, the safe and secure hosted BEACON AMA software suite provides utilities with regular updates, long-term support and maintenance. Comprehensive training is provided at the time of system deployment. To maintain best practices, a library of online videos and options for web-based training and support are also available. Once deployed, our technical support specialists may be contacted by phone, email and web to provide ongoing, customer-friendly support.

Additionally, Badger Meter offers extended customized training to further enhance user expertise.

SOFTWARE ACCESS

Developed as a hosted software platform, the BEACON AMA software suite can be accessed through standard web browsers: Google® Chrome (29 or higher), Microsoft® Internet Explorer® (9 or higher), Apple® Safari® (5 or higher) or Mozilla® Firefox® (23 or higher).

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Badger Meter | HR | E LCD Encoder

DESCRIPTION

Applications: The High Resolution Encoder (HR-E LCD) is a fully electronic, solid-state encoder with no moving parts. It is designed for use with all current Badger Meter Recordall® Disc, Turbo Series, Compound Series, Combo Series and Fire Service meters and assemblies. The HR-E LCD provides connectivity with Badger Meter ORION® and GALAXY® AMR/AMI endpoints and other AMR/AMI technology solutions approved by Badger Meter.

Note: For more detailed information, refer to LCD-IOM-01-EN.

Field Programmable: The HR-E LCD comes standard as factory-programmed to customer specifications, with the option for field-programming the unit of measure, meter type, meter model, billing units, and rate-of-flow time and units. Programming is performed through the IR port via a computer.

Electronic Resolution: Encoded output from the HR-E LCD includes nine-digit resolution.

Status Indicators: Status indicators are sent as part of the encoder extended message to AMR/AMI systems such as ORION ME and SE endpoints that are capable of receiving an extended message. The details can also be read through an IR interface.

Mounting: Icons on the HR-E LCD encoder face indicate encoder status and alarm conditions. The fully potted encoder assembly has a bayonet mount compatible with all Recordall Disc, Turbo Series, Compound Series, Combo Series and Fire Series meters and assemblies. The bayonet mount positions the encoder in any of four orientations for visual reading convenience. The HR-E LCD can be removed from the meter without disrupting water service.

Magnetic Drive Communication: The HR-E LCD detects movement of the wet side meter magnet with magnetic sensors to provide reliable and dependable encoded communication.

Tamper-resistant Features:
Unauthorized removal of the HR-E LCD is inhibited by a tamper-resistant Torx seal screw. Torx seal screws are provided as standard accessories. Optional proprietary tamper-proof screws are also available.

Magnetic sensors detect and report an attempted encoder removal. In addition, the HR-E LCD encoder is resistant to magnetic tampering. The encoder detects an attempted tamper—as well as encoder removal—and sends a tamper alarm in either situation. Approved endpoints that are capable of receiving the alarms, such as ORION ME and SE can then report the tamper condition to the meter reading software.

SPECIFICATIONS

Encoder type	Straight reading, permanently sealed, electronic LCD absolute encoder with field-programmable option
Encoder display	Status indicators, unit of measure, billing units, automatic toggle between 9-digit and 6-digit consumption (segmented leak detector in this mode), rate of flow, meter model
Unit of measure	U.S. gallons, Imperial gallons, cubic feet, cubic meters, and liters clearly identified on register face
Flow rate	Seconds, minutes, and hours
Numerals	7 mm (0.28") high
Weight	11 ounces
Humidity	0…100% condensing
Temperature	Storage: – 40…60° C (– 40…140° F) Max. ambient for 1 hr: 72° C (150° F) Electronics & Display: –10…60° C (14…140° F)
Status indicators	Electronic and visual icons for: Meter functioning correctly, meter alarm (indicates temperature limits exceeded, magnetic tamper or encoder removal), reverse flow, suspected leak, 30-day no usage, end of battery life
Signal output	Industry standard ASCII format
Signal type	Three-wire synchronous
Battery	Lithium thionyl chloride AA cell, fully encapsulated within encoder housing
Battery Life	20 years (calculated)

Product Data Sheet

Construction: The housing of the HR-E LCD is constructed of an engineered polymer enclosure and a polycarbonate lens. For long-term performance, the enclosure is fully encapsulated, weatherproof, and UV-resistant to withstand harsh environments and to protect the electronics in flooded or submerged pit applications. An epoxy potting (patent pending) comprises the encoder bottom. Due to this unique sealing, the HR-E LCD exceeds all applicable requirements of AWWA Standard C706 and C707.

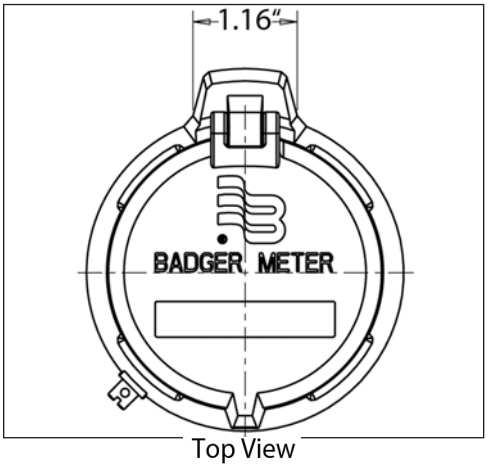
Wire Connections: The HR-E LCD is provided as either a factory-wired assembly or as an encoder with pre-sized wire harness available for connection in the field. Standardardized lead lengths are 3, 10, 25, and 75 feet.

308 Connector: The Badger Meter 308 In-line connector is an optional feature that allows connectivity to an AMR/AMI devices, without the need for a field splice kit.

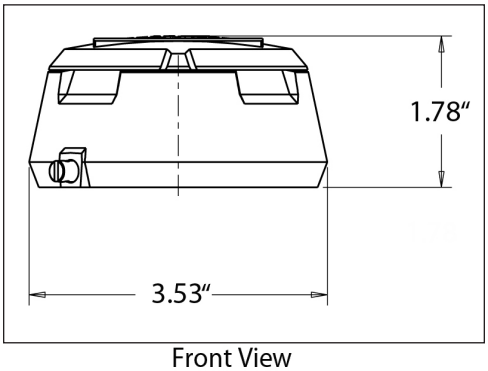
Operating Characteristics: The HR-E LCD is shipped in storage mode so a meter status alarm is not triggered. In storage mode, the meter model is displayed. Upon sensing one revolution of the meter magnet, the HR-E LCD goes into normal operation mode. The display then automatically toggles between these four modes:

- 9-digit consumption displays for 30 seconds.
- 6-digit consumption (segmented leak detector in this mode) displays for 20 seconds.
- Rate of flow displays for 5 seconds.
- Meter model displays for 5 seconds.

DIMENSIONAL DRAWINGS



Top View



Front View

MEASUREMENT RESOLUTION

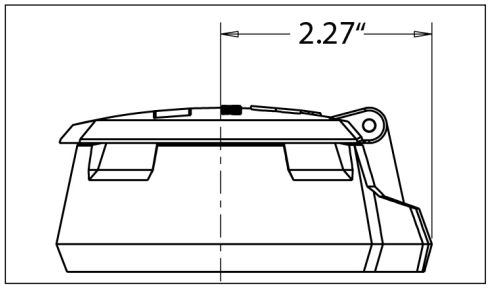
The electronic encoder output resolution of the HR-E LCD Encoder is as noted below.

Recordall Disc Series	Size	9-dial encoder output (gal)	9-dial encoder output (ft^3)	9-dial encoder output (m^3)
LP	5/8", 5/8 x 3/4"	0.01	0.001	0.0001
M25	5/8", 5/8 x 3/4"	0.01	0.001	0.0001
M35	3/4"	0.01	0.001	0.0001
M40	1"	0.01	0.001	0.0001
M55	1"	0.01	0.001	0.0001
M70	1"	0.01	0.001	0.0001
M120	1-1/2"	0.1	0.01	0.001
M170	2"	0.1	0.01	0.001

Recordall Turbo Series	Size	9-dial encoder output (gal)	9-dial encoder output (ft^3)	9-dial encoder output (m^3)
T160	1-1/2"	0.1	0.01	0.001
T200	2"	0.1	0.01	0.001
T450	3"	0.1	0.01	0.001
T1000	4"	0.1	0.01	0.001
T2000	6"	1	0.1	0.01
T3500	8"	1	0.1	0.01
T5500	10"	1	0.1	0.01
T6200	12"	10	1	0.01
T6600	16"	10	1	0.01
T10000	20"	10	1	0.01

Recordall Compound Series	Size	9-dial encoder output (gal)	9-dial encoder output (ft^3)	9-dial encoder output (m^3)
High Side T200	2"	0.1	0.01	0.001
Low Side M25	2"	0.01	0.001	0.0001
High Side T450	3"	0.1	0.01	0.001
Low Side M25	3"	0.01	0.001	0.0001
High Side T1000	4"	0.1	0.01	0.001
Low side M35	4"	0.01	0.001	0.0001
High Side T2000	6"	1	0.1	0.01
Low Side M35	6"	0.01	0.001	0.0001
High Side T3500	8"	1	0.1	0.01
Low side M120	8"	0.1	0.01	0.001

NOTE: For Fire Service Meters and Assemblies, please refer to appropriate Disc and TSM information provided above.



Left Side View

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Badger Meter

Recordall® Disc Meters

Lead-Free Bronze Alloy, Sizes 5/8", 5/8" x 3/4", 3/4" & 1"
NSF/ANSI Standards 61 and 372 Certified

Model LP—5/8", 5/8" × 3/4"

Model 25—5/8", 5/8" × 3/4"

Model 35—3/4"

Model 55—1"

Model 70—1"

DESCRIPTION

The Recordall Disc Series meters meet or exceed the most recent revision of AWWA Standard C700 and are available in a lead-free bronze alloy. The meters comply with the lead-free provisions of the Safe Drinking Water Act, are certified to NSF/ANSI Standards 61 and 372 (Trade Designations: MLP-LL, M25-LL, M35-LL, M55-LL, M70-LL) and carry the NSF-61 mark on the housing. All components of the lead-free bronze alloy meter (housing, measuring element, seals, and so on) comprise the certified system.

Applications: For use in measurement of potable cold water in residential, commercial and industrial services where flow is in one direction only.

Operation: Water flows through the meter's strainer and into the measuring chamber where it causes the disc to nutate. The disc, which moves freely, nutates on its own ball, guided by a thrust roller. A drive magnet transmits the motion of the disc to a follower magnet located within the permanently sealed register. The follower magnet is connected to the register gear train. The gear train reduces the disc nutations into volume totalization units displayed on the register or encoder face.

Operating Performance: The Recordall Disc Series meters meet or exceed registration accuracy for the low flow rates (95%), normal operating flow rates (100 ± 1.5%), and maximum continuous operation flow rates as specifically stated in AWWA Standard C700.

Construction: Recordall Disc meter construction, which complies with ANSI/AWWA standard C700, consists of three basic components: meter housing, measuring chamber, and permanently sealed register or encoder. The meter is available in a lead-free bronze alloy with externally-threaded spuds. A corrosion-resistant engineered polymer material is used for the measuring chamber.

Magnetic Drive: Direct magnetic drive, through the use of high-strength magnets, provides positive, reliable and dependable register coupling for straight-reading or AMR/AMI meter reading options.

Tamper-Proof Features: Unauthorized removal of the register or encoder is inhibited by the option of a tamper detection seal wire screw, TORX® tamper-resistant seal screw or the proprietary tamper-resistant keyed seal screw. Each can be installed at the meter site or at the factory.

Maintenance: Badger Meter Recordall Disc Series meters are designed and manufactured to provide long-term service with minimal maintenance. When maintenance is required, it can be performed easily either at the meter installation or at any other convenient location.

To simplify maintenance, the register, measuring chamber, and strainer can be replaced without removing the meter housing from the installation. No change gears are required for accuracy calibration. Interchangeability of parts among like-sized meters and meter models also minimizes spare parts inventory investment. The built-in strainer has an effective straining area of twice the inlet size.

Connections: Tailpieces/Unions for installations of meters on various pipe types and sizes, including misaligned pipes, are available as an option.

Meter Spud and Connection Sizes

Model	Size Designation	×	"L" Laying Length	"B" Bore Dia.	Coupling Nut and Spud Thread	Tailpiece Pipe Thread (NPT)
LP	5/8"	×	7-1/2"	5/8"	3/4" (5/8")	1/2"
	5/8" x 3/4"	×	7-1/2"	5/8", 3/4"	1" (3/4")	3/4"
25	5/8"	×	7-1/2"	5/8"	3/4" (5/8")	1/2"
	5/8" x 3/4"	×	7-1/2"	5/8", 3/4"	1" (3/4")	3/4"
35	3/4"	×	7-1/2"	3/4"	1" (3/4")	3/4"
	3/4"	×	9"	3/4"	1" (3/4")	3/4"
	3/4" x 1"	×	9"	3/4"	1-1/4" (1")	1"
55	1"	×	10-3/4"	1"	1-1/4" (1")	1"
70	1"	×	10-3/4"	1"	1-1/4" (1")	1"

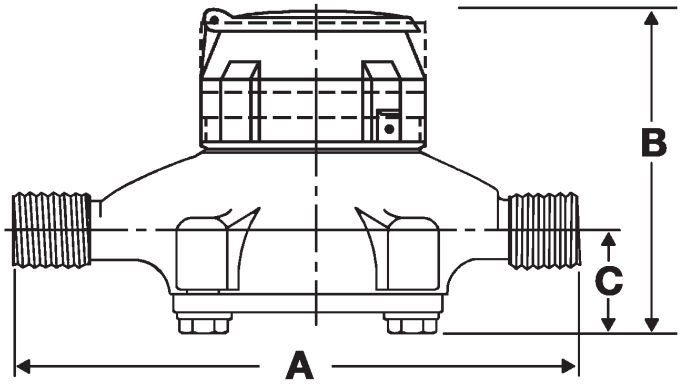
SPECIFICATIONS

	Model LP (5/8" & 5/8" × 3/4")	Model 25 (5/8" & 5/8" × 3/4")	Model 35 (3/4")	Model 55 (1")	Model 70 (1")
Typical Operating Range (100% ± 1.5%)	0.5…20 gpm (0.11…4.5 m^3/hr)	0.5…25 gpm (0.11…5.7 m^3/hr)	0.75…35 gpm (0.17…7.9 m^3/hr)	1…55 gpm (0.23…12.5 m^3/hr)	1.25…70 gpm (0.28…16 m^3/hr)
Low Flow	0.25 gpm (0.057 m^3/hr) Min. 95%	0.25 gpm (0.057 m^3/hr) Min. 98.5%	0.375 gpm (0.085 m^3/hr) Min. 97%	0.5 gpm (0.11 m^3/hr) Min. 95%	0.75 gpm (0.17 m^3/hr) Min. 95%
Maximum Continuous Operation	10 gpm (2.3 m^3/hr)	15 gpm (3.4 m^3/hr)	25 gpm (5.7 m^3/hr)	40 gpm (9.1 m^3/hr)	50 gpm (11.3 m^3/hr)
Pressure Loss at Maximum Continuous Operation	**5/8" size**: 2 psi @ 10 gpm (0.14 bar @ 2.3 m^3/hr) **5/8" × 3/4" size**: 1.5 psi @ 10 gpm (0.10 bar @ 2.3 m^3/hr)	**5/8" size**: 3.5 psi @ 15 gpm (0.24 bar @ 3.4 m^3/hr) **5/8" × 3/4" size**: 2.8 psi @ 15 gpm (0.19 bar @ 3.4 m^3/hr)	5 psi @ 25 gpm (0.37 bar @ 5.7 m^3/hr)	3.4 psi @ 40 gpm (0.23 bar @ 9.1 m^3/hr)	6.5 psi @ 50 gpm (0.45 bar @ 11.3 m^3/hr)
Maximum Operating Temperature	80° F (26° C)				
Maximum Operating Pressure	150 psi (10 bar)				
Measuring Element	Nutating disc, positive displacement				
Meter Connections	*Available in NL bronze and engineered polymer to fit spud thread bore diameter sizes:*				
	5/8" or 3/4" (DN 15 mm)	**5/8" size**: 5/8" (DN 15 mm) **5/8" × 3/4" size**: 3/4" (DN 15 mm)	3/4" (DN 20 mm)	1" (DN 25 mm)	1" (DN 25 mm)

MATERIALS

	Model LP (5/8" & 5/8" × 3/4")	Model 25 (5/8" & 5/8" × 3/4")	Model 35 (3/4")	Model 55 (1")	Model 70 (1")
Meter Housing	Lead-free bronze alloy				
Housing Bottom Plates	Lead-free bronze alloy, cast iron, engineered polymer		Cast iron, lead-free bronze alloy		
Measuring Chamber	Engineered polymer				
Disc	Engineered polymer				
Trim	Stainless steel				
Strainer	Engineered polymer				
Disc Spindle	Engineered polymer	Stainless steel	Stainless steel	Engineered polymer	Stainless steel
Magnet	Ceramic	Ceramic	Ceramic	Polymer bonded	Ceramic
Magnet Spindle	Engineered polymer	Stainless steel	Stainless steel	Engineered polymer	Stainless steel
Register Lid and Shroud	Engineered polymer, bronze				

DIMENSIONS



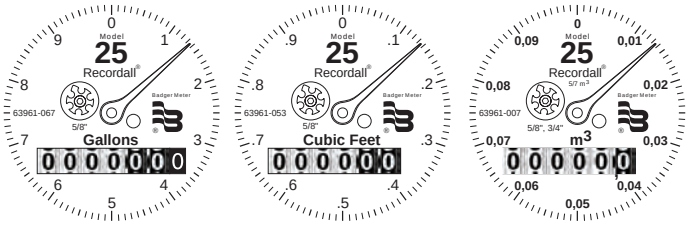
Meter Size	Model	A Laying Length	B Height Reg.	C Centerline Base	Width	Approx. Shipping Weight
5/8″ and 5/8″ × 3/4″ (15 mm)	LP	7-1/2" (190 mm)	3.70" (94 mm)	1.26" (32 mm)	3.75" (95 mm)	3 lb (1.4 kg)
5/8" (15 mm)	25	7-1/2" (190 mm)	4-15/16" (125 mm)	1-11/16" (42 mm)	4-1/4" (108 mm)	4-1/2 lb (2 kg)
5/8" × 3/4" (15 mm)		7-1/2" (190 mm)	4-15/16" (125 mm)	1-11/16" (42 mm)	4-1/4" (108 mm)	4-1/2 lb (2 kg)
3/4" (20 mm)	35	7-1/2" (190 mm)	5-1/4" (133 mm)	1-5/8" (41 mm)	5" (127 mm)	5-1/2 lb (2.5 kg)
3/4" (20 mm)		9" (229 mm)	5-1/4" (133 mm)	1-5/8" (41 mm)	5" (127 mm)	5-3/4 lb (2.6 kg)
3/4" × 1" (20 mm)		9" (229 mm)	5-1/4" (133 mm)	1-5/8" (41 mm)	5" (127 mm)	6 lb (2.7 kg)
1" (25 mm)	55	10-3/4" (273 mm)	6" (152 mm)	2-1/32" (52 mm)	6-1/4" (159 mm)	8-3/4 lb (3.9 kg)
1" (25 mm)	70	10-3/4" (273 mm)	6-1/2" (165 mm)	2-5/16" (59 mm)	7-3/4" (197 mm)	11-1/2 lb (5.2 kg)

REGISTERS / ENCODERS

Standard—Sweep-Hand Registration

The standard register is a straight-reading, permanently sealed magnetic drive register. Dirt, moisture, tampering and lens fogging problems are eliminated. The register has a six-odometer wheel totalization display, 360° test circle with center sweep hand, and flow finder to detect leaks. Register gearing is made of self-lubricating engineered polymer, which minimizes friction and provides long life. The multi-position register simplifies meter installation and reading. The register capacity is 10,000,000 gallons (1,000,000 ft^3, 100,000 m^3).

A Model 25 register is used in the following example:



Model	Gallon	Cubic Feet	Cubic Meter
LP	10	1	0.1
25 (5/8")	10	1	0.1/0.01
25 (5/8" × 3/4")	10	1	0.1/0.01
35	10	1	0.1
55	10	1	0.1
70	10	1	0.1

Optional—Encoders for AMR/AMI Reading Solutions

AMR/AMI solutions are available for all Recordall Disc Series meters. All reading options can be removed from the meter without disrupting water service. Badger Meter encoders provide years of reliable, accurate readings for a variety of applications and are also available pre-wired to Badger Meter approved AMR/AMI solutions. See details at **www.badgermeter.com**.

BROWNS HILL
ENGINEERING & CONTROLS

8119 Shaffer Parkway, Unit C
Littleton, CO 80127
PHONE: 720-344-7771
FAX: 720-344-7460

Service Quote

Client: Arabian Acres
Project Tank and Well installation
Adding Mission Unit M800
and Water Pilot

Browns Hill Job #: 14-310SQ01
Date: August 15, 2014

Subject: Browns Hill Engineering & Controls, LLC herein proposes to furnish instrumentation, control systems and electrical specifically listed in the following "Scope of Work".

Scope of Work:

Equipment

Provide the following in accordance with the requirements of the contract documents:

- Provide and install one Mission Unit M800
- Provide and install one Waterpilot level transmitter with 0-30 PSI
  Program as needed
- Misc. wire and hardware as needed

This proposal includes all factory tests, field inspections, field testing, operator/maintenance training and startup services as required in the contract documents.

Only items listed on this scope of work are included in this pricing.

Exclusions: The following items are specifically excluded from this scope of work. These items are noted for clarification purposes. This list is not intended to include all items on the project that are excluded.

- All costs for onsite storage, handling and equipment protection.
- Installation of in-line devices
- All warranties will be FOB the equipment manufacturers repair facility
- All field wire/cable installation and field terminations
- All costs associated with field installation of equipment and devices
- All costs associated with cutting, patching and painting
- No local taxes or federal taxes have been included in this proposal.
- No bonding costs have been included in this proposal.

Browns Hill Engineering & Controls, LLC agrees to perform all work described per this proposal for the following lump sum price.

Proposal lump sum cost
$7,973 and no/100 dollars

This proposal is valid for 30 days and subject to revision after that time.

We are now accepting all major credit cards.

We appreciate the opportunity to provide this proposal and should you have any questions please contact the undersigned at 720-344-7771.

Sincerely,

Allen Thomas, Service Manager
Browns Hill Engineering & Controls, LLC

MISSION

SCADA Made Simple

MODEL M-800 Series

Real Time Monitoring And Control System

This type of low cost, turnkey SCADA system has never been available before. The complete system includes M-800 field RTU, all wireless connections, report and graph software, all alarms and a website.

One M-800 Is A Complete SCADA System

M-800 RTU Comes With Everything You Need

Continuous, Real Time Wireless Connectivity

Centralized Web Software And/Or Direct Into Yours

Full Suite Of Cost Saving Software Features

Flexible Alarm Notifications, Tracked To Alarm Site

Website Provides Remote Data Access & Control

One M-800 Is A Complete SCADA System

Each M-800 includes a field RTU, Nextel wireless communications, web based HMI software, amazing alarm notifications and a website. The whole system is up and running in a few hours.

M-800 RTU Comes With Everything You Need

Each RTU has 11 digital, 2 analog, 2 pulse counter (optional) and 1 key reader inputs; 3 outputs. It also includes a radio, enclosure, antenna, power supply and backup battery.

Continuous, Real Time Wireless Connectivity

The M-800 series connects continuously through Nextel. There is no polling. Analog and digital input changes are updated as they occur.

Centralized Web Software And/Or Direct Into Yours

MISSION's web based software is very simple; you set it up yourself in 10 minutes. Simultaneously, you can also send the data into your existing software like Wonderware® or Intellution®.

Full Suite Of Cost Saving Software Features

It tracks hourly pump run times and starts, analyzes them and calls you before there's a serious problem. Continuous volumetric flow calculations and false alarm suppression features save money too.

Flexible Alarm Notifications, Tracked To Alarm Site

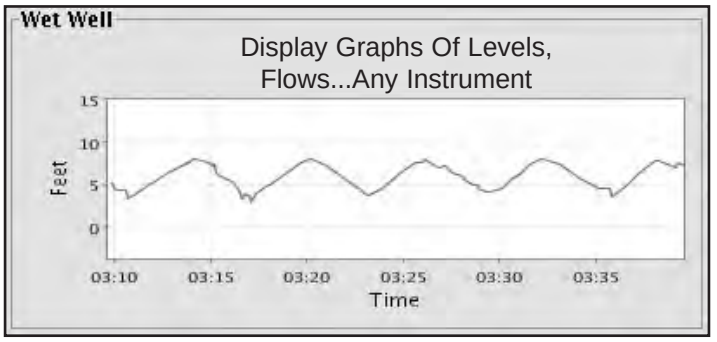
Alarms can be delivered via all pagers, e-mail, faxes, voice phone calls or TCP/IP. Electronic RTU service keys log personnel site arrival and maintenance times. No more manual logs.

Website Provides Remote Data Access & Control

MISSION provides each customer with a secure website to view current status, run reports or make updates. It even runs on WAP cellphones.

OVERVIEW

MISSION uses Nextel and centralized computer services to offer a revolutionary, real time monitoring and control SCADA system. It can also economically replace, or complement, existing radio or phone line based SCADA systems. It has never been easier or more economical to add a new site, replace troublesome sites or replace costly phone lines. It's extremely easy to use, and it installs in a few hours. The wireless communication is through Nextel to *MISSION*'s automated control center and then out to you. The data goes to your secure *MISSION* web site which can be your HMI and/or seamlessly to your existing HMI computer using any OPC compliant software like Wonderware® or Intellution®. *MISSION* provides incredible web graphics to display real time analogs, digital status and control. There are no additional computers, contracts or licenses to obtain. *MISSION* handles all hardware and services.



MISSION's automated Control Center also simultaneously generates alarm and status notifications to your personnel via all pagers, e-mail, faxes, voice phone calls or TCP/IP. All alarms are easily confirmed by time and recipient, and tracked out to the problem site through electronic RTU service keys. The keys also track maintenance personnel activity while working on site. The system handles standard SCADA functions such as continuous analog values, general alarms, pump run times/starts, real time storm surge flow monitoring, meter reading, and well or tank level monitoring with pump control, etc. Continuous volumetric flow calculations and weekly management reports are included. Most importantly to you, the *MISSION* system saves you money over existing telemetry and monitoring methods. It addition to its lower cost, it can save money in reduced labor and overtime with its advanced monitoring information and field personnel management tools. Now supervisors can conveniently oversee what's happening, who's responding and when it happened. All this at the price of many autodialers and less than the cost of most phone lines!

TECHNICAL SPECIFICATIONS SUMMARY

Hardware:

- 8 supervised digital inputs, changeable to run time/starts accumulators. 3 additional digital inputs built in (AC and battery fail, input wiring fault).
- 2 analog inputs: 0-5 VDC, 4-20mA, 10-bit resolution, 4 alarm set points per input
- 2 pulse counter inputs (opt.): meter or flow reading
- 1 electronic key reader for site activity tracking
- 3 remotely controllable, form C dry contact relay outputs (1 amp @ 12 VDC), N.O./N.C.
- Supervised 1.2 amp power supply with 5ah battery backup included
- 8 vertical LED's have two display modes: diagnostic or signal strength.
- 8 channel LED's display alarm status

Radio:

- Units automatically self enroll, no startup delays
- Nextel radio with 128 bit encryption
- 2 watt maximum transmit power
- Receiver sensitivity: -112dbA

Physical:

- N8321 NEMA1 enclosure: 11"h x 11"w x 3.5"d
- N8322 NEMA4X enc: 13.25"h x 13.75"w x 5.5"d
- N8323 NEMA1 "FlatPak": 7.75"h x 10.5"w x 1.5"d
- Operating temperature –20F to +160F

***MISSION* Control:**

- All *MISSION* facilities secured and backed up
- Data center can link real time with existing SCADA system control room HMI software (Wonderware, Intellution, etc.) that are OPC compliant.

***MISSION* Website:**

- Web site user access setup, additions, deletions
- View data from both Model 100 and 800 series units
- Read only and read/write access by password

***MISSION* Web Software:**

- No engineers needed as "programming" is simple
- View key data from multiple units on one screen, and change it yourself quickly and easily.
- Numerous false alarm suppression features

***MISSION* Notification:**

- Powerful alarm notification scheduler changes call list by time/date and alarm type
- Simply program "on duty" personnel for manual or automatic rotation by time of day or day of week.

Mission Communications
3050-G Business Park Drive
Norcross, GA 30071
+1.877.993.1911
www.123mc.com

Technical Information
Waterpilot FMX21

Hydrostatic level measurement
Compact device for level measurement in fresh water, wastewater and saltwater, communication via HART

Reliable and robust level probe with ceramic measuring cell

Application

The Waterpilot FMX21 is a pressure sensor for hydrostatic level measurement. Endress+Hauser offers three different versions of the FMX21 sensor:
- FMX21 with a stainless steel housing, outer diameter of 22 mm (0.87 in): Standard version suitable for drinking water applications and for use in bore holes and wells with small diameters.
- FMX21 with a stainless steel housing, outer diameter of 42 mm (1.65 in): Heavy duty version, easy clean flush-mounted process diaphragm. Ideally suited for wastewater and sewage treatment plants.
- FMX21 with a plastic insulation, outer diameter of 29 mm (1.14 in): Corrosion resistant version generally for use in saltwater, particularly for ship ballast water tanks.

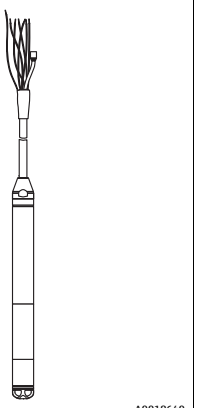
Your benefits

- High resistance to overload and aggressive media
- High-precision, robust ceramic measuring cell with long-term stability
- Climate proofed sensor thanks to completely potted electronics and 2-filter pressure compensation system
- 4 to 20 mA with superimposed HART 6.0 output signal
- Simultaneous measurement of level and temperature with optionally integrated Pt100 temperature sensor
- Accuracy
  - Reference accuracy ±0.2 %
  - PLATINUM version ±0.1 %
- Automatic density compensation to increase accuracy
- Usage in drinking water: KTW, NSF, ACS
- Approvals: ATEX, FM, CSA
- Marine certificate: GL, ABS, LR, BV, DNV
- Extensive range of accessories provides complete measuring point solutions

Endress+Hauser
People for Process Automation

Function and system design

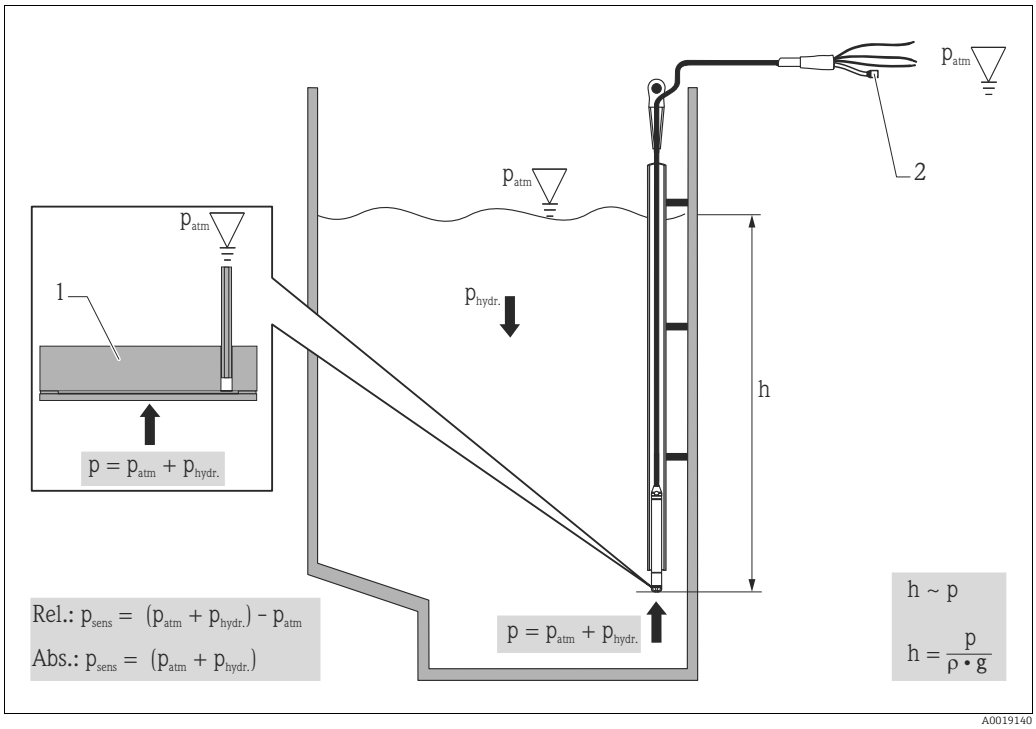
Device selection

Waterpilot FMX21	 A0018640	 A0018641	 A0018642
Field of application	Hydrostatic level measurement in deep wells e.g. drinking water	Hydrostatic level measurement in wastewater	Hydrostatic level measurement in saltwater
	NOTICE **The Waterpilot is not suitable for use in biogas plants since the gases can diffuse through the elastomers (seals, extension cable).** ▸ For applications with biogas Endress+Hauser offers the level transmitter Deltapilot.		
Process connection	▪ Mounting clamp ▪ Extension cable mounting screw with G 1½" A or NPT 1½" thread		
Outer diameter	22 mm (0.87 in)	42 mm (1.65 in)	max. 29 mm (1.14 in)
Extension cable	PE, PUR, FEP (→ 📄 25)		
Seals	▪ FKM Viton ▪ EPDM [1]	FKM Viton	▪ FKM Viton ▪ EPDM [1]
Measuring ranges	▪ Gauge pressure: from 0 to 0.1 bar to 0 to 20 bar (0 to 1.5 psi to 0 to 300 psi) ▪ Absolute pressure: from 0 to 2 bar to 0 to 20 bar (0 to 30 psi to 0 to 300 psi)		▪ Gauge pressure: from 0 to 0.1 bar to 0 to 4 bar (0 to 1.5 psi bis 0 to 60 psi) ▪ Absolute pressure: from 0 to 2 bar to 0 to 4 bar (0 to 1.5 psi bis 0 to 60 psi)
	▪ Customer-specific measuring ranges; factory-calibrated ▪ The following output units can be configured: %, mbar, bar, kPa, MPa, mmH_2O, mH_2O, inH_2O, ftH_2O, psi and numerous level units.		
Overload	Up to 40 bar (600 psi)		Up to 25 bar (375 psi)
Process temperature range	−10 to +70 °C (+14 to +158 °F)		0 to +50 °C (+32 to +122 °F)
Reference accuracy	▪ ±0.2 % of the set span ▪ Optional: ±0.1 % of set span (PLATINUM version)		
Supply voltage	10.5 to 35 V DC, Ex: 10.5 to 30 V DC		
Output	4 to 20 mA (invertible) with superimposed digital communication protocol HART 6.0, 2-wire		
Options	Drinking water approval	—	
	▪ Large selection of approvals, including ATEX, FM, CSA ▪ Broad range of accessories ▪ Integrated Pt100 temperature sensor and TMT182 temperature head transmitter (4 to 20 mA HART) ▪ Marine certificate		
Specialties	▪ High-precision, robust ceramic measuring cell with long-term stability ▪ Automatic density compensation ▪ Customer specific cable marking ▪ Absolute pressure measuring cell		

1) Recommended for drinking water applications and not for use in hazardous areas.

Measuring principle

The ceramic measuring cell is a dry measuring cell, i.e. pressure acts directly on the robust ceramic process isolating diaphragm of the Waterpilot FMX21.
Any changes in the air pressure are routed through the extension cable, via a pressure compensation tube, to the rear of the ceramic process isolating diaphragm and compensated for. A pressure-dependent change in capacitance caused by the movement of the process isolating diaphragm is measured at the electrodes of the ceramic carrier. The electronics then convert this into a signal which is proportional to the pressure and is linear to the level of the medium.



1 *Ceramic measuring cell*
2 *Pressure compensation tube*

h *Level height*
p *Total pressure = atmospheric pressure + hydrostatic pressure*
ρ *Density of the medium*
g *Gravitational acceleration*
$p_{hydr.}$ *Hydrostatic pressure*
p_{atm} *Atmospheric pressure*
p_{sens} *Pressure displayed on the sensor*

Temperature measurement with optional Pt100 resistance thermometer [1)]

Endress+Hauser also offers the Waterpilot FMX21 with an optional 4-wire Pt100 resistance thermometer to measure level and temperature simultaneously (→ 30). The Pt100 belongs to Accuracy Class B in accordance with DIN EN 60751.

Temperature measurement with optional Pt100 and TMT182 temperature head transmitter [1)]

Endress+Hauser also offers the TMT182 temperature head transmitter with the HART protocol to convert the temperature signal to an analog, scalable 4 to 20 mA output signal superimposed with HART 6.0.
See also: "Density compensation with Pt100 temperature sensor" (→ 9); "Ordering information" (→ 28); "Accessories" (→ 30) and Technical Information TI00078R.

1) Not for use in hazardous areas.

CARUS
WATER



Municipal Drinking Water

AQUA MAG® BLENDED PHOSPHATE

DATA SHEET

AQUA MAG® blended phosphate is the premier corrosion inhibitor and sequesterant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability utilizing a broad spectrum of phosphates for better sequestering and corrosion control.

BENEFITS OF AQUA MAG

• Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing

• Decreases iron tuberculation to extend the life of the distribution system

• Inhibits lead and copper leaching resulting in lower lead and copper levels in the delivered potable water

• Minimizes the occurrence of microbial-influenced corrosion providing longer life system

• Controls iron and manganese minimizing rusty and dirty water in the system

• Reduces discoloration, staining, and mineral build-up resulting in fewer customer complaints

• Diminishes calcium scale deposits typically seen in hot water lines and heaters

• Saves money by reducing corrosion and scale; lowering chlorine demand and decreasing hydrant flushing, leaks, and failures

PROPERTIES AND CERTIFICATIONS

Description:	Clear homogenous liquid
Viscosity:	< 2 cps at 70° F
Freezing Point:	< 38° F
Specific Gravity:	1.34-1.40
pH (1% w:w):	6.0 ± 0.5

NSF/ANSI Standard 60, Kosher Approved
Conforms to 21 CFR, Section 182 and 184 (USDA)

HANDLING AND STORAGE

AQUA MAG blended phosphate should be handled with care. Wear proper protective equipment including goggles, face shield, apron, respirator and proper gloves when handling this product.

Protect containers from physical damage. Store in a cool, dry area in closed containers. In case of accidental release: contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Absorb with inert media and dispose of properly. Disposal of all materials shall be in full and strict compliance with federal, state, and local regulations. Consult the MSDS for additional safety and handling information.

SHIPPING

AQUA MAG blended phosphate is generally considered to be safe and is not classified as hazardous according the US Department of Transportation, Canada TDG, UN, IMDG, or IATA regulations.

COMPATIBILITY INFORMATION

AQUA MAG blended phosphate can be stored in high-medium density polyethylene, cross-linked polyethylene, fiberglass reinforced plastic, 316 stainless steel, and glass lined/epoxy lined steel tanks. Piping materials may include schedule 80 PVC/CPVC piping, clear PVC, and white polyethylene tubing. Pump materials may include ceramic, Teflon, viton, hypalon and PVC liquid end pump materials.

Metering equipment can include diaphragm and peristaltic type metering pumps and other pumps meeting compatibility requirements.

It is not compatible with black iron, mild steel, galvanized metals, aluminum, zinc, copper, lead, brass, bronze, tin, and other base metals.

CORPORATE HEADQUARTERS I 315 Fifth Street, Peru IL 61354 I Tel + 1.815.223.1500 / 1-800-435-6856 I Fax + 1.815.224.6697 I Web: www.caruschem.com I E-Mail: salesmkt@caruschem.com
CARUS EUROPE I Parque Empresarial de ASIPO I C/Secundino Roces 3, Planta 1, Oficina 13-14 I 33428 Cayes, Llanera Spain I Tel +34.985.78.55.13 / Fax +34.985.78.55.10

rev. 02/14
form PH 15100

CARUS
WATER



Municipal Drinking Water

AQUA MAG® BLENDED PHOSPHATE

DATA SHEET

SHIPPING CONTAINERS

5-gallon (57-lb) Jerrican
Made of high density polyethylene (HDPE). Weighs 3.0 lb (1.36 kg).
The net weight is 57 lb (25.85 kg).

15-gallon (171-lb) Drum
Made of high density polyethylene (HDPE). Weighs 6.5 lb (3.0 kg).
The net weight is 171 lb (77.6 kg).

30-gallon (342-lb) Drum
Made of high density polyethylene (HDPE). Weighs 14 lb (6.35 kg).
The net weight is 342 lb (155 kg).

55-gallon (627-lb) Drum
Made of high density polyethylene (HDPE). Weighs 21 lb (9.5 kg).
The net weight is 627 lb (284 kg).

SHIPPING CONTAINERS CONT.

275-gallon IBC (Intermediate Bulk Container)
Weighs 129 lb (58.5 kg). The net weight is 3135 lb (1,422 kg). The IBC has a 2 in. butterfly valve with NPT threads in bottom sump.

Bulk quantities up to 4150 gallons are available.

Other containers may be available, contact Carus Corporation at 800-435-6856 for details.

CARUS VALUE ADDED

LABORATORY SUPPORT

Carus Corporation has technical assistance available to answer questions, evaluate treatment alternatives, and perform laboratory testing. Our laboratory capabilities include: Consulting, Treatability Studies, Feasibility Studies, and Analytical Services.

FIELD SERVICES

As an integral part of our technical support, Carus provides extensive on-site treatment assistance. We offer full application services, including technical expertise, supervision, testing, and feed equipment design and installation in order to accomplish a successful evaluation and/or application.

CARUS CORPORATION

During its more than 97-year history, Carus' ongoing emphasis on research and development, technical support, and customer service has enabled the company to become the world leader in permanganate, manganese, oxidation, and base-metal catalyst technologies.

CORPORATE HEADQUARTERS | 315 Fifth Street, Peru IL 61354 | Tel + 1.815.223.1500 / 1-800-435-6856 | Fax + 1.815.224.6697 | Web: www.caruschem.com | E-Mail: salesmkt@caruschem.com
CARUS EUROPE | Parque Empresarial de ASIPO | C/Secundino Roces 3, Planta 1, Oficina 13-14 | 33428 Cayes, Llanera Spain | Tel +34.985.78.55.13 / Fax +34.985.78.55.10

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form PH 15100

NOTES:
1) ALL LOCATIONS APPROXIMATE.
2) PARCEL BOUNDARIES PROVIDED BY TELLER COUNTY. INFORMATION NOT VERIFIED BY AQUAWORKS DBO, INC.
3) LOCATIONS OF EXISTING DISTRIBUTION SYSTEM COMPONENTS BASED ON "EXISTING DISTRIBUTION SYSTEM MAP" BY JDS-HYDRO CONSULTANTS, INC. DATED 3/28/11.

WELL #5
WELL #4
WELLS #3 & #9
& CONTROL BUILDING B
WELL #1 &
CONTROL
BUILDING A
WELL #8
WELL #2
WELL #7
WELL #6
WATER
STORAGE
TANK

PRELIMINARY
NOT FOR CONSTRUCTION

REV. No:	DATE:	BY:	REVISION DESCRIPTION:

DRAWN BY: MB
DESIGNED BY: AS
FILE PRINTED ON: 9/9/2014 10:03:12 AM

0 1 IF THIS BAR DOES NOT READ 1" DRAWING IS NOT LABELED TO SCALE

AquaWorks DBO INC
DESIGN BUILD OPERATE

PROJECT: ARABIAN ACERS METROPOLITAN DISTRICT
DISTRIBUTION SYSTEM IMPROVEMENT PROJECT
WOODLAND PARK, COLORADO

ENGINEER: AQUAWORKS DBO, INC.
3252 WILLIAMS STREET
DENVER, COLORADO 80216
(303) 477-5915

SHEET TITLE: EXISTING DISTRIBUTION SYSTEM MAP

PROJECT NUMBER:	SCALE:	SHEET:
#2817	1" = 700'	1