CRESCENTA VALLEY WATER DISTRICT

2700 FOOTHILL BOULEVARD
LA CRESCENTA, CALIFORNIA

Agenda for the Meeting of the Engineering Committee
of the Crescenta Valley Water District
To be held on

March 15, 2019 at 9:00 AM

Posted March 14, 2019 at 9:00 AM

Call to Order

Adoption of Agenda

Information Items

1. Status of Groundwater Wells and Well Capacity
2. Discussion on Water System Pressures
3. CVWD's AMI Business Case - Presentation by UtiliWorks, Project E-998
4. Project Update
    - TTHM Study and Upgrades to Disinfection System, Project E-995
    - Oak Creek Reservoir Rehabilitation, Project E-970
    - Well 2 and Related Facilities, Project E-956
    - Well Rehabilitation of Wells 1 & 7, Project E-999
    - Stormwater Capture Facilities at CVC Park, Project E-985

Public Comments

At this time, members of the public shall have an opportunity to address the Committee on items of interest that are within the subject matter jurisdiction of this Committee. This opportunity is non-transferable and speakers are limited to three (3) minutes each.

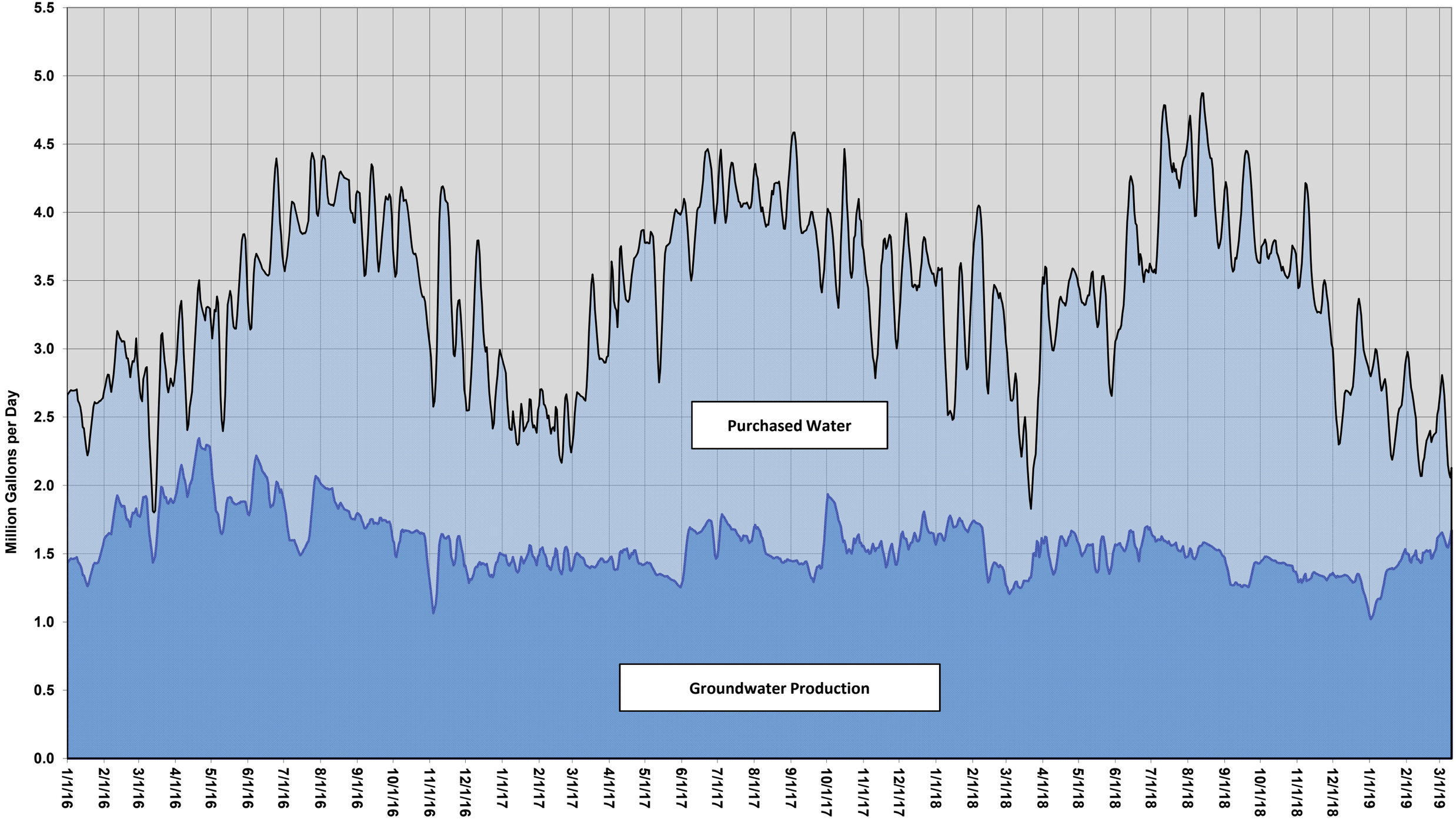
Committee Member's Request for Future Agenda Items

Next Engineering Committee Meeting – April 12, 2019

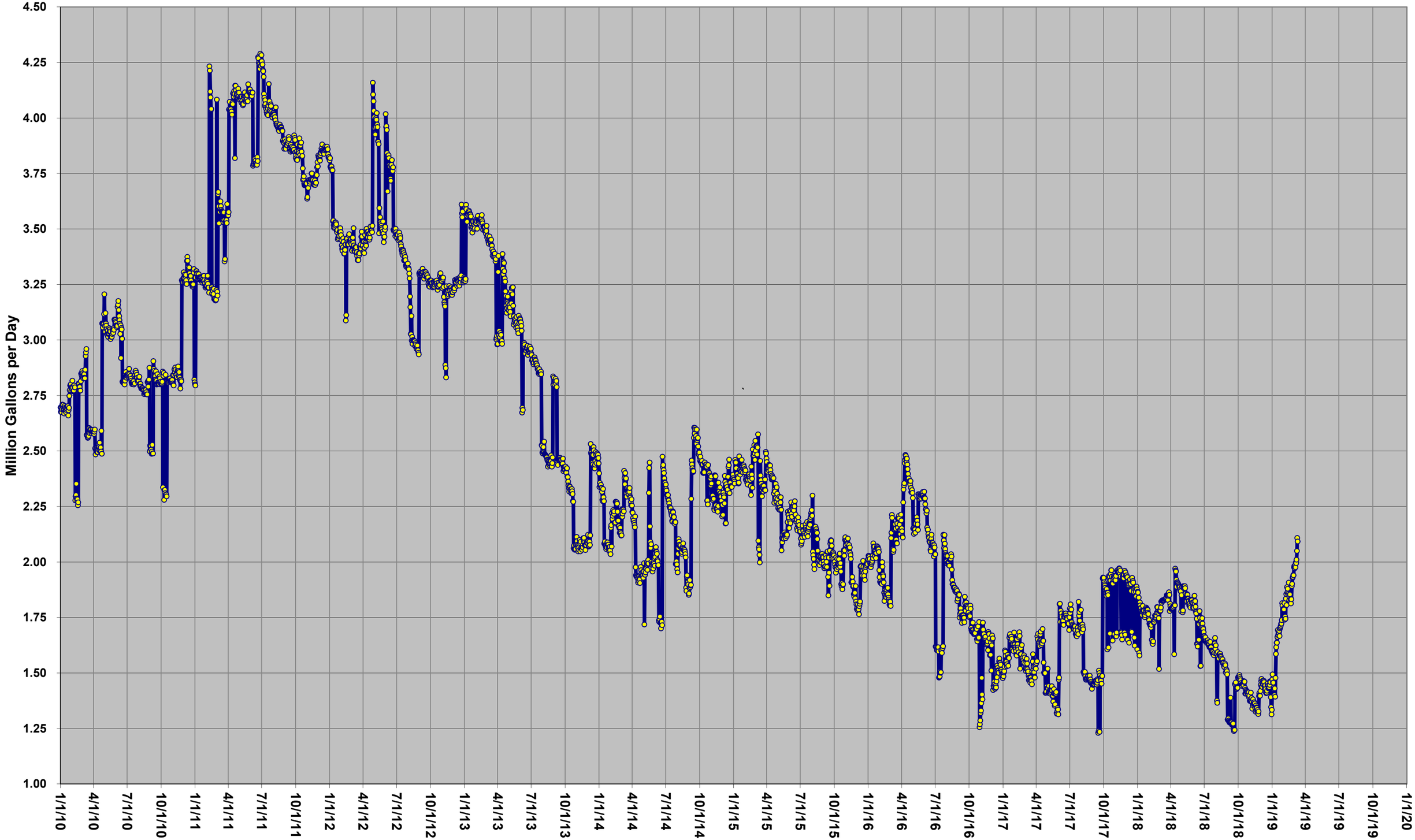
Adjournment

Water Production Chart 2016 - 2019

Groundwater Production (MGD) Total Water (MGD)



Crescenta Valley Water District
2010-19 Well Capacity Status (MGD)



CRESCENTA VALLEY WATER DISTRICT
STAFF REPORT

Information Item No. 2

To: Engineering Committee — March 15, 2019

From: David S. Gould, P.E. – District Engineer

Subject: **Discussion on Water System Pressure**

Water System Pressures Discussion on CVWD's Pressure Zones and Water System Pressure

BACKGROUND:

CVWD was incorporated in 1950 with a combination of the Crescenta Water Mutual Company and the Mountain Water Company. The water distribution and water storage system were combined to create eight (8) pressure zones. As housing developments were built like the Wiley Tract, additional pressure zones, water distribution pipes and water storage tanks were installed and added to the system.

The current water distribution and water storage system has 11 pressure zones with pressures ranging from 35 psi to 240 psi. See table on right for pressure ranges within each pressure zone, which correlates to the attached Fire Hydrant Static Pressures, Service Area & District Boundary Map.

Pressure Zone	Min Pressure (psi)	Max Pressure (psi
1	38	110
2	40	155
3	62	106
4	65	145
5	90	150
6	50	172
7	40	170
8	58	110
9	35	240
10	70	171
11	95	220

The pressure at a customer's meter is based on the difference between the water level in a reservoir and the elevation at the home, which is called the static pressure (water is not moving). When there is water demand in a zone, pressure can decreased based on the amount of flow (volume) traveling through a pipeline in a certain area. There are also friction losses in a pipeline due to the roughness of the inside of the pipe and the number of bends, valves and pipe size changes in a water system that can affect he water pressure. During design, engineers perform hydraulic grade line calculations to predict and plan for these pressure differences.

DISCUSSION:

Director Erickson asked staff whether or not CVWD has a policy or regulation addressing water pressure supplied to a customer? A customer had pointed out that he has 167 psi at his house and it seemed a bit high for a single family home. Director Erickson was also wondering how many other customers regularly experience high water pressure.

1) The District does have a policy in the Rules & Regulations about water pressure as stated below:

ARTICLE 8: Rules Applicable to Existing Water Customers

8.01: DESCRIPTION OF SERVICE

A. Quantities: *The District will endeavor to supply water dependably and safely in adequate quantities and pressures to meet the reasonable needs and requirements of Customers.*

B. Quality: *The District will endeavor to supply water for domestic use or human consumption that is potable, not harmful to human health, free from objectionable taste, odor or color, and within health standards.*

C. Responsibility for Loss or Damage: *Customers shall accept such conditions of pressure and service as are provided by the District system, and hold the District harmless for any loss or damage to Customers resulting from District's failure to meet service goals stated within this section, or due to any interruptions in service.*

Also, the Uniform Plumbing Code (UPC) states in Chapter 6 – Water Supply and Distribution;

Section 608 – Water Pressure, Pressure Regulators, Pressure Relief Valves, and Vacuum Relief Valves

608.1 Inadequate Water Pressure

Where the water pressure in the main or other source of supply will not provide a residual water pressure of not less than 15 pounds force per square inch (psi) (103 kPa), after allowing for friction and other pressure losses, a tank and a pump or other means that will provide said 15 psi (103 kPa) pressure shall be installed. Where fixtures, fixture fittings, or both are installed that require residual pressure exceeding 15 psi (103 kPa), that minimum residual pressure shall be provided.

608.2 Excessive Water Pressure

Where static water pressure in the water supply piping is exceeding 80 psi (552 kPa), an approved-type pressure regulator preceded by an adequate strainer shall be installed and the static pressure reduced to 80 psi (552 kPa) or less.

Pressure regulator(s) equal to or exceeding 1½ inches (40 mm) shall not require a strainer. Such regulator(s) shall control the pressure to water outlets in the building unless otherwise approved by the Authority Having Jurisdiction. Each such regulator and strainer shall be accessibly located aboveground or in a vault equipped with a properly sized and sloped bore sighted drain to daylight, shall be protected from freezing, and shall have the strainer readily accessible for cleaning without removing the regulator or strainer body or disconnecting the supply piping. Pipe size determinations shall be based on 80 percent of the reduced pressure where using Table 610.4.

An approved expansion tank shall be installed in the cold water distribution piping downstream of each such regulator to prevent excessive pressure from developing due to thermal expansion and to maintain the pressure setting of the regulator. Expansion tanks used in potable water systems intended to supply drinking water shall be in accordance with NSF 61. The expansion tank shall be properly sized and installed in accordance with the manufacturer's installation instructions and listing. Systems designed by registered design professionals shall be permitted to use approved pressure relief valves in lieu of expansion tanks provided such relief valves have a maximum pressure relief setting of 100 psi (689 kPa) or less.

2) The District does have areas within the water distribution system that the water system pressure is above 80 psi. In areas with high pressure, a homeowner is required per the UPC to install a pressure regulator to reduce the pressure into the house to 80 psi or lower. Upon further research, the majority of the water fixtures (bathroom faucets, shower heads, washing machines, etc.) manufactured today is rated up to 80 psi.

   The typical pressure regulator sold at Home Depot or Lowes is rated to 150 psi maximum pressure. However, if a resident has higher pressure than 150 psi, a higher rated pressure regulator (up to 300 psi) can be purchased through Grainer or other water supply company.

SUMMARY:

Since the 1950's, the District has served water in certain areas with pressures higher than 80 psi and the majority of homeowners have installed pressure regulators to reduce the pressure inside their home. District staff, when they have responded to concerns in the field or at the office, has advised customers about high water pressure and installing pressure regulators. If the water distribution system was designed today, the pressure zones, reservoir locations and system water pressure would be reconfigured in a way to avoid high pressures in the distribution system.

Prepared & Submitted by:

David S. Gould, P.E.
District Engineer

DRAWN BY ELM-1972					
REV. BY	DATE	REV. BY	DATE	REV. BY	DATE
ELM	3-72	JAH	8-80	JAH	10-06
R.F.R.	5-74	JAH	1-90	JAH	1-07
R.F.R.	8-76	JAH	12-90	JAH	5-09
H.J.S.	11-76	JAH	12-92	JAH	1-10
R.F.R.	2-77	JAH	10-93	JAH	4-11
R.F.R.	7-77	JAH	6-94	JAH	2-12
JDF	5-78	JAH	8-94	JAH	9-13
DJ	3-79	JAH	10-94	JAH	5-15
GLE	12-80	JAH	7-95	JAH	5-16
CJDL	6-3-81	JAH	8-95	JAH	8-18
M.J.G.	4-20-83	JAH	11-95		
CAH.	2-26-85	JAH	11-05		

LEGEND

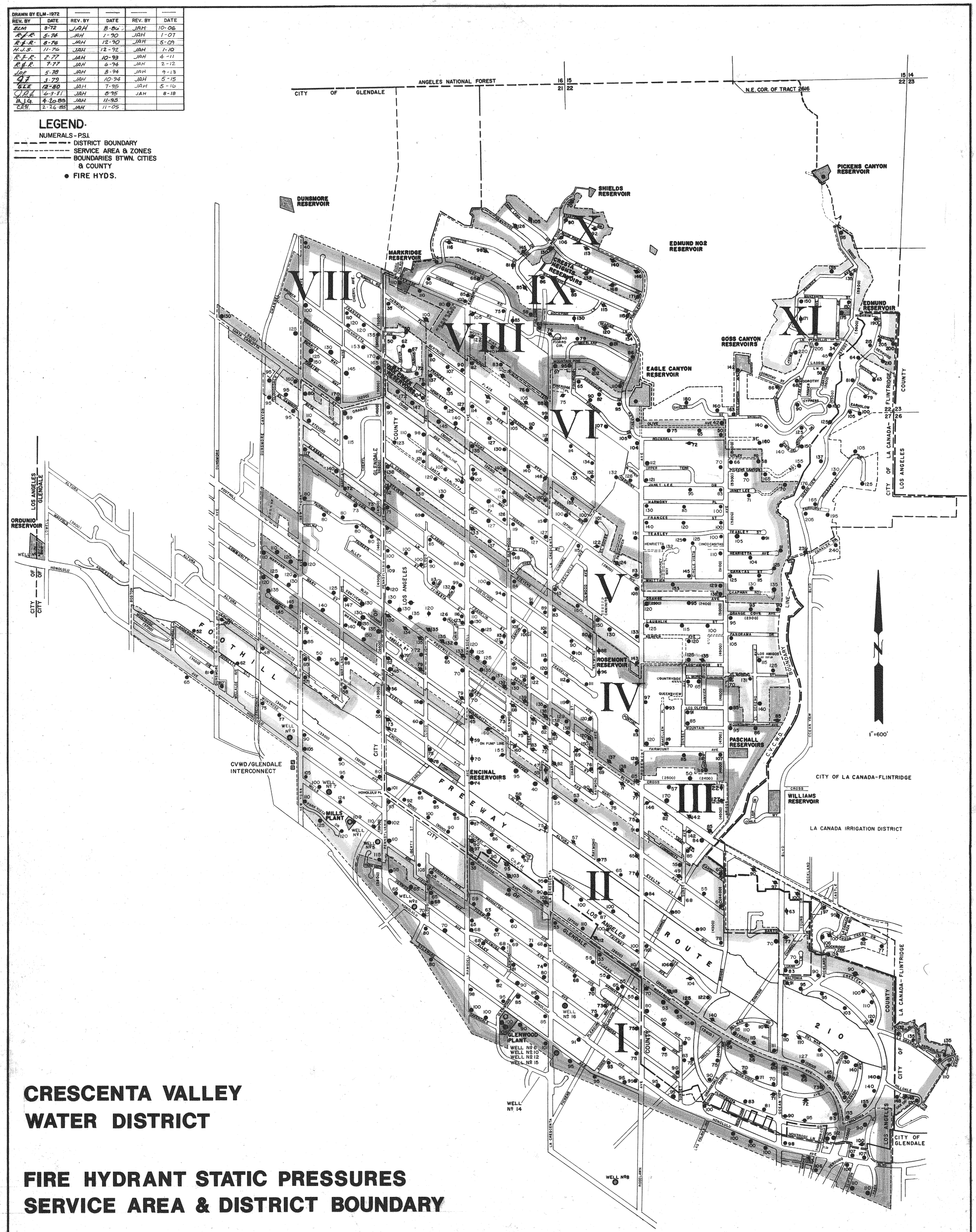
NUMERALS - P.S.I.

DISTRICT BOUNDARY

SERVICE AREA & ZONES

BOUNDARIES BTWN. CITIES & COUNTY

● FIRE HYDS.



CRESCENTA VALLEY WATER DISTRICT

FIRE HYDRANT STATIC PRESSURES SERVICE AREA & DISTRICT BOUNDARY

CRESCENTA VALLEY WATER DISTRICT
STAFF REPORT

Information Item No. 3

To: Engineering Committee — March 15, 2019

From: David S. Gould. P.E. – District Engineer

Subject: **CVWD's Advanced Metering Infrastructure (AMI) Business Case**

INFORMATION ITEM:

Presentation by UtiliWorks on CVWD's AMI Business Case.

BACKGROUND:

- Presentation – February 2018 Board meeting– Discussion on three (3) phases of AMI, preliminary costs and project schedule.
- Presentation – August 2018 Engineering Committee meeting– Brett Foreman from WaterSMART on Preparing for AMI.
- November 2018 – awarded contract to UtiliWorks Consulting to develop a baseline business case for an AMI program.

There has been discussion at previous Board meetings about the status of CVWD's AMI program, the next steps for installation and implementation of the program, and an estimation of costs to complete the project, along with possible available grant funding for the project.

DISCUSSION:

Staff met with the team from UtiliWorks for a 3-day seminar in January 2019 to begin the assessment of CVWD's AMI program. Staff provided information to UtiliWorks that will be used to prepare a baseline business case study for CVWD for AMI, including a cost-benefit analysis for the installation and implementation of the program, an estimation of costs to complete the project, and funding options, including available grant funding.

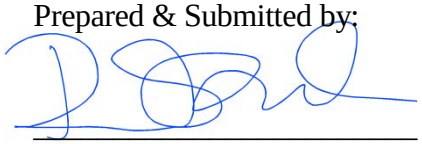
The draft report was submitted for staff's review at the end of February 2019, and comments were provided with respect to input assumptions, anticipated benefits, capital and operational expenses, intangible customer service benefits, and conservation impacts.

UtiliWorks finalized CVWD's AMI Business case, and the report sent to the Engineering Committee on March 4, 2019 for review at this Engineering Committee meeting.

SUMMARY:

UtiliWorks will be making a presentation at this Engineering Committee meeting. Comments will be incorporated into the report for final presentation at the April 9, 2019 Board Meeting.

Prepared & Submitted by:



David S. Gould, P.E.
District Engineer

Crescenta Valley Water District

Business Case Report

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UtiliWorks™

Strategic Utility Consulting

Purpose and Applicability of this Document

The purpose of this document is to provide a written record of UtiliWorks Consulting's (UtiliWorks') business case, as contracted by the Crescenta Valley Water District (CVWD or the District).

Document History and Distribution

Revision History

Revision #	Date	Description of Change	Author
V0.1	2/1/2019	First Draft	Bret Vonder Reith, Jon Madrid Mitchell, Nicole Griffin
V0.2	2/26/2019	Second Draft, incorporating model changes from updated assumptions and comments from CVWD	Bret Vonder Reith, Jon Madrid Mitchell, Nicole Griffin
V1.0	3/11/2019	Final Draft	Bret Vonder Reith, Jon Madrid Mitchell, Nicole Griffin

Distribution

Recipient Name(s)	Date	Recipient Organization	Distribution Method
David Gould, et. al	2/1/2019	CVWD	Electronic
David Gould, et. al	2/26/2019	CVWD	Electronic
David Gould, et. al	3/11/2019	CVWD	Electronic

Table of Contents

List of Figures

List of Tables

A. Executive Summary

The foundation of this Crescenta Valley Water District business case is the implementation of a comprehensive advanced metering infrastructure (AMI) solution.

AMI is a transformational technology. Currently, a customer's meter is read by CVWD once every other month for the purpose of billing. In contrast, an AMI system provides a steady stream of meter reading and diagnostic data at hourly intervals, as well as event-driven alerts and alarms, through a specialized communications network belonging to the utility. UtiliWorks estimates that, to date, about 60% of all water utilities have adopted AMI technology.

Though AMI is a matured technology, UtiliWorks recommends that a utility justify the implementation based on the business case, readiness, and goals of the utility. The alignment of these elements is key to a successful implementation. The objective of this business case is to arrive at a realistic and conservative result—not to underestimate project costs and not to overstate potential benefits. An overview of costs and benefits for the 20-year project lifespan, in present-day dollars, is shown in Table 1 - CVWD Business Case Overview.

Table 1 - CVWD Business Case Overview

Total Project Lifespan Category	Value ($000)
Estimated Capital Expense	$3,328
Estimated Operational Expense	$1,927
Estimated Hard Dollar Benefits	$5,020
Estimated Reallocation for High Service Delivery Benefits	$3,304

As illustrated in the table, estimated benefits outpace the total cost of ownership of the system, not only re-couping capital and ongoing operational costs, but also providing CVWD a 58% return-on-investment for the implementation of an AMI system. The payback period for this system is estimated to be about 10 years. Note that these results are highly conservative, even compared to results achieved by other UtiliWorks clients, with some benefits being purposely underestimated by as much as 30-50%.

With respect to the benefits identified in this report, UtiliWorks recognizes the strong customer service commitment CVWD has to its customers. In addition to those benefits that can readily quantified as operational savings to CVWD, a number of "soft" customer service-oriented benefits can be realized that improves both customer satisfaction and the relationship CVWD has with its customers.

AMI provides both customers and CVWD alike near-real-time information about individual water usage. With this information, customers will be empowered to more effectively manage water usage to suit their wants and needs, allowing choices that sustain and improve quality of life. Because of the amount of water usage data CVWD will have access to, customer service representatives will also be able to more readily and expediently address customer concerns and inquiry. Additionally, the function of customer service at CVWD will transform from being reactive to being proactive—helping alert customer of potential leaks, planned service outages, or other events before they become problematic.

Overall, UtiliWorks believes AMI implementation to be a highly favorable project for CVWD, should it be implemented, allowing the utility to realize improved operations and planning, as well as greater service to its customers. The combination of hard dollar benefits, plus reallocation for higher service delivery benefits, and additional intangible benefits, appears to provide superior levels of value to CVWD and its customers, as compared to the current operations and services that are offered today.

B. Business Case Scope

The project scope included in this business case analysis includes: an AMI system to intake hourly meter reads and to provide a network and meter configuration management toolkit; a meter data management system (MDMS) for retention and validation of large volumes of meter register and interval data and to perform analysis thereof; a customer portal for presentment of data and to improve customer communications; installation services for meters and equipment; and the necessary professional services and integration of systems to these and other business-critical systems. As part of this effort, CVWD plans to replace some meters entirely, while retrofitting other meters, and equipping all meters with AMI endpoints. Upon project completion, all meters will be equipped with AMI endpoints, and 100% of meter reading in CVWD's service area will be automated.

As part of the cost-benefit analysis, UtiliWorks has developed a comprehensive financial model, which represents the deployment of these technologies. The primary components of this financial model include:

- Anticipated Benefits (i.e., potential operational savings, revenue enhancement, reduction of water leaks, improved service for customers, improved asset utilization, etc. realized over the project lifespan).
- Operational Expense (OpEx) (i.e., annual fees related to software hosting and licensing incurred post-deployment; and maintenance of meters, transceivers, and data collectors).
- Capital Expense (CapEx) (i.e., AMI infrastructure, equipment, installation, professional services, etc. incurred during deployment).

The combination of these three areas is used to project net annual cash flow over the project lifespan.

UtiliWorks' general approach when developing the financial model underpinning the business case is to review assumptions with respective utility staff to ensure that each assumption is adequately and accurately reflected in the model. Our underlying philosophy is not to overstate the potential benefits and not to underestimate the cost so as to ultimately arrive at a conservative result. Herein, we outline the underlying assumptions, the financial model results summary, and a breakdown of costs and benefits used in the calculations. The detailed model inputs provided by CVWD, along with assumptions underlying the cost and benefit calculations, are summarized herein.

C. Assumptions

UtiliWorks submitted a series of data requests to CVWD related to the utility's operational costs and current business functions. A data collection workbook was developed, and, through a series of iterative requests and meetings, the workbook was populated to inform the assumptions used in the financial model. The workbook is comprised of the following areas of inquiry:

- Base Assumptions—includes general CVWD demographics and financial assumptions; used to inform the estimation of costs and benefits across the project lifespan.
- Expenditure Assumptions—includes a series of qualitative questions; used to determine the extent of the capital outlay of the project, such as whether to include the cost of warehousing for storage of equipment, sales tax, etc.
- Water Operations Assumptions—includes all expense and revenue categories related to water operations at CVWD; used to inform the service-related benefits of the project.

In the water operations assumptions category, expenses and revenues are allocated into finer sub-categories—meter reading, customer service (including field services), billing, revenue, and general operations—for the purposes of the benefits analysis.

Alongside the information requested, CVWD provided UtiliWorks with details underlying its meter population, helping to define the meter replacement schedule that is built into the model's capital expense assumptions.

The following key assumptions are also reflected in the business case:

- The lifespan of the project is aligned to the industry-standard lifespan of a water meter endpoint, at 20 years (10-15 full warranty; remaining lifespan prorated).
- A 9-month proof of concept (POC) beginning in November 2019 will be initiated (inclusive of planning and selection of a small area of the service territory to conduct meter upgrades) before full deployment of an AMI system across the service territory.
- Full implementation, from POC to total system functionality, is estimated to take approximately 24-30 months from the November 2019 start date.
- CVWD plans to utilize the services of a third-party installation contractor for water meter upgrades (both replacements and retrofits) on all meters.
- Net-zero staffing change will occur, and AMI-related responsibilities will be absorbed by current staff.
- Any software associated with AMI will be hosted and not maintained on-premise/in-house.
- CVWD has 8,157 meters in its field population and will be replacing 2,245 under this AMI program. The remaining meters will be retrofit with an endpoint.
- Approximately 180 residential meters were installed with a yoke assembly and service lateral. It is assumed that these meters will be retrofit with a meter reading device (i.e., endpoint), rather than fully replaced with the service lateral and meter, due to cost prohibitions, and these meters will all require a retrofit register. All other residential meters are assumed to be capable of being directly spliced-in to an AMI endpoint without the need of a new register.
- All meter lids will be replaced with AMI-compatible lids. Estimated costs for installation labor and materials are included.
- An internet-based customer portal will be implemented alongside a MDMS.

- CVWD pays sales tax at a flat rate of 9.5% for all equipment and services.
- CVWD abides by union labor requirements.
- CVWD abides by prevailing wage requirements.
- CVWD abides by performance bond requirements.
- AMI and MDMS systems will require integration into the CIS, GIS, and SCADA systems.

D. Financial Metrics

Under the purview of the cost-benefit analysis conducted, the financial metrics under evaluation are detailed in Table 2 – Financial Metrics of Interest. Note that all values used in the cost-benefit analysis are in terms of present-day dollars.

Table 2 - Financial Metrics of Interest

Financial Metric	Description
Present Value	The cumulative benefits minus the costs of a project (both OpEx and CapEx). It can be thought of similarly to a profit and loss statement where the present value tells you the magnitude. This metric is presented in dollars.
Return on Investment (ROI)	Calculated by looking at total profit (revenue minus cost) divided by the total investment over a specified period. This metric is presented by percentage.
Payback Period	The length of time it takes for the investment to show a positive return. This metric is presented in years.

E. High-Level Cost-Benefit Analysis Results

Broadly, benefits related to the implementation of an AMI project can be classified into one of three categories, as detailed in Table 3 – Benefit Categories.

Table 3 - Benefit Categories

Benefit Category	Description
Hard Dollar Benefits	Real dollars that can be directly attained either by avoided cost or revenue recovery.
Reallocation for Higher Service Delivery Benefits	Employee time and manpower that are freed-up, either by reduction or elimination of a certain function, or improved efficiencies in daily activities. These resources can be used to augment other functions within a utility that are lacking resources or provide new operational and service functionality to the utility and its customers.
Intangible Benefits	Benefits that are not easily measurable but can affect the overall perception, morale, or operation of an organization. Also includes increased customer satisfaction. These benefits have not been quantified as part of the cost-benefit analysis.

Herein, the AMI business case reflects two cost-benefit iterations, based on combinations of these benefits being included. In Iteration 1, we develop financial metrics based on a hard-dollar proposition only; in Iteration 2, we develop financial metrics taking into account both the hard dollar benefits and the benefits related to reallocation for higher service delivery.

Note that the results of the cost-benefit analysis that follow are highly conservative, even compared to other such models UtiliWorks has conducted for other clients, with some benefits being purposely underestimated by as much as 30-50%.

1. Iteration 1: Hard Dollar Benefits

The first iteration we analyze is the cost-benefit only accounting for hard dollar savings. The financial metrics associated with this iteration are shown in Table 4 – Iteration 1 Financial Metrics Results.

Table 4 - Iteration 1 Financial Metrics Results

Financial Metric	Iteration 1 Results
Present Value ($000)	$(234)
ROI	-4%
Payback Period	Payback Not yet Achieved
Estimated Benefits ($000)	$5,020
Estimated OpEx ($000)	$1,927
Estimated CapEx ($000)	$3,328
CapEx Cost/Meter ($000)	$408.03

In this iteration, although the payback period lies outside the projected project lifespan, hard dollar benefits alone still account for about 96% of the total cost of ownership of the AMI system.

Additionally, projections from this iteration predict positive cash flow in the years following implementation, and average earnings based on the benefits and operational cost differential are $155,000 annually throughout the lifespan of the project.

Note that the total estimated lifetime hard dollar benefits have been reduced by over $7.1 million over the lifespan of the project (or over $355,000 annually) as a result of an assumed 3.5% conservation in total purchased water by customers (about 87.5 AF total or 3,496 gallons per meter, per year). The estimated lost revenue associated with this conservation is highly aggressive and is likely to be less than projected, especially in light of a number of factors, including:

- Conservation hardening and the degree of conservation program saturation in the service area
- Loss of revenue does not account for the avoided cost of purchasing water (i.e., the lowered cost of goods sold, which is realized as a benefit to CVWD)
- Recouping of revenue through rate adjustments
- Increased conservation could also be attributed to upcoming legislative requirements, as mandated by the state of California

UtiliWorks believes that, due to the nature of the conservative estimates for benefits and expenses used in Iteration 1, the true hard dollar values proposition of implementing an AMI system to be a near-breakeven or slightly-positive investment.

2. Iteration 2: Hard Dollar Benefits, with Reallocation for Higher Service Delivery Benefits

The financial metrics for Iteration 1 notwithstanding, the true value of an AMI system is predicated on a utility's ability to transform its operational and customer service capabilities to provide more efficient and valued-added services to its service territory. In Iteration 2, we analyze the cost-benefit accounting for both hard dollar savings, as well as benefits associated with reallocation for higher service delivery. The financial metrics associated with this iteration are described in Table 5 – Iteration 2 Financial Metrics Results.

Table 5 - Iteration 2 Financial Metrics Results

Financial Metric	Iteration 2 Results
Present Value ($000)	$3,070
Return on Investment	58%
Payback Period (Years)	10
Estimated Benefits ($000)	$8,325
Estimated OpEx ($000)	$1,927
Estimated CapEx ($000)	$3,328
CapEx Cost/Meter ($000)	$408.03

Net and cumulative cash flow across the project lifespan is illustrated in Figure 1 – Iteration 2 AMI Cash Flow, while relative costs and benefits are plotted in Figure 2 – Iteration 2 Cost-Benefit Analysis with a cash flow overlay. Net annual cash flow is positive post-AMI deployment. Additionally, the average earnings based on the benefits and operational cost differential is $320,000 annually throughout the lifespan of the project.

Note that, as in Iteration 1, the total estimated lifetime hard dollar benefits for Iteration 2 have been reduced by over $7.1 million over the lifespan of the project (or over $355,000 annually) as a result of assumed increased conservation by customers. The same caveats in Iteration 1 regarding why the estimated lost revenue associated with this conservation is highly aggressive and is likely to be less than projected also apply to Iteration 2.

Figure 1 - Iteration 2 AMI Cash Flow

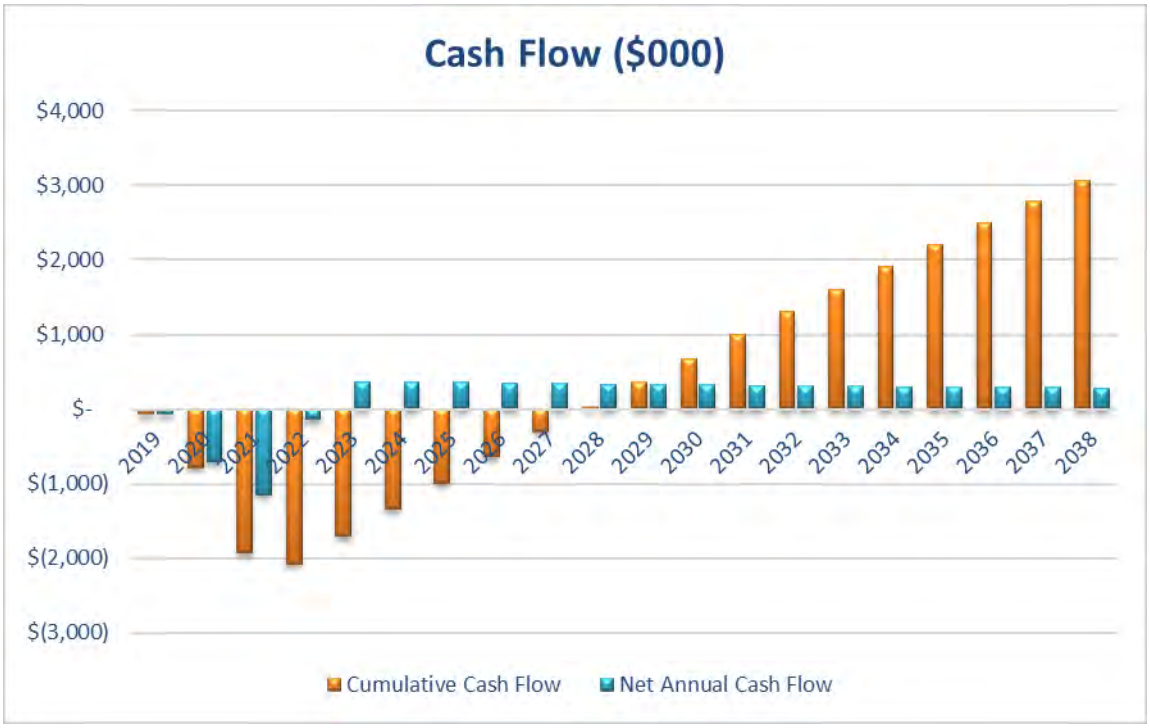
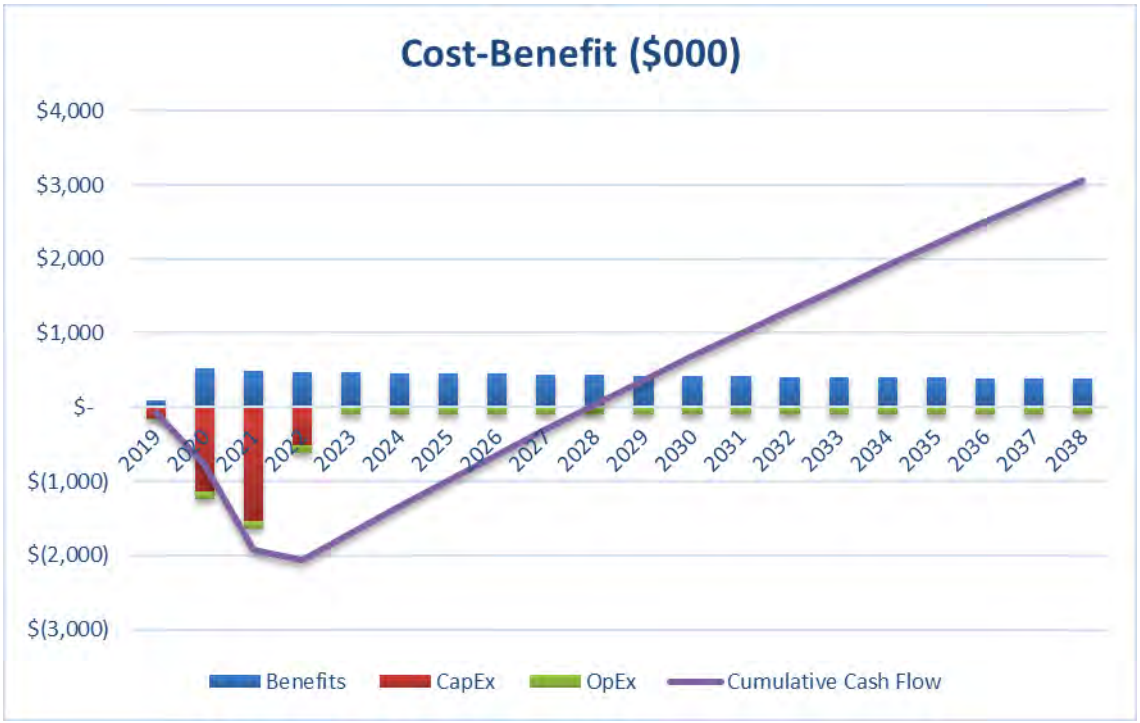
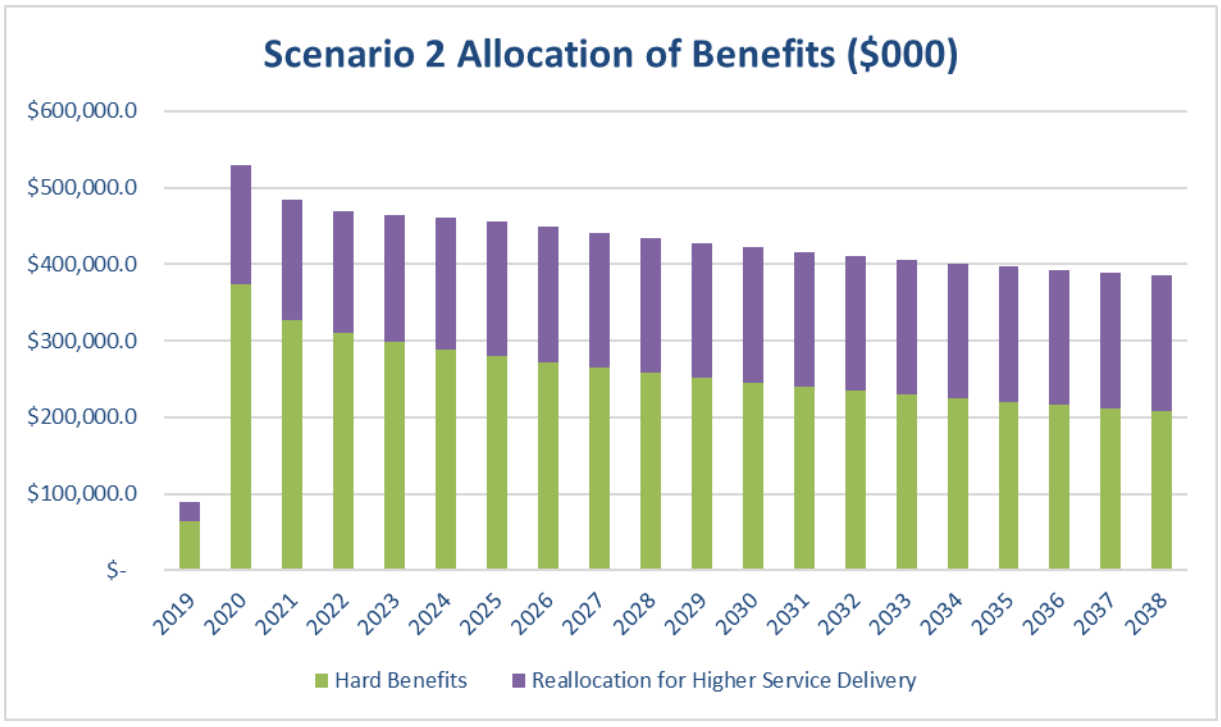


Figure 2 - Iteration 2 Cost-Benefit Analysis



As compared to Iteration 1, about 40% of total benefits can be attributed to reallocation for higher service delivery. A visual representation of this contribution-share by year is illustrated in Figure 3 - Iteration 2 Allocation of Benefits.

Figure 3 - Iteration 2 Allocation of Benefits



Based on the assumptions underlying Iteration 2, the deployment of an AMI system at CVWD indicates a positive ROI. Additionally, the estimated payback period is 10 years. This period is less than the standard 15-year period for the full warranty of an AMI endpoint, which is a positive result. The ability to realize savings within the warranty period means that, in the event that another technology supplants AMI within the water industry, CVWD will be free to pivot to said technology before the useful life of an endpoint has been reached. This will preclude the need to absorb sunk costs or invest additional capital in the AMI system prior to achieving breakeven investment.

It should be noted that the overall outlook of the model can change with variance to the underlying assumptions. If, for example, UtiliWorks/CVWD can conduct aggressive vendor negotiations, the estimated expenditures will decrease. The overall AMI initiative would, in turn, realize a more accelerated payback. Another area with margin for improving the business case is additional operational benefits from post-deployment data utilization. These metrics are especially attainable in consideration of the fact that, for the purposes of this model, 10% of project costs alone have already been allocated as contingency funds that may not be fully used during implementation, and many benefits have been purposely underestimated for the sake of arriving at a conservative result. A summary of sensitivities performed is illustrated in Table 6 – Iteration 2 Sensitivity Matrix. In this matrix, capital expenses, operational expenses, or benefits are increased or decreased to see changes in financial metrics.

Table 6 - Iteration 2 Sensitivity Matrix

	CapEx Sensitivity		OpEx Sensitivity		Benefits Sensitivity	
Financial Metrics	-10%	5%	-10%	5%	-5%	10%
Present Value ($000)	$3,403	$2,903	$3,263	$2,973	$2,654	$3,902
Return on Investment (ROI)	69%	54%	64%	56%	50%	74%
Payback Period (Years)	9	11	10	11	11	9
Estimated Benefits ($000)	$8,325	$8,325	$8,325	$8,325	$7,908	$9,157
Estimated OpEx ($000)	$1,927	$1,927	$1,735	$2,024	$1,927	$1,927
Estimated CapEx ($000)	$2,996	$3,495	$3,328	$3,328	$3,328	$3,328
CapEx Cost/Meter ($000)	$367.23	$428.44	$408.03	$408.03	$408.03	$408.03

From this sensitivity, we can derive best- and worst-cases underlying deployment of AMI technology. The best- and worst-cases are compared in Table 7 – Iteration 2 Best- and Worst-Cases.

Table 7 - Iteration 2 Best- and Worst-Cases

Financial Metrics	Best-Case	Worst-Case
NPV ($000)	$4,428	$2,391
Return on Investment (ROI)	94%	43%
Payback Period (Years)	8	12
Estimated Benefits ($000)	$9,157	$7,908
Estimated OpEx ($000)	$1,735	$2,024
Estimated CapEx ($000)	$2,996	$3,495
CapEx Cost/Meter	$367.23	$428.44

Note that even the worst-case has a payback period of less than 15 years. Though the actual project outcome is likely to fall between the best- and worst-cases, UtiliWorks believes the implementation of an AMI project is nonetheless likely to result in a positive outcome for CVWD.

F. Cost Estimate Summary

1. Estimated Capital Expense

UtiliWorks utilizes current vendor pricing when modeling the components of the estimated project cost. Pricing from proposals, bids, and contracts received by UtiliWorks on behalf of clients is aggregated into a comprehensive database, inclusive of hardware, software, installation, and professional services costs. Each of these categories is itemized so as to provide the highest degree of accuracy possible. Whenever conflicting pricing is noted, UtiliWorks uses a blended rate or upper estimate. This methodology ensures that CVWD is provided with a conservative estimate for planning and budgeting. In addition to ordinary expenditures on equipment and professional services, the financial model includes the CVWD tax rate of 9.5%, and an overall project contingency of 10% on capital costs (not counting tax). The conservative value on contingency is a result of UtiliWorks' high degree of confidence in cost projections provided by its pricing database.

Based on the assumptions used, the total capital outlay is estimated to be approximately $3.3 million, without respect to sensitivity.

Figure 4 - Estimated Program Capital Expense by Category illustrates the capital costs of the project by category, and Figure 5 – 30-Month Estimated Program Capital Expense by Fiscal Year illustrates the capital outlay of the project per fiscal year for a 30-month deployment. CVWD may also elect to proceed with a shorter 24-month deployment period, and this capital outlay is reflected in Figure 6 – 24-Month Estimated Program Capital Expense by Fiscal Year.

Figure 4 - Estimated Program Capital Expense by Category

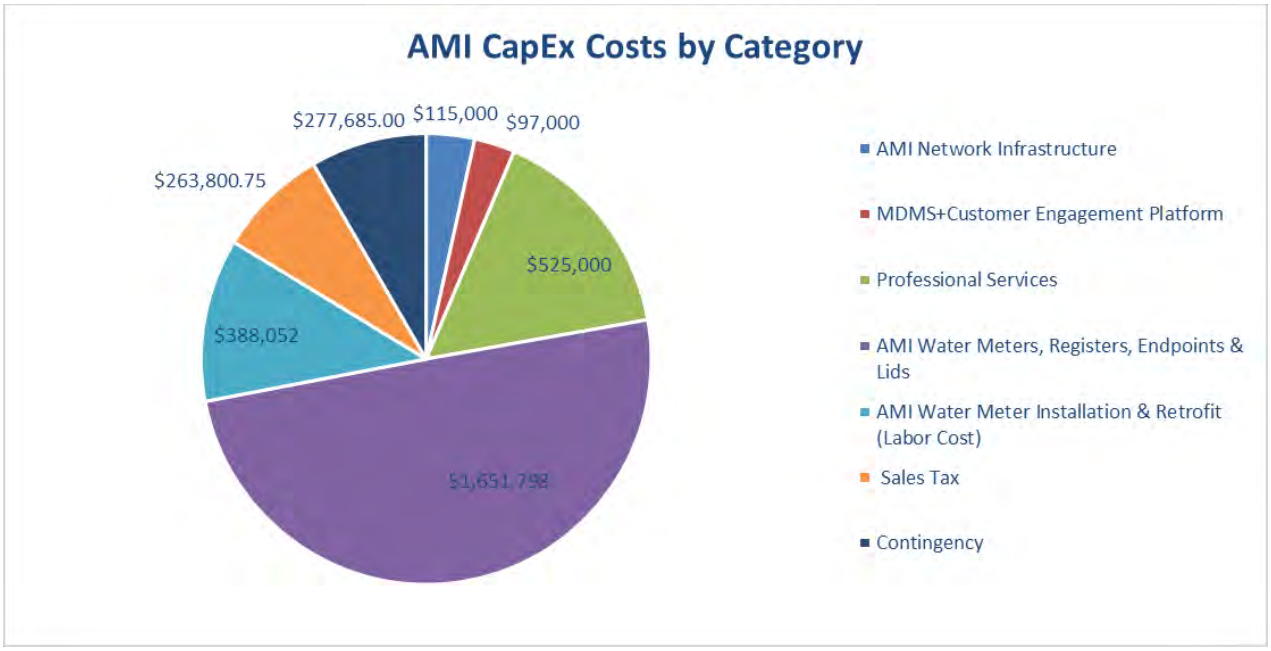


Figure 5 - 30-Month Estimated Program Capital Expense by Fiscal Year

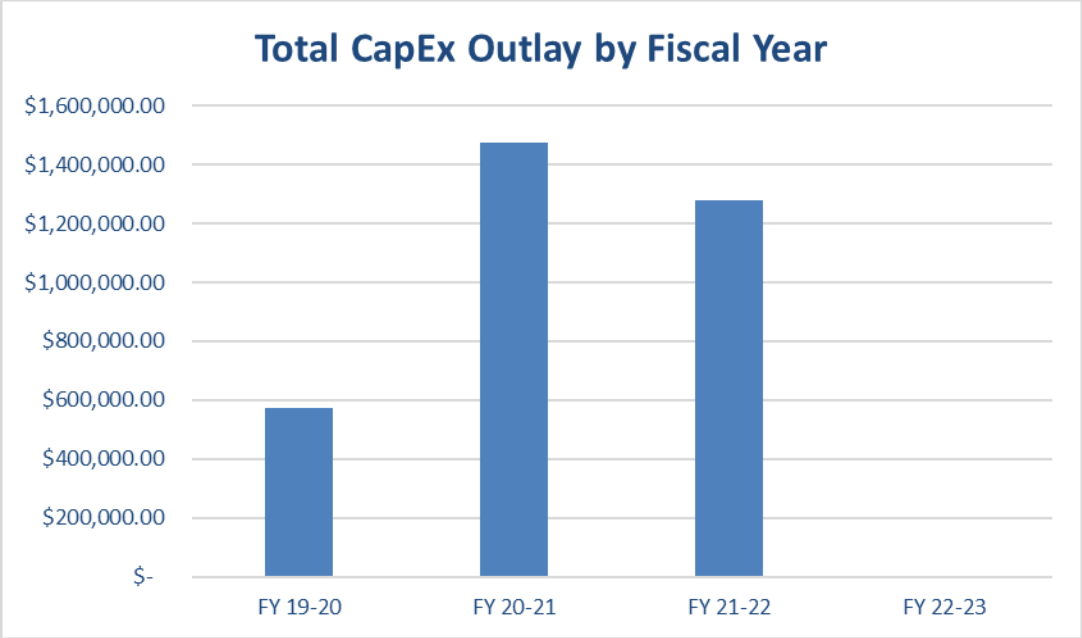
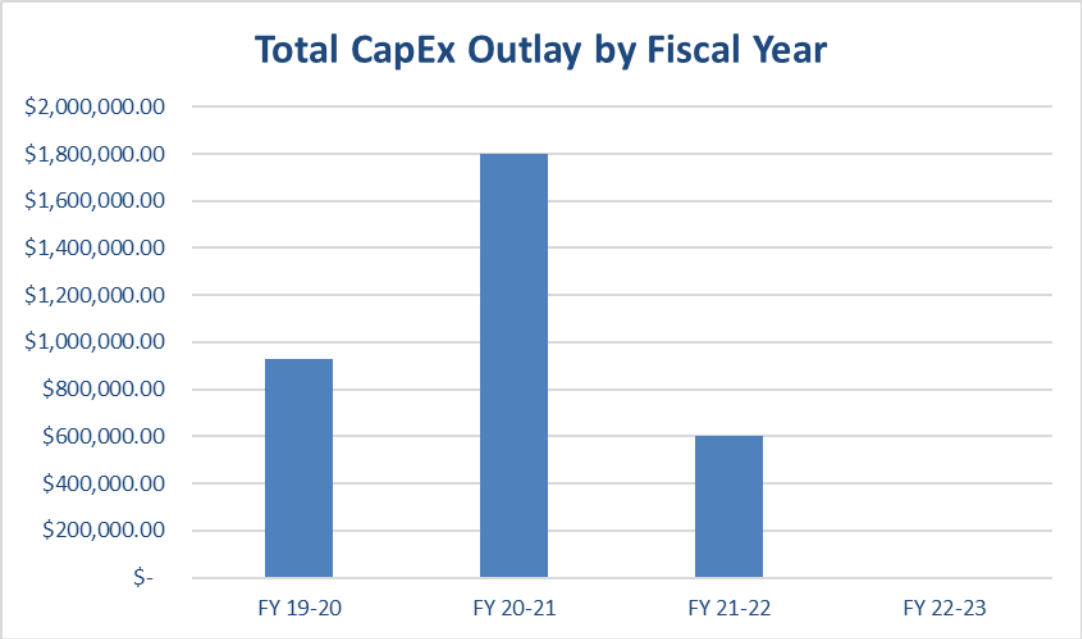


Figure 6 - 24-Month Estimated Program Capital Expense by Fiscal Year



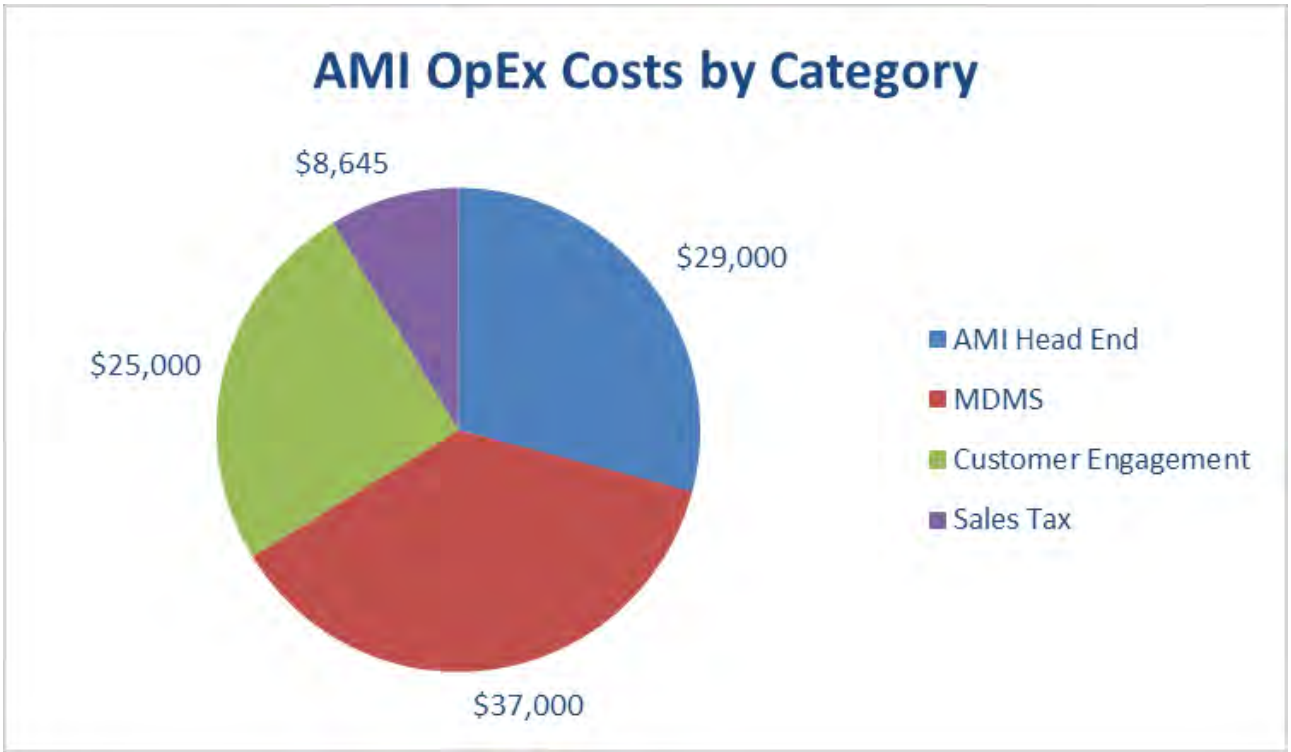
2. Estimated Operating Expense

As with capital expenses, UtiliWorks leverages its database of vendor pricing to arrive at estimates of ongoing operational expenditures for software licensing, maintenance, and support services. The CVWD tax rate is also included.

Staffing costs related to program management, the maintenance of the network, and utilization of the data are assumed to be absorbed internally, as staff is anticipated to be reallocated to perform AMI-related functions. Net-zero staffing change is assumed.

Figure 7 - Estimated Annual Program Operating Expense by Category illustrates the operational costs of the project by category during the first year of implementation. Per this model, additional operating expenses of approximately $100,000 will be incurred per annum after deployment of the system, across the project lifespan, without respect to sensitivity.

Figure 7 - Estimated Annual Program Operating Expense by Category



G. Benefits Estimate Summary

As noted previously, benefits have been classified into one of three categories: hard benefits, reallocation for higher service delivery benefits, and intangible benefits. This categorization was conducted in conjunction with CVWD. Reallocation for higher service delivery benefits are back-calculated based primarily on labor rate and percentage of time on a given task.

Table 8 - Program Benefit Assumptions summarizes benefits areas, benefit category, key calculation assumptions, and average annual value. Additional descriptions of the benefits represented are provided in Table 9, Table 10, and Table 11.

Table 8 - Program Benefit Assumptions

Benefit	Category	Assumption(s)	Average Annual Benefit
Revenue Increase From More Accurate Metering	Hard Dollar	4.0% Historical Water Loss Decrease after Smart Metering	$ 388,000
Revenue Lost to Conservation	Hard Dollar	3.5% Total Water Conservation, Compounded 5%	$ (355,186)
Savings from Meter Reading Vehicle Maintenance	Hard Dollar	98.5% Reduction Based on Vendor Service Level Agreements	$ 9,308
Water Adjustments Reduction	Hard Dollar	80% Reduction	$ 18,400
Printing & Postage Cost	Hard Dollar	50% of Customers on Paperless Billing, with 40% Increase in Monthly Paper Billing	$ 12,450
Savings from Pumping Costs	Hard Dollar	3.0% Electricity Savings	$ 22,500
Water Theft Averted	Hard Dollar	0.25% Industry Average on Annual Billings, Reduced by 70% for Conservative Estimate; Reduced 10% Annually	$ 18,886
Savings from Water Meter Reading	Hard Dollar	28% Wage Decrease after Attrition of Meter Reading Staff Duties	$ 30,600
Avoided Public Outreach Costs (paper, materials & programs)	Hard Dollar	25% Reduction	$ 21,875
Cash from Meter Scrap Value	Hard Dollar	$1.25/lb. Brass; One-Time Benefit Post-Deployment	$ 1,687
Reductions in System Water Loss	Hard Dollar	85% Reduction in Loss; Reduced 5% Annually	$ 91,062

Benefit	Category	Assumption(s)	Average Annual Benefit
Water Re-Read Reduction (other than Meter Reader)	Reallocation	98.5% Reduction Based on Vendor Service Level Agreements	$ 45,876
Water Move-In/Out Reads	Reallocation	1,072 Eliminated Annually	$ 38,592
Service Requests to Check Leaks	Reallocation	85% Reduction	$ 8,729
Service Requests to Download Meter	Reallocation	95% Reduction	$ 30,813
Conversion from Meter Reading to Utility Worker	Reallocation	85% Remaining Wage of New Utility Worker after Attrition of Meter Reading Staff	$ 32,300
Other Areas of Labor Management	Reallocation	Conservative Estimate	$ 8,125
Operations Analytics	Reallocation	Conservative Estimate	$ 8,125
		Total	**$432,145**

Per this model, CVWD can expect to realize benefits averaging approximately $432,145 per annum after deployment of the system. Note that some benefits start and drop-off at different points in the project lifespan, and not all benefits are constant within the cost-benefit project lifespan projection.

1. Estimated Hard Dollars

The implementation of an AMI system can directly impact the revenue stream of a utility. A summary description of these benefits is provided in Table 9 – Hard Dollar Benefits.

Table 9 - Hard Dollar Benefits

Benefit	Benefit Description
Revenue Increase From More Accurate Metering	Improved revenue capture because of replacing worn, inaccurate meters that under-read the volumetric flow of water.
Savings from Meter Reading Vehicle Maintenance	Vehicle costs related to gas, maintenance, and depreciated will be avoided.
Water Adjustments Reduction	Reduction of lost revenue by not having to make adjustments for high water bills.
Printing & Postage Cost	Savings realized in migration of customer to paperless billing, offset by increased printing and postage costs incurred by switching the monthly billing.
Savings from Pumping Costs	The frequency of AMI read data will allow CVWD to optimize its pumping schedule and reduce electricity costs.

Benefit	Benefit Description
Water Theft Averted	A savings as a result of unaccounted-for losses that can be recovered via theft detection routines.
Savings from Water Meter Reading	Cost differential of keeping the Meter Reader position when he retires but hiring a new full-time equivalent at a lower salary.
Avoided Public Outreach Costs	Implementation of a customer portal will allow for easier public outreach and reduce costs related to customer mailers, conservation materials, and rebate programs.
Cash from Meter Scrap Value	One-time savings as a result of scrapping meters during deployment of the AMI infrastructure.
Reductions in System Water Loss	Data analytics routines will allow CVWD to better identify and reduce system leaks.

2. Estimated Reallocation for Higher Service Delivery

In addition to those benefits that can be realized as hard dollars, the implementation of AMI will free human capital at CVWD to provide a reallocation of manpower to different areas or ongoing projects at CVWD. The freeing of these resources is the result of reduction of duties related to functional areas that are taken over by the AMI system, or as a result of greater efficiencies induced by access to the data and analytics provided by the AMI system and MDMS.

A summary of reallocation for higher service delivery benefits is given in Table 10 - Reallocation for Higher Service Delivery Benefits.

Table 10 - Reallocation for Higher Service Delivery Benefits

Benefit	Benefit Description
Meter Re-Read Reduction	Elimination of manual meter reading expenses, including staff time, for reading activities outside of those typically needed for bill production, as by high/low or other exception.
Move-In/Move-Out Read Reduction	Elimination of most off-cycle read field activities when customers move in and out of a premise; this savings will result from new presentation of daily AMI reads and the ability to collect on-demand reads.
Customer-Generated Leak Check Service Order Reduction	Reduction of many field activities and expenses in creating work orders and rolling a truck on behalf of customer inquiry for leak checks.

Benefit	Benefit Description
Customer-Generated Meter Download Service Order Reduction	Reduction of many field activities and expenses in creating work orders and rolling a truck on behalf of customer inquiry for download of reading data from the meter.
Conversion from Metering Reading to Utility Worker	Elimination of manual meter reading expense for normal billing activities.
Other Areas of Labor Management	Misc. reduction in typical operational functions across departments.
Operation Analytics	Misc. improved efficiencies in typical operational functions across departments.

3. Intangibles

In addition to those benefits that can be quantified and are included in the cost-benefit analysis, numerous intangible/soft benefits will be realized. While many of these benefits are not easily measurable, they are certainly real and achievable with the successful deployment of an AMI system. By leveraging the AMI system and interval read data for other value-added activities beyond typical meter reading, many of these intangible benefits have a large, direct, and positive impact on the customer experience.

A summary of intangible benefits is provided in Table 11 - Intangible Benefits.

Table 11 - Intangible Benefits

Benefit	Benefit Description
Improved Customer Experience and Customer Call Quality	Using interval consumption data and on-demand readings, customers can more effectively manage their usage, and customer service representatives can more readily troubleshoot problems for customers.
Improved Emergency Protocol	The frequency and volume of AMI data will allow CVWD to respond more swiftly and efficiently to emergencies than it is capable of doing currently, especially when paired with the analytic capabilities of an MDMS system. Additionally, expediated customer messaging will allow for improved notification of customers during emergencies.
Targeted Messaging	Ability to conduct customer outreach through the use of a portal or other messaging protocol. Targeting individual customer groups by geography, class, or usage, public outreach can be used to augment a number of different programs within the utility. Examples of types of customer messaging include: • News alerts, such as when new capital improvement projects are underway, billing changes, or new programs • Conservation messaging • General district activities

Benefit	Benefit Description
Improved Reliability & Conservation	The AMI system will enable CVWD to model the overall system to facilitate proactive management and improve reliability and conservation.
Improved System Planning Capabilities	Information that can be produced and analyzed from an AMI system can facilitate the improved management and monitoring of system performance, leading to better informed capital investment decisions. System engineering and maintenance programs can be supported with better, more frequent access to the more granular data that will be provided by the AMI system.
Meter Diagnostics to Monitor Aging	Using routines for identifying slowing meters or failing batteries, CVWD can improve the accuracy and precision of its meter replacement program, thereby reducing unnecessary meter replacements and service interruptions to customers.
Risk Mitigation and Reliability Assurance	Mitigates risk of revenue loss as a result of a catastrophic failure of meters through identification of systemic failures for any meter batches installed by improving response time. Better preparedness for handling these failures, should they occur, will also prevent unscheduled, emergency labor costs. In addition to protecting revenue, risk mitigation directly improves perception of system reliability to customers.
Improved Budgeting	Use of granular interval data from meters can allow for improved analysis of water demand and pricing sensitivity, such as budget-based rates.
Timely and Accurate Meter Reading	Coordination across a variety of staff within CVWD. AMI reads will alleviate the strain on staff to deliver timely and accurate meter reads and bills.
Customer Perception of Bill Impact	AMI will enable CVWD to move from bi-monthly to monthly billing, reducing the impacts a large bi-monthly bill will have on certain households, as well as decreasing perception that water service from CVWD is more expensive than those of neighboring utilities.
Meter Right-Sizing	Data and alarms produced by an AMI system will provide CVWD with the ability to detect if a water meter is over or undersized.
Improved Safety	With the introduction of AMI, CVWD will have the ability to remotely read meters, initiate on-demand meter reads, and potentially remotely disconnect/reconnect customers. These actions will dramatically reduce exposure to risky conditions on the road and at customer premises, due to weather conditions, unfriendly pets, physically hard to access meters, and theft.

Benefit	Benefit Description
Use of Network	A utility-owned network will provide new communications infrastructure to CVWD that may be leveraged for other devices, such as any existing flow sensors or pressure sensors, or new Internet of Things (IoT) devices.
Expedited Leak Detection & Conservation	The influx and quantity of data will allow CVWD to use analytics allowing the identification of leaks within hours or days, rather than weeks or months.
Environmental Sustainability	Greater operational efficiencies and fewer field visits will allow for better utilization of natural resources and a reduction in environmental impacts as a result of less wasted water and fuel.
Compliance with Future Legislative Requirements	With the introduction of AMI, CVWD will better prepare itself to address all legislative and/or CA state requirements regarding conservation or other resource-related issues.
District Brand Perception	Customer perception improvement as a result of: • Faster response times • More informed customer service • Averted high water bills • Averted leaks/breaks • Improved public messaging • Higher perception of billing accuracy • Higher perception of staying current with technological improvements
Carbon Footprint Reduction	Reduction of vehicle contributions to carbon footprint and greenhouse emissions.

H. Conclusions

Even with the highly-conservative estimates of both costs and benefits, UtiliWorks believes the implementation of an AMI to be a positive undertaking for CVVD, with a relatively short payback period of 10 years and a positive ROI of 58%.

The combination of hard dollar benefits, plus reallocation for higher service delivery benefits, and additional intangible benefits, appears to provide superior levels of value to CVWD and its customers, as compared to the current operations and services that are offered today. In particular, the intangible benefits identified and described in Table 11 – Intangible Benefits will allow CVWD to provide an unprecedented level of customer service.

Though no civil infrastructure project should be undertaken solely on the basis of financial gain, the benefits from adopting AMI are significant. CVWD has already begun installation of smart meters and is reporting positive results. With high degrees of staff engagement, technological familiarity, and cross-institutional knowledge observed at the utility, it is UtiliWorks' conclusion that CVWD is well-positioned to implement AMI with minimal risk to the organization.

CRESCENTA VALLEY WATER DISTRICT
STAFF REPORT

Information Item No. 4

To: Engineering Committee March 15, 2019

From: David S. Gould, P.E. – District Engineer

Subject: **Project Status - FY 18/19 - Capital Improvement Project Program**

FY 18/19 – CIP Project Schedule & Cost Estimate - The FY 18/19 Capital Improvement Project (CIP) program includes the following projects which are summarized below:

1. **TTHM Study and Chloramine Disinfection, Project E-995** – Staff has updated the project schedule based on the lead-time for the ammonia skids, and the precast concrete vault provided by the vendors. The ammonia tank for Mills Plant was delivered at the end of January 2019, the ammonia skids were delivered February 27, 2019, and the precast concrete vault should be delivered around the week of May 13, 2019. CVWD's crews are working on installing the ammonia equipment at the Mills Plant, which should be completed by the end of March and then proceed to the work at the Glenwood Plant, which should be completed in May 2019.

   Staff and its consultants are also working with the Division of Drinking Water (DDW) to amend the District's permit to operate. Staff is planning to submit a permit amendment request with supporting data to DDW in late March 2019, and the amendment to the permit should be completed by the end of April 2019.

   As staff continues monitoring the trends in the TTHM levels over the next few months, it's believed that the levels will stay near or below the target level of 64 ug/L. Staff has discussed their concerns that TTHM levels will rise during the summer of 2019 due to high demands, temperature and reduced groundwater. Staff is in discussion on a start date for the conversion to chloramines and is tentatively looking at June 2019.

   03/15/19 Project Update:

   - Equipment ordered and waiting on delivery
   - Construction at Mills Plant – March 2019
   - Water Main – Dead-End Flushing started March 5, 2019
   - Construction at Glenwood Plant – May 2019
   - DDW approval – anticipated in April 2019
   - Installation of Chlorine Analyzers at 6 sites – April - May 2019
   - Tentative Date – Conversion to Chloramines – June or July 2019

2. **Steel Reservoir Rehabilitation at Oak Creek Reservoir #2, Project E-970** – The District has two (2) 1.6 MG steel tanks at its Oak Creek Reservoir site which were built in 1958 and 1961. The Oak Creek Reservoirs were re-coated with seismic structural upgrades in 2001. In 2005 and 2011, the reservoirs were again inspected, and the report stated that there was increased corrosion on the roof and rafters above the water line. Oak Creek Reservoir #1 was completed in May 2018, and Oak Creek Reservoir #2 was postponed until November 2018.

   03/15/19 Project Update:

   - Oak Creek Reservoir #2
     - Interior and floor coating removal and re-coating – 3/22/19
     - Fill Reservoir – 3/27/19
     - Anticipated completion date – 4/10/19

3. **CVWD's Well 2 and Related Facilities, Project E-956** – APTwater completed the testing phase of the project including water quality testing to reduce nitrates. The AroNite Verification Report was returned with comments from DDW on 2/12/19. APTwater and staff have been working on responding to comments, which included providing an Operations & Maintenance Manual. Staff will be resubmitting to DDW by March 21, 2019, and it anticipates DDW will approve the system by the end of April 2019. In addition, APTwater has been training CVWD's water operations staff over the past few weeks to take over operations and maintenance of the AroNite Nitrate Removal Treatment System.

4. **Rehabilitation of Wells 1 & 7, Project E-999** – The FY 18/19 Capital Improvement Project (CIP) budget included the rehabilitation of Wells 1 and 7 as part of the District's on-going well rehabilitation program. The design and specifications were completed in early December 2019 and a contract was awarded to General Pump Company in January 2019 for $127,000.

   03/15/19 Project Update:

   - Construction – Well 1
     - Pull Well 1 pump & motor – March 15, 2019
     - Cleaning well casing – March 25, 2019
     - Complete by middle April 2019
   - Construction – Well 7 – Starting Late April 2019

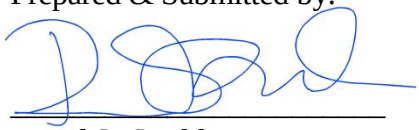
5. **Stormwater Capture Project, Project E-985** – John Robinson Consulting (JRC) has been assisting CVWD and their consultant, Greg Hamer from Wood Environmental (formally Foster Wheeler), with developing the conceptual plan to depict the planned facilities at CVC Park that will include:
   - Infiltration galleries beneath the ball field area and parking areas, including piping from the Verdugo Wash
   - Conversion of the southern end of Dunsmore Avenue to a "green street," including improved drainage, bioswales, and other improvements,
   - Park improvements to ball field, basketball court and picnic areas
   - Native plant demonstration garden in the southeast end of the park

   The next steps will be to complete the conceptual plan and then meet with County of Los Angeles Department of Parks & Recreation and Department of Public Works, City of Glendale, and CV Town Council to get input and comments.

   03/15/19 Project Update:

   - Preliminary Conceptual Plan – to be reviewed at 4/12/19 Engineering Committee meeting
   - Meet with Stakeholders for input and comment
   - Meet with City of Los Angeles to discuss storm water rights within the Verdugo Basin
   - Develop a preliminary cost estimate for review
   - Develop a project schedule for design, review, approvals and construction
   - Develop potential project funding
   - Presentation to Board of Directors

Prepared & Submitted by:



David S. Gould, P.E.
District Engineer