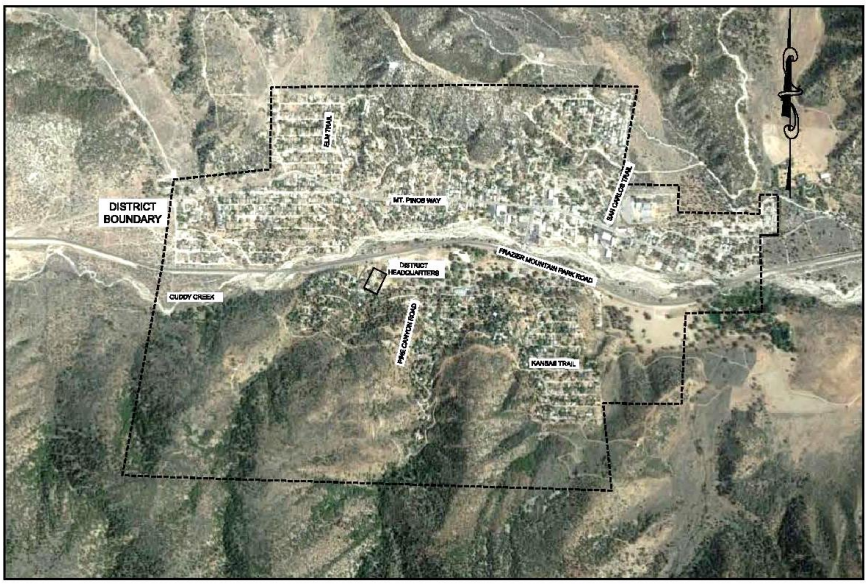
Frazier Park Public Utility District
Preliminary Engineering Report
Meter Replacement Project

INTRODUCTION



FRAZIER PARK PUBLIC UTILITY DISTRICT

Frazier Park Public Utility District (District) is located just north of the southern border of Kern County with Ventura County. It serves the community of Frazier Park. Frazier Park is located about 45 miles south of Bakersfield and 3 miles west of Interstate 5 on Frazier Mountain Park Road. The population of Frazier Park was 2,691 as of the 2010 Census. The District has embarked on a path of annexation of the Lake of the Woods Mutual Water Company (LOW). Lake of the Woods is not yet metered, but is pursuing a parallel path for installation of meters in the anticipation of being annexed to Frazier Park. Frazier Park is a severely disadvantaged community; therefore, the District works very hard at minimizing cost while providing reliable water service to the community. The District staff and Board of Directors live in the community and have a vested interest in doing a good job in meeting the community's water needs.

The District serves 1,303 metered connections. In past years the District purchased meters from several different meter manufacturers and thus there is a need for maintaining a large inventory of replacement parts from several different manufacturers. This is problematic. Therefore, a goal of this program is to purchase meters from only one manufacturer and thereby reduce the District's spare parts inventory.

Currently meters are manually read each month, taking about one week for four full-time meter readers. The District's field staff consists of four full-time operators who do double-duty during the time that meters must be read. Meter reading duties, combined with operation and maintenance commitments, make it difficult for the field staff to keep up with the operational needs of the District.

The majority of the District's meters were installed in the mid-eighties; therefore, these meters are now approximately 30 years old. As meters age they slow down and this results in inaccurate water bills and "lost" water. Therefore, the District has implemented a program to replace the older meters. This program has achieved limited success because the District's field staff is already over-committed, as explained above. It is estimated that over the past 10 years the District has been able to replace about 15% to 20% of the District's meters.

DISTRICT METERING AND BILLING PROGRAM

The District is on a monthly billing cycle. Meters are installed in meter boxes that are generally located on the street frontage. Meter reading is usually conducted between the 15th and 20th of each month. However, this can vary depending on more pressing needs, such as pipe repairs. The meter readings are transferred from the field data collectors into the District's billing program, which is provided by RVS Utility Billing Systems. This involves the District's administrative staff which also must follow-up and correct incorrect water bills due to meter misreadings while also performing other administrative duties. Sometimes this involves one or two field visits to re-read the meter and check the meter's accuracy.

THE NEED FOR NEW REMOTELY-READ METERS

The Situation

As noted above, the District's field staff performs operation and maintenance of the wells and the water distribution system. The District's water production system consists of four wells, the oldest well is about 50 years old and the youngest is two years old. The distribution system consists of many miles of steel water pipe, much of which was installed in the 1950's and 60's. This pipe has experienced multiple failures that are increasing in frequency. While a majority of this pipe was installed in the community's roadways much of it runs under private property and is not covered by formal easements. Most residential streets are private; this means that a majority of the District's pipelines are not in county-dedicated roadways. The residential roads are very narrow, have many encroachments such as driveways, retaining walls and fences that complicate the repair process and make pipe repairs very time consuming and expensive. Repairs often involve hand-digging to expose pipelines that are under or adjacent to these features. Additionally, valves that were intended to isolate segments of the distribution piping have been lost with no record of their locations. Isolation valves are frequently not effective because of additional piping that has been installed that bypasses them. Many of these pipes have not been recorded on the District's maps. Therefore, often the District's storage tanks must be drained in order to de-water the lines. Lake of the Woods is experiencing this problem as well.

The Problem

With a four-person field crew that is responsible for pipeline repair, well operation and maintenance, and meter reading, the billing cycle is often spread out through the month and therefore water production and water deliveries cannot be correlated on a monthly basis with any degree of confidence. Access problems occur in winter if meter box lids are frozen, or if cars are parked above the meter boxes, or if the meter boxes are buried because of winter and spring rains, or the boxes are filled with dirt due to rodent activity. In these situations, estimates of water deliveries must be made. Therefore, comparisons of monthly water use are unreliable, as the meter reading days do not match up from one month to the next. This is exacerbated by the fact that there is not a separate meter-reading crew and the meter registers must be read visually. Registers are often covered with dirt or scratched, which makes it difficult to obtain accurate meter readings. Valid measurements of monthly water use are particularly important if water use restrictions must be put in place. Comparison of annual water deliveries is problematic because of the unmetered loss of water due to pipe failures. It is also difficult to make a good correlation between the District's well production and actual water deliveries because existing meters are aged and reading low (or not recording at all); which then makes it difficult to determine actual water losses due to leaky water lines and pipe failures.

The Solution

It is estimated that the meters can be read by one person in one day with remote-read water meters and a drive-by (AMR – Automatic Meter Reading) system. An AMI (Advanced Metering Infrastructure) system would offer even greater benefits. Equipping meters with remote shut-off valving would further enhance the safety and efficiency of District operations. These systems will save the District's staff an average of 152 person-hours per month in field reading time and vehicle operation expenses, and streamline the District's billing system, thus, saving administrative time. It will facilitate accurate meter readings, consistently read at specific times of the month, and result in a system that assists the District and its water users in the implementation of water savings measures. An additional benefit will be the determination of the amount of water lost due to the District's leaky pipes, residential water leaks, and pipe failures.

TYPICAL METER INSTALLATIONS IN FRAZIER PARK

The attached maps of the district's distribution system show the general location of the existing water meters. As stated above, the meters can be installed in public roads, in downtown sidewalks, private property, and near landscaping features that limit access. Below are some typical installations.

Photo 1

The above installation is adjacent to a paved driveway off a typical street in the residential area of Frazier Park. Note that the street is unpaved and very narrow.

The following photos show the installation in more detail. It is adjacent to a block wall and paved driveway. The meter is about 15-inches below the top of the meter box. The angle meter stop can be seen in the meter box in Photo 3.

Photo 2

Photo 3

Photo 4 shows another installation on a residential street. The meter is adjacent to a hedge along the frontage of the lot. Meter replacement should be accomplished with the meter box in place, although excavation around the meter box to accomplish installation would be possible as well, as the surrounding material is earth. The difficulty in all of these installations is getting access to the piping, which is buried in dirt.

Photo 4

Photo 5 shows a meter installation in the downtown area of Frazier Park. The meter is about 30–inches below the top of the meter box and the meter box is installed in the sidewalk.

Photo 5

Photo 6 shows the meter at the bottom of the meter box. This installation will require saw-cutting, removal, and replacement of the sidewalk.

Photo 6

Photos 7 and 8 are of another meter installation in the downtown area where the meter is installed on private property and may require saw-cutting to accomplish the task. The meter in this installation is about 6-inches below the top of the meter box (Photo 8).

Photo 7

Photo 8

ALTERNATIVES AVAILABLE TO THE DISTRICT

The following alternatives are available to the District.

Alternative No.1 – Replace all 1,303 meters with new remote-read water meters.

Alternative No. 2 – Replace only the registers on all 1,303 meters with remote-read registers.

Alternative No. 3 – Replace a portion of the registers with remote-read registers and replace the remaining meters with new meters with remote-read capability.

Alternative No. 4 – Do nothing.

These four alternatives are discussed in the following sections of this report.

DISCUSSION OF ALTERNATIVES

Alternative No.1 – Replacing All the Water Meters in the Community

Alternative No. 1 involves the removal of all of the District's individual water meters and replacing them with remote-read water meters. The benefit of this alternative is the replacement of the District's water meters, the majority of which were installed in the mid-eighties. Positive-displacement water meters slow down with age due to mechanical wear, therefore it is recommended that they be replaced every 20 years. This is compounded by the loss of water due to aged, leaky, steel pipes that comprise the majority of the District's distribution system. The result is loss of revenue for the District; the loss being due to water that is pumped from the District's wells but lost through leaky pipes, or unmeasured at the point of delivery. The District serves a Severely Disadvantaged Community. Increasing the water rates to cover water loss has a major impact on this community of retired and low-income families. This also creates a financial hardship on the District, as it attempts to keep the rates as low as possible while providing a reliable water supply for the community. Recovering unmetered water allows the District to recover the cost of pumping the water and results in a fair distribution of costs throughout the community. Replacing the meters with remote-read meters also has the benefit of reducing the number of person-hours spent reading meters, releasing the District's field crew to perform other needed operations and maintenance tasks.

Alternative No. 2 – Retro-Fitting the Existing Meter Registers with New Registers Incorporating Remote-Read Technology

Alternative No. 2 involves the removal and replacement of the registers on the existing meters with new registers incorporating remote-read technology. This alternative, while much less expensive than Alternative No. 1, does nothing to help the District recover water lost due to inaccurate, artificially-low water measurement. As noted above, this loss of revenue creates a financial hardship on the District.

Alternative No. 3 – Retro-fit 20% of District's Existing Meter Registers with New Registers Incorporating Remote-Read Technology and Replace 80% of District's Meters with New Meters with Remote-Read Technology

It is estimated that there is about 20% of the District's meters that are 10 years old or newer due to the District's meter replacement efforts over the last 10 years. The District would retro-fit these meters (261 meters) with remote-read registers and transmitters. The remaining 1043 meters would be replaced with new meters with the remote-read technology. The advantage is installation cost. The disadvantage is that the older meters would not necessarily match the new meters that would be installed in the remainder of the District and therefore require a separate inventory of replacement parts. The District currently has variety of replacement meters because until recently the District did not purchase replacement meters from one manufacturer, and therefore the District has a number of different meters requiring a variety of replacement parts. Additionally, the older meters would have about 50% of their life remaining and would begin to lose accuracy sooner, resulting in lost water, lost revenue, and inaccurate distribution of costs to the water users.

Alternative No. 4 – No Project

In the "no project" alternative the system would continue to operate as it presently does. There would be continued revenue loss, inaccurate correlation between the water produced from the wells and the water delivered, no way to accurately compare the amounts of monthly water delivered from year to year, continued inefficient use of field personnel, and no way to retrieve the day-to-day water use for residents concerned about high water bills. Reading meters in the winter time with frozen lids, or when vehicles are parked over the meter box (most meters are installed in narrow unpaved streets), or when the box is filled with dirt or mud, would continue to be a problem for the District.

ENGINEER'S COST ESTIMATES

Alternative No. 1

Engineer's Cost Estimate To Replace 1,303 Water Meters In The District's Water System with New Meters Incorporating Remote-Read Technology

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization, Demobilization, Cleanup	1	LS	$115,200	$115,200
2	Potholing Existing Meters & Final Design	1	LS	$52,400	$52,400
3	5/8"X3/4" Meter Replacement – Plastic Piping	300	EA	$1,200	$360,000
4	5/8"X3/4" Meter Replacement – Copper Piping	300	EA	$1,300	$390,000
5	5/8"X3/4" Meter Replacement – Steel Piping	650	EA	$1,400	$910,000
6	1" Meter Replacement – Steel Piping	50	EA	$1,500	$75,000
7	1-1/2" Meter Replacement – Steel Piping	3	EA	$1,600	$4,800
8	Remote Read Software, Hardware, Computer Station & Reading Device	1	LS	$10,500	$10,500
9	Repair Damaged Private Property	1	EA	$52,400	$52,400
10	Remove, Re-plumb, Replace Well Meters	3	EA	$10,500	$31,500
	Subtotal				$2,001,800
	20% Contingency				$400,400
	Construction Cost				$2,402,200
	Final Design & Construction Management @ 7.5%				$180,200
	District Administrative Costs @ $1,050 / mo.				$17,900
	Legal Fees				$20,000
	Total Project Estimate				**$2,620,300**

Alternative No. 2

Engineer's Cost Estimate To Retro-Fit 1,303 Existing Meter Registers with New Registers Incorporating Remote-Read Technology

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization, Demobilization	1	LS	$47,100	$47,100
2	Property Repair	1	LS	$20,900	$20,900
3	Purchase New Registers / Radio Transmitters	1,303	EA	$380	$495,100
4	Install Remote Radio Transmitters	1,303	EA	$260	$338,800
5	Remote Read Software, Hardware, Computer Station, & Reading Device	1	LS	$10,500	$10,500
6	Replace Well Meter Registers–Reconfigure Piping	3	EA	$10,500	$31,500
	Subtotal				$943,900
	20% Contingency				$188,800
	Construction Cost				$1,132,700
	Final Design & Construction Management @7.5%				$85,000
	District Administrative Costs @ $1,050/mo.				$17,900
	Legal Fees				$20,000
	Total Project Estimate				**$1,255,600**

Alternative No. 3
Engineer's Cost Estimate To Retro-Fit 20% of the District's Existing Meter Registers with New Registers Incorporating Remote-Read Technology, and Replace 80% of the District's Meters with New Meters with Remote-Read Technology

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization, Demobilization, Cleanup	1	LS	$115,200	$115,200
2	Potholing Existing Meters	1	LS	$52,400	$52,400
3	5/8"X3/4" Meter Replacement – Plastic Piping	240	EA	$1,200	$288,000
4	5/8"X3/4" Meter Replacement – Copper Piping	240	EA	$1,300	$312,000
5	5/8"X3/4" Meter Replacement – Steel Piping	520	EA	$1,400	$728,000
6	1" Meter Replacement – Steel Piping	40	EA	$1,500	$60,000
7	1-1/2" Meter Replacement – Steel Piping	2	EA	$1,600	$3,200
8	Remote Read Software, Hardware, Computer Station & Reading Device	1	LS	$10,500	$10,500
9	Purchase New Registers/Radio Transmitters	261	EA	$380	$99,200
10	Install Remote Radio Transmitters	261	EA	$260	$67,900
11	Repair Damaged Private Property	1	EA	$41,900	$41,900
12	Remove, Re-plumb, Replace Well Meters	3	EA	$10,500	$31,500
	Subtotal				$1809,800
	20% Contingency				$362,000
	Construction Cost				$2,171,800
	Final Design and Construction Management@7.5%				$162,900
	District Administrative Costs @ $1,050 / mo.				$17,900
	Legal Fees				$20,000
	Total Project Estimate				**$2,372,600**

Alternative No. 4
No Project

This alternative is to do nothing. The capital cost of this alternative is therefore zero.

METER REPLACEMENT ALTERNATIVES

Meter Type Alternatives

Alternatives for replacement meter types include positive displacement meters and velocity meters.

1. Positive Displacement Meters
   Positive displacement meters are the District standard for water service meters. They are the standard due to their low cost, high accuracy for low flow rates, and multiple options for meter reading technologies.

2. Velocity Meters
   Velocity meters use electromagnetic signals to measure flow rate. The signals are powered by an internal battery. The batteries typically have a design life of 20 years and would need to be replaced at that time. These meters are beneficial in systems with high sand content because they do not have any internal parts that can be damaged by the sand. Sand production is not necessarily a problem with the District's wells, but air input from the frequent pipe failures is often an issue and the District attempts to flush out the air with limited success. Velocity meters in this application will be considered as an alternate, depending on the demonstrated performance of this technology in systems that deal with significant amounts of air.

No specific meter manufacturer will be specified. The District does not have a preference for one meter manufacturer versus another. Water meters manufactured by any of the major meter manufacturers: Badger, Neptune, Sensus, Mueller-Hersey, or equivalent, that pair well with the RVS Billing Systems billing package would be acceptable to the District. Of concern to the District is the availability and quality of factory support, and this will be a consideration in the selection of the meter manufacturer, along with a comparative analysis of the features that are offered by each manufacturer. Therefore, the selection of the meter manufacturer will be left open to competitive bid. At this time five manufacturers can interface well with the RVS system: Sensus, Mueller-Hersey, RG3, Badger, and Neptune. All manufacturers must pre-qualify their systems with the District in order to be considered for the project.

Meter Reading Technology Alternatives

Meter reading technology alternatives include manual-read and remote-read meters.

1. Manual-Read Meters
   Manual-read meters have a register on the meter that records the total water served and is read by a member of the District staff each month. The District spends an inordinate amount of time reading the existing meters as explained earlier.

2. Remote-Read Meters

Remote-read meters include a radio transmitter attached to each water meter. Meter reading is performed by either driving past the meters with the vehicle-mounted meter reading device (AMR system) or via a system that transmits the meter readings and other information to the District's office via cell phone service or radio frequency (AMI system). The readings are then electronically downloaded into the billing software.

AMR System: The AMR system is a one-way transmission of data from the meter to the mobile, drive-by system. It transmits the total water registered on the meter at the time of interrogation by the mobile unit. It cannot be interrogated from the office. It is a basic system, less costly than the AMI system, but more time consuming and requires that the District provide a truck and technician to drive by the meter once a month.

AMI System: The AMI system ("smart metering technology") is a two-way system that can be interrogated by the office. It can produce instantaneous meter readings. Water use parameters can be set up for each meter, to signal the office if excessive water use is detected, low pressures, or tampering is detected. The office can also obtain a record of water use to discuss water bills with individual water users who are concerned about their water bills and water use. This is also helpful in determining if unauthorized water use is detected. The AMI system can also be equipped to remotely shut-down water deliveries with a remotely-operated valve installed on the meter. This reduces the potential of on-site conflicts, allows the District to shut off water service even if there are cars parked over the meter box, the lid is frozen shut, or a water user places a heavy object over the meter box to prevent shut off. Some systems can even monitor water pressure at the meter.

SELECTION OF AN ALTERNATIVE

Alternative No.1 is the most expensive of the four alternatives, however it delivers to the District the highest benefit. It allows the District to continue operating with as few field personnel as possible thereby providing the most efficient use of the field crew. It allows for accurate determination of "lost" water, provides water conservation information for water users, saves administrative time in the billing operation, produces accurate monthly water measurements for water users who are concerned about their water use, and allows the District to more effectively manage its water supplies and its delivery system.

The District will consider both types of meters, positive-displacement meters, and velocity meters, and it will obtain proposals for both the AMR and AMI metering systems. The preferred system is the AMI system. However, if AMI is cost-prohibitive at this time, the District would opt for an AMR system that would be capable of upgrading to AMI at an affordable cost.

Alternative No.1 is recommended.

PROJECT SCHEDULE

Item	Duration (Calendar Days)	Completion Day
Completion of Preliminary Engineering Report	Completed	0
Procurement of Funding	120	120
Bidding and Contract Award	90	210
Review Contractor Submittals	30	240
Issue Notice to Proceed	N/A	240
Construction	180	420
Substantial Completion, Start-Up, and Testing	30	450
State Review / Issue Notice of Completion	30	480

APPENDIX

DRAWINGS: SHEETS 1 – 7