WOLF CREEK PROPERTY OWNERS ASSOCIATION
WATER SYSTEM

SYSTEM ASSESMENT

Prepared For:

Wolf Creek Property Owners Association

October, 2013

Prepared By:

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PACE Project No. 13458.00

Wolf Creek Property Owners Association Water System
System Assessment

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INTRODUCTION

The Wolf Creek Property Owners Association requested a water system assessment to identify deficiencies and recommend improvements. The findings will be used to develop a capital improvement and funding plan that could be implemented and serve the system needs through build out.

The assessment was preceded by a reservoir and physical capacity analysis in 2009 and an updated physical capacity analysis in 2012. The 2012 physical capacity analysis confirmed the system could serve the platted full build out of 79 ERU's.

A system tour was conducted on June 13, 2013 by Pete Soderquist, system operator and Larry Cordes of PACE Engineers. The findings summarized in this report are based on the information gathered and observations made during the tour, follow up correspondence, and the previous evaluations.

SOURCES

Observations – The system is served by Wells No. 2 (55 gpm installed capacity) and No. 3 (55 gpm installed capacity). The well house at Well No. 3 serves as the junction point where both wells combine and pump to the system reservoir by way of a dedicated 4 inch PVC transmission pipe. Both well sites are posted with wellhead protection advisory signs. No potential contaminant sources exist within the 100 foot sanitary control areas. Okanogan County and the Association have a no-spray agreement in place for the adjacent County right-of-way. The well house at Well No. 3 is secure and in good condition.

Analysis – Presently the well pumps are controlled by a reservoir float and configured to alternate starts. To qualify for the multiple source storage credit presented in the 2012 capacity analysis the well pumps should be configured with duplex control logic. Duplex control logic utilizes an additional float or level sensor at the reservoir that would start the second (lag) pump when the first (lead) pump is not keeping pace with demand.

Improvements - Upgrading Wells 2 and 3 to a duplex control is recommended and is discussed further in the controls section.

DISTRIBUTION PIPING AND PRESSURE ZONES

Observations – The distribution system is predominantly 2 and 4 inch glued joint pressure class PVC pipe installed in the late 1970's. Leakage was significant until 2011 when a leak detection and repair effort was completed. Water loss due to leakage was dramatically reduced but the number and types of leaks found was an indicator the piping was aged. Generally glued joint PVC piping has a life expectancy of 20 years depending on soils conditions, installation, and other factors. A system wide piping upgrade within the next 5 to 10 years may be justified.

The walk-through and a review of the system mapping identified the following distribution system issues:

- The Sundance booster pump has been decommissioned but the primary 4 inch transmission is routed through the pump house. A short segment of the 4 inch is reduced to 2 inch.
- The Upper Green Meadow service line above the reservoir is purported to be a single ½ inch diameter. This is undersized for a combined residential service. It was noted that the lower elevation customer's water usage (Wimberger) is noticeable to the higher customer (Seckinger).
- Green Meadows lots 11, 12 and 27-29 service pressures are in the 36-42 psi range. Property owners have expressed concern and the Association wishes to identify a means to address the issue.
- System mapping shows a 2 inch pipe connection between Sundance Lane and Park Lane. The terminus has never been located and it is assumed either the Sundance and Park Lane pipes dead end or the connection is valved off. An evaluation of the benefits of having the connection open is needed.
- The Cottonwood piping loop is 2 inch diameter PVC and could serve a total of 32 connections at full build out. An evaluation of the loop at full build out demand is needed to confirm if the existing 2 inch is adequate.

Analysis

Upper Green Meadows Service Line –The Upper Green Meadows service line should be a minimum 1 1/4 inch inside diameter over the segment that is shared. The segments serving the individual residences should be a minimum of 1 inch inside diameter. The Association should only be responsible for the segment between the system piping and the service meter.

Green Meadows Low Pressures - An analysis of the 2 inch service line serving Green Meadows lots 11/12 and 27-29 shows that the service line is not undersized. The low pressures are attributed to elevation. Possible options for improving service pressure would be a) individual residential booster pumps, b) a new booster pump to serve all connections, or c) a new system reservoir at a higher elevation. Per DOH standards the system is obligated to provide a minimum 30 psi service pressure at the meter. Pressure issues beyond the meter are the customer's responsibility.

Sundance Lane & Park Lane Connection – A network hydraulic analysis was not completed. By inspection the primary benefit to restoring the connection between Sundance and Park Lane would be to improve circulation at the dead ends. Because the Park Lane pipe is in the Virginia Hills pressure zone a pressure reducing valve would be required on the connecting pipe. The connection would effectively create a new demand on the Virginia Hills booster pump and may increase run times and affect Virginia Hills service pressures. A more detailed hydraulic analysis would be needed to assess the impacts before confirming the need.

Cottonwood Meadows – The Cottonwood loop was analyzed under four scenarios as follows:

Scenario	Domestic Demand	Irrigation Demand	Pipe size	Results
I	Peak hour demand at full build out (65 gpm & 32 conn's),	None	Existing 2 inch PVC	17-21 psi pressure loss between well house and north side
II	Peak hour demand at full build out	4 gpm per connection on alternating days (64 gpm)	Existing 2 inch PVC	Excessive demand, negative pressures
III	Peak hour demand at full build out	Same as II	3 inch (PVC or HDPE)	6-8 psi pressure loss between well house and north side
IV	Peak hour demand at full build out	Same as II	3 inch (PVC or HDPE) with cross pipe	3-4 psi pressure loss between well house and north side

As shown the irrigation demand is estimated at 4 gpm per connection. If an alternating day irrigation schedule is used the total Cottonwood irrigation demand would be 64 gpm. If the irrigation schedule is broken down to hourly intervals the total demand could be less.

If an alternating day irrigation schedule is not practical the additional irrigation demand would be 128 gpm.

The following conclusions can be drawn from the results:

1. The existing 2 inch piping is marginally adequate for the Cottonwood full build out peak hour demand.
2. The existing 2 inch piping would not support peak hour demand and additional irrigation demand.
3. A 3 inch pipe loop would be adequate for full build out peak hour demand and an alternating day irrigation schedule.
4. Adding a 3 inch cross pipe provides a small benefit to the loop pressure.
5. If an alternating day irrigation schedule is not realistic a 3 inch pipe loop would be inadequate. A minimum 4 inch pipe loop would be necessary.

System Piping Upgrade – Given the age and history of leaks a piping replacement project should be considered in the 5 to 10 year time frame. The most cost effective approach would be to replace with high density polyethylene-iron pipe size (HDPE-IPS) with consideration for using AWWA C-900 PVC for the 4 inch pipe segments. With the exception of Cottonwood Meadows, the existing pipe sizes appear adequate. However a system wide hydraulic analysis should be completed to determine if larger diameters are needed.

Recommended Improvements –

Upper Green Meadows Service Line – It is recommended the Association verify the service line size to the Wimber/Seckinger service meter and provide a minimum 1 ¼ inch i.d. service line. Facilitating an upgrade of the service line beyond the meter to 1 inch i.d. would be appropriate.

Green Meadows Low Pressures – Construction of a new reservoir at a higher elevation would improve the Green Meadows low pressures. If a new and higher reservoir is not practical individual residential booster systems purchased by the property owners is the next alternative. The Association is not obligated to provide a booster pump to serve the affected lots.

Sundance & Park Lane Connection – If stagnant water is a problem the connection piping between Sundance and Park Lane should be further investigated. If the pipe exists and is in good condition a pressure reducing valve at the Sundance cul-de-sac should be considered. A more detailed hydraulic analysis of the Virginia Hills pressure zone is recommended before committing to the PRV option. The analysis would be provided under a separate scope of services.

Cottonwood Meadows –If customers adhere to an alternating day/time irrigation schedule a 3 inch diameter loop piping would be adequate. This is an uncertainty though and given the small incremental cost of 3 inch versus 4 inch pipe it is recommended the loop be increased to 4 inch diameter piping. The proposed cross pipe provides small benefit relative to the costs and effort associated with acquiring easements.

System Piping Upgrade – A system piping upgrade should be considered within 5 to 10 years. A hydraulic analysis should be completed to verify required pipe sizes and pipe ages should be reviewed to determine if some segments could remain as-is.

STORAGE

Observations - The existing reservoir is partially buried and was constructed in 1978. No leaks were apparent on the visible exterior. The reservoir appears structurally sound and could be expected to have a remaining service life of ten years or more.

Analysis - The system is currently limited by equalizing storage to the platted full build out of 79 ERU's, (October 2012 physical capacity analysis). If the system wishes to increase the number of connections beyond 79 increasing the equalizing storage component should be the focus.

Equalizing storage requirements are a function of peak hour demand. Before planning to construct additional storage it is recommended the system reduce and/or verify actual peak hour demand. This can be accomplished by reducing system maximum day demand or by monitoring the reservoir level during a high usage period with the source wells off.

In addition to equalizing storage the following storage related issues were evaluated:

Fire Suppression Storage - The storage reservoir does not have a dedicated fire suppression component and distribution fire suppression capability is limited to two-2 inch riser pipes located in Cottonwood and Green Meadows. It is estimated the risers could deliver approximately 100 gpm, a reasonable amount for filling a 3,000 gallon fire tender or direct connection fire hose. The risers do not have the capacity to support a pumper truck.

The 2009 evaluation included comments provided by Okanogan County Fire District No. 6 recommending fire storage equivalent to 2 to 3 hours of fire demand. The District also recommended installation of standard hydrants. Upgrading the system to this level of protection would require approximately 100,000 gallons of storage and a distribution system consisting of 8 inch piping.

Another approach would be to construct a new reservoir as presented in the 2009 reservoir evaluation. Doing so would provide approximately 7,700 gallons of extra storage that could be considered available for fire suppression. Installation of more riser pipes at key locations in the distribution system would also be beneficial. With these enhancements the system would have the capability to support fire personnel with tender filling points or to a limited extent direct hose connections if necessary.

If not already in-place a protocol for supporting a fire should be developed. The protocol should address the following:

1. Backflow prevention
2. Customer usage restrictions
3. Reservoir and well level monitoring
4. Coordination with local fire district
5. Operator assignments
6. Metering?

Wolf Creek Reservoir - The Wolf Creek reservoir provided ground level storage when the system utilized Wolf Creek as a source. The reservoir volume appears to be approximately 10,000 to 15,000 gallons and is located at elevation 1,960 ft. Structurally the reservoir appeared in good condition.

Due to location and elevation the Wolf Creek reservoir has limited options for usage. The elevation is too low to provide gravity pressure to Green Meadows. Cottonwood could be served but would require significant piping and valve modifications and pressure would be less than 40 psi. The only scenario in which the reservoir could function would be if Wolf Creek was restored as a source and the reservoir provided treated water storage prior to boosting to the distribution system. This scenario is unlikely and use of the Wolf Creek reservoir is not practical.

Recommended Improvements – Although the amount of storage available is sufficient for the 79 ERU full build out the age of the existing reservoir and the low pressure issues justify planning for a replacement reservoir. The 2009 reservoir evaluation presented five alternatives for a new reservoir:

Alternative 1 – Maintain Existing (Do Nothing)
Alternative 2 – New Reservoir at Existing Site and Maintain Existing Reservoir
Alternative 3 - New Reservoir at Existing Site and Abandon Existing Reservoir
Alternative 4 – New Reservoir on Virginia Hills Lot 23
Alternative 5 – New Reservoir at Higher Elevation

Of these Alternatives 3 through 5 provide the most long term benefit. Alternative 3 would have no impact on the existing wells and could be constructed within the existing reservoir easement. However Alternative 3 would not address the Green Meadows pressure issues.

If the Association wishes to address the Green Meadows pressure issues, Alternative 4 or Alternative 5 should be considered. Both would improve the Green Meadows pressures and eliminate or modify the booster pumping requirements to Virginia Hills and Upper Green Meadows. Both would also affect the existing well pumps.

Given that the Green Meadows pressures meet the Department of Health standards the most cost effective alternative would be Alternative 3 - New Reservoir at Existing Site and Abandon Existing Reservoir.

WELL CONTROLS

Observations – Wells No. 2 and 3 are currently controlled by a reservoir float and configured with an alternating start switch. No provision exists for the idle (lag) pump to automatically start if the operating (lead) pump is not filling the reservoir. Additional information regarding the well pumps was gathered from a telephone conversation with Pat Norwill of Norwill Electric. A summary of Pat's comments regarding a duplex control upgrade:

- Configuring Wells No. 2 and No. 3 to a duplex control system could be done. Possible options for doing so:
    - Wire Connection - Install a new reservoir float with hard wire connection to the Well No. 3 site. This would entail trenching new wire and conduit from Well No. 3 to the decommissioned Sundance booster site and utilizing the existing conduit between Sundance and the reservoir to pull new wire from Sundance to the reservoir.
    - Radio Signal - Install a new reservoir float with radio signal connection to the Well No. 3 site. This option would utilize a radio transmitter to send a reservoir level signal between the reservoir and Well No.3. However a direct line of sight does not exist between the two locations and at least one repeater location would be needed.
    - Lead pump timer – Install a timer that would start the lag pump when the lead pump has run for an extended period. This configuration would operate under the assumption that lead pump operation for an extended period indicates that lag pump support is needed.

Analysis – Radio signal communication has proven to be more reliable than wire communication for water system controls. Timers are useful but vulnerable to fluctuations in demand and may require seasonal calibration. A wire connection would require approximately 2,700 lineal feet of new wire and conduit trenching.

Recommended Improvement - It is recommended the feasibility of a radio link be investigated and a detailed design developed. If the radio link is not practical a timer configuration should be evaluated.

BOOSTER PUMPS

Observations - The Upper Green Meadows (5 hp) and Virginia Hills (7 ½ hp) booster pumps are currently configured to pump to the respective pressure zones. A valved intertie between the zones was recently added to allow discharge zones to be interchanged.

Additional information regarding the booster pumps was gathered from a telephone conversation with Jake Whipple of Beaver Creek Mechanical:

- The booster pumps have had problems starting after power outages or line voltage variations. One incident delayed a pump start until the reservoir was too low and burned out the pump.
- In response to the delayed pump start incident an additional low level float was added to the reservoir. If the reservoir level drops below the pump suctions the float triggers a signal that prevents the pumps from starting.
- Reconfiguring the booster pumps to combine pressure zones could be done electrically if needed. Having two pumps of the same size would make the combination more practical.
- Three phase power is not available at the site.

Analysis – The current booster pump and pressure zone configuration could be improved by the following modifications:

1. Replacing the 5 hp unit with a new 7 ½ hp to provide two redundant pumps capable of serving peak hour demand to a combined Upper Green Meadows/Virginia Hills pressure zone. The Upper Green Meadows zone would dictate the pressure requirement of the pumps. A duplex control logic would be needed to alternate lead duty and start the lag pump if needed.
2. Combining pressure zones with a common discharge pipe and installing a pressure reducing valve on the Virginia Hills leg.

Recommended Improvements – The booster pumps could be modified to a two unit duplex control in one of two ways:

1. Monitor the Virginia Hills unit and when a significant repair is needed replace with a 7 ½ hp matching the Green Meadows unit. The piping intertie and pressure reducing valve could also be installed and the controls system modified to a duplex logic, or
2. Replace the existing installation with a new skid mounted two pump booster assembly with capacity to serve both Green Meadows and Virginia Hills. A piping intertie and pressure reducing valve would still be required. The skid assembly may fit within the existing enclosure. If not a new building would be constructed.

The second option with a new enclosure would be appropriate if a new reservoir is constructed.

SECURITY

Observations – The well sites and reservoir appear properly secured. Unless there is a history of vandalism no additional provisions appear necessary.

CAPITAL IMPROVEMENTS

The listing of capital improvements derived from this assessment is summarized in Table 1. Cost detail is provided in appendix B. Improvements are listed in order of priority with the following criteria used as a guide.

A) Health – Does the improvement provide a safer water supply to the system customers and support all applicable health regulations and standards?

B) Regulatory – Does the improvement address a regulatory compliance issue?

C) Maintenance – Does the improvement address a maintenance need?

D) Service – Does the improvement increase the level of service to system customers? Specifically, are service pressures, flows, or water quality upgraded by the improvement?

E) Fire Protection – Does the improvement enhance fire protection throughout the system?

F) Supply – Does the improvement increase the available water supply?

G) Cost – Can the cost of the improvement be financed by the system?

H) Land Use – Does the improvement conform to land use plans and policies?

In general, the criteria are arranged in order of priority. An improvement that addresses the health criteria will have priority over one that addresses fire protection. Since most improvements will address multiple criteria and others may have benefits that don't match the criteria, some judgment was used in prioritizing improvements.

FUNDING OPTIONS

Under the assumption Wolf Creek will pursue outside financing for capital improvements, the following are possible funding sources. Excerpted summaries of each program are provided in appendix C.

Drinking Water State Revolving Fund – Loan

USDA Rural Development – Loans and Grants

Community Development Block Grant – Grants

Rural Community Assistance Corporation – Loans & Grants

National Rural Water Association – Loans & Grants

Table 1
WOLF CREEK PROPERTY OWNERS ASSOCIATION WATER SYSTEM
CAPITAL IMPROVEMENT PROGRAM

	Project Title	Classification	Description			Cost Estimate[1]
1A	Source Wells - Upgrade to Duplex Control	Regulatory	Upgrade Well No.2 and Well No 3 to duplex control logic with radio link to reservoir			$ 79,000
1B	Source Wells - Upgrade with Timer Control	Regulatory	Upgrade Well No.2 and Well No 3 to replicate a duplex control logic with timer on lead pump			$ 5,000
2	Distribution System Upgrade - Cottonwood Loop	Service/Maintenance	Replace Cottonwood Drive with 4 inch HDPE, IPS, 32 service connections, & additional fill hydrants			$ 164,000
3A	New Reservoir	Service/Maintenance	Alternative 3 - New Reservoir at Existing Site - Abandon Existing			$ 241,000
3B	New Booster Pumps/ Modified Pressure Zones	Maintenance	Provide new skid mounted booster pump assembly, 2 @7.5 HP, with new pump house enclosure.			$ 84,000
4	Upper Green Meadows Lots 30 & 31 Service Line	Service	Provide minimum 1.25 inch service line to Lots 30/31 meter	1	LS	$ 2,000
5	Chlorination System Improvements	Maintenance	Provide separate enclosure at new reservoir site for chlorination equipment	1	LS	$ 13,000
6	Distribution System Upgrade - Long Term	Maintenance	Reservoir to Well House 3 Distribution - 4 inch AWWA C-900	2,600	LF	
			Green Meadows Loop - 4 inch AWWA C-900	3,500	LF	
			Sundance Lane - 2 inch HDPE - IPS	500	LF	
			Green Meadows - Lots 11/12 & 27-29 - 2 inch HDPE - IPS	1,600	LF	
			Virginia Hills - 2 inch HDPE - IPS	990	LF	
			Aspen Lane & Winding Road -2 inch HDPE - IPS	1,600	LF	
			Wells to Reservoir Transmission - 4 inch AWWA C-900	2,600	LF	
			Virginia Ridge Road - 4 inch AWWA C-900	1,100	LF	
			Fill Hydrants - 2 inch	8	EA	
			Roadway Restoration - Crushed Surfacing	1,528	TON	
			Service Reconnections & New Connections	47	EA	
			Distribution System Upgrade - Long Term - Total			$ 363,000

[1] All costs shown in 2013 dollars. Estimates include sales tax, 25% engineering, and a 25% construction contingency.

KEY TO LOT NO. PREFIXES

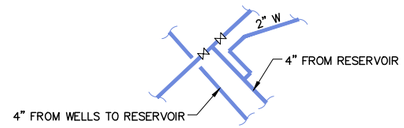
CM – COTTONWOOD MEADOWS
VH – VIRGINIA HILLS
GM – GREEN MEADOWS

LEGEND

EXISTING VALVE
DISTRIBUTION SYSTEM UPGRADE NEAR TERM
DISTRIBUTION SYSTEM UPGRADE LANG TERM

NOTE

ALL PIPING LOCATIONS ARE APPROXIMATE



DETAIL 1 / – SCALE: NTS

DETAIL 2 / – SCALE: NTS

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PLOT TIME: 10/10/2013 10:43 AM
USER NAME: KAREN SCOTT
XREF FILES: ####

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SCALE –

WOLF CREEK PROPERTY OWNERS ASSOCIATION
WATER SYSTEM
SYSTEM IMPROVEMENTS

FIGURE 1

The Wolf Creek improvements would be a strong candidate for a Drinking Water State Revolving Fund loan and possibly assistance from Rural Community Assistance Corporation or National Rural Water Association. Both the USDA and Community Development Block Grant programs are more competitive and place more restrictions on eligibility.

The 2013 DWSRF Loan applications are due September 30, 2013. It is expected the 2014 applications will also be due during late September. The DWSRF program requires a DOH approved water system plan or small water system management program. In addition financial information demonstrating the system has sufficient revenues to cover the repayment obligations is required. Loan funds are typically available 8-12 months after application. A September 2014 application would fund a late 2015 or early 2016 construction. Preconstruction costs associated with planning, application, preparation, and engineering for the proposed project can be reimbursed by the loan.

It is recommended the Association define the scope of the improvement project and review the DWSRF loan terms relative to the system's current rates. A revised rate structure may be necessary. This review could be done during early 2014 in preparation for a September 2014 DWSRF loan application. The Rural Community Assistance Corporation and National Rural Water Association funding options should also be investigated during this time period.

SUMMARY

The improvements recommended herein are intended as a guide to the Wolf Creek Property Owners Association Board of Directors. Costs shown are budgetary estimates to assist in planning and evaluating funding options. Further evaluation and more detailed design effort would be necessary to refine the scope of the improvements and the costs.

Prepared and submitted by,

PACE ENGINEERS, INC.

Larry M. Cordes, P.E.

APPENDIX A:

COTTONWOOD LOOP HYDRAULIC ANALYSIS

App A - Cottonwood Loop Hydraulic Analysis

Scenario I - Peak hour demand at full buildout (65 gpm).

JUNCTION RESULTS, SI

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-1	0	1837.0	1975.0	59.8
J-14	22	1820.0	1926.5	46.1
J-18	13	1820.0	1925.9	45.9
J-22	15	1835.0	1926.6	39.7
J-30	15	1855.0	1936.3	35.2

PIPE RESULTS, SI

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)	Status
P-10	J-18	J-14	487.8	2	150	-6.8	0.7	0.6	1.2	Open
P-2	J-1	J-30	1508.0	2	150	36.2	3.7	38.7	25.7	Open
P-20	J-22	J-18	734.6	2	150	6.2	0.6	0.7	1.0	Open
P-3	RES9000	J-1	10.0	12	135	65.0	0.2	0.0	0.0	Open
P-30	J-30	J-22	1012.1	2	150	21.2	2.2	9.6	9.5	Open
P-4	J-1	J-14	1359.8	2	100	28.8	2.9	48.5	35.7	Open
P21	J-1	J-22	832.6	3	150	0.0	0.0	0.0	0.0	Closed

Comments - At full build out PHD approximatly 17-21 psi of pressure loss between well house and first junctions.

App A - Cottonwood Loop Hydraulic Analysis

Scenario II - Peak hour demand at full buildout (65 gpm) plus 4 gpm per connection irrigation demand.

JUNCTION RESULTS, SII

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-1	0	1837.0	1975.0	59.8
J-14	44	1820.0	1799.8	-8.7
J-18	26	1820.0	1797.8	-9.6
J-22	30	1835.0	1800.4	-15.0
J-30	30	1855.0	1835.2	-8.6

PIPE RESULTS, SII

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)	Status
P-10	J-18	J-14	487.8	2	150	-13.6	1.4	2.1	4.2	Open
P-2	J-1	J-30	1508.0	2	150	72.4	7.4	139.8	92.7	Open
P-20	J-22	J-18	734.6	2	150	12.4	1.3	2.6	3.5	Open
P-3	RES9000	J-1	10.0	12	135	130.0	0.4	0.0	0.1	Open
P-30	J-30	J-22	1012.1	2	150	42.4	4.3	34.8	34.4	Open
P-4	J-1	J-14	1359.8	2	100	57.6	5.9	175.2	128.8	Open
P21	J-1	J-22	832.6	3	150	0.0	0.0	0.0	0.0	Closed

Comments - Peak hour demand combined with irrigation demand can not be maintained. System pressures go negative.

App A - Cottonwood Loop Hydraulic Analysis

Scenario III - Peak hour demand at full buildout (65 gpm) plus 4 gpm per connection irrigation demand on alternating days. <u>Pipe sizes increased to 3 inch.</u>

JUNCTION RESULTS, SIII

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-1	0	1837.0	1975.0	59.8
J-14	44	1820.0	1950.7	56.6
J-18	26	1820.0	1950.4	56.5
J-22	30	1835.0	1950.8	50.2
J-30	30	1855.0	1955.6	43.6

PIPE RESULTS, SIII

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)	Status
P-10	J-18	J-14	487.8	3	150	-13.6	0.6	0.3	0.6	Open
P-2	J-1	J-30	1508.0	3	150	72.4	3.3	19.4	12.9	Open
P-20	J-22	J-18	734.6	3	150	12.4	0.6	0.4	0.5	Open
P-3	RES9000	J-1	10.0	12	135	130.0	0.4	0.0	0.1	Open
P-30	J-30	J-22	1012.1	3	150	42.4	1.9	4.8	4.8	Open
P-4	J-1	J-14	1359.8	3	100	57.6	2.6	24.3	17.9	Open
P21	J-1	J-22	832.6	3	150	0.0	0.0	0.0	0.0	Closed

Comments - At full build out PHD approximatly 6-8 psi pressure loss between well house and first junctions.

App A - Cottonwood Loop Hydraulic Analysis

Scenario IV - Peak hour demand at full buildout (65 gpm) plus 4 gpm per connection irrigation demand on alternating days. Pipe size increased to 3 inch and cross tie pipe added.

JUNCTION RESULTS, SIV

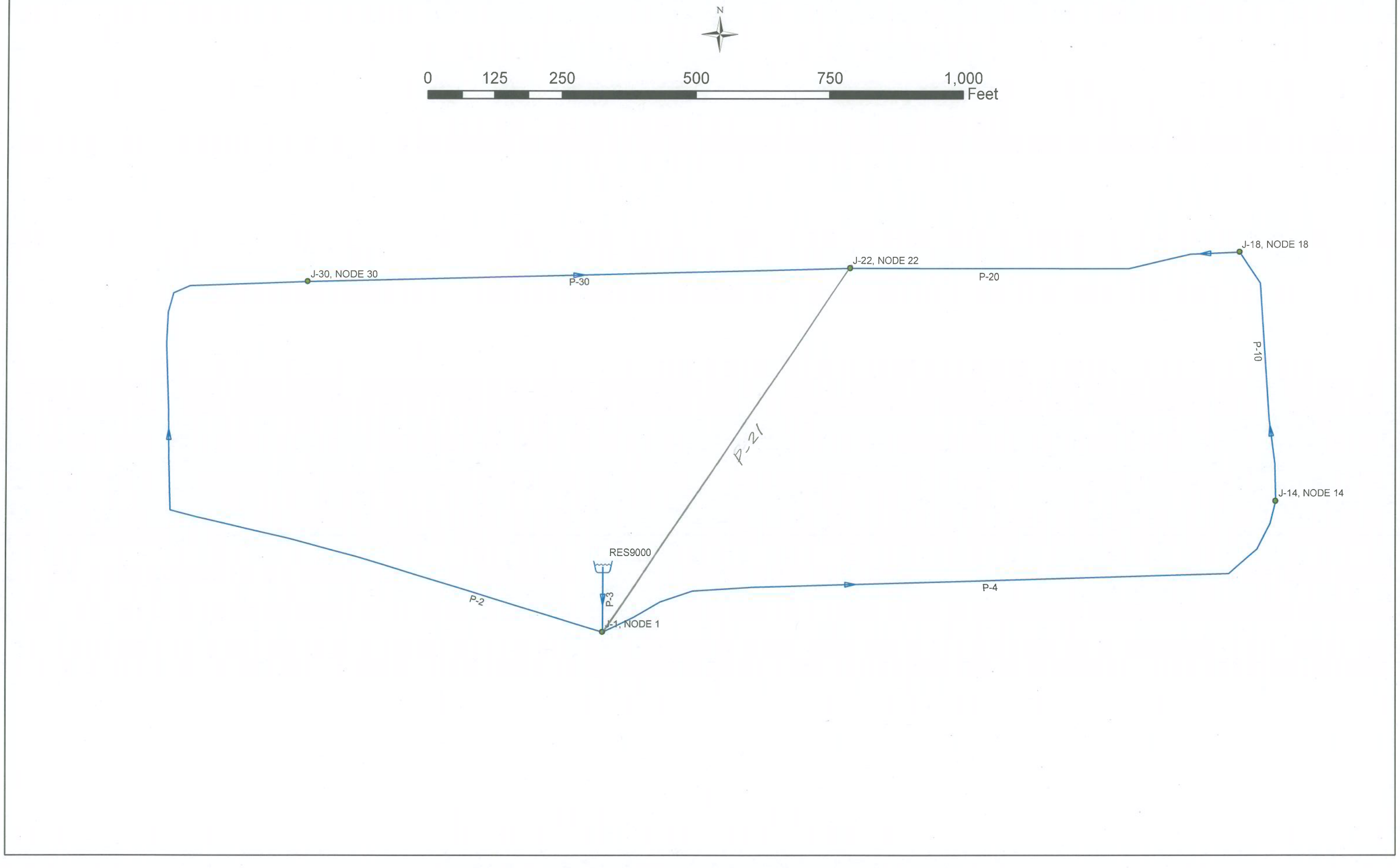
ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-1	0	1837.0	1975.0	59.8
J-14	44	1820.0	1965.7	63.1
J-18	26	1820.0	1965.8	63.2
J-22	30	1835.0	1968.3	57.8
J-30	30	1855.0	1968.7	49.2

PIPE RESULTS, SIV

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/kft)	Status
P-10	J-18	J-14	487.8	3	150	9.6	0.4	0.2	0.3	Open
P-2	J-1	J-30	1508.0	3	150	39.6	1.8	6.4	4.2	Open
P-20	J-22	J-18	734.6	3	150	35.6	1.6	2.5	3.5	Open
P-3	RES9000	J-1	10.0	12	135	130.0	0.4	0.0	0.1	Open
P-30	J-30	J-22	1012.1	3	150	9.6	0.4	0.3	0.3	Open
P-4	J-1	J-14	1359.8	3	100	34.4	1.6	9.4	6.9	Open
P21	J-1	J-22	832.6	3	150	56.0	2.5	6.7	8.0	Open

Comments - At full build out PHD approximatly 3-4 psi of pressure loss between well house and first junctions.

Note - For analysis purposes the cross tie pipe (P-21) was connected at the wellhouse node. The actual connection would be farther east. A reasonable assessment of the pressure benefit is still provided.



WOLF CREEK - COTTONWOOD LOOP

APPENDIX B:

COST ESTIMATES

Wolf Creek Property Owners Association

Source Wells - Upgrade to Duplex Control

Engineers Estimate

Item	Description	Unit	Quantity	Unit Price		Cost
1	Radio Telemetry - Transmitters/Repeaters/Receivers	Lump Sum	1	25,000		25,000
2	Controls Modifications at Wellhouse	Lump Sum	1	15,000		15,000
3	Floats or Level Sensors at Reservoir	Lump Sum	1	8,000		8,000
4	Start-up Procedure	Lump Sum	1	2,000		2,000
				Total Estimated Direct Cost	$	50,000
				Sales Tax	7.90%	3,950
				Total Construction Cost Estimate	$	53,950
				Engineering Design and Construction Administration	25%	12,500
				Contingency	25%	$ 12,500
				Total	$	78,950
				For Budgeting Purposes	$	79,000

Wolf Creek Property Owners Association

Source Wells - Upgrade with Timer Control

Engineers Estimate

Item	Description	Unit	Quantity	Unit Price		Cost
1	Install timer on lead pump	Lump Sum	1	3,000		3,000
		Total Estimated Direct Cost			$	3,000
		Sales Tax		7.90%		237
		Total Construction Cost Estimate			$	3,237
		Engineering Design and Construction Administration		25%		750
		Contingency		25%	$	750
		Total			$	4,737
				For Budgeting Purposes	$	5,000

Wolf Creek Property Owners Association

Distribution System Upgrade - Cottonwood Loop

Engineers Estimate

Item	Description	Unit	Quantity	Unit Price	Cost
1	Mobilization	Lump Sum	1	$ 10,300	$ 10,300
2	Cottonwood Drive - 4 inch HDPE - IPS	LF	5,200	10.00	52,000
3	Fill Hydrants - 2 inch	EA	4	500	2,000
4	Roadway Restoration - Crushed Surfacing	TON	936	25	23,400
5	Service Reconnections & New Connections	EA	32	500	16,000
			Total Estimated Construction Cost		$ 103,700
			Sales Tax	7.90%	8,192
			Total Construction Cost Estimate		$ 111,892
			Engineering Design and Construction Administration	25%	25,925
			Contingency	25%	$ 25,925
			Total		$ 163,742
			For Budgeting Purposes		***$ 164,000***

Wolf Creek Property Owners Association

New Reservoir

Alternative 3 - New Reservoir at Existing Site - Abandon Existing

Engineers Estimate

Item	Description	Unit	Quantity	Unit Price	Cost
1	Mobilization	Lump Sum	1	$ 7,400	$ 7,400
2	Concrete Reservoir, 26 ft. dia. X 10 ft. ht. (39,700 gal)	Lump Sum	1	55,715	55,715
3	Site Grading and Piping	Lump Sum	1	9,200	9,200
4	New Floats or Modify Controls	Lump Sum	1	2,000	2,000

Total Estimated Construction Cost (2009)		$ 74,315
Escalation factor - 2.0% annually, 2009-2013		$ 1.08
Adjusted Construction Cost (2013)		$ 80,441
Sales Tax	7.90%	5,871
Total Construction Cost Estimate		$ 160,628
Engineering Design and Construction Administration	25%	40,157
Contingency	25%	$ 40,157
Total		$ 240,942
For Budgeting Purposes		$ 241,000

Estimating Basis:

1	Mobilization	Estimated at 11% of all other costs				
2	Concrete Reservoir, 26 ft. dia. X 10 ft. ht. (39,700 gal)					
	Reservoir by Mount Baker Silo				$ 47,000	
	Site grading and foundation excavating					
	Reservoir excavation	90 CY	$	15.00		1,350
	Reservoir backfill & compaction	60 CY	$	5.00		300
	Misc reservoir accessories					2,000
	Subtotal					50,650
	General contractor markup	10%				5,065
	Total					55,715
3	Site Grading and Piping					
	Ductile Iron Pipe - 6 inch	50 LF	$	80 [1]		4,000
	Overflow Piping - 6 inch	75 LF	$	20		1,500
	Gate valves - 6 inch	3 EA	$	900		2,700
	Construct stabilized overflow discharge	1 LS	$	1,000		1,000
	Total					9,200
4	New Floats or Modify Controls	1 LS	$	2,000		2,000

Wolf Creek Property Owners Association

New Booster Pumps/ Modified Pressure Zones

Engineers Estimate

Item	Description	Unit	Quantity	Unit Price	Cost
1	Mobilization	Lump Sum	1	$ 5,300	$ 5,300
2	New Booster Pumps - skid mounted, 2 @ 7.5 HP	Lump Sum	1	25,000	25,000
3	New Pump House	SF	144	40	5,760
4	Pump House Electrical	Lump Sum	1	6,000	6,000
5	Pressure Reducing Valve	Lump Sum	1	3,000	3,000
6	Site Grading and Piping	Lump Sum	1	5,000	5,000
7	Pressure Zone Piping Modifications	Lump Sum	1	3,000	3,000
			Total Estimated Direct Cost		$ 53,060
			Sales Tax	7.90%	4,192
			Total Construction Cost Estimate		$ 57,252
			Engineering Design and Construction Administration	25%	13,265
			Contingency	25%	$ 13,265
			Total		$ 83,782
			For Budgeting Purposes		$ 84,000

Wolf Creek Property Owners Association

Chlorination System Improvements

Engineers Estimate

Item	Description	Unit	Quantity	Unit Price		Cost
1	Chlorination Equipment	Lump Sum	1	3,000		3,000
2	New Enclosure	Lump Sum	1	4,000		4,000
3	Piping Modifications	Lump Sum	1	1,000		1,000
				Total Estimated Direct Cost	$	8,000
				Sales Tax	7.90%	632
				Total Construction Cost Estimate	$	8,632
				Engineering Design and Construction Administration	25%	2,000
				Contingency	25%	$ 2,000
				Total	$	12,632
				For Budgeting Purposes	$	13,000

Wolf Creek Property Owners Association

Distribution System Upgrade - Long Term

Engineers Estimate

Item	Description	Unit	Quantity	Unit Price	Cost
1	Mobilization	Lump Sum	1	$ 22,800	$ 22,800
2	Reservoir to Well House 3 Distribution - 4 inch AWWA C-900	LF	2,600	12.00	31,200
3	Green Meadows Loop - 4 inch AWWA C-900	LF	3,500	8.00	28,000
4	Sundance Lane - 2 inch HDPE - IPS	LF	500	8.00	4,000
5	Green Meadows - Lots 11/12 & 27-29 - 2 inch HDPE - IPS	LF	1,600	8.00	12,800
6	Virginia Hills - 2 inch HDPE - IPS	LF	990	8.00	7,920
7	Aspen Lane & Winding Road -2 inch HDPE - IPS	LF	1,600	8.00	12,800
8	Wells to Reservoir Transmission - 4 inch AWWA C-900	LF	2,600	12.00	31,200
9	Virginia Ridge Road - 4 inch AWWA C-900	LF	1,100	12.00	13,200
10	Fill Hydrants - 2 inch	EA	8	500	4,000
11	Roadway Restoration - Crushed Surfacing	TON	1,528	25	38,205
12	Service Reconnections & New Connections	EA	47	500	23,500
	Total Estimated Construction Cost				$ 229,625
	Sales Tax			7.90%	18,140
	Total Construction Cost Estimate				$ 247,765
	Engineering Design and Construction Administration			25%	57,406
	Contingency			25%	$ 57,406
	Total				$ 362,578
	For Budgeting Purposes				***$ 363,000***

APPENDIX C:

FUNDING SOURCE INFORMATION

Department of Health - DWSRF

Program:	Drinking Water State Revolving Fund (DWSRF)
Eligible Applicants:	Community and non-community water systems (includes for-profit and non-profit systems, but not federal or state-owned systems); both privately- and publicly-owned (cities, counties, special purpose districts) systems are eligible
Eligible Projects:	Drinking water infrastructure projects aimed at increasing public health protection
Loan/Grant:	Loan (Federal funds); a limited amount of subsidy is available for communities with high affordability index rates and consolidation projects $12M per jurisdiction per year; $24M for jointly-owned projects 1.0 – 1.5% interest rate 20 year repayment 1% loan fee assessed at contract execution
Match:	None required
Timeline:	Apply: September 2014 (annual funding cycle) Awarded: after Public Works Approval (no legislative approval)

Department of Health - DWSRF

What's New	
What's New: Funding Cycle	The DWSRF program is returning to a fall application cycle. There seems to be a better bidding climate for clients in the winter.
What's New: Status of Funds	DWSRF programs are receiving a reduced amount of funding; the capital grants may cease in federal fiscal year 2017

Community Development Block Grant

Program:	A) General Purpose Block Grant	B) Planning-Only Grant
Eligible Applicants:	Rural (CDBG non-entitlement) cities (fewer than 50,000 people) and counties (fewer than 200,000 people)	
Eligible Projects:	Acquisition, design and construction / renovation of public infrastructure (e.g. water, sewer, streets, stormwater) and community facilities; and local assistance programs - housing rehabilitation (including side connections) or microenterprise assistance, that principally benefit low- and moderate-income persons	Planning - including infrastructure system plans, community strategic plans, feasibility studies, pre-engineering reports (no final design), housing needs assessments, and other community planning activities that principally benefit low- and moderate-income persons
Loan/Grant:	Grant (Federal funds) Up to $750,000	Grant (Federal funds) Up to $24,000 for a single jurisdiction; Up to $35,000 for single jurisdiction projects that address urgent public health and safety needs; Up to $40,000 for multiple jurisdictions/joint application
Match:	None required, but those with match receive more points	
Timeline:	Apply: est. Feb. 2014 (annual funding cycle) Awarded: est. July 2014, contingent upon federal funding and timing; no legislative approval)	Ongoing, until all funds awarded (2013 applications accepted beginning May 2013 through April 2014 on a fund-available basis)

Community Development Block Grant

What's New	
What's New: Income Data	(Hopefully) new low- and moderate-income data from HUD
What's New: Timeline	2013: waiting for execution of federal funding agreement; 2014: anticipate reductions due to sequestration and delayed federal allocation
Coordination Efforts: General Purpose Grant Planning-Only Grant	 Tech teams; if ranked high will seek to replace loan offer with grant to ensure affordability Require pre-plan meetings with regulatory agencies, competitive if financial need documented

National Rural Water Association

Eligible Applicants:	Municipalities, counties, special purpose districts, Native American Tribes, nonprofit corporations (including cooperatives, with up to 10,000 people and rural areas with no population limits)
Eligible Projects:	Pre-development costs associated with proposed water and wastewater projects. Short-term costs of replacing equipment, small-scale extension of services or other small capital projects that are not part of regular operations and maintenance.
Loan/Grant:	Loan (Federal funds) 3% interest rate
Timeline:	Open year-round
Contact:	Tracey Hunter, 360-462-9278; thunter@erwow.org; david@nrwa.org; 800-332-8715 http://www.nrwa.org/benefits/revolvingloan.aspx

Public Works Trust Fund

Program:	Construction	Pre-Construction
Eligible Applicants:	Counties, cities, special purpose districts, and quasi-municipal organizations that meet certain requirements. No school districts or port districts.	
Eligible Projects:	New construction, replacement, and repair of existing infrastructure for domestic water, sanitary sewer, stormwater, solid waste, road or bridge projects, and reasonable growth	Pre-construction activities that prepare a specific project for construction
Loan/Grant:	Loans (State funds) $250 million may be available for 15 -17 Biennium. Maximum loan amount to be determined.	To be determined
Match:	To be determined	
Timeline:	Apply: Spring 2014 (annual funding cycle) Awarded: July 2015 (subject to legislative approval)	To be determined

Public Works Trust Fund

What's New	
What's New: Interest Rates	Interest rate of PWTF loan is tied to the loan repayment period and the average daily market interest rate (ADMR) for tax-exempt municipal bonds as published in the bond buyer's index for a period of 30 – 60 days prior to the application cycle.
What's New: Status of Funds	The 2013-2015 Capital Budget includes selection, ranking, and submission process changes for the awarding of construction loan funds. These changes are listed in Section 7032 of Engrossed Substitute Senate Bill 5035 (ESSB 5035).
What's New: Coordination	PWTF funds for the 2014 loan list have been redirected by the Legislature. PWB will coordinate with all appropriate financing agencies to assist these projects.

Rural Community Assistance Corp.

Feasibility and Pre-Development Loans	
Eligible Applicants:	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less, or 10,000 or less if guaranteed by USDA Rural Development financing
Eligible Projects:	Water and/or wastewater planning, environmental work, and other work to assist in developing an application for infrastructure improvements
Loan/Grant:	Loan (Federal funds) Maximum $50,000 for feasibility loan Maximum $350,000 for pre-development loan One year term 5.5% interest rate
Timeline:	Open year-round
Contact:	Josh Griff, 720-951-2162; jgriff@rcac.org; www.rcac.org

USDA Rural Development

Program:	Water and Environmental Program
Eligible Applicants:	Communities under 10,000 population
Eligible Projects:	Water, wastewater, storm water, solid waste
Loan/Grant:	Federal funds $16M available for loans; $5M available for grants
Match:	None required
Interest Rate:	Set quarterly; current rates are 2.125% - 3.5%
Term:	Up to 40 years
Timeline:	Open year-round Federal fiscal year funding cycle is October 1 – September 30 National Office reviews if funding >$5M

USDA Rural Development

What's New	
What's New: Interest Rates	Likely to increase next quarter (September 2013)
What's New: Status of Funds	Nearing end of fiscal year; pooling occurs August 9th Next fiscal year begins October 1 Expect funding to be similar to FY13 allocations ($16M loan, $5M grant)
What's New: Coordination	Projects leveraging with other funders receive additional points in score