



RIVERBEND RESOLUTION NO. 20160817-04

AUTHORIZING THE APPROVAL OF THE FINAL REPORT ON THE WATER LINE LEAK DETECTION PROJECT AT THE RED RIVER ARMY DEPOT

WHEREAS, Riverbend Water Resources District is a conservation and reclamation district created under and essential to accomplish the purposes of Section 59 Article XVI, Texas Constitution, existing pursuant to and having the powers set forth in Chapter 9601 of the Special District Local Laws Code of the State of Texas; and

WHEREAS, Riverbend Water Resources District, on behalf of the Red River Army Depot ("RRAD"), was in need of a water line leak detection evaluation of almost 39 miles of pipeline on RRAD foot print; and

WHEREAS, Utility Services Associates recently completed a thorough evaluation of the RRAD water distribution lines from June 01, 2016 through June 17, 2016 and found approximately seven leaks;

NOW, THEREFORE, BE IT RESOLVED that the Riverbend Water Resources District Executive hereby authorizes the approval of the final report on the water line leak detection project at the Red River Army Depot for full publication.

PASSED and APPROVED this 17th day of August, 2016

A handwritten signature in blue ink, appearing to read "Sean Rommel", is written over a horizontal line.

Sean Rommel, President

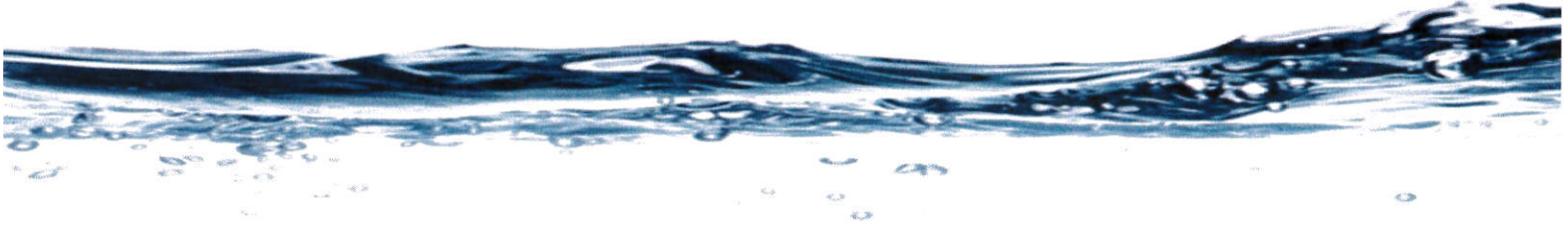
ATTEST:

A handwritten signature in black ink, appearing to read "Fred Milton", is written over a horizontal line.

Fred Milton, Secretary

Attached: Final Report on the Water Leak Detection Project dated July 15, 2016.

Final Report



Water Line Leak Detection Project for:
Riverbend Water Resource District
at
Red River Army Depot, Texarkana, TX



Project Dates:
06/01/2016 through 06/17/2016

19655 1st Avenue South, Suite 101
Seattle, WA 98148

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COVER LETTER

July 15, 2016

Riverbend Water Resource District
Attn: Eli Hunt
228 Texas Ave., Suite A
New Boston, TX 75570

Re: June 2016 Red River Army Depot Water Leak Detection Survey and Pinpointing Project

Dear Mr. Hunt:

Utility Services Associates, LLC, (USA) is pleased to submit the enclosed Final Report on leak detection services recently completed.

The information contained in this Final Report details the procedures and results specific to this project. When applicable, recommendations have been made concerning the best approach for the repair of leaks detected and preparation for future leak detection projects.

As you review this Final Report, please pay close attention to the Leak Consultant's remarks and field observations in the Project Observation section of this report. These may assist you in determining the best course of action regarding specific leaks.

At times specific individual Leak Reports may differ in the Final Report from those provided during the course of the project. These changes, usually insignificant, generally pertain to the manner in which we report leaks and do not alter the methods used or results of pinpointing.

We strongly suggest you contact us prior to excavating any leak that we have labeled with "CAUTION" for further explanation.

This leak detection project is productive since we pinpointed leakage that, when repaired, can reduce your water loss, saving Riverbend Water Resource District dollars now and in the future. We appreciate your confidence in USA. If you have any questions, call us at (877) 585-5325 or (206) 429-3751.

Sincerely,



For: Rob Meston
President



EXECUTIVE SUMMARY

LEAK DETECTION EXECUTIVE SUMMARY

From June 1, 2016 through June 17, 2016 USA performed a leak survey for **Riverbend Water Resource District at the Red River Army Depot in Texarkana, TX.** Our Leak Consultant, Brian Carey, used and appreciated the information provided by Dave Mathews to expedite and provide an accurate survey. The tables below detail the information gathered.

Time Spent on Project	
Surveying:	75 Hr
Pinpointing:	2 Hr
Other Time:	19 Hr
Total Time:	96 Hr

Total Areas Surveyed	
Total Distance in Miles	38.5417
Total Distance in feet	203,500

The mileage was estimated by the Water Loss Consultant and may not match maps.

Access Points Contacted	
Hydrants	351
Valves	538
Services	8
Other	32
Total	929

Leak Type Noises Detected	
Hydrants	1
Valves	2
Services	1
Other	0
Total	4

Leaks Pinpointed	
Main	1
Valve	1
Hydrant	1
Service Line	0
Service Connection	0
Curbstop	0
Other	1
Total	4

Total Water Loss Identified	
Gallons Per Minute (GPM):	18.25
Gallons Per Day:	26,280
Gallons Per Month:	799,350
Gallons Per Year:	9,592,200

Unidentified Water Loss	
Faulty Meters	0
Unidentified Leaks	0
Possible Consumer Side Leaks	0

This project was divided into two phases; the survey phase and the pinpointing phase. The following pages outline exactly how those two phases progressed and the results of each. Any leaks pinpointed will be detailed in the attached Leak Reports.

PROJECT OBSERVATIONS

PROJECT OBSERVATIONS (Water Distribution Lines)

GENERAL

USA recently completed a leak detection project for the for the Red River Army Depot on behalf of the Riverbend Water Resource District in New Boston, TX. The field work portion of the project was started on June 01, 2016 and was completed on June 17, 2016. The information listed below was generated by data collected by USA Water Loss Consultant, Brian Carey, during the field work portion of the project.

SPECIFICS

The project was broken down into two different phases:

1. **Survey Phase** – sounding of appurtenances and recording all leak anomalies detected for further investigation.
2. **Pinpointing Phase** – pinpointing all anomalies that were detected during the survey phase.

1. Survey Phase Information

The survey was focused on part of the base as pre-determined determined by the client. The maps used were fairly accurate, however, there was a significant portion of the base of between 8-10 miles that were not surveyed by the request of our client. This was because they are getting prepared to install new pipe in this area.

The survey went well, but like all military bases it is difficult to tell where and how much the water is being used on base as there are very few meters outside of the master meters. Most of the appurtenances that were available were accessible. Sound travel was good in most cases. Whenever PVC was checked, we contacted all available appurtenances due to the poor sound carrying characteristics of PVC pipe.

Overall, the survey portion of this project went well. We detected and recorded eight (8) leak type noises for re-investigation during the Pinpointing Phase.

2. Pinpointing Phase Information

As a result of this Phase, we have detected and reported seven (7) leaks. Information follows on specific leaks. For additional information and a drawing of each leak, please refer to the Leak Report section of this Final Report:

Leak Report #5

This leak location may be off slightly. Sometimes, build up in small diameter pipe can give false or inaccurate leak locations. Use caution when excavating and if no leak is found, excavate several feet in either direction.

Leak Report #6

This leak location may be off slightly. There is also a lot of noise from a line across the way from this location. We recommend that line be abandoned (we were told it was on the schedule to be cut and capped) and then re-checking this location before digging to make sure the noise isn't from the line 30' away.

Additional Pinpointing Notes:

7 different flush valves are being used to try and maintain chlorine residuals throughout the base. 2 of these flush valves flush a minimum of 10 gallons per minute 24/7 and the remaining 5 flush valves flush as much per minute but only during certain parts of the day. Taking this into account, this adds to a very conservative 25 gpm or 36,000 gallons per day. Add in the 18.25 gpm from the 4 leaks found, that is a conservative total of 43.25 gpm or 62,280 gallons per day. When you add in the cost that the base is paying per 1,000 gallons (\$ 4.75 per 1,000 gallons) this is a total cost of \$295.83 per day, \$8,874.90 per a 30 day month and \$107,977.95 per year.

RECOMMENDATIONS

Continue on a rotational survey through the system as there appears to be a high likelihood of leaks on the older, galvanized lines.

We recommend you expose all valves and exercise them periodically. Valves are an integral part of the water system and they regulate the distribution of water. Exercising valves is recommended by valve manufacturers and AWWA.

Find a solution to keep the chlorine residuals at or above state recommended levels.

CONCLUSION

Overall, we feel the project was very successful as leaks were detected and pinpointed. When these leaks are repaired, lost water and revenue will be reduced.

We would like to thank Dave Mathews for his field assistance. His hard work and knowledge of the system proved invaluable. We look forward to working with the Red River Army Depot and the Riverbend Water Recourse District on future conservation projects.

Brian Carey
Water Loss Consultant

SURVEY PHASE REVIEW

SURVEY PHASE REVIEW (Water Distribution Lines)

The first step in our survey was to review the distribution maps of the system for familiarization of the pipe network and available appurtenances to be used for contact points.

As the leak survey progressed, we determined the distances that even quiet leak type sounds traveled in various pipe materials, pipe sizes and pressure zones in each area of the system. This might have been done by slightly turning on fire hydrants, hose bibs, etc., creating a simulated, quiet leak sound. Appurtenances in that area were then checked with a sound amplification instrument to see how far the simulated leak sounds traveled, thus determining how often we would make contact with appurtenances in a given section of the water distribution system. In most areas, contact was made with pipe appurtenances at intervals no greater than 300 feet where contact points were available and accessible at pre-determined distances as noted in Paragraph B (whichever distance is necessary to obtain complete coverage). This allowed for even more quiet leaks to be located. Whenever we surveyed PVC lines, all available appurtenances were contacted.

We then conducted a comprehensive survey by making physical contact with all available main line appurtenances (valves, hydrants, etc.) and necessary customer services. USA used a sonic leak detection amplification instrument designed for this purpose.

Appurtenances Surveyed

Hydrant	351
Valves	538
Services	8
Other	12
Total	929

When normal contact points were not available or could not be created within a reasonable distance, we made an attempt to use a sonic ground listening instrument to make physical ground contact at intervals no greater than 6 feet directly over the pipe. If conditions did not allow this procedure our Leak Consultant advised you at time of project and notes of such are included in the Project Observations. Ground listening devices are employed when ground cover is pavement, cement or similar hard surface.

When ground cover was not a hard surface and normal contact points were not available, we made an attempt to use probe rods or a specially designed sounding plate at 6-foot intervals. A sound amplification instrument with 3VG or greater transducer was employed in conjunction with this equipment, directly over the pipe. If conditions did not allow this procedure our Leak Consultant advised you at time of project and was detailed in the Project Observations section of this Final Report. Direct contact to the main line at intervals outlined in Preparation for Service resulted in the most thorough survey.

Areas Surveyed

Street	From	To	Distance
N Boundary Patrol Rd	Recruitment Center	James Carlow Dr	10,840
James Carlow Dr	N Boundary Rd	Park Dr	1,065
Park Dr	James Carlow Dr	N Boundary Rd	1,700

James Carlow Dr	Park Dr	End of Road	1,810
Circle Dr	James Carlow Dr	James Carlow Dr	990
Bowie Ave	Park Dr	Golf Maintenance Building	1,895
Wright Patman Dr	Bowie Ave	Bowie Ave	955
Texas Ave	James Carlow Dr	The Base Gate	5,825
Service St	Texas Ave	End of Street	1,080
Miller Rd	Service St	End of Road	740
Arkansas Ave	Service St	Ammunition Dr	1,875
Combat Rd	Texas Ave	Road Block	1,315
Ave A	Combat Rd	10th St	7,135
10th St	Ave A	End of Road	6,800
Ave B	10th St	5th St	2,210
Ave C	5th St	10th St	2,200
Ave D	10th St	5th St	2,240
Ave K	Texas Ave	E Boundary Patrol Rd	5,875
Combat Rd	Texas Ave	Arkansas Ave	4,005
Arkansas Ave	Combat Rd	Guard Shack	1,340
Ave H	5th St	10th St	2,245
8th St	Ave I	Ave K	910
7th St	Ave A	Ave K	3,180
6th St	Ave J	Ave K	505
5th St	Ave A	Ave K	3,200
Ave I	Main Gate	10th St	5,140
Texas Ave	E Boundary Patrol Rd	Combat Rd	6,335
Ave E	5th St	10th St	2,220
Ave F	5th St	10th St	2,210
Ave G	5th St	10th St	2,200
8th St	Ave A	Ave G	1,775
9th St	Ave A	Ave G	1,770
Elliot Lake Rd	E Boundary Patrol Rd	End of Road	19,480
Campground Area	Campground Area	Campground Area	4,480
Buildings 312, 333, 369, 333A, 334A, 365, 365B, 320, 342, 317, 317A, 316, 315B, 332, 320, 315, 319, 321, 345, S-337, S-341, 357, 388, 325, 323, 324, 442, 358, 323B, 343, 327, 329, 371	Spot Check	Buildings	17,843
Buildings 442, 441, 431, 432, 433, 443, 412E, 421, 411, 401, 402, 405, 403, 406, 407, 412B, 412D, 490, 490B, 454	Spot Check	Buildings	14,147
Buildings 375, 376, 377, 378, 398, 372, 397, 374, 366, 551, 561, 571, 578, 500, 580, 589, 543, 581, 541, 591, 553, 552, 548, 557, 507, 509	Spot Check	Buildings	9,495
Buildings 445, 435, 425, 415, 409, 417, 416, 426, 436, 434, 446, 447, 437,	Spot Check	Buildings	6,765

440, 418, 000, 438, 462, 451, 410, 493			
Buildings 592, 582, 572, 562, 554, 558, 586, 552, 563, 573, 583, 593, 521, 520, 588, 584, 585, 449, 439, 000, 419, 427, 420, 430, 544, 000, 595, 594, 596, 499	Spot Check	Buildings	17,113
Miscellaneous laterals, cross country mains and parking lot water lines	Spot Check	Miscellaneous	20,592
Total Area Surveyed in Feet			203,500
Total Area Surveyed in Miles			38.5417

A detailed report of decibel levels at suspected leak sound locations and observations were compiled during the survey for reinvestigation and possible pinpointing at a later time. This reinvestigation increased the speed of the survey and eliminated correlating on most false leak sounds.

Leak Type Noises Detected

Contact Points	Noises Detected
Hydrant	1
Valves	2
Services	1
Other	0
Total	4

All indications of leaks found during the survey were verified a second time, after which, the leaks were pinpointed with a computer based sound correlator when possible. Pinpointing information can be found in the Pinpointing and Leak Reports Sections.

End of Section

PINPOINTING PHASE REVIEW

PINPOINTING PHASE REVIEW (Water Distribution Lines)

All indications of leaks found during the survey were verified a second time, after which, the leaks were pinpointed with a computer based sound correlator when possible. Pinpointing leak locations through interpretation of sound intensity, either by ear, decibel metering or other like methods was not used when contact points were available for use with the correlator. However, ground listening devices were used as a quick double check on pinpointed leaks.

The equipment used did not normally require valves to be operated during surveying and pinpointing. However, on occasion, services or valves were operated to eliminate service draw noises or to change velocity noise.

The correlator equipment used had the capability to prompt the operator to input the variables when different pipe sizes and/or pipe material were encountered in the same span to be investigated. This is necessary to insure accuracy of results based on the automatic computation of the correct leak sound velocity in leak pinpointing operations. Our correlators have the capability of correlating up to seven various pipe sizes and types at one time in a given space. To insure effective performance in all field environments encountered in the distribution system (i.e. traffic noise, draw, pump operation, industrial noise, etc.), the correlator equipment provides 16 auto filter options and/or infinite manual filter options.

We provided a copy of leak reports, when pinpointed, which included leak locations and estimated GPM loss.

Leaks Pinpointed

Number	Leak Type	Location	GPM
1	Main	Ave. I at Building #350	15.00
2	Hydrant	6th St. Between Ave. J and Ave. K	0.25
3	Valve	N. Boundary Patrol Rd at Training Center	1.00
4	Other	Elliot Lake Rd Campground #24 and #27	2.00
Total			18.25

These leak reports, also included a leak repair priority classification. These classifications are as follows:

Class I Any leak which is hazardous in terms of potential undermining, possibly resulting in surface collapse, encroachment and/or damage to nearby utilities, commercial or private properties or leaks severe enough to warrant immediate repair.

Class II All leaks that display water losses significant enough to be monitored on a regular repair schedule.

Class III Relatively small leaks that should be repaired as workload permits.

Repair Priority

Number	Leak Type	Location	GPM
Total Class I			0.00

Number	Leak Type	Location	GPM
1	Main	Ave. I at Building #350	15.00
Total Class II			15.00

Number	Leak Type	Location	GPM
2	Hydrant	6th St. Between Ave. J and Ave. K	0.25
3	Valve	N. Boundary Patrol Rd at Training Center	1.00
4	Other	Elliot Lake Rd Campground #24 and #27	2.00
Total Class III			3.25

Whenever any of the leaks detected by USA were repaired prior to completion of the field work, we gave Riverbend Water Resource District the option to have that section of the system re-surveyed to be sure no very quiet leaks were missed due to an over powering noisy leak sound.

Please note that leakage that was detected and pinpointed may be larger or smaller than estimated. Estimates are based on several variables including type and size of pipe, pressure and interpretation of correlation filter results.

End of Section

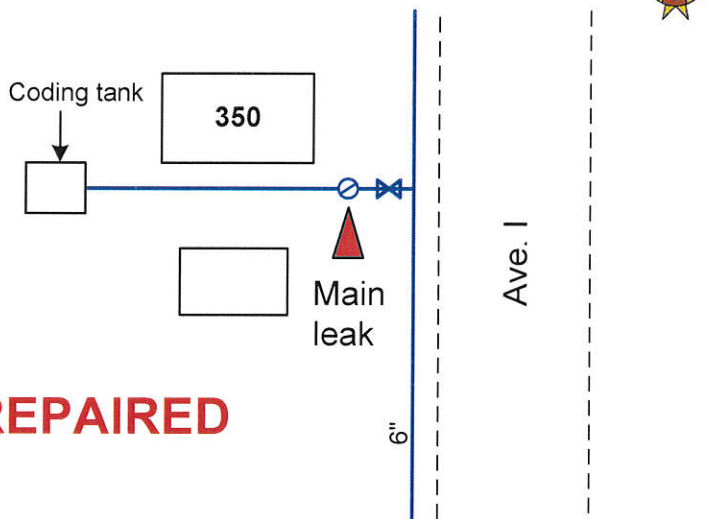
LEAK REPORTS

Leak Report

Utility Services Associates, LLC

Location: Ave. I at Building #350
 Map #: _____ GPS: _____
 Remarks: Leak on 2" main line feeding the diesel engine test cooling towers. Leak is fixed.
 Leak Type: Main
 Recommendations: Repaired

Map Not To Scale



REPAIRED

Leak Consultant: BC
 Leak No: 1
 Leak Class: II
 Leak Rate: 15 GPM
 Cover Type: Soil
 Site Marked: No
 Date: 06/17/16
 Job No: 16201

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Equipment used: S-30 Portable Listening Device

Computer Correlation Results

Scan Time	Grade	Dist "Red"	Dist "Blue"

Water Loss
(this leak, in gallons)

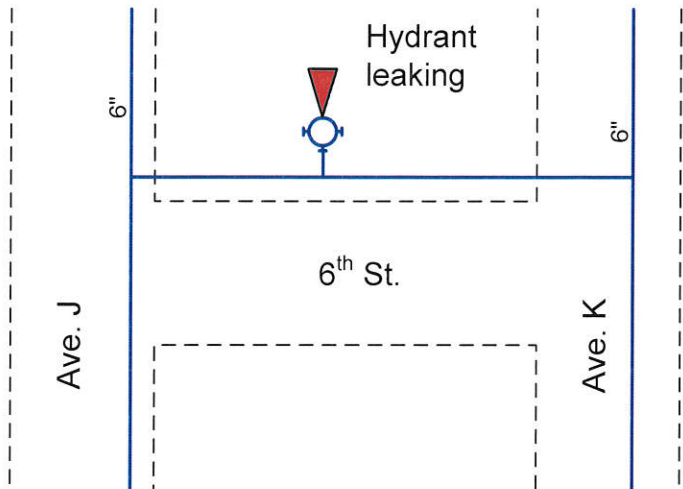
DAILY 21,600
 WEEKLY 151,200
 MONTHLY 657,000

Leak Report

Utility Services Associates, LLC

Location: 6th St. Between Ave. J and Ave. K
 Map #: _____ GPS: _____
 Remarks: Fire hydrant leaking on 6th St. between Ave. J and Ave. K.
 Leak Type: Hydrant
 Recommendations: Repair / Replace

Map Not To Scale



Leak Consultant: BC
 Leak No: 2
 Leak Class: III
 Leak Rate: .25 GPM
 Cover Type: Soil
 Site Marked: No
 Date: 06/13/16
 Job No: 16201

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Equipment used: S-30 Portable Listening Device

Computer Correlation Results

Scan Time	Grade	Dist "Red"	Dist "Blue"

Water Loss
(this leak, in gallons)

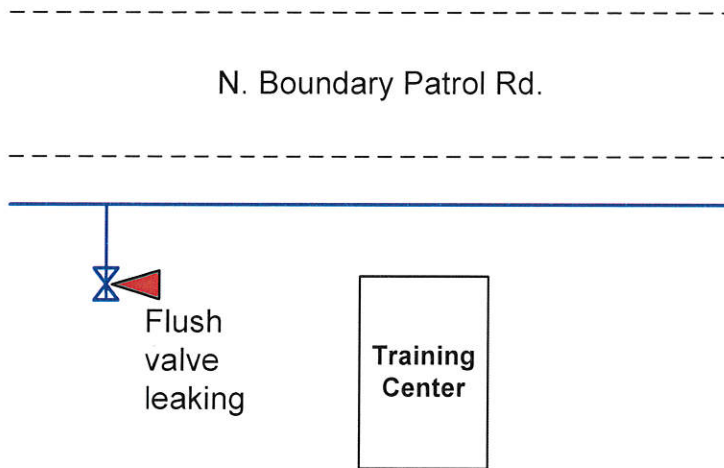
DAILY 360
 WEEKLY 2,520
 MONTHLY 10,950

Leak Report

Utility Services Associates, LLC

Location: N. Boundary Patrol Rd at Training Center
 Map #: _____ GPS: _____
 Remarks: Flush valve leaking. This flush valve is usually flushing 24/7 but was turned off for survey purposes. Still leaking.
 Leak Type: Valve
 Recommendations: Repair / Replace

Map Not To Scale



Leak Consultant: BC
 Leak No: 3
 Leak Class: III
 Leak Rate: 1 GPM
 Cover Type: Soil
 Site Marked: No
 Date: 06/13/16
 Job No: 16201

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Equipment used: S-30 Portable Listening Device

Computer Correlation Results

Scan Time	Grade	Dist "Red"	Dist "Blue"

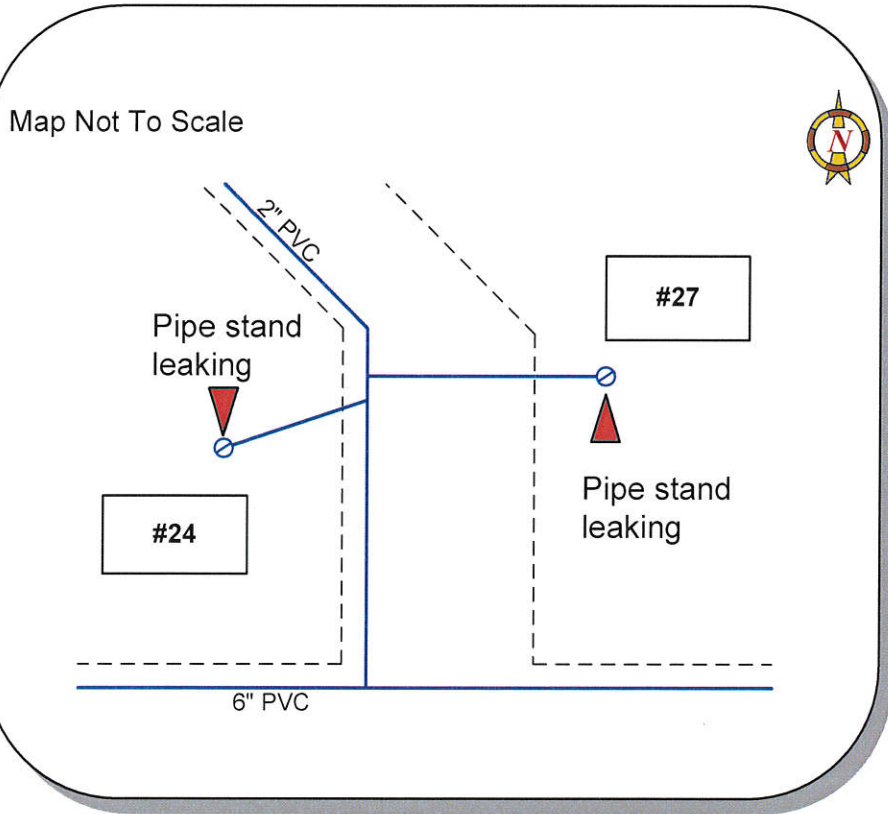
Water Loss
(this leak, in gallons)

DAILY 1,440
 WEEKLY 10,080
 MONTHLY 43,800

Leak Report

Utility Services Associates, LLC

Location: Elliot Lake Rd. Campground #24 and #27
 Map #: _____ GPS: _____
 Remarks: Pipe stands for campground water hook ups are leaking.
 Leak Type: Pipe stands
 Recommendations: Repair / Replace



Leak Consultant: BC
 Leak No: 4
 Leak Class: III
 Leak Rate: 2 GPM
 Cover Type: Soil
 Site Marked: No
 Date: 06/13/16
 Job No: 16201

Space left blank for digital photo.

Equipment used: S-30 Portable Listening Device

Computer Correlation Results

Scan Time	Grade	Dist "Red"	Dist "Blue"

Water Loss
(this leak, in gallons)
 DAILY 2,880
 WEEKLY 20,160
 MONTHLY 87,600

CONCLUSION

LEAK SURVEY CONCLUSION

Our thanks to Eli Hunt and all persons involved with this project for their assistance in gathering all the necessary paperwork and personnel to create, with USA, a mutually beneficial leak detection project.

With this survey you have demonstrated concern for prudent water utilization and conservation.

Capitalizing on the most advanced leak detection technology available today, USA has successfully completed this Leak Detection Survey. The contents of this Final Report provide Riverbend Water Resource District and the Red River Army Depot with a permanent record of the activities performed to complete a Leak Survey along with the results achieved.

An important characteristic of this Leak Report is that the facts contained herein can be used in formulating a database for decision making regarding: the need for possible future meter programs, rehabilitation and pipe line replacement and/or the investigation of new water sources, etc. These types of decisions, regarding your utilization of water, now can be predicated more on facts rather than supposition or conjecture.

Prompt repair of any leaks reported provide an immediate benefit to Riverbend Water Resource District and the Red River Army Depot, which includes recovery of most water revenue and water conservation, etc.

Having achieved these results, we recommend that you continue to set up the infrastructure necessary to continue investigating leakage in the water distribution system. Implementation of any on-going leak survey program will ensure that leak losses are kept to a minimum, and the added enhancement of saving costs due to emergency call outs.

Utility Services Associates, LLC, is proud to have served Riverbend Water Resource District in this way and we wish to thank you for your substantial assistance and cooperation in this project.

If you or your staff has any questions regarding this Final Report, please feel free to call us at (877) 585-5325 or (206) 429-3751.

Best Regards,



For Rob Meston
President



