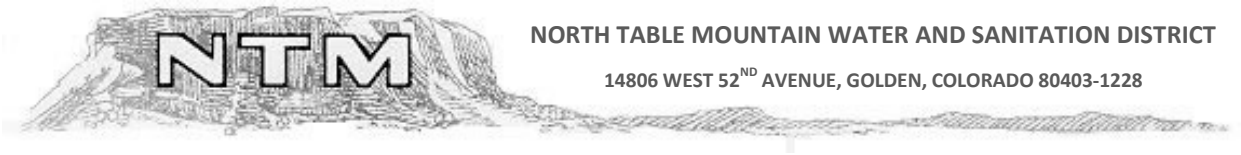

NORTH TABLE MOUNTAIN WATER AND SANITATION DISTRICT

14806 WEST 52ND AVENUE, GOLDEN, COLORADO 80403-1228

North Table Mountain Water and Sanitation District

Colorado Water Conservation Board Water Efficiency Grant Final Report

February 24, 2013

Prepared by:
Table Mountain Hydrology

Introduction

North Table Mountain Water and Sanitation District ("the District" or "NTM") is submitting this final grant report for the Water Efficiency Grant it received from the Colorado Water Conservation Board (CWCB). The District is extremely grateful to the CWCB for providing this grant, as well an earlier grant that supported the development of its Water Conservation Plan (WCP).

For more than 50 years, North Table Mountain Water and Sanitation District has provided high-quality water and sewer service to the Fairmount Community and portions of the cities of Arvada, Golden and Wheat Ridge. The District currently serves more than 10,000 residents, businesses and industries. This District developed a Water Conservation Plan that was approved by the Colorado Water Conservation Board on June 23rd, 2009. The overall goal of the Plan is to significantly reduce current and future per capita water demands through water conservation efforts.

The CWCB Water Efficiency Grant helped the District implement the following key components of its Water Conservation Plan:

- Sonic Leak Detection;
- Landscape Regulations; and
- Irrigation Audit Pilot Program.

In this report we review Water Efficiency Grant tasks, project accomplishments, obstacles encountered and estimated water savings

Water Efficiency Grant Components

Task 1: Sonic Leak Detection

Description

In 2011, the District hired Advanced Leak Analysis & Solutions, Inc. (Advanced Leak Analysis) to provide a detailed leak survey of their water distribution system. Maps of The District's system were reviewed to select monitoring locations. Data loggers were then installed on water valves, fire hydrant valves and service lines in key areas. Ground microphones were utilized to pinpoint leak detections.

Accomplishments

The Advanced Leak Analysis system review found that "In general the distribution system is in good shape and indicates regular maintenance is being completed properly." One distribution system leak was identified during the survey and promptly repaired by the District. Another 13 leaks were found to be coming from one specific brand of fire hydrant - Pacific States. In their report, Advanced Leak Analysis recommended that the District consider a stepped-up maintenance program and/or replacing the Pacific States fire hydrants.

In response to survey findings, the District has decided to replace all Pacific States fire hydrants – not just the leaking ones – with more efficient, better quality hydrants that have been proven not to leak. The District estimates that there are 75 Pacific States hydrants throughout their system and they intend to replace 100% of these at the rate of 10 per year. To date nine hydrants have been replaced.

The District will also continue its ongoing system maintenance program, which the survey confirms is successful in identifying and repairing system leaks. Also, to improve system monitoring, in 2011 the District installed two new meters to measure water leaving the treatment plant. Prior to this, the District only monitored water entering the treatment plant and didn't have exact data for the volume of water being distributed after treatment plant losses and recycling.

To more rapidly identify leaks, NTM recently initiated a pilot program to read customer meters on a monthly basis. NTM has historically read and billed customers quarterly, with the exception of very large water use customers who are billed monthly. The pilot program has gone well and the District expects to continue monthly readings. While billing will continue to be quarterly, at least in the near future, NTM staff review monthly data for abnormalities. When high readings are identify, customers are promptly contacted and assistance provided to help them locate and repair leaks. The District also hopes to make monthly meter readings available online for customer review.

Obstacles Encountered

No significant obstacles were encountered while implementing the leak detection program. Logistically, replacing fire hydrants requires the District's field crews to shut down the water main where hydrants are located. This causes inconvenience to both customers and field crews. However, having replaced several hydrants, the District is now better able to plan for the water main shut downs.

Water Savings

NTM estimates that the Pacific States hydrants leak at a rate of approximately 1 gallon per minute which equates to 0.5 million gallons per year per hydrant. For the 13 hydrants know to be leaking, replacing those hydrants will save an estimated 6.5 million gallons – or just under 20 acre-feet. Expanding that analysis to cover all 75 Pacific States hydrants, which are known to be prone to leaking, replacing the hydrants has the potential to decrease water lost through leaks by up to 115 acre-feet annually. Data aren't available to estimate the savings from the one other system leak that was identified during the survey and repaired or the leaks that NTM repairs through its regular maintenance program.

The primary finding of the leak detection survey is that the District's existing maintenance and repair program is working well. Many utilities loose significant volumes of water through system leaks. Prior to this survey, the District did not have sufficient data to determine if unidentified problems existed within its system. Thanks to the leak detection survey and the new meters installed on the treatment plant, the District now knows that

system water loss is minimal and their ongoing maintenance and repair operations are successfully identifying and addressing system leaks.

Task 2. Landscape Regulations

Description

The District estimates that nearly 50% of water used each year in their service area is for outdoor irrigation. To help insure that new developments use water efficiently, the District hired Table Mountain Hydrology to assist in the development of two new regulations, a Soil Amendment Regulation and a New Development Common Area Landscape Regulation.

Accomplishments

The District developed and adopted the following regulations:

- Soil Amendment Regulation –The District developed a soil amendment regulation (attached) applicable to all new commercial, industrial, park, HOA and residential (2 homes or more) developments. Incorporating sufficient organic matter into soil can significantly decrease supplemental irrigation demands, as properly amended soil results in healthier plants and better retains moisture in the root zone where it can be utilized by plants.

- New Development Common Area Landscape Regulation – The District developed landscaping requirements for HOA common area landscaping and parks, which it has found are often very high water use areas. NTM's new regulations (attached) require that landscape and irrigation systems for common areas and parks are designed by certified, licensed or similarly qualified landscaping and irrigation professionals. The regulation establishes that annual supplemental irrigation (in excess of natural precipitation) not exceed 15 gallons per square-foot. This provides developers and others with the flexibility to include higher water use turf areas by offsetting them with more water wise landscaping in other areas. Irrigation systems must be hydrozoned and have smart controllers. Water for irrigation must be metered separately from other uses.

The first development to comply with the regulations is currently being built. It will have 50 homes and approximately five acres of irrigated common area landscaping. Two other developments, with a total of 350 homes and eight acres of common area landscaping, have been approved and are expected to break ground in 2013. The expectation is that these developments will use significantly less water for outdoor irrigation as a result of the District's new landscape regulations.

Obstacles Encountered

The District's Board of Directors initially had concerns about adopting landscaping regulations, primarily ensuring they could successfully be implemented without unduly burdening District staff. NTM carefully crafted the regulations to realize significant water savings while putting most of the impetus of regulation compliance on developers/builders

rather than NTM staff. Once the Board was satisfied that staff would be able to enforce the regulations, they were in full support, recognizing the opportunity that each new development presents to ensure efficient water use and the long-term stability of the District's water supplies. The District's Project Engineer reviews and approves landscape plans and a District field crew member has voluntarily stepped up and is now serving, very successfully, as the District's landscape inspector, ensuring on-the-ground regulation compliance.

NTM has been ironing out many issues as it works through the first development to come in under the new regulations. For example, though regulations require soil amendment in all permeable areas, the developer initially only wanted to incorporate soil amendment in front yards, saying home owners would be responsible for amending backyards. The District insisted that front and back yards be amended at time of development. Similarly, the landscape designer had originally included non-irrigated storm water retention areas in the total irrigated area for supplemental irrigation calculations, which would have lowered the average per square foot water demands, allowing more irrigation on other areas. NTM required that stormwater retention areas be removed from acreage calculations. NTM has also had to make program modifications in response to builder concerns. For example, rather than holding off on tap installation as the main enforcement mechanism, as originally planned, in response to builder concerns the District instead requires a line of credit be provided. While it has been difficult at times, the District is finding regulation implementation and enforcement to be much easier as many details are figured out as the first development goes in under the new regulations.

Water Savings

No metered water use data are currently available as the first development is still being constructed.

Assuming homes with soil amendments use 20% less water for irrigation than average outdoor residential use in the District, the 400 new homes currently permitted, will save an estimated 6.65 million gallons (20 acre-feet) annually. At full build out, the soil amendment regulation will save 117 million gallons (359 acre-feet) annually.

Comparing average per acre water use for common area landscaping in the District's service area to the new 15 gallon/square-foot supplemental irrigation requirement is expected to save 8.2 gallons/square-foot annually. The three developments under construction, or anticipated to break ground in 2013, have a total of 13 acres of irrigated common area. These communities are anticipated to use 4.6 million gallons (14 acre-feet) less water annually that developments build before the regulations were implemented. At build out, it is estimated that the common area landscape regulations will save 41.5 million gallons (127 acre-feet) each year.

Task 3. Irrigation Audit Pilot Program

Description

To decrease water use among customers with high outdoor water use rates, NTM contracted with the Center for Resource Conservation (CRC) to provide irrigation audits through the Slow the Flow Colorado program. For each audit, the CRC evaluated irrigation system efficiency and developed customer-specific recommendations including watering schedule modifications and system maintenance.

Accomplishments

The District originally planned to provide five residential and five large area (HOA and parks) audits. The large audits cost less than originally budgeted. As a result, NTM was ultimately able to provide 21 individual audits and five large area audits.

Residential customers with higher use rates were invited to participate in a lottery for the audits and one very high residential customer was specifically invited to receive an audit. Two parks and three HOA common areas also received audits. Additionally, the District decided to offer all customers who participated in the lottery $10 off audits, which was matched by a $10 rebate provided by the CRC. One customer took advantage of this.

The audits found that the vast majority of soils in the District's service area are clay. All audit participants were encouraged to switch to "cycle and soak" irrigation to prevent runoff (irrigating for a short period, waiting to allow water to soak in and then irrigating again as compared to irrigating for a longer period of time all at once).

The large area audits found that distribution uniformity was substandard more than 50% of the time. Additionally system pressures were often too high and watering schedules tended to exceed the recommended water times. The CRC provided customers with system-specific improvements to address these issue as well as other concerns, including increasing conservation measures (such as installing rain gages), making necessary system repairs, replacing/repairing tilted and inappropriate heads, and fixing broken or leaking valves. Recommendations were provided to landscape maintenance companies and HOA board of directors. In addition to system and scheduling modifications, one HOA has changed landscape management companies and another has stopped irrigating a stormwater detention pond as a result of the audits.

Residential audits examined outdoor usage and also surveyed indoor fixtures and appliances. Educational materials regarding indoor water savings potential were provided to participants. Similar to the large area audits, irrigation system distribution uniformity was found to be substandard in most cases. Spray zone system pressures were frequently also too high and watering schedule adjustments were recommended. System specific recommendations, similar to those for large audits, were provided to home owners. A survey of audit participants found that 50% felt the audits were "satisfactory" and another 50% felt they were "excellent".

District staff and the Board of Directors feel the program is a success in that it has opened lines of communications with customers and provided a means to discuss the importance of water conservation. The program also provides the District with a means to offer concrete assistance when customers are concerned with high water bills. This District intends to continue the program, offering customers discounts of $20 towards individual audits.

Water Savings

Because the audits were completed over the 2012 irrigation season, the District has not yet had sufficient time to collected data to evaluate water use changes.

Assuming audit customers make system and scheduling modifications sufficient to decrease outdoor water use by 10% (as compared to average outdoor use in the District), the five large and 21 residential audits would save 837,300 gallons (2.6 acre-feet) annually. Additional savings will result from future audits, but those savings are not estimated here.

Conclusion

The programs implemented with the assistance of the CWCB Water Efficiency Grant have been very successful. Table 1 summarizes the significant water savings that are anticipated to result from the programs implanted with Water Efficiency Grant assistance. As a medium-sized water utility, the District is proud to have such robust water conservation programs in place. With the assistance of CWCB grants, District staff and board have embraced the water conservation ethic and are encouraging their customers to do the same. In this way, the District will continue to provide high quality water and service while ensuring supplies are sufficient to ensure that the needs of existing and future customers are met.

Table 1: Estimated Annual Water Savings by Task (rounded to the nearest 100)

	Estimated Annual Water Savings			
	Near Future		**Build Out**	
Task	**(gal/yr)**	**(AF/yr)**	**(gal/yr)**	**(AF/yr)**
1. Sonic Leak Detection Program	37,500,000	115	37,500,000	115
2a. Soil Amendment Regulations	6,646,900	20	116,999,500	359
2b. Common Area Landscape Regs	4,643,500	14	41,511,500	127
3. Irrigation Audit Pilot Program	837,300	3	837,300	3
TOTAL	49,627,700	152	196,848,200	604

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North Table Mountain Water and Sanitation District

Landscape Irrigation and Soil Amendment Specifications

NORTH TABLE MOUNTAIN WATER AND SANITATION DISTRICT
14806 WEST 52ND AVENUE, GOLDEN, COLORADO 80403-1228

Soil Amendment Specifications

Residential/Commercial Lots

Updated 06/01/2012

Soil Amendment Specifications are applicable to developments larger than 2 (two) lots. Each lot must be amended. Before the District will set a water meter, the property owner must sign an Affidavit of Soil Amendment certifying that amendment has been installed.

An invoice must also be provided to the District representative to show the amount of amendment delivered to the site, the site may be inspected by District staff.

If it is not possible to apply to the Soil Amendment, such as when the ground is frozen, property owner must sign the affidavit stating that it will be installed by a specified date, agreed on by the owner and District staff.

Amendment Specifications:

1. Tilled soil amendment product is required for all permeable area of the development including each individual lot and all common areas.
2. Amendment must be from the approved Soil Amendment List or approved equal.
3. Each 1,000 square feet of soil must be amended with 4 cubic yards of approved compost, see approved compost list.
4. Amendment must be incorporated into the soil to a depth of 6 inches, roto-tilled.
5. This rule applies to all permeable areas of the property.

If landscaping is planted without having been inspected, the District shall require the landscaping be removed. Landscaping will not be allowed to be re-planted until a Soil Amendment inspection is passed.

Schedule an inspection with the District at 303-279-2854, a District Representative will conduct an inspection within two business days of the request.

Provide the inspector with documentation, such as an invoice or load ticket with information regarding the soil amendment product, quantity and property address or the representative can inspect material stock piles on-site. The inspector will visually confirm that compost was added and ensure the ground was tilled to the required depth.

If the District determines that the soil amendment was not installed according to specifications or if the property owner does not comply with the terms of the signed affidavit, the water service for the property is subject to suspension and associated fees as stated in the District regulations.

NORTH TABLE MOUNTAIN WATER AND SANITATION DISTRICT
14806 WEST 52ND AVENUE, GOLDEN, COLORADO 80403-1228

Affidavit of Soil Amendment Installation

Updated 06/01/2012

Address or Development: _____

As a condition of receiving a meter set from North Table Mountain Water and Sanitation District (the District), the undersigned, as the property owner or responsible party for the above address, does hereby certify and affirm that the following actions have taken place prior to installation of landscaping or will take place by:_____
Date

Incorporation of Proper Soil Amendment:

- Adding approved compost at a rate of four cubic yards per 1,000 square feet of permeable area, incorporated (roto-tilled) to a depth of six inches. This applies to ALL permeable area on each lot or common area.

This Affidavit must be accompanied by invoices to document the installation of soil amendments.

The owner or responsible party for the above address also acknowledges that incorporation of soil amendments is subject to independent verification by the District and that if the District determines that landscaping was installed without proper amendments or if soil amendment was not incorporated by the above date, the property owner is subject to suspension of water service, including associated fees, under the District regulations.

_____ _____

Printed Name of Owner or Responsible Party Signature Date

Accepted by:

_____

Signature of District Representative Date

APPROVED SOIL AMENDMENT PRODUCT LIST		
Supplier	**Phone**	**Manufacturer/Product Name**
A-1 Organics	970-454-3492	A-1 Organics/BioComp, EcoGro
Ainsworth Rock Sales	303-295-2990	B.O.S.S./Class 1 Black Tea Compost
All Demolition Excavating Company	303-467-3366	Select Materials/Compost #5W1235
APC Landscape Supply	303-279-6611	A-1 Organics/BioComp
Bedrock Landscaping	303-637-9743	A1 Organics/BioComp, B.O.S.S/Class 1 Black Tea Compost
B.O.S.S Compost, Inc	303-659-5958	Class 1 Black Tea Compost
CMT Excavating	303-489-3036	REC Compost
Colorado Landscape Materials	303-456-9944	5-Way Planters Mix**
Colorado Landscape Supply	303-995-1351	Compost
Colorado Materials, Inc.	303-682-2314	A-1 Organics/BioComp, CMI Compost
Designs by Sundown	303-356-8488	Humalfa/Natures Prescription
Direct Landscape Supply	303-781-2270	B.O.S.S/Class 1 Black Tea Compost, REC Compost
Echter's Garden Center	303-424-7979	Select Materials/Compost #5W1235
Front Range Material, Inc.	303-425-9992	Front Range Material Compost, REC Compost (Item 16-600)
Green Valley Turf Farm	303-798-6764	B.O.S.S./Class 1 Black Tea Compost
GreenStock Materials	303-494-7625	A-1 Organics/BioComp
Harmony Gardens	720-685-7733	Humalfa/Natures Prescription
Humalfa, The Organic Fertilizer	970-466-7981	Natures Prescription
James Nursery	303-288-2424	Humalfa/Natures Prescription
Jared's Nursery & Garden Center	303-979-6022	B.O.S.S/Class 1 Black Tea Compost, Select Materials/Compost #5W1235
Jensen Sales Co.	303-791-4250	Supreme Compost
Jones Fine Sand	303-289-1428	B.O.S.S/Class I Black Tea Compost
Midwest Materials	303-776-6323	A-1 Organics/Bio Comp
Nick's Garden Center	303-696-6657	Boss/Planters Mix**
Paulino Gardens	303-429-8062	Select Materials/Compost #5W1235
Picadilly Nursery	303-659-2382	Humalfa/Natures Prescription
Pine Lane Nursery	303-841-3009	Humalfa/Natures Prescription
Pioneer Sand Co.	Multiple	A-1 Organics/BioComp, Planters Mix**
Prime Materials, LLC	303-655-0431	B.O.S.S./Class 1 Black Tea

		Compost
APPROVED SOIL AMENDMENT PRODUCT LIST (cont.)		
Supplier	**Phone**	**Manufacturer/Product Name**
Renewable Fiber	303-798-1292	Premium Dairy D/ BioCompost, Royal Compost*
Santa Fe Sand and Gravel	303-794-5960	Cottonwood Dairy/Compost #3
Select Materials (wholesale only)	303-857-4688	Compost #17-07-SW, Compost #5W1235
Silver Crown Landscape Materials	303-683-0200	Compost #3, Compost #5W1235
Simplot Partners	720-941-0646	A-1 Organics/BioComp
Storjohann Trucking LLC	303-324-2263	A-1 Organics/Bio Comp
Titan Landscape Materials	303-960-3408	B.O.S.S./Class 1 Black Tea Compost, Cottonwood Dairy/Compost 3
Unique Hardscapes	303-774-8302	A1 Organics/BioComp

*pH at upper limit of a Class II compost.

**Limited to use in excavated planting beds on a case-by-case basis.

Updated Oct. 28, 2011

NORTH TABLE MOUNTAIN WATER AND SANITATION DISTRICT
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Landscape/Irrigation Specifications

Common Areas

Updated 12/07/2012

Regulations are applicable to common areas for developments and parks with a total landscaped area of 0.75 acres or more.

A Landscape and Irrigation Plan must be submitted with the Construction Plans for construction approval.

The following are the Landscape Plan requirements:

Specifications:

- Plan must be designed and signed/stamped by a certified professional.
- Irrigated areas – provide water use calculations verifying an average of 15 gallons per square foot or less per year irrigation requirements.
- Plant species, sizes, water requirements and supplemental irrigation water needs will be identified for each hydro-zone.

Notes to be included on Plan:

- In order for the District to set a meter, the owner or responsible party must sign the Landscape and Irrigation Affidavit.
- If the District determines that the property owner does not comply with the terms of the signed affidavit, the water service for the property is subject to suspension and associated fees as stated in the District regulations.
- Soil Amendment will be applied prior to landscaping. Soil Amendment will be added at a rate of 4 (four) cubic yards per 1,000 (thousand) square feet of permeable area, incorporated (roto-tilled) to a depth of 6 (six) inches. This applies to ALL permeable areas of each individual lot and all common areas.
- Landscape Plan must have the following table, completed, on the plans:

Water Budget

High Water Zone	SF	x 18 Gallons/SF/Season =	Gallons/Season
Moderate Water Zone	SF	x 10 Gallons/SF/Season =	Gallons/Season
Low Water Zone	SF	x 3 Gallons/SF/Season =	Gallons/Season
TOTAL Gallons Needed by all Zones =			Gallons/Season
TOTAL Square Feet for all Zones =			SF
Average Gallons/SF/Season for all Zones =			Gallons/SF/Season

The average cannot exceed a maximum of 15 Gallons/SF/Season,

The irrigation season is from mid-April to mid-October (26 weeks)

The following are the Irrigation Plan requirements:

Specifications:

- Plan must be designed, signed/stamped by an approved professional.
- System shall be designed to optimize the efficient application of irrigation water.
- Landscape plan shall encourage the efficient use of irrigation water through a water-wise design.
- Plan must be consistent with the Landscape Plan.

Notes to be Included on Plan:

- In order for the District to set a meter, the owner or responsible party must sign the Landscape and Irrigation Affidavit.
- If the District determines that Landscaping does not comply with the terms of the signed affidavit, the water service for the property is subject to suspension and associated fees as stated in the District Regulations.

Please take the following into consideration when designing the Irrigation and Landscape plans:

- Plant selection and location should match plant water needs to appropriate hydrozone.
- Plants of similar water needs should be grouped together in hydrozones for irrigation purposes.
- Native species should be used whenever possible.
- System should be hydro-zoned (adhering to Landscape Plan) with individual irrigation zones/valves dedicated to plants of similar water needs.
- Turf areas shall be separately zoned from other landscaped areas.
- No single zone shall mix irrigation component types: rotors, pop-up spray heads, micro irrigation, etc.
- System must be equipped with automatic rain shut off device(s).
- Plan should specify type of sprinkler head (rotor or spray, drip, subsurface irrigation), placement (location, alignment depth, pop-up height), rates, and coverage (sprinkler heads must provide head to head coverage).
- Plan should avoid over-spraying onto impermeable and non-landscaped areas and runoff.
- Irrigation scheduling should be controlled via climate or sensor-based irrigation controllers.
- Irrigation water application calculations by zone must be provided.

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Affidavit of Landscape and Irrigation Installation

Updated 06/01/2012

Address or Development: _____

As a condition of receiving a meter set from North Table Mountain Water and Sanitation District (the District), the undersigned, as the property owner or responsible party for the above address, does hereby certify and affirm that the following actions have in fact taken place or will take place by: _____
Date

Landscape and Irrigation:

- Landscape and Irrigation has been installed according to the Landscape and Irrigation plans approved by the District.

The owner or responsible party for the above address also acknowledges that installation of Landscape and Irrigation is subject to independent verification by the District and that if the District determines that landscaping and irrigation was not installed according to plans or by the above date, the property owner is subject to suspension of water service, including associated fees, under the District regulations.

_____ _____

Printed Name of Owner or Responsible Party Signature Date

Accepted by:

_____

Signature of District Representative Date