

**CITY OF BOULDER  
WATER RESOURCES ADVISORY BOARD  
INFORMATION ITEM**

**MEETING DATE: January 25, 2016**

**AGENDA TITLE:** Information Item – 2015 Year in Review

**PRESENTER/S:**

Jeff Arthur, Director of Public Works for Utilities  
Douglas Sullivan, Acting Principal Engineer for Water, Wastewater, and Stormwater  
Annie Noble, Acting Principal Engineer for Flood and Greenways  
Joe Taddeucci, Water Resources Manager  
Bret Linenfelser, Water Quality Environmental Services Manager  
Ken Baird, Utilities Financial Manager  
Tom Settle, Water Treatment Manager  
Chris Douville, Wastewater Treatment Manager  
Joe Cowan, Utilities Maintenance Manager  
Eric M. Ameigh, Public Works Project Coordinator

**I. PURPOSE**

A significant portion of the work performed by the Utilities Division relates to the day-to-day operations and maintenance of existing infrastructure. While the WRAB's official role in these activities is minimal, recommendations on capital improvements, master plans, and policy issues have a significant impact on operations. This memorandum contains an overview of 2015 operations to provide the WRAB with additional context for upcoming agenda items where the board will be asked to make recommendations, as well as highlights of the 2015 capital improvements program.

**II. OVERALL MISSION**

The mission of the Utilities Division of the Public Works Department is to provide quality water services, as desired by the community, in a manner which protects human and environmental health and emphasizes sound management of fiscal and natural resources. This includes the following services:

- Potable Water Treatment and Distribution
- Water Resources and Hydroelectric Management
- Wastewater Collection and Treatment
- Stormwater Collection and Conveyance
- Water Quality Protection and Enhancement

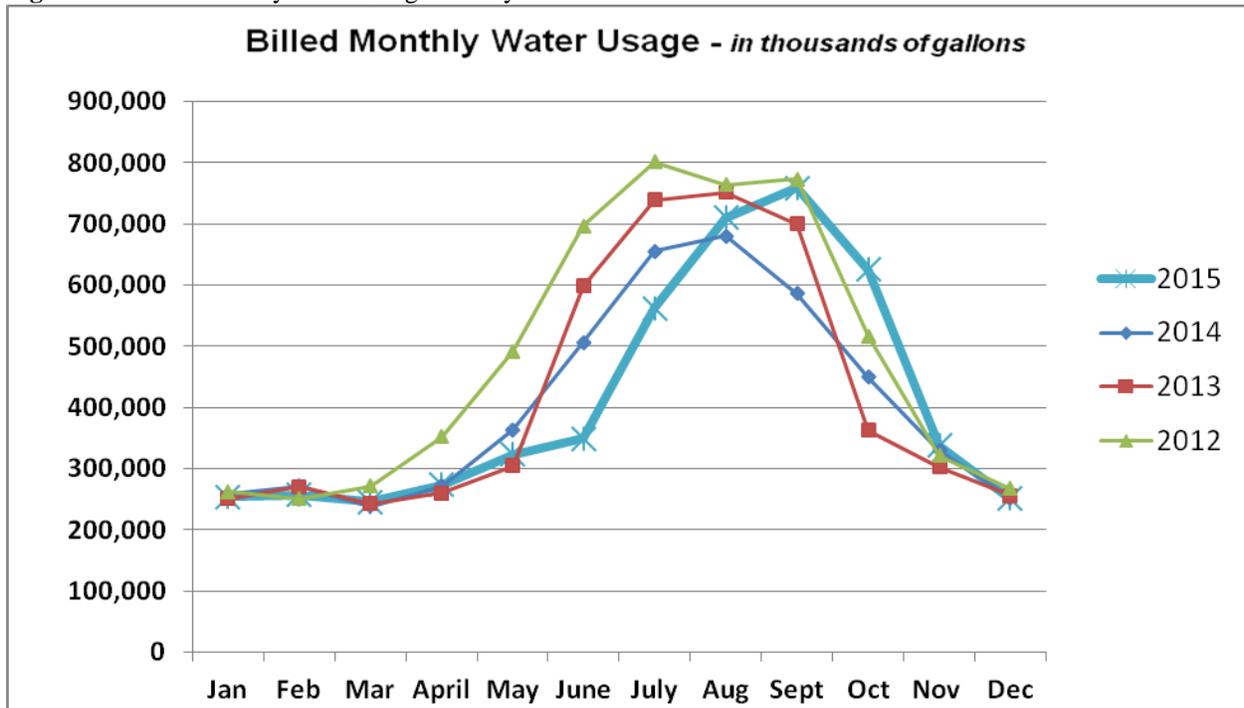
- Infrastructure Planning, Construction and Maintenance
- Administration and Emergency Planning/Response

### III. OVERVIEW: UTILITIES FINANCES

#### *Water Use Based on Billed Consumption*

Billed water consumption in 2015 was the second lowest in over 20 years. Over that time period, only 2014 saw lower consumption. Compared to 2014, consumption increased by two percent. An abnormal consumption pattern followed abnormal weather. The city experienced the wettest April-July period in the last 20 years. As a result, billed consumption through August was even lower than the first eight months of the exceptional 2014 year. That was followed by the driest August-September period in nearly 100 years which resulted in the highest October use since the years before the 2002 drought. Figure 1 below compares the monthly usage pattern of the previous four years.

**Figure 1:** Billed Monthly Water Usage History

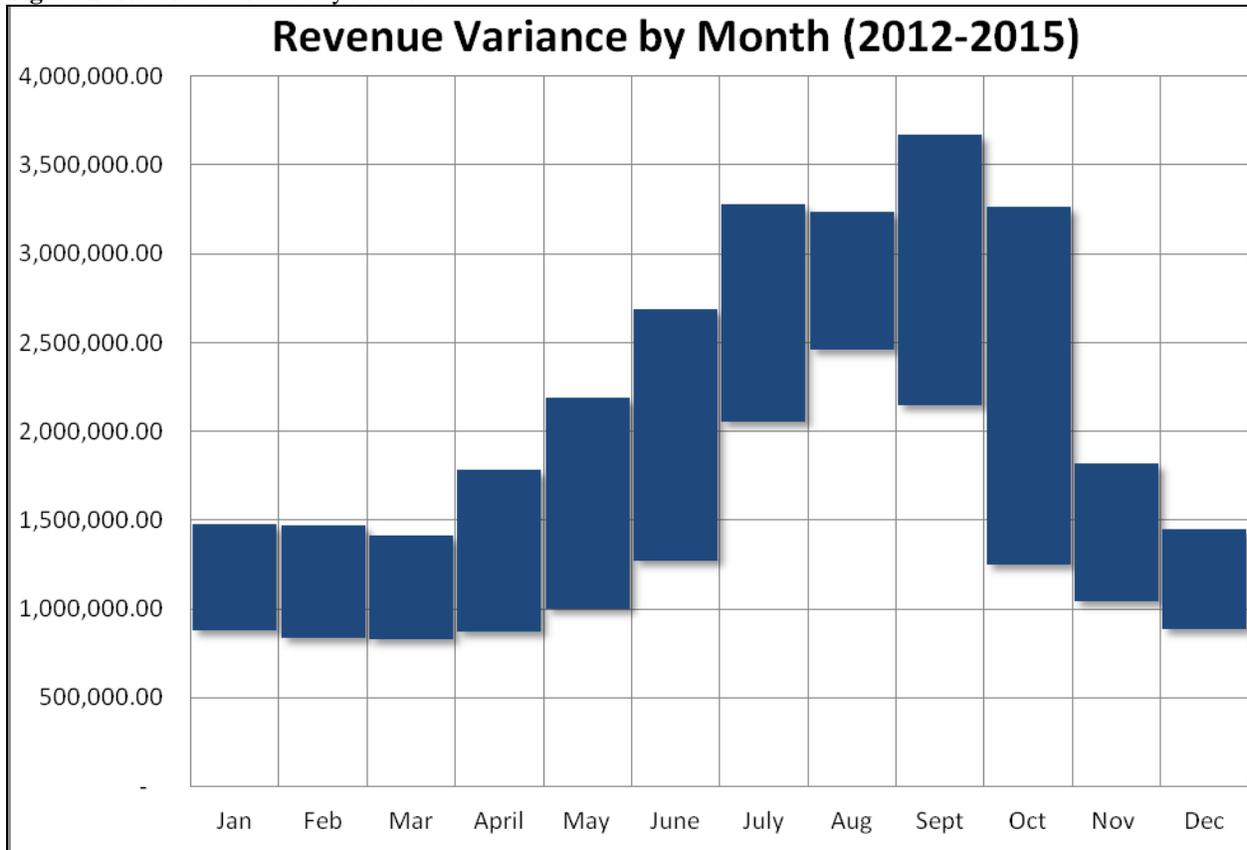


#### *Revenues*

Under normal circumstances, two years of relatively low use would generally have a significant negative impact on the Water Fund’s finances. However, the past two years featured record revenues from Plant Investment Fees (PIF) related to new development. If not for abnormal PIF revenues during the last two years, a draw on the fund balance of over \$3 million likely would have been required—the equivalent of a 13 percent one-time water rate increase. Data from recent years have highlighted the vulnerability of the primary revenue stream (customer billings) to fluctuations in the weather. When comparing monthly revenues during summer months in recent years, the average difference between high and low revenues is \$900,000. Figure 2 below shows the range of revenue received by month in the previous four years. As staff seeks to understand

the effects of climate change and weather variability on the water utility, close attention will be paid to the resilience of key revenue streams. In the upcoming rate study, staff intends to quantify revenue variability, better understand the existing risks, and explore potential options for managing revenue variability and its effects.

**Figure 2:** Revenue Variance by Month



In the Wastewater Fund, consumption and expected revenues were both two percent lower than 2014. This continues a consistent downward trend in wastewater use that will be a focus of the rate study. The Stormwater/Flood Management Fund ended the year with revenues slightly below projections although, like the other utility funds, PIF revenues were higher than expected.

***Bond Financing***

Two separate bonds were issued in 2015. In July, the Flood/Stormwater Fund received \$23 million in bond revenue primarily to fund the Wonderland Creek flood mitigation project. In October, the Wastewater Fund received \$10 million in bond financing.

The wastewater bond was originally intended to fund a large diameter (42-inch) wastewater interceptor rehabilitation project to address pipe corrosion. However, after heavy rain events in 2013 and 2015 exposed the pipe, staff determined that the vulnerability related to the interceptor’s alignment parallel to Boulder Creek would now also need to be addressed. The existing alignment presents a high risk of the pipe potentially being washed out in the future. The need for additional time to study the complex problem of simultaneously dealing with the

corrosion and the alignment resulted in the project being delayed beyond 2015. The 2015 wastewater bond funding was therefore reallocated to fund other Wastewater Utility projects, including \$5.5 million to the Wastewater Treatment Facility Nitrogen Upgrades Project and \$4.5 million to the annual sanitary sewer rehabilitation program. The cash funds that would have paid for these other projects will instead now be used to fund the interceptor project in the future. Additional information about the wastewater collection system projects can be found in the Wastewater Operations section of this memorandum.

For both bonds, Standard and Poor's (S&P) gave a rating of AAA and Moody's rating was Aa1. According to a recent S&P report, only around 6 percent of their rated water and sewer issues receive the AAA rating. The high rating is due to strengths such as "a prolonged trend of strong financial operations," a "manageable capital program with additional debt needs," and a "robust and diverse local economy."

### ***Upcoming Key Issues: Utility Rate Structure Analysis***

The Rate Structure Analysis, generally referred to as the rate study, is an important project which began in 2015. It is intended to identify opportunities for improvements and modifications that will ensure the water, wastewater, and stormwater/flood management rate structures are in alignment with current conditions and support city goals. During the spring, staff conducted an outreach effort to solicit broader feedback across all customer classes. The initial public engagement process took place in April and May 2015 and consisted of three open houses and an online survey. More than 26,000 postcards were mailed to utilities customers to notify them about the engagement opportunities. At the June 2015 WRAB meeting, staff presented the results of the public engagement process, as well as options for the study's guiding principles and its areas of study. WRAB's discussion and input was critical to setting the project on a solid foundation.

The project will focus on three distinct but related areas of work. They are:

1. Cost of service analysis and revenue stability.
2. Effectiveness of water budgets in meeting conservation, equity, and revenue goals.
3. Stormwater/flood management fee calculation methodology.

Given the experience in 2014 and 2015 with abnormally low billed water consumption and abnormally high PIF revenue, staff will use this project as an opportunity to examine how all three utilities, but especially the water utility, can remain financially resilient. Current trends provide reason to question whether the existing water rate structure is sufficient to ensure long term financial sustainability for the utility.

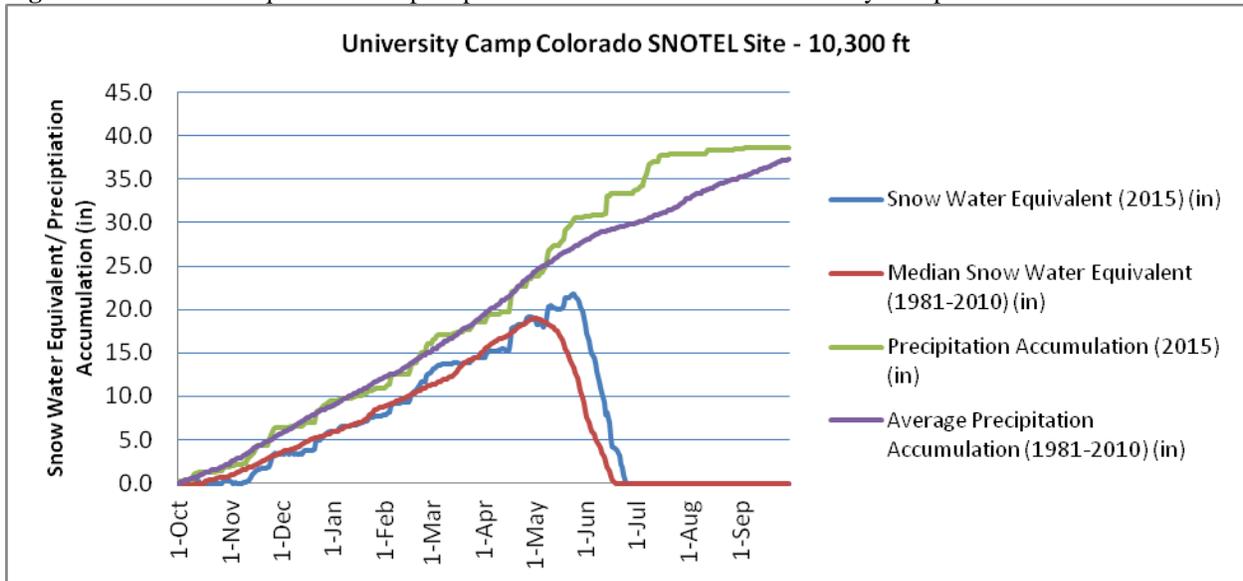
WRAB will have an active role in the project over the course of 2016 and likely 2017 as well. Staff is projecting that any changes to the rate structures will be implemented in the 2018 budget although there is a possibility that minor or very straightforward changes could be implemented in the 2017 budget.

#### IV. OVERVIEW: WATER RESOURCES

##### *Precipitation and Streamflow*

The city relies on snowmelt runoff to fill and store water in its upper Boulder Creek basin reservoirs each year. In 2015, snowpack was average throughout the winter until early May, which is when the snow usually begins to melt and streamflows start to rise. Due to the unusually wet and cold May, snowpack peaked three weeks later than average. Figure 3 shows the snowpack trend for the University Camp SNOTEL site in the Silver Lake Watershed for the 2015 water year<sup>1</sup>.

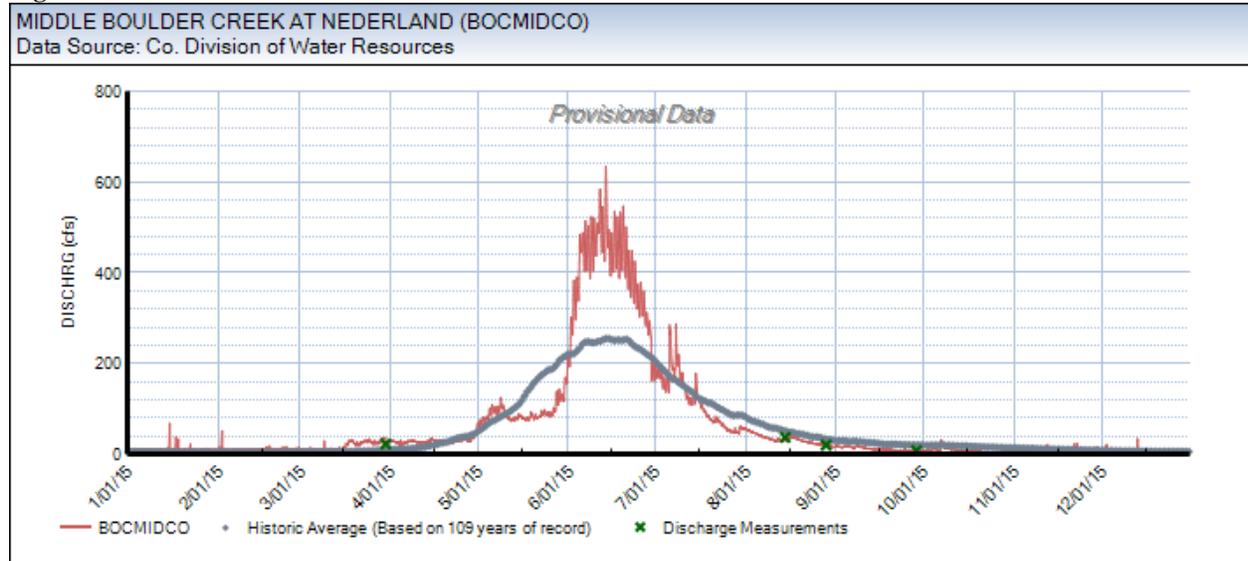
**Figure 3:** Snow water equivalent and precipitation accumulation at the University Camp SNOTEL site



Despite a delayed start, a combination of rain and warmer temperatures in late May and June led to runoff occurring quickly once the snow began melting. The rapid snowmelt runoff in the late spring, combined with the dry summer and fall weather conditions, caused stream flows to fall below average starting in mid-July. Figure 4 includes 2015 and historical average stream flow conditions upstream of Barker Reservoir.

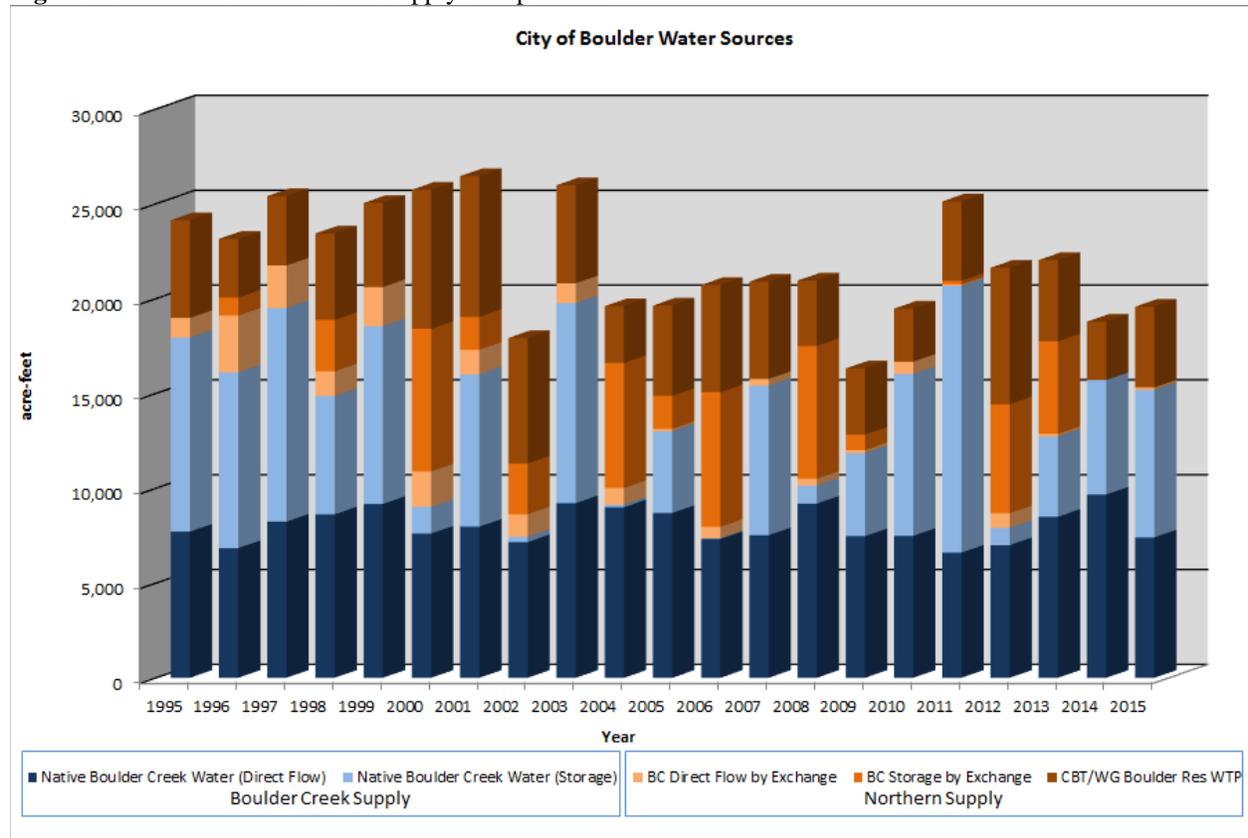
<sup>1</sup> Water professionals often use the “water year” calendar to track water resources. A water year is twelve months period, typically beginning October 1 or November 1, and is designated by the calendar year in which it ends. For example, water year 2015 began October 1, 2014 and ended September 30, 2015. Water years follow a hydro-meteorologic cycle and start in the fall when snowpack may begin to accumulate.

**Figure 4: 2015 Middle Boulder Creek Streamflows at Nederland**

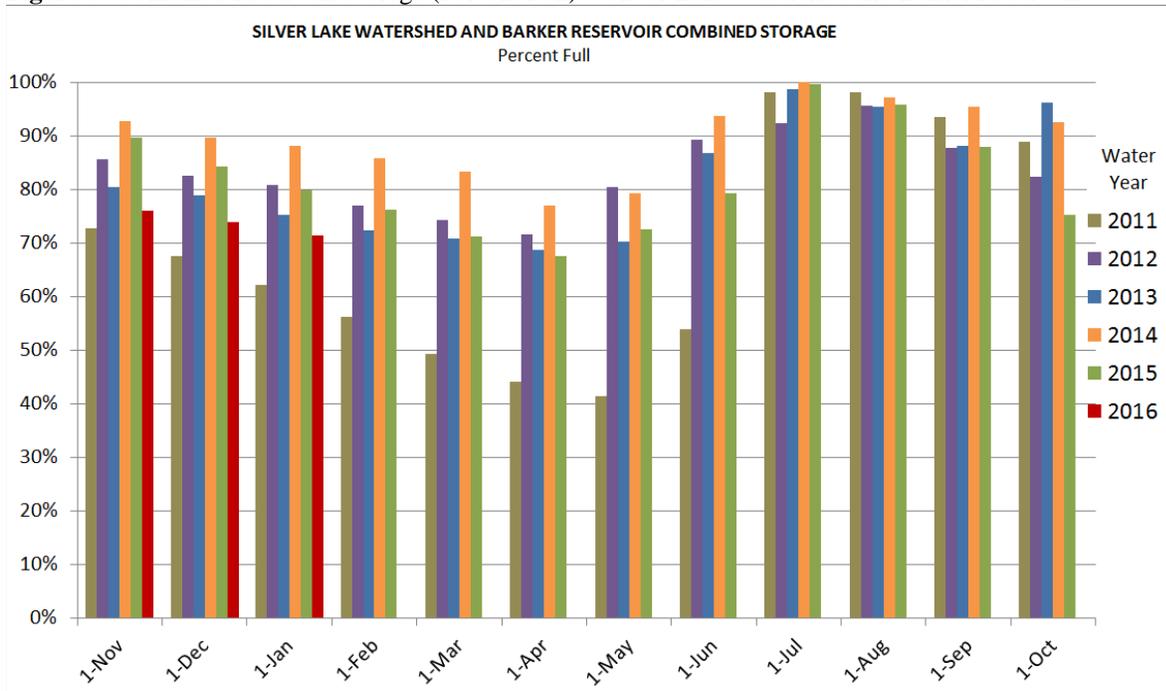


City mountain storage reservoirs filled and spilled in 2015, although the dry conditions in the second half of the year required the city to draw on reservoir storage earlier than normal. To preserve storage, the city shifted water sources to rely more heavily on Northern supplies starting in September. Figure 5 shows a summary of historical water supply composition. Figure 6 shows historical reservoir storage levels by water year.

**Figure 5: Historical Source Water Supply Composition**



**Figure 6: Combined Reservoir Storage (Percent Full) – Silver Lake Watershed and Barker Reservoir**



The abundant snowpack and runoff in 2015 allowed the city to lease 3,200 acre-feet of water to agricultural users through its annual leasing program. The wet spring resulted in low initial demand, but leasing requests increased later in the season due to drier conditions.

***Hydropower***

With the integration of hydroelectric facilities in the municipal water supply system, hydroelectric operations depend on municipal water demand as well as water supply and distribution operations. The city produced \$1,947,000 in hydropower revenue for 2015 compared to projected revenue of \$2,218,000. Actual revenue fell short of projected hydroelectric revenue in 2015 as a result of supply and distribution system maintenance projects that required the respective hydro facilities to be offline. In some cases, the outages were unexpected or longer in duration than anticipated due to external factors such as weather.

Total generation for 2015 was about 37,107,600 kilowatt hours (kWh) or enough to meet the average annual needs of approximately 4,600 households. Hydroelectric power generation during 2015 displaced the need to burn approximately 18,600 tons of coal at a traditional, coal-fired power plant.

***Irrigation Ditches***

The Water Utility is a shareholder in several irrigation ditch companies. In addition to conveying ditch water, many ditches in town intercept stormwater from areas above the ditches due to their orientation to the slope of the land. The 2013 flood and subsequent intense rain events have had a significant impact on most of the contributing natural drainages and city stormwater facilities, resulting in increased stormwater contribution to ditches. In response to increased Water Resources staff time spent on issues related to irrigation ditches and stormwater interaction, and

to be more proactive with irrigation ditch education and outreach, a dedicated position for irrigation ditches was added to the Water Resources group in 2015.

### ***Capital Improvements***

In 2015, notable capital improvement and maintenance projects in the source water system included the following:

- Construction of the Barker caretaker house overlooking Barker Dam. Construction is in progress and anticipated to be completed in February 2016.
- Rehabilitation of Kossler Reservoir, including raising the dam crest and adjoining dykes to meet dam safety freeboard requirements; removing the deteriorating concrete southeast dam face and replacing with riprap; and modifying the spillway to accommodate the probable maximum flood.
- Drilling new anchors to secure the ice hood and hydraulic cylinder top mounts on Barker Dam Gate #2 and making preparations for removal and replacement of the existing manual and electrical gear with new electrical actuators and instrumentation for the gate valve outlets adjacent to the spillway.
- Inspection, cleaning and grouting repair of concrete pipe on the Barker Gravity Pipeline between Magnolia Road and Kossler Reservoir.
- Completion of the seventh Lakewood Pipeline internal inspection. The condition of the pipe continues to match the findings of the previous inspections and does not indicate that the cement mortar lining or corrosion on the underlying steel require immediate attention. Staff will formulate a future monitoring and potential maintenance plan for the pipeline.
- As part of the State Engineer's dam safety program, the Silver Lake Reservoir outlet works and dam, Goose Lake outlet works and dam, and Boulder Reservoir outlet works and dam were all inspected and found to be in good condition. Barker Dam and Kossler Dam were also inspected and received good overall condition ratings.
- Staff continued to work on evaluating options for power purchase agreements for the city's eight hydroelectric facilities.

### ***Upcoming Key Issues***

Water Resources will be focusing on a number of activities in 2016 as follows:

- Updating the climate change assessment capability of the city's water supply model and evaluating the effects of potential future climate scenarios on the city's water supply and water conservation program.
- Continued evaluation of the Carter Lake Pipeline through the 2017 budget process.

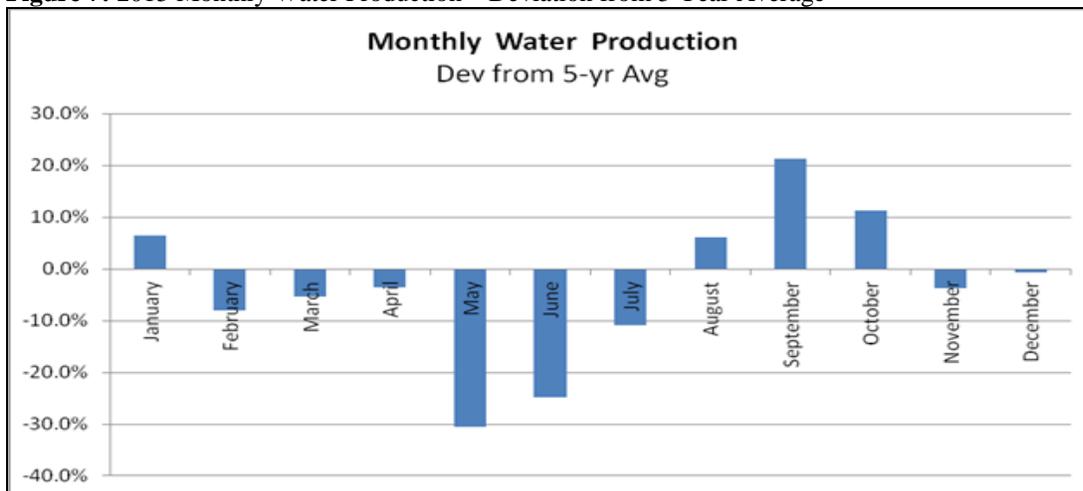
- Continued work on irrigation ditch matters such as education and outreach, ditch and stormwater issues, and support of major maintenance projects for Anderson and Farmers Ditch.
- On-going Barker Gravity Pipeline maintenance, including performing a test section of alternative rehabilitation methods (lining).
- Completion of the Albion Dam outlet works inspection (postponed in 2015 due to high reservoir levels) and installation of a permanent repair.
- Replacement of Barker Dam spillway gate actuators to allow electrical operation from the valve house. Alternatives to modify other watershed dam outlet systems will be investigated, starting with Silver Lake and Island Lake Dams.
- Kossler Reservoir inlet weir and outfall concrete repair and additional rip rap to stop further significant deterioration in advance of future rehabilitation/replacement project.
- Continued evaluation of the city’s existing power purchase agreements (PPAs).

## V. OVERVIEW: WATER TREATMENT & DISTRIBUTION

### *Operations*

The city’s Betasso and Boulder Reservoir water treatment plants (WTP), produced 5.785 billion gallons in 2015, which was 1.2 percent greater than 2014 but 1.6 percent below the 5-year average. Above normal precipitation through June lowered the demand for water early in the year, but very dry weather through the summer and fall increased demand to near-record levels in September and October. Figure 7 below illustrates the swings in demand for drinking water during 2015. Betasso WTP produced 75 percent and Boulder Reservoir WTP produced 25 percent of the total water volume. The drinking water system met all regulatory compliance requirements during 2015.

**Figure 7: 2015 Monthly Water Production – Deviation from 5 Year Average**



Boulder Reservoir WTP production was limited early in the year by Boulder Feeder Canal operations and an abundance of “free river” water in the Boulder Creek Watershed which was available to the Betasso facility. By late summer, and into the fall, Boulder Reservoir WTP operated at much higher production rates due to the drier weather pattern and a steady shift in water source storage.

In preparation for the upcoming Betasso CIP, new approaches to the disposal of water treatment residuals were tested at the facility. The implementation of continuous processing allowed all components of the residuals storage systems to be cleaned out during 2015. It was the first time in many years.

In support of Utilities field operations, plant maintenance staff implemented new scheduled procedures for checking all distribution system facilities on a routine basis for preventative and predictive maintenance. The program was successful in identifying several early-stage problems that prevented system breakdowns.

Both water treatment facilities have had solar panel installations for the past four years. The power generation from these systems in 2015 was 225,000 kWh, which represents approximately 10 percent of the total power used in the two facilities and \$29,300 in cost savings.

In the second quarter, Water Treatment reached full staffing levels for the first time in two years.

Utilities maintenance staff responded to 69 water main breaks in 2015 compared to 64 in 2014 and 74 in 2013. The city’s break history remains similar to industry averages. Coordination between capital and operations/maintenance staff to effectively target main replacement will remain a priority in 2016.

During 2015, the water distribution maintenance workgroup implemented structured programs to address hydrant maintenance, valve operation, and leak detection. The group set a goal of a three year maintenance cycle for valves and hydrants and was successful in completing work on one third of the system in 2015. The leak detection program covered five miles of pipe and identified nine leaks, primarily associated with fire hydrants.

### ***Capital Improvements***

In 2015, notable capital improvement projects in the water treatment and distribution system included the following:

- 2,000 feet of aging 26” steel transmission main was replaced between Sunshine Hydroelectric Facility and the intersection of 4<sup>th</sup> & Mapleton with new 30” ductile iron pipe.
- Over 18,000 feet of water main, 12” in diameter or smaller, was replaced.
- Thirty percent design was initiated for replacement and rehabilitation of 13,000 feet of 18” steel transmission pipe installed in the 1940s.

- A wireless and fiber upgrade is underway at storage tanks, pump stations and hydroelectric facilities to relegate the aging radio communication equipment to a backup role.
- Sixty percent design for the upcoming Betasso CIP was completed. Final design will be completed in early 2016 and the project will be bid in the summer of 2016.
- Betasso WTP filter backwash supply pumps and filter surface wash pumps were replaced. Both sets of pumps were original installations and had exceeded their useful lives.

### ***Upcoming Key Issues***

- The water transmission inspection and rehabilitation budget over the next six years has been established based on known problems and proposed inspection of other large diameter mains throughout the city. The additional condition assessments will allow the city to budget for replacement and rehabilitation of these mains in the future.

## **VI. OVERVIEW: WASTEWATER TREATMENT & COLLECTIONS**

### ***Operations***

The Wastewater Treatment Facility (WWTF) operated with no effluent permit violations in 2015, treating an average of approximately 15.6 million gallons per day (MGD) of wastewater. Flows in 2015 were near those experienced in 2013 and 2014. Similar to the precipitation of 2013 and lingering impacts in 2014, this past year was heavily influenced by significant precipitation in May 2015 and early summer moisture, which created elevated levels of infiltration and inflow. Flows to the WWTF peaked during rainy May at 39.9 MGD. Wastewater treatment performance and effluent quality were excellent in 2015, where concentrations of permitted parameters were the lowest on record.

2015 marked the fifth full year of using electric power generated from solar photovoltaic at the WWTF, with the overall system producing over 8 million kWh to date. Between the solar power and the power generated by the cogeneration system, approximately one third of the electrical power needs for the WWTF were generated by renewable technology in 2015. Utilities Maintenance crews performed the construction activities to install two new potable water meter vaults at the WWTF, to obtain complete metering of potable water use at the 75<sup>th</sup> St. campus. By using city employees instead of a traditional general contractor, significant cost savings were achieved.

In 2014, a condition assessment of the sanitary sewer system, which included a six mile section of sanitary sewer pipe located immediately upstream of the WWTF, revealed corrosion issues in the large diameter concrete interceptor sewer. Based on that discovery, a contractor was hired in 2015 to inspect the approximately 100,000 remaining feet of mid-sized concrete sewers in the upstream trunk sewer system. The goal of the 2015 condition assessment was to comprehensively understand the extent of the corrosion in all the concrete pipe sections before prioritizing the rehabilitation program, for which bond financing was secured in October. The

2015 condition assessment showed that corrosion issues are also prevalent in the upstream system but not as severe as in the interceptor sewer.

In addition to its corrosion problems, the large diameter interceptor sewer was also found to have alignment issues following the September 2013 flood and the May 2015 rainfall event. Both events exposed sections of the interceptor when flow from Boulder Creek left its banks and eroded new channels across the interceptor alignment. For this reason, city staff began investigating the possibility of an interceptor realignment project. The proposed project would move the pipeline away from Boulder Creek, which would address both the internal corrosion issue and the alignment vulnerability issue simultaneously.

In the downtown Boulder area, an inspection of approximately 100,000 feet of clay sewer pipe revealed widespread structural issues such as broken and fractured pipes and differential settling leading to offset joints. Utilities maintenance staff focused their inspection efforts on the Gunbarrel area in order to attempt to locate the source of significant inflow that has been observed during wet weather events. This inspection effort has yielded one possible area of inflow and has also shown that the sewers in the Gunbarrel area are generally in good condition with few structural defects.

The city contracted to install a network of permanent flow monitoring stations in the collection system. The network includes ten flow monitors placed at the downstream end of individual sewer basins. The flow monitors have already successfully recorded several high-flow events due to wet weather, including one in May 2015 which resulted in flows of 50 MGD at the WWTF. The data for this May 2015 event was in fact used to calibrate the wet weather response of the sewer system in the city's updated hydraulic model.

### ***Water Quality and Regulatory Issues***

The WWTF effluent discharge permit renewal was submitted in October 2015 in accordance with the 5-year renewal process. The current permit expires on May 1, 2016. Discussions with the State of Colorado indicate that the Boulder WWTF permit will likely be renewed at the end of 2016. Key issues were discussed with WRAB at the December 2015 meeting, and include revised limits for ammonia and nitrate, inclusion of Regulation 85 nitrogen and phosphorus into the permit, and the request for continuation of two flow tiers.

### ***Infrastructure Evaluation***

The additional revenue from the increase in Stormwater/Flood Management rates allowed the city to hire a new Infrastructure Resilience and Outreach Coordinator in the Water Quality and Environmental Services group to help develop programs that, among other things, reduce inflow and infiltration of groundwater into the city's sanitary sewer.

In addition, recognizing residential contributions to inflow and infiltration, ongoing concerns about sanitary sewer back-ups, and the need to help homeowners with flood preparedness, staff applied for a \$215,000 grant to help conduct on-site *Home Recovery and Resilience Assessments*. The assessments, which will take place in 2016 if the city is awarded the grant, aim to help homeowners mitigate flood concerns and better understand their impacts to the sanitary and storm sewer systems.

### ***Capital Improvements***

In 2015, notable capital improvement projects in the wastewater collection and treatment system included the following:

- Construction on the Nitrogen Upgrades Project, expected to cost \$4.5 million, began in August 2015. The Nitrogen Upgrades Project will improve the WWTF's capability to achieve permit compliance for ammonia, nitrate, and total inorganic nitrogen (Regulation 85). The project will result in enhanced denitrification utilizing two external carbon sources to enhance microbiological activity (acetic acid and weak wort from Avery Brewing).
- Modifications to the IBM Lift Station, expected to cost \$1.5 million, began in September 2015. Upgrades to the lift station are needed to address several key issues, including State of Colorado mandated overflow protection, mitigation of rags and other debris, improved reliability of the pumps, and various aging infrastructure concerns. Initial construction progress and quality of work has been good.
- 2015 was the first year of the city's greatly expanded cured-in-place pipe lining program. The city lined 75,000 feet of sewer in 2015, which is a significant increase over the approximately 20,000 feet that were lined in previous years. Due to the larger scope of work compared to previous years and a competitive bidding environment, the city was also able to procure these lining services at approximately 60 percent of the previous cost per linear foot. The 2015 lining contract resulted in rehabilitation of all of the sewers in the Frasier and Keewaydin Meadows neighborhoods, and approximately half of the sewers in the Martin Acres neighborhood.

### ***Upcoming Key Issues***

- The WWTF Nitrogen Upgrades Project construction will be a major focus in 2016, with an emphasis on successful startup of the new carbon feed and enhanced denitrification system.
- The IBM Lift Station Improvements Project construction is scheduled for completion in late 2016. A critical aspect of this project is a bypass pumping system, requiring close coordination to successfully install the new pumps and accomplish station upgrades while simultaneously pumping the incoming wastewater.
- Continued dialog and identification of the path forward for the aging cogeneration system. As discussed at the December 2015 WRAB meeting, there are both challenges and opportunities with the system, and a future path may or may not involve producing electricity.
- A full-system condition assessment contract will be awarded in 2016 which will result in a single contractor providing sewer cleaning and inspection services for 1.5 million feet of sanitary sewer over a two year period. This project will provide the city with a snapshot of the condition of the entire sewer system. This information will be used to direct future rehabilitation efforts.

- The annual sanitary sewer rehabilitation efforts will continue in 2016 with a focus on rehabilitation of corroded concrete trunk sewers and structurally deficient smaller sewers in the downtown Boulder area. The 2016 rehabilitation project will represent the largest investment the city has made in sewer rehabilitation to date with an anticipated project cost of \$3.5 to \$4.0 million.
- In 2015, city staff initiated conversations with various property owners including Boulder County and the Regional Transportation District (RTD) regarding the proposed large diameter pipeline realignment project. In 2016, city staff will hire a design engineer to begin the alternatives evaluation and preliminary design associated with the large diameter pipeline realignment effort.
- The flow monitoring network will be expanded from 10 to 17 monitoring stations in order to monitor additional areas of interest such as possible sources of inflow and infiltration and areas identified as near or over capacity by the hydraulic model.

## **VII. OVERVIEW: STORMWATER & FLOOD MANAGEMENT**

### ***Operations***

The city's stormwater and flood management utility prepares the city for significant rainfall events through stormwater collection and conveyance, floodplain mapping, floodplain regulations, public education, flood insurance, flood preparedness, flood mitigation master planning, stormwater quality programs, maintenance and capital improvement projects that mitigate flood risk. The regional Urban Drainage and Flood Control District provides support to the city with routine maintenance, master planning, capital and maintenance projects and flood emergency preparedness.

Storm sewer and flood control maintenance operations include cleaning, inspection, and repair of storm sewers, vegetation control in and around waterways, mowing of native grass channels and embankments, as well as cleaning and inspection of trash racks for culverts under roadways and maintained per ditch company agreements. This work includes both planned activities and responses to community requests.

### ***Floodplain Mapping Updates***

Floodplain mapping provides the basis for flood management by identifying the areas subject to the greatest risk of flooding. During 2015, staff worked on the following mapping updates:

- Bear Canyon Creek (from Colorado Avenue to Boulder Creek): The revised mapping was submitted to the Federal Emergency Management Agency (FEMA) for adoption in December 2014. Staff has been responding to comments and questions from FEMA and expects FEMA will adopt the study by summer of 2016.
- Boulder Slough (Broadway to 30th St.) and Boulder Creek Physical Map Revision: The city submitted new floodplain mapping to FEMA for Boulder Creek in 2012 and for Boulder Slough in February 2015. FEMA is incorporating the Boulder Slough mapping

changes into the Boulder Creek Mapping update. FEMA held an open house this fall and the 90 day public comment period began in November. The mapping is expected to go into effect in December 2016.

- Upper Goose and Two Mile Creek: City Council approved the revised mapping in July and the mapping was submitted to FEMA in October for review and approval. Staff expects FEMA adoption of the study by summer of 2016.
- Skunk, King's Gulch and Bluebell Creek: The updated mapping was last presented to WRAB in May. Based on consultant peer review comments, it was determined to develop a two dimensional hydraulic model to better define split flow paths. The revised mapping will be presented to WRAB in 2016.

### ***Flood Mitigation Plans***

Flood mitigation plans identify and evaluate the feasibility of completing capital improvement projects to reduce the risk of flooding. The following three mitigation planning efforts were added to the work program as a result of the September 2013 flood:

- Gregory Creek: The flood mitigation plan was presented and recommended for approval by WRAB in April 2015 and accepted by Council in December. Staff will move forward with design work for improvements to the most downstream portion of the creek in 2016 and look for opportunities to fund, through the 2017 budget process, additional projects identified in the plan.
- Bear Canyon Creek: The modeling for this drainageway was developed by combining several separate hydraulic models that resulted from Letters of Map Revisions following improvement projects over the years. It was determined that further model refinement was necessary and that the new modeling effort should use the city's current approach that uses a two-dimensional model (Flow-2D) to define major flow paths and spill flows. The consultant is currently working on revising the model, which will then be used to identify flood mitigation opportunities. This information will be presented to WRAB in 2016.
- Boulder Creek: A watershed-wide plan was initiated at the end of 2014 with the Urban Drainage and Flood Control District taking the lead on the study and city staff conducting the public engagement process. WRAB reviewed the plan in November 2015 and recommended council acceptance. The plan will be taken to council for review and consideration in early 2016.
- South Boulder Creek: City Council accepted the South Boulder Creek Flood Mitigation Plan in August 2015. The plan includes designing and constructing flood mitigation measures in phases. The initial phase includes construction of a regional stormwater detention facility located on the south side of US 36 on Colorado Department of Transportation (CDOT) land and University of Colorado (CU) land. The city is in the process of selecting an engineering firm to begin preliminary design of the US 36 regional stormwater detention facility. Annexation and the development of the CU South

Campus site, including the detention facility, are being considered through the Boulder Valley Comprehensive Plan Update process.

### ***Capital Improvements***

Major drainageway improvements are programmed into the six-year Capital Improvement Plan (CIP) after a flood mitigation plan has been approved. Typically, a Community and Environmental Assessment Process (CEAP) is completed prior to construction of a project in order to evaluate alternatives and minimize impacts on the environment and community. During 2015, the following major drainageway projects included:

- Fourmile Canyon Creek: A flood mitigation plan for Fourmile Canyon and Wonderland Creeks was completed in 2011. Flood and Greenways improvements along Fourmile Canyon Creek between 19<sup>th</sup> and 22<sup>nd</sup> Street are currently under design and will be bid in the spring of 2016. A CEAP to evaluate upstream improvements west of 19<sup>th</sup> Street along Fourmile Canyon Creek is currently underway. Staff held an open house in November 2015 to solicit input from the public on multi-use path options. Various flood mitigation options were also presented.
- Wonderland Creek: The Wonderland Creek project went to bid in October 2015 and construction is anticipated to begin this winter. The project will include extending the multi-use path along Wonderland Creek, providing three new pedestrian and bicycle underpasses, and constructing flood mitigation along the project reach. The project extends from Foothills Parkway to Winding Trail and is anticipated to be completed in early 2018.
- Storm water utility capital improvements in 2015 focused primarily on contracting inspection services in order to conduct widespread condition assessments of the storm sewer system. Utilities staff cleaned and inspected the storm sewers serving University Hill and downtown Boulder. The inspections revealed widespread structural failure of the storm sewers in the University Hill area and significant debris buildup in the storm sewers serving downtown. This inspection data will be used to advise the 2016 storm sewer rehabilitation program.

### ***Upcoming Key Issues***

- Updated flood mapping for Skunk, King's Gulch, and Bluebell Creeks is expected to be presented to WRAB in the third quarter of 2016.
- The Bear Canyon Creek flood mitigation plan is anticipated to be presented as an information item during the second quarter, with a final plan expected to be completed by the third quarter.
- A CEAP for the area along Fourmile Canyon Creek upstream of 19<sup>th</sup> Street is planned to be completed and provided to WRAB this spring as an information item.
- Staff will also provide an update on the status of the preliminary design of the first phase of the South Boulder Creek flood mitigation improvements.

## VIII. OVERVIEW: WATER QUALITY AND ENVIRONMENTAL SERVICES

### ***Flood Education and Outreach***

Staff developed and implemented a flood safety campaign which included distributing 3,500 door hangers, two utility bill inserts, outreach booths, Daily Camera advertisements and a flood safety and home preparedness seminar. Additionally, staff installed three large-scale stickers (one spanning a pedestrian bridge) in the downtown area which were viewed by approximately 2,000 pedestrians per day. These outreach efforts support the Community Rating System (CRS), helping to reduce flood insurance costs for Boulder residents.

### ***Utility Regulatory Support***

The city's Stormwater Program focuses on managing groundwater discharges and the city's state-issued Municipal Separate Storm Sewer System (MS4) permit. Staff worked to prepare for increasingly stringent permit requirements while negotiating with the regional Keep It Clean Partnership (KICP) to reduce stormwater outreach efforts the city is contracted to perform. These changes stem from new the MS4 permit focusing much more heavily on in-field construction oversight and less on outreach. These efforts have allowed staff to continue regional KICP collaboration and enhance permit compliance.

In 2015, staff were actively involved in developing and refining regulatory requirements at the State level to support the Water, Wastewater and Stormwater/Flood Utilities. Primary areas of focus for the Wastewater and Stormwater/Flood Utilities included the June 2015 South Platte Basin water quality standards hearing and preparation for the June 2016 state-wide water quality standards hearing. Primary issues of concern for both hearings include:

- Water temperature standards for Boulder Creek to protect aquatic life.
- Nutrient (phosphorus and nitrogen) and periphyton (algae) standards for Boulder Creek to protect aquatic life and recreational uses.
- Arsenic standards to protect human health and evaluation of existing treatment technologies.

### ***Water Conservation, Resilience, and Regional Collaboration***

Staff continued to work on key water conservation efforts while developing partnerships to meet larger city goals. The Water Efficiency Plan, which staff presented to WRAB in September 2015, is part of a larger state-required reporting update that staff will finalize in 2016 with WRAB input. As a part of that effort, and working toward greater city integration, Utilities staff coordinated climate modeling updates to support other city efforts such as the [Climate Commitment Framework](#). Other outreach efforts in 2015 included the 2015 Watershed Summit, the EPA required drinking water [Consumer Confidence Report](#), and the [Community Guide to Flood Safety](#). The latter is part of a larger initiative to keep the community engaged with flood preparedness.

### ***Upcoming Key Issues***

- In 2016, staff will develop a temperature standards compliance proposal for the June 2016 Basic Standards Hearing.

- Staff will provide a final update on required Stormwater Quality Program changes needed to meet final MS4 stormwater permit requirements.
- Staff will complete the Water Efficiency Plan as well as Phase II of the Fire Mitigation and Response Plan. Both will be presented to WRAB for feedback in 2016.

## **IX. NEXT STEPS**

Staff will present the 2015 Year in Review, with an emphasis on the year's highlights, at the Jan. 25 WRAB meeting. Staff will answer questions from the board about operational and capital issues from 2015 as well as any questions about upcoming issues in 2016.