C I T Y O F B O U L D E R
WATER RESOURCES ADVISORY BOARD
INFORMATION ITEM

MEETING DATE: January 26, 2015

AGENDA TITLE: Information Item – 2014 Year in Review

PRESENTER/S:
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Bob Harberg, Utilities-Principal Engineer
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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 has a very limited role in these activities, recommendations on capital improvements, master plans, and policy issues have a significant impact on operations. This memorandum provides an overview of 2014 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 2014 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. TOP STORIES OF 2014

Each year brings new developments, anomalies, and notable events. 2014 was no exception. The following items are some of the key stories of note from this past year.

Significant Precipitation

Boulder experienced higher than average snowfall during 2014. Total snowfall was 106 inches, compared to an average of 90.7 inches. Since 1893, Boulder has experienced only 18 years with greater than 100 inches of snow. Total Boulder precipitation for the year was 23.57 inches, compared to an average of 20.69 inches. Boulder's reservoirs were fuller than normal at the start of the year, primarily due to the heavy rainfall during September 2013. Reservoir storage levels ranged from 80 to 90 percent of capacity, compared to averages for the same period of 50 to 80 percent of capacity. In addition, the snow water equivalent (SWE) at the University Camp Snotel site was well above average throughout the early part of the year, reaching about 170 percent of average at the beginning of the snowmelt run-off in mid-March. Boulder's reservoirs filled and spilled, and no drought stage declarations were needed during 2014. On a state-wide basis, drought conditions improved significantly during 2014. At the beginning of the year, only 32 percent of the state was classified as drought free, but by the end of the year, almost 70 percent of the state was considered drought free. The good availability of water this year also allowed water conservation staff to dedicate more time to strategic and longer range projects.

Additional 2014 Impacts of 2013 Flood

The immediate impacts of the flood were clear, but there were follow-on effects into 2014.

- Wastewater Treatment Facility: Infiltration of additional water into the sanitary sewer system as result of the flood and high groundwater throughout the year meant higher than normal flows into the Wastewater Treatment Facility during 2014.

- Boulder Reservoir: The flood caused the Boulder Reservoir Water Treatment Facility to shut down due to extreme reservoir turbidity. It is estimated that the flood created a sediment load to Boulder Reservoir twice the annual average. Boulder Reservoir water quality indicators remained well above normal levels into early 2014. Those levels decreased over the winter months and returned to normal by the end of 2014.

- Staffing Needs: The flood necessitated new or accelerated capital projects which in turn required new staff positions to manage them. Two new positions were budgeted in the Flood and Greenways work program (Utilities Planner and Flood and Greenways Project Manager). The Utilities Planner position was hired in July as a fixed term position pending approval of the 2015 budget and the Flood and Greenways Project Manager position was hired in December. A Flood and Greenways Civil Engineer I was hired in December to fill a vacant GIS position.

First Year of Many for Flood Response
A number of efforts took place to restore or improve the function of the water, wastewater, and stormwater systems impacted by the flood.

- The city comprehensively inspected over 140,000 feet of sanitary sewer pipe and added new lining to nearly 10,000 feet of sanitary sewer pipe. A multi-year program to identify deficiencies and repair the wastewater collections system will ramp up significantly in 2015. Similar efforts to identify and repair or replace sections of the city's stormwater collection system began in 2014 and will continue into 2015.

- The flooding that occurred on Boulder Creek and its 14 tributaries resulted in the deposition of large amounts of sediment and debris within the waterways. As a result, 720 tons of debris and 46,000 cubic yards of sediment needed to be removed from the major drainageways in order to restore drainage capacity. Significant effort was also expended in repairing drop structures, areas of erosion, and channel infrastructure. It is anticipated that this work will be complete later in 2015.

- Phase 1 of the Pre and Post Wildfire Planning project focused on refining a small-scale watershed analysis and hazard ranking (e.g., wildfire hazard, flooding/debris flow hazard and soil erodibility) for the Boulder Creek watershed. A hazard analysis of water supply infrastructure in the Boulder Canyon area was also completed. A WRAB update on these efforts is scheduled for July 2015.

Increased Public Engagement
2014 work efforts related to flood response and preparation were significantly influenced by increased public enagement and awareness.. The debris and sediment removal project required extensive communication with property owners during the spring runoff when property owners were under heightened awareness following the September 2013 flood.

The Utilities Division played a key role in outreach and education on flood-related matters in 2014. Efforts included open houses, door to door contacts, informational inserts for utility bills, and a new Community Guide to Flood Safety. Staff also held numerous public open houses and other meetings to talk with the public about floodplain mapping, flood mitigation planning, and upcoming capital improvements. This level of engagement is very likely to continue into 2015 and beyond as the community works together toward recovery and resilience goals.

Funding Increase for Utilities
City Council approved the 2015 budget which included rate increases of 5 percent in the water fund, 30 percent in the wastewater fund, and 75 percent in the stormwater and flood management fund. The budget includes significant additional investment in utilities infrastructure, with an emphasis on the wastewater collection system and flood mitigation projects, as well as increased staffing in all three funds.

Succession Planning
Improving economic conditions contributed to a large number of anticipated workforce changes materializing in 2014. Three of four supervisors retired at the Wastewater Treatment Facility in

2014. In Water Treatment, 2015 will see one third of operations staff with less than a year of experience working for the city. In the Utilities Maintenance group, 20 of 40 employees have different jobs from the ones they had at the beginning of 2014. Across all workgroups, attracting and retaining employees has been a challenge. The pools of qualified candidates seem to be smaller than in years past and many qualified candidates have been unwilling to accept current wages and/or shift schedules. The Utilities management team and the Human Resources Department are working together to evaluate job descriptions and pay scales to insure the city remains a competitive employer into the future. Previous succession planning efforts have allowed for smooth transitions and helped avoid impacts to service delivery. At the same time, the influx of fresh ideas and new energy have supported substantial progress on establishing a strong culture of continous improvement across the division.

Irrigation Ditch Demands Intensify

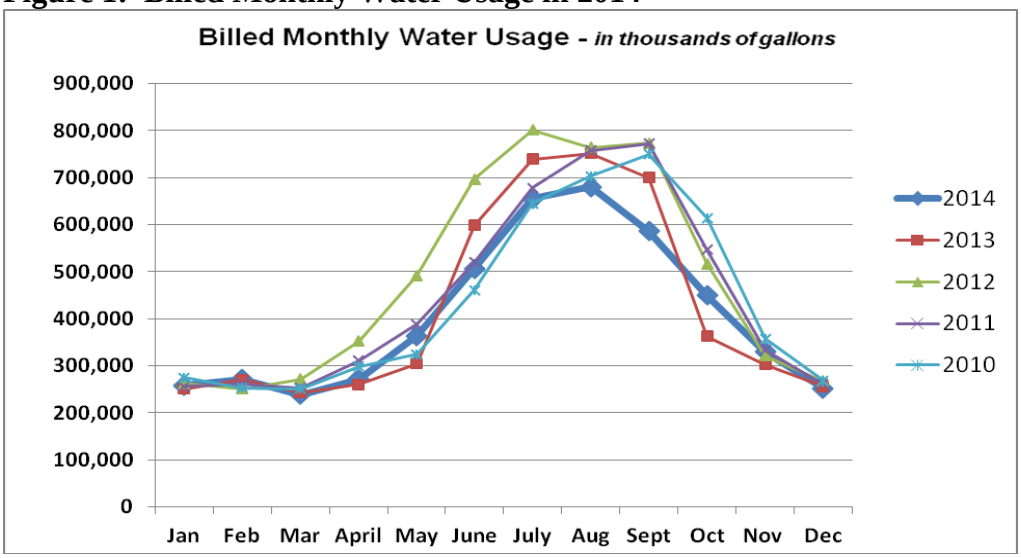
In addition to managing and operating the city's source water supply, the Utilities Division's Water Resources workgroup has a role supporting irrigation ditch matters. The associated demand on staff time has been increasing for a number of years, and has further intensified since the 2013 flood due to saturated ground water levels, changed drainage patterns and heightened awareness in the community. Irrigation Ditch work dominated Water Resource's work load in 2014, and as a result, an additional position was approved for Water Resources through the 2014 budgeting process.

IV. FINANCIAL OVERVIEW

Water Use Based on Billed Consumption

Billed water consumption in 2014 was the lowest in over 20 years. Compared to 2013, consumption decreased by 3.5 percent. There are a few reasons for such low usage, including weather and the effect of rainfall on outdoor watering. Boulder saw 23.5 inches of precipitation in 2014, which was the second highest in 10 years. As Figure 1 shows on the next page, the relative decrease in consumption was most pronounced August through October. This was due not only to higher than average total precipitation during those months, but also the frequency of rainfall and a freeze and snowfall coming relatively early in September. Another factor contributing to lower consumption is indoor usage as measured by Average Winter Consumption (AWC). AWC represents average consumption from December through February, when most usage takes place indoors. For single-family residential, AWC decreased by nearly 4 percent compared to 2013, which continues a long-term downward trend. Indoor use has been decreasing due to water conservation measures such as more efficient fixtures.

Figure 1: Billed Monthly Water Usage in 2014



Revenues

The decreased billed consumption resulted in revenue for water use coming in around $2,100,000 less than anticipated. Fortunately, Plant Investment Fees (PIFs) were at about $4,500,000 more than projected. This was primarily due to several large private development projects that had been deferred due to financing difficulties during the recession moving forward with construction. Both the Wastewater and Stormwater/Flood Management Funds were also helped by the higher than expected PIFs, and all the utilities funds ended the year slightly above revenue projections. Plant Investment Fees represent "one time" revenues and staff will continue to carefully track trends in billed consumption which have a stronger correlation to the financial health of the utility.

Flood Recovery Grant Funding

In addition to continuing to work with the Federal Emergency Management Agency (FEMA) for reimbursement of flood costs, city staff has been successful in seeking other grant funding related to flood recovery. One award from the Colorado Department of Public Health and Environment provides approximately $1,600,000. About $600,000 will be used for design and construction of the re-route of the wastewater interceptor at 61st street, and the other $1,000,000 will support design and construction of the extension and installation of city water lines for the Githen Acres neighborhood for annexation to the city. Another grant award was from the Community Development Block Grant – Disaster Recovery program, which provided $500,000 to contribute to the required FEMA local match for sediment and debris removal in drainageways.

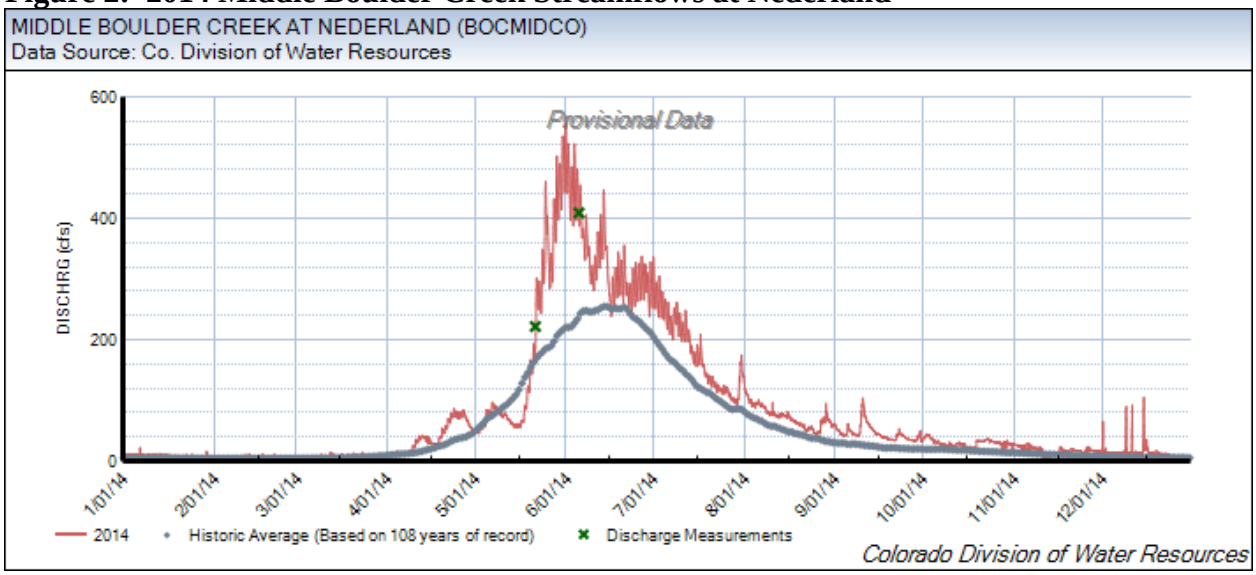
V. OVERVIEW: WATER RESOURCES

Water Abundance

The city relies upon snowmelt runoff to fill and store water in its upper Boulder Creek basin reservoirs each year. While the snowpack at the beginning of the year was slightly below average, the snow water equivalent in the city's watershed had risen to over 160 percent of average by the middle of February.

Owing to the greater than average snowpack, the 2014 peak snowmelt runoff season greatly exceeded the historical average. Figure 2 includes 2014 and historical average stream flow conditions upstream of Barker Reservoir. Except for May, prior to peak snowmelt, the basin experienced frequent and/or prolonged "free river" conditions throughout the year. This means that water availability exceeded active water rights diversions. As a result, the city was able to lease about 7,300 acre-feet of water for agricultural uses and no drought-related curtailment was required in the leasing program.

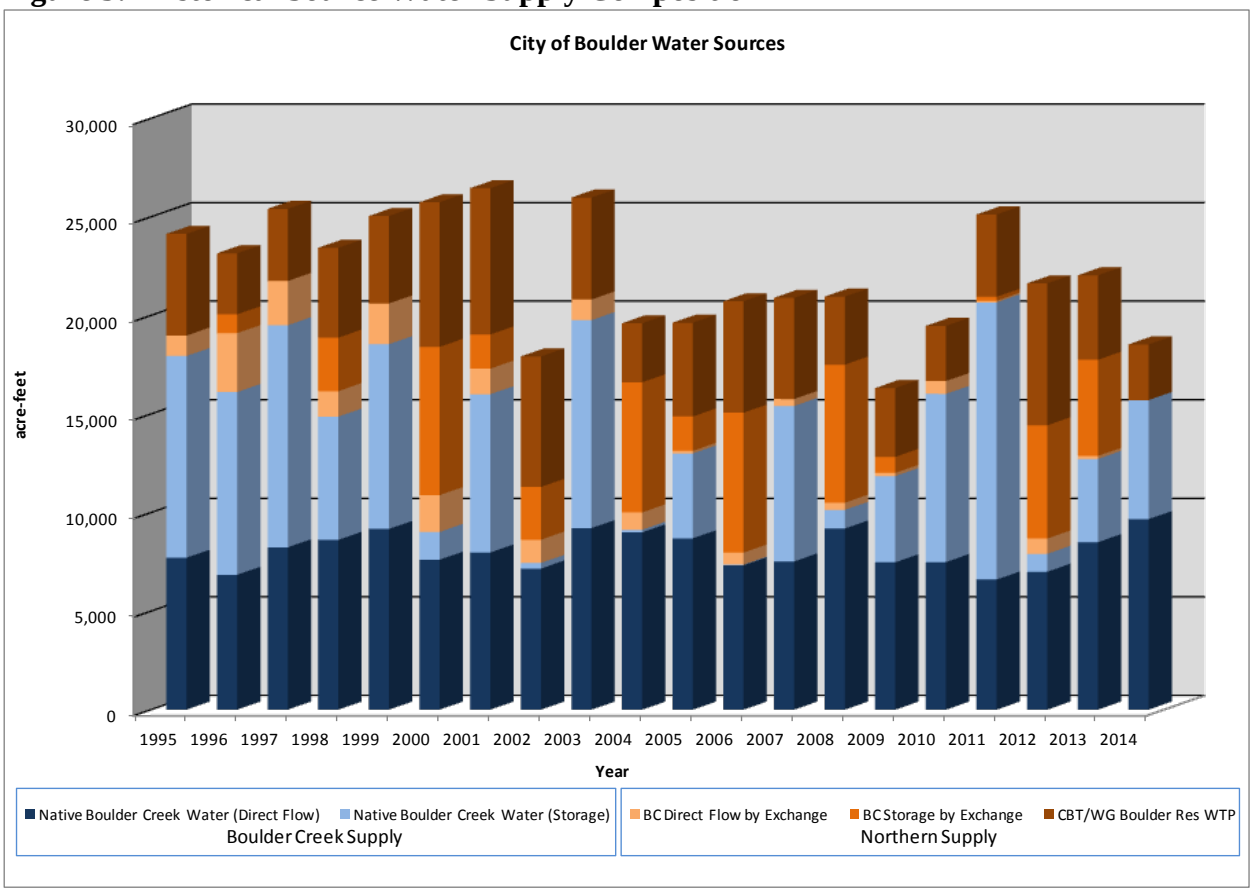
Figure 2: 2014 Middle Boulder Creek Streamflows at Nederland



Water Sources Summary

The snowfall and runoff from the 2013-2014 winter allowed the city to fill its mountain storage reservoirs during the spring. The city used a total of 2,838 acre-feet of Colorado Big Thompson (CBT) water in water year 2014 (November 1, 2013 to October 31, 2014). This represents a greater than 70 percent reduction from the 10,307 acre-feet used in 2013 and reflects the abundant water supply in the city's native basins during 2014. CBT water is intended to supplement native basin supplies. Figure 3 on the next page shows a summary of historic water supply composition.

Figure 3: Historical Source Water Supply Composition



Hydropower

The city received $2,435,000 in hydropower revenue for 2014 compared to projected revenue of $2,406,000. Total generation for 2014 was about 51,000,000 kilowatt hours (kWh) or enough to meet the average annual needs of approximately 8,000 households. Hydroelectric power generation during 2014 displaced the need to burn approximately 25,000 tons of coal at a traditional, coal-fired power plant.

The high reservoir storage levels and increased stream flow above Barker Reservoir prior to the 2014 snowmelt provided a somewhat unique opportunity to increase generation at Boulder Canyon Hydroelectric (BCH) during a time of year when the city is normally using its stored water for municipal supply. Because Barker Reservoir levels were still high following the September 2013 flood and because runoff would be greater than average, the city increased production at BCH during February through May.

The city met its projected hydroelectric revenue for 2014 despite significant outages at several hydroelectric facilities. Betasso Hydro was offline for approximately 8 months due to unscheduled outages for mechanical and gravity pipe repairs. BCH was out of service for approximately 8 weeks due to Barker Gravity Pipeline repair needs.

Irrigation Ditches
The Water Utility is a shareholder in several irrigation ditch companies. Sections of many of the irrigation ditches in and around the city were damaged or compromised as a result of the September 2013 flooding.

Irrigation ditches intercept stormwater from the upslope areas above the ditches due to their alignment along a line perpendicular to the slope of the land. The 2013 flood had a significant impact on most of the contributing natural drainages and city stormwater facilities. The net result of those impacts was increased stormwater contribution to the ditches. During 2014, Water Resources staff responded to an increasingly large number of residential complaints related to irrigation ditch and stormwater interaction, especially during spring and summer thunderstorms.

Water Conservation, Resilience, and Regional Collaboration
Water Conservation is a part of long-term utility goals and while key aspects of the programs remain constant, in wetter years additional resources can often be placed into longer term planning goals and regional collaboration. In 2014 the Water Conservation Program not only worked towards completing the Water Conservation Futures Study and the Commercial, Industrial and Institutional Study but it also coordinated on resilience, climate and local food efforts. Some of the efforts noted also have regional implications which not only involve the Boulder Valley Comprehensive Plan update but also tied back to a four year effort with the Boulder County Consortium of Cities. A key recommendation of the Consortium's Water Stewardship Task Force was to hold a water users meeting in Boulder County and the city's Water Conservation Program has worked to help make this a reality. The event, scheduled for January 21, 2015, includes a presentation on the State Water Plan followed by panels on topics ranging from water conservation to watershed planning and from in-stream flows to agriculture.

Capital Improvements
In 2014, notable capital improvements projects in the source water system included the following:

- Flood restoration projects for Wittemyer Ponds as well as Anderson and Farmers Ditches. The ditch restoration projects were actually ditch company projects but still required considerable staff time due to staff's leadership role as board members of those companies.

- Unplanned replacement of 60 feet of the Barker Gravity Pipeline as a result of a leak that was discovered in August 2014.

- Preparation of construction documents and bidding for the Kossler Southeast Dam refacing project, which is planned for construction in 2015.

- Though not a capital project, obtaining a Forest Service Special Use permit for the Barker Gravity Pipeline to occupy national forest land was a significant undertaking. By obtaining this permit, the conditional license exemption previously granted by the Federal Energy Regulatory Commission (FERC) for the Boulder Canyon Hydroelectric Project (BCH) went into full effect. The exemption replaced the previous project

license, and removed Barker Dam and Reservoir, the Barker Gravity Pipeline, Kossler Reservoir and the Boulder Canyon Penstock from FERC jurisdiction. Only the Boulder Canyon Hydro power plant and adjacent appurtenant facilities remain under FERC jurisdiction similar to the city's other seven license-exempt hydroelectric facilities.

Upcoming Key Issues

- Internal inspection of Lakewood Pipeline. Results of the inspection should provide information on the extent to which construction defects may impact the useful life of the pipeline.

- Completion of the Kossler Southeast Dam refacing project (postponed in 2014 due to licensing work and County repair work on Flagstaff Road).

- Completion of the Albion Dam and Silver Lake Dam outlet works inspection (Albion postponed in 2014 due to high reservoir levels).

- Renewal or replacement of the city's existing power purchase agreements (PPAs), which will expire between 2015 and 2017, requiring negotiation of new agreements.

- Continued work on irrigation ditch matters such as ditch/stormwater issues for various ditches and support of major maintenance projects for Anderson and Farmers Ditch Companies.

- Evaluation of climate change on the city's water supply and water conservation program through continued work on the Water Conservation Futures Study.

VI. OVERVIEW: WATER TREATMENT & DISTRIBUTION

Operations

The city's two water treatment plants (WTP), Betasso and Boulder Reservoir, produced 5.695 billion gallons in 2014, which was 0.5 percent less than 2013 and 5 percent below the 5-year average. As mentioned previously, above normal precipitation lessened the demand for water. Betasso WTP produced 82 percent and Boulder Reservoir WTP produced 18 percent of the total volume. Boulder Reservoir WTP production was limited by Boulder Feeder Canal operations and an abundance of "free river" water in the Boulder Creek Watershed to the Betasso facility. Boulder Reservoir WTP also operated at much lower production rates in 2014 due to the curtailed demand for treated water.

The drinking water system met all regulatory compliance requirements during 2014. The Colorado Department of Public Health and Environment (CDPHE) conducted their tri-annual inspection of the potable water system, including both plants, distribution system and operational records. No significant deficiencies were noted in the inspection.

Capital Improvements

In 2014, notable capital improvements projects in the water treatment and distribution system included the following:

- Preliminary inspection of the Sunshine transmission line between the Betasso WTP and the Sunshine Hydroelectric Facility was started in the fall of 2013. This portion of the pipe appeared to be in good shape and a new effluent meter was installed on the line at Betasso. In December, work was initiated to replace the 2,000 feet of Sunshine transmission line below Sunshine Hydroelectric Facility that is in poor condition.

- The distribution main replacement budget was expanded by 50 percent in 2014 and over 22,000 feet of water main was replaced.

- At the Betasso WTP, work was completed on a residuals pilot study and analysis of the filters. HDR was selected as the Betasso Capital Improvement Project design consultant. They are building on the completed studies and have completed a facility assessment in preparation for the alternatives analysis, cost estimate and preliminary design.

- At the Boulder Reservoir WTP, a new flash mixing system was installed and an analysis of electrical system and backup power feasibility was completed.

- Critical valves and pumps in the system were tested and upgraded to increase system resiliency and provide for better water system redundancy.

Upcoming Key Issues

- HDR's initial facility assessment at the Betasso WTP has identified over $20,000,000 worth of needs. Currently, a little over $12,000,000 is budgeted for the project.

- Continued disposal of Betasso WTP water treatment residuals efficiently and quickly enough to prevent impact to plant operations is an ongoing challenge.

- The water transmission inspection and rehabilitation budget over the next 6 years has been established based on known problems and inspection of other large diameter mains throughout the city. The condition assessments will allow the city to budget for replacement and rehabilitation in the future. This program will be separate from the smaller diameter distribution main replacement program that is funded with over $3,000,000 annually.

- Continued implementation of the Safety program and making budget requests for addressing safety-oriented, physical plant deficiencies noted during 2014 inspections at both water treatment facilities

- Training two new water treatment operations staff members. One third of the operations staff will have one year or less experience in the two plants.

- Annexations of various residential enclaves will require the construction of water main extensions.

- Review previous problems and identify solutions to address failures of the dissolved air flotation (DAF) recycle line at Boulder Reservoir WTP. This component has a single-point-of-failure criticality in the operation of the DAF clarification system.

VII. OVERVIEW: WASTEWATER TREATMENT & COLLECTIONS

Operations

The Wastewater Treatment Facility (WWTF) operated with no effluent permit violations in 2014, treating an average of 15,000,000 gallons per day of wastewater. Flows in 2014 were higher than recent years due to excess infiltration entering the sanitary sewer system from the residual effect of the September 2013 flood event and associated higher than normal groundwater conditions. Wastewater treatment staff continued to successfully operate the ultraviolet disinfection system that went online in 2013. The fourth full year of using electric power generated from solar photovoltaic occurred during 2014 at the WWTF, with the overall system production to date exceeding 6,500,000 kilowatt hours. When combining solar power with power generated by the cogeneration system, approximately one third of the electrical power needs for the WWTF were generated by renewable technology in 2014.

In 2014, significant work was also completed in the wastewater collection system. Utilities hired Redzone Robotics to inspect 31,189 feet of the city's large diameter sanitary sewer interceptor sewer at a cost of $172,185. This project was a comprehensive condition assessment process that utilized TV inspection, laser and sonar technologies for the section of interceptor sewer from South Boulder Rd to the WWTF. This section of sewer is comprised of 30-inch through 42-inch diameter reinforced concrete pipe (RCP). This project was initiated to identify and quantify the volume of debris remaining in the system from the September 2013 flood event. Contractors also performed standard CCTV inspection of 113,000 feet of 8" to 12" sewers in areas which had severe wastewater backups during the 2013 flood event at a cost $170,101. No significant quantity of flood debris was identified in either the interceptor or upstream collection system; however, the contractors did identify several stretches of sewer with severe structural and corrosion problems.

The city also contracted with Stantec to conduct an extensive flow monitoring study. The study utilized 60 flow meters installed throughout the collection system at a cost of $338,722. The purpose of the study was to identify sewersheds with excessive rates of inflow and infiltration (I&I) to advise the location of future rehabilitation efforts. The flow monitoring study was able to capture the impact of the elevated groundwater table from the September 2013 flooding and the impact of rainfall-induced I&I on wastewater flows. The study concluded that 70 percent of the collection system is in Fair to Good condition, 29 percent of the system is in Poor condition, and 1 percent of the system is in critical condition.

Utilities staff continued the annual cured in place pipe (CIPP) lining program and lined approximately 9,875 feet of 8", 10", and 15" mains at a cost of $282,885. This represented a decrease in lining over previous years because part of the funding for this program was reallocated to the inspection and flow monitoring projects to more effectively prioritize future efforts.

Water Quality and Regulatory Issues
In 2014, staff led a Front Range utility effort to receive a $160,000 grant from the Water Environment Research Foundation (WERF) to perform a nutrient study on Boulder Creek in order to determine what impact, if any, nutrients discharged from the city's 75th St. wastewater treatment facility have on algae growth in Boulder Creek. Extensive water quality and algae monitoring was conducted in 2014 to support the effort. Results will be presented to WERF in final report due June 2015.

Utilities staff were actively involved in multiple state-level regulatory efforts as well. Primary areas of focus for the Wastewater and Stormwater/Flood Utilities included preparation for the June 2015 South Platte Basin water quality standards hearing and 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.

Additional water quality studies will be conducted in 2015 focusing on sources of arsenic, fate and transport of nutrients in Boulder Creek and evaluation of ammonia toxicity in Boulder Creek. These efforts are necessary to support future compliance requirements of the WWTF integrated into state-directed regulatory work groups.

Capital Improvements
While 2014 did not include any construction activities at the WWTF, important design efforts were conducted. The most significant project of the year was the design for the Nitrogen Upgrades Project. Once constructed, the improvements will increase the ability of the WWTF to remove nitrogen in accordance with CDPHE Regulation 85 which adds nitrogen and phosphorous considerations to future effluent permitting. This project will include the construction of a carbon addition facility that will store both acetic acid and also weak wort (sugar water from a local brewery) to assist with the facility's nitrogen removal process. This project will also include modifications to the existing aeration basins to change the biological process from an Modified Lutzack Ettinger (MLE) process to a 4-Stage Bardenpho process. MLE uses only two process zones (anoxic and aerobic), while the 4-stage Bardenpho process essentially adds a second anoxic and second aerobic zone to the MLE system.

Other improvements will include primary sedimentation basin bypass, diffuser replacement in the solids contract tanks, and a new post aerobic digestion process which will aid in the removal of nitrogen and phosphorous. The design was 100 percent complete and approved by the State of Colorado Water Quality Control Division (WQCD) in December. The Engineer's Opinion of Probable Cost for the project's construction is approximately $3,500,000.

A second important design project was initiated in 2014 for upgrades to the IBM Lift Station, the city's only major raw wastewater lift station that serves a portion of the Gunbarrel area. Upgrades to the station are needed to address several key issues, including Colorado WQCD-

mandated overflow protection, mitigation of rags and other debris, improved reliability of the pumps, and various mechanical and electrical aging infrastructure concerns. The station was originally constructed in 1965, and was last upgraded in 2000.

Upcoming Key Issues

- The WWTF Nitrogen Upgrades Improvements project will be bid in early 2015.
- IBM Lift Station Improvements project will be bid in mid 2015.
- Determining the path forward for the aging cogeneration system.
- Implementation of the organizational changes and associated technology to support unattended operation at night as a departure from 24/7 coverage.
- Development and implementation of a more aggressive, proactive wastewater collection system operations, maintenance, and renewal plan. Typically, such a condition assessment is scheduled with a five-year recurrence interval. However, due to the September 2013 flood, staff suspects damage is widespread and therefore the assessment cycle will need to be expedited to three to four years in order to assess flood damage.
- Significant increase in sanitary sewer rehabilitation efforts in 2015. The city intends to use CIPP lining to rehabilitate 100,000 ft of sewer in the Frasier Meadows, Keewaydin Meadows, and Martin Acres neighborhoods at a cost of approximately $2,000,000. This effort will rehabilitate all remaining vitrified clay and concrete sewers in these neighborhoods.
- Staff will place approximately 5-10 flow meters in the collections system over an extended period of three to five years in order to identify sewer basins with excessive I&I and quantify any reductions in I&I that the rehabilitation program may achieve.

VIII. OVERVIEW: STORMWATER & FLOOD MANAGEMENT

Operations

The city's stormwater and flood management utility prepares the city for significant rainfall events through floodplain mapping, risk assessments, floodplain regulations, public education, flood insurance, flood preparedness, master planning, stormwater quality programs, and maintenance.

Flood control maintenance operations include vegetation control in and around waterways, mowing of native grass channels and embankments, as well as cleaning and inspection of trash racks for ditch company agreements and culverts under roadways. This work includes both planned and responses to calls from the community.

In the past year, staff continued clean-up efforts from the 2013 flood by removing sediment and debris from water ways. Primary areas of focus for 2014 were:

- Sand removal from sumps.
- Clean trash grates after every storm event.
- Keep waterways clear of debris.

624 tons of sand and 260 cubic yards of debris (brush/trash) were removed by city crews. Contractors working on behalf of the city removed approximately 720 tons of debris and 46,000 cubic yards of sediment from the major drainageways, in addition to repairing drop structures, areas of erosion and channel infrastructure. This effort required significant coordination with FEMA and substantial monitoring and documentation. This also required a significant public engagement effort, particularly prior and during spring runoff when property owners were under heightened awareness following the September 2013 flood.

Floodplain Mapping Updates

- Bear Canyon Creek (from Colorado Avenue to Boulder Creek): An Open House was held on July 1 to present the mapping to the public. The mapping was reviewed and recommended for approval by WRAB on July 21 and was approved by City Council and submitted to FEMA for adoption in December.

- Boulder Slough (Broadway to 30th St.): An Open House was held on July 9 to present the mapping to the public. The mapping was presented and recommended for approval by WRAB in a public hearing on July 21and is awaiting final construction of modifications at the 30th St. Underpass prior to review and consideration by Council.

- Upper Goose and Twomile: An Open House was held on Nov. 13 and an update was presented to WRAB on Nov. 17. A follow-up WRAB meeting to request a recommendation is scheduled for March 2015.

- Skunk, King's Gulch and Bluebell**:** An Open House was held followed by a WRAB meeting on Aug. 18. A follow-up WRAB meeting to request a recommendation is scheduled for Apr. 2015. WRAB recommended adoption of the mapping at the Sept. 15 meeting pending consultant evaluation of the spill flow from Bluebell Canyon creek downstream of 15th St.

- Fourmile Canyon Creek**:** The Fourmile Canyon Creek mapping was reviewed to evaluate the spill flows to Wonderland Creek based on the flood extents of the September 2013 flood. The analysis did not identify a need to update current mapping.

Capital Improvements

In 2014 the City focused on the repair of existing storm sewers and expansion of existing storm sewers to address localized drainage issues. The City utilized contractors to repair or replace damaged storm sewers at 30th St. & Colorado, Baseline Rd. & 10th St., 4th St. & Kalmia, 4th St. & Juniper, 6th St. & College Ave., Ithaca Dr. & Wildwood Rd., Goose Creek along Edgewood Dr., Bear Creek at Wildwood Dr., and Two Mile Creek at Spring Valley Dr. A contractor also excavated the detention basins at the intersection of Foothills Hwy. and Baseline Rd. to restore their design capacity and establish a low-flow channel. Approximately 800 feet of storm sewer on 14th St. from College Ave. to Euclid Ave. was also lined using cured in place pipe.

Staff held an open house on Aug. 25 to update the public on the design elements of the Wonderland Creek Greenways project. Agreements with the Burlington Northern Railroad and Boulder and Whiterock Ditch Company have been drafted and are in negotiations, Colorado Department of Transportation (CDOT) has approved the Right of Way plans for the project, easements and permits are being secured and the final design plan sets finalized. An ordinance approving the use of eminent domain for property acquisition for this project was approved by Council on Dec. 16, 2014.

Upcoming Key Issues

The September 2013 flood will continue to influence both operations and capital efforts for 2015. Significant sediment and debris removal will be required to restore capacity of both local and major drainage systems. Longer term efforts will be required to restore habitat and features such as drop structures and sediment traps. Additional key issues will include prioritization and funding of mitigation projects, consideration of property acquisition to reduce hazards and/or allow mitigation, and consideration of changes to regulations and design standards to provide a higher level of protection from future flood.

Wonderland Creek Greenways Project: Eminent domain proceedings will begin to secure the remaining necessary easements by the June 30, 2015 deadline for advertising for construction bid as required by the federal grants for this project. This project will be bonded and will go to bid in June 2015.

South Boulder Creek Flood Mitigation Planning: An Open House followed by a WRAB meeting was held on Aug. 18, and an Open Space Board of Trustees meeting was held Aug. 20 and Sept. 10 to present mitigation alternatives including regional detention at US 36. Information was also presented to Council at the Sept. 30 flood study session. City staff is working to identify US 36 detention alternatives that would be less impactful to Open Space land. An information update to WRAB is scheduled for March 2015.

Other Flood Mitigation Planning: The following three mitigation planning efforts were added to the work program as a result of the September 2013 flood:

- Gregory Creek: An Open House was held June 12 and a second Open House followed by a WRAB meeting was held on Oct. 20. A follow-up information item is scheduled for WRAB in April 2015.

- Bear Canyon Creek: An Open House was held July 1. A follow-up information item is scheduled for WRAB in April 2015 and again in August 2015.

- Boulder Creek: A watershed wide plan was initiated at the end of 2014 with Urban Drainage and Flood Control District taking the lead on the study and city staff conducting the public engagement process. An information item is scheduled for WRAB in May 2015.

IX. NEXT STEPS

Staff will present the 2014 Year in Review, with an emphasis on the year's highlights, at the Jan. 26 WRAB meeting. Staff will answer questions from the board about operational and capital issues from 2014 as well as any questions about upcoming issues in 2015.