City of Louisville
COLORADO • SINCE 1878

City Council
November 4, 2019

Addendum #1
Items Received at the Meeting

From:	Felicity Selvoski
To:	Susan Loo; Rob Zuccaro
Cc:	Heather Balser; Megan Davis; City Council
Subject:	RE: 1013 Jefferson Ave
Date:	Monday, November 4, 2019 12:31:50 PM
Attachments:	1021 Main Grant Agreement.pdf 721 Grant_Grant Agreement.pdf

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Hi Susan,

Thanks for the questions/concerns. Attached are two grant agreements (1021 Main and 721 Grant) that included insulation in the scope of work. Additionally, City Council approved a grant for 620 Grant Avenue at the September 2019 meeting for the addition of insulation to that landmarked property.

The applicant is no longer requesting grant funds for any plumbing work – the request is only for the work related to insulation.

When reviewing the HSA for 721 Grant (one of the properties where insulation was approved as preservation work, grant agreement attached), the report includes the following language: "*There is no interior or exterior access to the attic space in the house. … Plan that there is little to no insulation in the attic, and add more as needed to achieve R49.*" R49 is what is required by building code in attic space, and what the applicant at 1013 Jefferson is requesting. While there was no recommendation in the 1013 Jefferson HSA regarding insulation, the same recommendation could apply regarding bringing the current insulation up to code. Per the HSA for 1013 Jefferson, the attic currently has 4" of insulation which is equivalent to R14. An additional 10" of insulation would be needed to meet the R49 recommendation.

The HSA for 1013 Jefferson does include language under the HVAC/Electrical/Plumbing heading regarding energy efficiency: "*Although not a deterioration concern, it is recommended that an energy audit be conducted to determine how the home is performing in terms of energy efficiency. An audit will be helpful to find any air infiltration problem areas and will help determine where efficiency upgrades will be most effective*." The addition of insulation to the house will reduce current air infiltration issues, improve the energy efficiency of the home, and bring it up to code.

Routine maintenance would be considered something that is done on a regular/reoccurring basis and necessary for the upkeep of the house – such as painting, window sealing, filter changes, etc. Insulation should have a lifespan of 50+ years, potentially much longer depending on the type installed, and shouldn't need to be replaced or maintained on a regular basis.

Regarding the HPC discussion on the topic – it was quite limited. The rational for approval was that the insulation would increase the usability and comfort of the house, and therefore aid in its preservation.

Let me know if I can answer any additional questions prior to the meeting tonight.

Best,

Felicity Selvoski
Planner / Historic Preservation
City of Louisville
fselvoski@louisvilleco.gov
P: 303-335-4594

We encourage you to visit our online maps webpage with planning and land use information.

From: Susan Loo
Sent: Saturday, November 2, 2019 11:13 PM
To: Rob Zuccaro <rzuccaro@louisvilleco.gov>; Felicity Selvoski <fselvoski@louisvilleco.gov>
Cc: Heather Balser <Heatherb@Louisvilleco.gov>; Megan Davis <mdavis@louisvilleco.gov>; City Council <Council@louisvilleco.gov>
Subject: 1013 Jefferson Ave

The Historic Structure Assessment on 1013 Jefferson Avenue states "the home is in good condition with no major repairs necessary."

The staff report notes we routinely pay for insulation. Could you please provide a link or two to previous HPF grants for insulation? Were water pipes involved?

And/or provide an explanation of how doing insulation in the 1013 Jefferson attic and crawl space preserves the structure?

I see no discussion from HPC members on this request in their minutes, just a 5-0 vote. Was there no discussion?

I am considering pulling this item from Consent.

Thank you in advance for any help in understanding why this is preservation/restoration and not maintenance.

PRESERVATION AND RESTORATION GRANT PROGRAM AGREEMENT

THIS PRESERVATION AND RESTORATION GRANT PROGRAM AGREEMENT (hereinafter "Agreement") is made and entered into this 13th day of November, 2018, by and between the City of Louisville, a Colorado home rule municipal corporation (hereinafter "City") and Paul and Erica Bieringer (hereinafter "Property Owner").

WITNESSETH:

WHEREAS, the City has made certain proceeds of the Historic Preservation Fund available to help property owners rehabilitate and preserve those resources which contribute to the character of
historic Old Town Louisville; and

WHEREAS, the Property Owner is the owner in fee simple of certain real property (the "Property") and the improvements thereon (the "Structure") located at 1021 Main Street, Louisville, Colorado; and

WHEREAS, the Property owner submitted an application to the City for approval of a Preservation and Restoration Grant for funding of exterior architectural and structural improvements to the Structure; and

WHEREAS, on November 5, 2018, the City Council adopted Resolution No.50, Series 2018, entitled A Resolution Approving a Preservation and Restoration Grant for the DiSalvo House located at 1021 Main Street (the "Resolution"); and

WHEREAS, the Resolution approved a grant in the amount of up to $42,929 to restore and preserve portions of the Structure as set forth in the attached Exhibit A; and

WHEREAS, the City and Property Owner desire to enter into this Agreement to define the roles and responsibilities of each of the parties regarding the grant;

NOW THEREFORE, in consideration of the mutual promises and covenants contained herein, the parties hereto agree as follows:

1. AMOUNT OF GRANT/ USE OF GRANT FUNDS: Pursuant to the disbursement schedule set forth in section 2 of this Agreement, the City agrees to reimburse the Property Owner in compliance with this Agreement in an amount of up to $42,929 (the "Grant") for the actual costs incurred by the Property Owner for the work set forth in Property Owner's Grant Application as approved by City Resolution No. 50, Series 2018 and as summarized in the attached Exhibit A (the "Work"). The City shall not make any disbursements unless elements of the Work are in compliance with all applicable plans, specifications, approvals and requirements.

2. COST/ DISBURSEMENT: Property Owner shall submit disbursement requests and the City shall make disbursements to Property Owner based upon the requirements in this Agreement.

For each disbursement request, Property Owner shall submit to the City copies of all invoices and pay records for all labor and materials used to complete the portion of the Work for which disbursement is sought. Each invoice shall contain sufficient detail regarding the element of Work that has been completed and shall relate directly to the Work items detailed in Exhibit A. The Property Owner shall submit an IRS Form W-9 completed and signed by the Property Owner; true and complete copies of all related payment records, agreements and orders for labor and materials; and such other supporting documentation as the City may require. When the City determines in its sole discretion that a submission is complete and payable pursuant to the terms of this Agreement, the City will make the applicable disbursement directly to the Property Owner within 10 days of such determination. The Property Owner is responsible for ensuring that all contractors and suppliers are paid.

3. INSPECTION AND AUDIT; ERRONEOUS PAYMENT: The City and its duly authorized representatives shall have access to all books, documents, papers, electronic files and records of the Property Owner that are related to this Agreement for the purpose of making audits and examinations and determining compliance with this Agreement. The City shall have access to the originals of all such materials and may make and keep copies thereof. If the City upon audit or otherwise determines that any amount has been paid to Property Owner in error for any reason, including, but not limited to overpayments or improper payments, then such funds shall be immediately repaid to the City upon demand and the same may be collected by any appropriate method as a debt to the City. Amounts not so repaid within 15 days of demand shall bear interest at the rate of one and one-half percent from the time of demand until the date of payment.

4. COMPLETION OF WORK: The Property Owner will undertake the construction of the Work in a timely manner. The Property Owner has twenty-four months to complete the Work, which time period shall begin upon the issuance of a building permit.

5. OTHER COSTS: Each party shall bear its own legal, accounting, overhead and administrative costs incurred in the drafting, execution or performance of this Agreement.

6. COMPLIANCE WITH CITY ORDINANCES: The Property Owner shall comply with all applicable City ordinances and building codes and shall be responsible at its own expense for obtaining and complying with all building and other permits required by the City for the completion of the Work.

7. TAX IMPLICATIONS: The City shall disclose the amount of grant funds distributed to the Property Owner to the Internal Revenue Service in accordance with the Internal Revenue Code and shall provide to the Property Owner and IRS Form 1099 showing the amount received. The Property Owner acknowledges and understands that grant funds constitute taxable income. The City makes no presentations or warranties concerning the tax consequences to the Property Owner as a result of receiving the grant funds.

8. FAILURE TO COMPLY: Any failure of the Property Owner to comply with the terms and conditions of this Agreement shall terminate the Property Owner's right to the Grant

payment.

9. NOTICE: Any notices or communication required or permitted hereunder shall be given in writing and shall be personally delivered, or sent by facsimile transmission or by United States mail, postage prepaid, registered or certified mail, return receipt requested, addressed as follows:

City:	Property Owner:
City of Louisville Attn: City Manager 749 Main Street Louisville, CO 80027 Fax: (303) 335-4550	Paul and Erica Bieringer 1021 Main Street Louisville, CO 80027

or to such other address or the attention of such other person(s) as hereafter designated in writing by the parties. Notices given in the manner described above shall be effective, respectively, upon personal delivery, upon facsimile receipt, or upon mailing.

10. ENTIRE AGREEMENT; AMENDMENTS: This writing, together with Exhibit A attached hereto, constitutes the entire Agreement between the parties hereto with respect to the subject matter herein, and shall be binding upon and inure to the benefit of the respective successors and assigns of said parties. This Agreement may be amended only by written agreement approved by both parties.

11. NO JOINT VENTURE OR PARTNERSHIP: Nothing contained in this Agreement is intended to create a partnership or joint venture between the City and the Property Owner with respect to the Work, and any implication to the contrary is hereby expressly disavowed. It is understood and agreed that this Agreement does not provide for the joint exercise by the parties of any activity, function or service, nor does it create a joint enterprise, nor does it authorize any party hereto to act as an agent of the other party hereto for any purpose.

12. GOVERNING LAW AND VENUE: This Agreement shall be governed by the laws of the State of Colorado and venue shall lie in the County of Boulder.

13. NO LIABILITY; NO WAIVER OF IMMUNITY: The City shall in no manner be liable to the Property Owner or any other person for any monies expended or liabilities incurred by the Property Owner in connection with the Grant program, whether or not the Property Owner is actually paid any funds from the Grant. No portion of this Agreement shall be deemed to constitute a waiver of any immunities the parties or their officers or employees may possess, nor shall any portion of this Agreement be deemed to have created a duty of care which did not previously exist with respect to any person not a party to this Agreement.

14. NO THIRD PARTY BENEFICIARY ENFORCEMENT: It is expressly understood and agreed that the enforcement of the terms and conditions of this Agreement, and all rights of action relating to such enforcement, shall be strictly reserved to the undersigned parties and

nothing in this Agreement shall give or allow any claim or right of action whatsoever by any other person not included in the Agreement. It is the express intention of the undersigned parties that any entity other than the undersigned parties receiving services or benefits under this Agreement shall be considered to be an incidental beneficiary only.

15. ASSIGNMENT: This Agreement may not be assigned by the Property Owner without the prior written consent of the City, which consent may be given or withheld at the City's sole discretion.

16. INDEMNIFICATION: The Property Owner shall be liable and responsible for any and all damages to persons or property caused by or arising out of the actions, obligations, or omissions of the Property Owner, its officers, employees, contractors, agents, representatives or other persons acting under the Property Owner's direction or control in performing or failing to perform any obligation of Property Owner under this Agreement or in any matter related to completion of the Work. To the fullest extent allowed by law, the Property Owner will indemnify and hold harmless the City, its elected and appointed officials, and its employees, agents and representatives (the "indemnified parties"), from any and all liability, claims, demands, liens, claims on funds, actions, damages, losses, judgments, costs or expenses, including but not limited to attorneys' fees, which may be made or brought or which may result against any of the indemnified parties as a result or on account of the actions or omissions of the Property Owner, its officers, employees, contractors, agents or representatives, or other persons acting under the Contractor's direction or control in any manner related to this Agreement or completion of the Work.

17. PAYMENTS TO CONSTITUTE CURRENT EXPENDITURES: Property Owner acknowledges and agrees that all payment obligations under this Agreement are current expenditures of the City, payable in the fiscal year for which funds are appropriated for the payment thereof. The City's obligations under this Agreement shall be from year to year only and shall not constitute a multiple-fiscal year direct or indirect debt or other financial obligation of Town within the meaning of Article X, Section 20 of the Colorado Constitution.

18. LEGAL CHALLENGE; ESCROW: The City shall have no obligation to make any grant payment hereunder during the pendency of any legal challenge to this Agreement. Any funds appropriated for payment under this Agreement shall be escrowed in a separate City account in the event there is a legal challenge to this Agreement.

19. TERMINATION: This Agreement shall terminate and become void and of no force or effect upon the City if Property Owner has not completed the Work in compliance herewith by July 1, 2021.

IN WITNESS WHEREOF, the parties have caused this instrument to be duly executed this _____day of _____, 20__.

PROPERTY OWNER:

_____

By:

Title: _____

CITY OF LOUISVILLE,
a Colorado home rule municipal corporation

By: _____
Robert P. Muckle, Mayor

Attest:

By: _____
Meredyth Muth, City Clerk

EXHIBIT A

DETAIL OF WORK/COST OF WORK

The grant includes $42,929 in matching funds for the following work on the existing structure at 1021 Main Street:

- **Site**
  - Site Grading, Remove Tree, Fencing (repair and replace missing section)
- **Foundation**
  - Foundations to support main floor, Repair/sealant at existing perimeter, Excavation
- **Structural Systems**
  - Reinforce main floor framing, Porch floor framing
- **Exterior Siding**
  - Repair, prep, paint historic siding and trim
- **Appurtenances (Porches)**
  - Porch, first floor replacement, Porch railing, Porch, second floor replacement
- **Envelope – Insulation**
  - Insulation, wall and roof
- **Envelope - Roofing and Waterproofing**
  - Roofing, Repair gutters and downspouts
- **Doors and Windows**
  - Window – full restoration (x5), Window – second floor egress windows (x2),
  - Exterior door – repair main level, Exterior door – new 2nd floor
- **Mechanical Systems**
  - New furnace
- **Electrical Systems**
  - Underground service, interior wiring

PRESERVATION AND RESTORATION GRANT PROGRAM AGREEMENT

THIS PRESERVATION AND RESTORATION GRANT PROGRAM AGREEMENT (hereinafter "Agreement") is made and entered into this 21st day of July, 2017, by and between the City of Louisville, a Colorado home rule municipal corporation (hereinafter "City") and James Caleb Dickinson (hereinafter "Property Owner").

WITNESSETH:

WHEREAS, the City has made certain proceeds of the Historic Preservation Fund available to help property owners rehabilitate and preserve those resources which contribute to the character of
historic Old Town Louisville; and

WHEREAS, the Property Owner is the owner in fee simple of certain real property (the "Property") and the improvements thereon (the "Structure") located at 721 Grant Avenue, Louisville, Colorado; and

WHEREAS, the Property owner submitted an application to the City for approval of a Preservation and Restoration Grant for funding of exterior architectural and structural improvements to the Structure; and

WHEREAS, on December 6, 2016, the City Council adopted Resolution No. 69, Series 2016, entitled A Resolution Approving a Preservation and Restoration Grant for the Louisville Hospital located at 721 Lincoln Avenue (the "Resolution"); and

WHEREAS, the Resolution approved a grant in the amount of up to $73,436.50 to restore and preserve portions of the Structure as set forth in the attached Exhibit A; and

WHEREAS, the City and Property Owner desire to enter into this Agreement to define the roles and responsibilities of each of the parties regarding the grant;

NOW THEREFORE, in consideration of the mutual promises and covenants contained herein, the parties hereto agree as follows:

1. AMOUNT OF GRANT/ USE OF GRANT FUNDS: Pursuant to the disbursement schedule set forth in section 2 of this Agreement, the City agrees to reimburse the Property Owner in compliance with this Agreement in an amount of up to $73,436.50 (the "Grant") for the actual costs incurred by the Property Owner for the work set forth in Property Owner's Grant Application as approved by City Resolution No. 69, Series 2016 and as summarized in the attached Exhibit A (the "Work"). The City shall not make any disbursements unless elements of the Work are in compliance with all applicable plans, specifications, approvals and requirements.

2. COST/ DISBURSEMENT: Property Owner shall submit disbursement requests and the City shall make disbursements to Property Owner based upon the requirements in this Agreement.

For each disbursement request, Property Owner shall submit to the City copies of all invoices and pay records for all labor and materials used to complete the portion of the Work for which disbursement is sought. Each invoice shall contain sufficient detail regarding the element of Work that has been completed and shall relate directly to the Work items detailed in Exhibit A. The Property Owner shall submit an IRS Form W-9 completed and signed by the Property Owner; true and complete copies of all related payment records, agreements and orders for labor and materials; and such other supporting documentation as the City may require. When the City determines in its sole discretion that a submission is complete and payable pursuant to the terms of this Agreement, the City will make the applicable disbursement directly to the Property Owner within 10 days of such determination. The Property Owner is responsible for ensuring that all contractors and suppliers are paid.

3. INSPECTION AND AUDIT; ERRONEOUS PAYMENT: The City and its duly authorized representatives shall have access to all books, documents, papers, electronic files and records of the Property Owner that are related to this Agreement for the purpose of making audits and examinations and determining compliance with this Agreement. The City shall have access to the originals of all such materials and may make and keep copies thereof. If the City upon audit or otherwise determines that any amount has been paid to Property Owner in error for any reason, including, but not limited to overpayments or improper payments, then such funds shall be immediately repaid to the City upon demand and the same may be collected by any appropriate method as a debt to the City. Amounts not so repaid within 30 days of demand shall bear interest at the rate of one and one-half percent from the time of demand until the date of payment.

4. COMPLETION OF WORK: The Property Owner will undertake the construction of the Work in a timely manner. The Property Owner has nine months to complete the Work, which time period shall begin upon the issuance of a building permit.

5. OTHER COSTS: Each party shall bear its own legal, accounting, overhead and administrative costs incurred in the drafting, execution or performance of this Agreement.

6. COMPLIANCE WITH CITY ORDINANCES: The Property Owner shall comply with all applicable City ordinances and building codes and shall be responsible at its own expense for obtaining and complying with all building and other permits required by the City for the completion of the Work.

7. TAX IMPLICATIONS: The City shall disclose the amount of grant funds distributed to the Property Owner to the Internal Revenue Service in accordance with the Internal Revenue Code and shall provide to the Property Owner and IRS Form 1099 showing the amount received. The Property Owner acknowledges and understands that grant funds constitute taxable income. The City makes no presentations or warranties concerning the tax consequences to the Property Owner as a result of receiving the grant funds.

8. FAILURE TO COMPLY: Any failure of the Property Owner to comply with the terms

and conditions of this Agreement shall terminate the Property Owner's right to the Grant payment.

9. NOTICE: Any notices or communication required or permitted hereunder shall be given in writing and shall be personally delivered, or sent by facsimile transmission or by United States mail, postage prepaid, registered or certified mail, return receipt requested, addressed as follows:

City:	Property Owner:
City of Louisville Attn: City Manager 749 Main Street Louisville, CO 80027 Fax: (303) 335-4550	James Caleb Dickinson 721 Grant Avenue Louisville, CO 80027

or to such other address or the attention of such other person(s) as hereafter designated in writing by the parties. Notices given in the manner described above shall be effective, respectively, upon personal delivery, upon facsimile receipt, or upon mailing.

10. ENTIRE AGREEMENT; AMENDMENTS: This writing, together with Exhibit A attached hereto, constitutes the entire Agreement between the parties hereto with respect to the subject matter herein, and shall be binding upon and inure to the benefit of the respective successors and assigns of said parties. This Agreement may be amended only by written agreement approved by both parties.

11. NO JOINT VENTURE OR PARTNERSHIP: Nothing contained in this Agreement is intended to create a partnership or joint venture between the City and the Property Owner with respect to the Work, and any implication to the contrary is hereby expressly disavowed. It is understood and agreed that this Agreement does not provide for the joint exercise by the parties of any activity, function or service, nor does it create a joint enterprise, nor does it authorize any party hereto to act as an agent of the other party hereto for any purpose.

12. GOVERNING LAW AND VENUE: This Agreement shall be governed by the laws of the State of Colorado and venue shall lie in the County of Boulder.

13. NO LIABILITY; NO WAIVER OF IMMUNITY: The City shall in no manner be liable to the Property Owner or any other person for any monies expended or liabilities incurred by the Property Owner in connection with the Grant program, whether or not the Property Owner is actually paid any funds from the Grant. No portion of this Agreement shall be deemed to constitute a waiver of any immunities the parties or their officers or employees may possess, nor shall any portion of this Agreement be deemed to have created a duty of care which did not previously exist with respect to any person not a party to this Agreement.

14. NO THIRD PARTY BENEFICIARY ENFORCEMENT: It is expressly understood and agreed that the enforcement of the terms and conditions of this Agreement, and all rights of action relating to such enforcement, shall be strictly reserved to the undersigned parties and nothing in this Agreement shall give or allow any claim or right of action whatsoever by any other person not included in the Agreement. It is the express intention of the undersigned parties that any entity other than the undersigned parties receiving services or benefits under this Agreement shall be considered to be an incidental beneficiary only.

15. ASSIGNMENT: This Agreement may not be assigned by the Property Owner without the prior written consent of the City, which consent may be given or withheld at the City's sole discretion.

16. INDEMNIFICATION: The Property Owner shall be liable and responsible for any and all damages to persons or property caused by or arising out of the actions, obligations, or omissions of the Property Owner, its officers, employees, contractors, agents, representatives or other persons acting under the Property Owner's direction or control in performing or failing to perform any obligation of Property Owner under this Agreement or in any matter related to completion of the Work. To the fullest extent allowed by law, the Property Owner will indemnify and hold harmless the City, its elected and appointed officials, and its employees, agents and representatives (the "indemnified parties"), from any and all liability, claims, demands, liens, claims on funds, actions, damages, losses, judgments, costs or expenses, including but not limited to attorneys' fees, which may be made or brought or which may result against any of the indemnified parties as a result or on account of the actions or omissions of the Property Owner, its officers, employees, contractors, agents or representatives, or other persons acting under the Contractor's direction or control in any manner related to this Agreement or completion of the Work.

17. PAYMENTS TO CONSTITUTE CURRENT EXPENDITURES: Property Owner acknowledges and agrees that all payment obligations under this Agreement are current expenditures of the City, payable in the fiscal year for which funds are appropriated for the payment thereof. The City's obligations under this Agreement shall be from year to year only and shall not constitute a multiple-fiscal year direct or indirect debt or other financial obligation of Town within the meaning of Article X, Section 20 of the Colorado Constitution.

18. LEGAL CHALLENGE; ESCROW: The City shall have no obligation to make any grant payment hereunder during the pendency of any legal challenge to this Agreement. Any funds appropriated for payment under this Agreement shall be escrowed in a separate City account in the event there is a legal challenge to this Agreement.

19. TERMINATION: This Agreement shall terminate and become void and of no force or effect upon the City if Property Owner has not completed the Work in compliance herewith by June 30, 2018.

IN WITNESS WHEREOF, the parties have caused this instrument to be duly executed this 21st day of July, 2017.

PROPERTY OWNER:

By: _____

Title: James Caleb Dickinson

CITY OF LOUISVILLE,
a Colorado home rule municipal corporation

By: _____
Robert P. Muckle, Mayor

Attest:

By: _____
Meredyth Muth, City Clerk

CITY OF LOUISVILLE SEAL COLORADO

EXHIBIT A

DETAIL OF WORK/COST OF WORK

Grant reimbursement up to $$73,436.50 for the following work items:

- Appurtenances
  - New railings, balusters and columns to match historic photos
- Doors and windows
  - Remove replacement windows and provide new with correct proportions
  - Remove replacement doors and provide new rail style doors
  - Repair and paint historic windows
  - Repair existing historic door
- Mechanical systems
  - Install new furnace and duct work
- Electrical systems
  - Underground service & interior wiring/distribution
  - Install smoke and CO2 detectors
- Site grading and drainage
  - Install drainage swales
  - Repair gutters
- Foundation
  - House shoring/lifting
  - Excavation
  - New foundations
- Structural systems
  - Repair rim board/lower wall
  - Repair/replace floor joists
  - Install roof framing reinforcements
- Exterior walls
  - Remove aluminum siding
  - Repair, prep, paint historic wood siding
- Envelope –Roofing
  - Re-roof with asphalt shingles
- Envelope – Insulation
  - Fill walls with spray fill cellulose
  - Insulate attic

From:	Caleb Dickinson
To:	City Council
Subject:	Resolution 10 tonight
Date:	Monday, November 4, 2019 4:37:01 PM

Hello Council and Mayor,

I was very pleased to see the 7-0 vote to approve the 1.5M rebate to Medtronics for their project at the Conoco/Phillips site. I agree with staff's recommendation and your reasoning that was articulated at the last meeting.

I heard the following points made:

- This is a local company that has been a good presence in Louisville
- We were concerned about them leaving our city before this project was announced
- We are excited about them attracting new employees to the area
- These jobs will be very high paying
- This project (building, employees, redevelopment) will give a boost to the surrounding area and add to our bottom line
- The rebate is only given after having received new revenue
- Basically, the entire purpose of BAP is to create these types of investment in our community.

I hope that we will see another 7-0 vote tonight to approve the Terraces on Main TIFF rebate. We have put this company through years of process to get to this point. We even created an entirely new process of 3rd party review in order to validate their request. This 3rd party review yielded a convincing argument for the rebate.

My understanding is that Boulder Creek Neighborhoods is:

- A local company that has been a good presence in Louisville
- We are concerned about them leaving our downtown if this project is not approved
- We are excited about them attracting new employees to the area who will shop in our downtown stores and restaurants
- These jobs are high paying
- This project (building, employees, redevelopment) will give a boost to the surrounding area and add to our bottom line
- The rebate is only given after having received new revenue
- Basically, the entire purpose of the TIFF rebate is to create these types of investment in our downtown community

If you are considering voting against the TIFF rebate for Terraces on Main, I hope that there are very clear reasons for treating these two companies differently.

There are definitely differences between a BAP and a TIFF rebate, but they seem to be similar incentive programs to help developers invest in our community.

Of course, Council already voted 7-0 to approve the project, so I know the issue isn't with the

building, the location or any of that. After several rounds and revisions we got a design that was palatable to everyone at the meeting, Council and public alike.

Staff recommends approval of the TIFF rebate and I hope that you all agree.

Respectfully,

Caleb Dickinson

From:	Kurt Kowar
To:	City Council
Cc:	Cory Peterson; Heather Balser; Megan Davis; Kevin Watson; Rob Zuccaro
Subject:	Additional Tap Fee Increase Requests For Information
Date:	Monday, November 4, 2019 3:45:40 PM
Attachments:	2019 Tap Fee Surrounding Cities.pdf Ordinance 2000-1339.pdf 2016 Water Management Plan - Final.pdf Water Efficiency Plan_Final_Jan2015.pdf

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All,

On an ongoing basis staff works under the guidance of Ordinance No. 1339, Series 2000 (attached), that delegates the City Administrator the authority to establish city water tap fees on a quarterly basis. A water tap fee increase is on tonight's agenda for discussion.

We received several great questions from folks regarding the proposed tap fee increases for this evening. I wanted to try and provide as much information in advance of the meeting to answer those questions or validate statements made. Please continue to read for additional information:

#1 - Statement: Basically, the traditional domestic 1.25 inch line has increased from $122,000 to $214,000. That is a substantial increase if someone wants to build a house. For a commercial property with a potential 2 inch line, the cost rises from $217,000 to $380,500.

A: The typical Single Family Home Tap Size is ¾". Some of the very large homes being built gravitate into the 1" range.

#2 – Question: While the price of CBT water is definitely trending up in the graph provided, the market value appears to go down sometimes. Does our model account for decreases as well as increases?

A: The City can increase and decrease tap fees as it feels is reasonable to recover the cost of water acquisition. In addition, staff has also now providing the ability for a developer to bring their own water shares for consideration under the assumption that developers may be able to acquire CBT at a cheaper cost somehow.

#3 – Question: Do we ever adjust tap fees mid-year to account for market changes?

A: Staff reviews tap fees on an ongoing basis. The last time staff felt there was an incremental need to increase tap fees was in 2016.

#4 Question: Staff indicates various communities are also raising tap fees. What are their proposed rates and how do they compare to ours?

A: A pdf of surrounding community tap fees is provided for review.

#5 Question: Our policy that growth pays its own way and costs should not be foisted on existing residents remains the guiding principle. However, if these new tap fees put us at a disadvantage, some staff suggestions on how we stay competitive would be useful.

A: This would need to be a future policy discussion with the City Council, Economic Development Director, and City Manager.

#6 Statement - I would appreciate more detail on the pros and cons of developers providing water rights in lieu of tap fees.

A: Cons – If a developer dedicates CBT water to the City there is not a downside as we understand our estimated tap fee costs for infrastructure and water. Pro – A developer may have opportunities to purchase or utilize an existing inventory of CBT water that the City may not.

#7 Statement - Links to minutes/discussions by members of the Utility and Finance Committees on this topic might also be enlightening.

A: https://www.louisvilleco.gov/home/showdocument?id=24843 (Page 5 of 6 of the minutes, Paragraph 2). This was also discussed at the October 25, Finance Committee, and October 30 Utility Committee. Minutes are not yet available for these.

#8 Question - 1- According to our current practices, at what point in the development review process does an applicant actually make a request and is assessed for water taps? Is it when they apply for a building permit or is it earlier in the review process? Do we have more time to analyze and consider the water tap fee proposal?

A: Applicants are assessed fees at the time a building permit is requested to be issued. Applicants are also provided tap fee information during pre-app meetings so that they are aware of current costs. Staff try to communicate and provide adequate heads up on tap fees so that there are not surprises at the time of payment. The burden of setting tap fees has been placed upon the City Administrator by Ordinance for efficiency, accuracy, and the necessity to properly and adequately finance the services provided by the water enterprise. However, the City Council may take as much time to set tap fees as they would like.

#9 Question - 2- Can staff provide Council with an analysis of the City's current inventory of water and how much additional development that any current surpluses could support recognizing our needs for resiliency against climate change and cyclical draught conditions. I

don't recall City Council seeing analysis of that kind in recent years. What is our capacity today and what will we need in the future?

A: On June 6, 2017 City Council approved an update of the City's Municipal Water Management Plan (attached). This was reviewed and built upon previous Raw Water Master Plans (1992, 1998, 2003). In addition, the City also completed a Water Efficiency Plan in 2014/2015 to be in compliance with the Colorado Water Conservation Board best practices and setup for the loan documentation requirements of the WWTP and Stormwater Loans. The City dependent on many different factors could utilize another 200 - 700 acre feet of water. One unit of CBT is 0.6 acre feet of water. Climate change analysis in this area doesn't provide definitive conclusions. Estimates range from an increase of 20% in precipitation to a decrease in 20% of precipitation with runoff likely shifting to earlier in the year by a month.

#9 Question: 3- What are the City's processes for providing credits to parcels being proposed for new or re-development which had already acquired water taps in the past? Is the cost of new taps at higher fees off-set partially by the capacity and taps already purchased for those properties mitigating the impacts to these developments?

A: Taps can be credit the actual cash payment that they provided at the original time of tap purchase. Sometimes this information is in City records and sometimes it is not. Staff will review historical usage of tap and consider the context of use for upsize requests. In addition, staff will review a volumetric credit based upon the City's published annual water budgets for specific tap sizes.

#10 Question - 4- Inasmuch as the City increased the requirements for sprinkling residential and commercial properties in recent years and thus causing the property owners to increase their associated tap sizes to accommodate the rare use of inside sprinkling systems, was that change reflected in our current modeling for replacement water? Obviously, the use of that water capacity would be highly infrequent and wouldn't be a continuing burden on the City's on-going water needs.

A: When the Residential Sprinkler Ordinance was approved the water ordinance was updated as well. If the sprinkler is the reason for an upsize there is not an additional charge. In fact, we are installing 1" meters by default for Single Family Residential homes to address this even though we collect tap fee for a ¾" tap.

#11 Question - 5- Can the staff provide a chart showing Louisville's current tap fees compared to the surrounding communities (Boulder, Lafayette, Superior, Broomfield, etc.) also indicating the new tap fees being proposed?

A: Information is attached. City Council has pushed staff to maintain accurate practices and

make data driven decisions. This recommendation reflects that ability to work with up to date cost models and react quickly to valid information. We do not believe other Cities are working under the clarity of cost recovery guidance that Louisville does or has current practices in place to respond quickly to market fluctuations in a confident and calculated manner. Some cities have new staff that are figuring out their principles, some cities subsidize their Utility, some cities do not subscribe to full cost recovery for various other reasons. Louisville's past and present have always been crystal clear regarding utility cost recovery.

#12 Question - 6- Can staff provide us a full list of CBT acquisitions over the past five years including the amounts purchased and the costs per unit? Also, could staff provide Council with the City's water consultant's forecast for future prices of CBT water?

A: Staff has been provided proprietary broker information that validates staff's recommendation. Unfortunately, this information is not publicly available. No one has a crystal ball for the forecast of future CBT prices. Strong growth now occurring in the Northern Colorado Front Range is driving pricing beyond increases traditionally seen in the early 2000's. 25 different sale transactions have occurred since June of 2019 with a price above $45,000 per unit of CBT. These were by Water Districts, Towns, and Developers. The average of the most recent 10 transactions with cost data available is $55,867. Information reviewed provides definitive trends of increasing CBT share costs.

#13 Question - - 7- What other policy and pricing alternatives did the City staff consider as part of a migration strategy for tap fee increases that would both meet our community goal of having growth pay its own way while maintaining the City's economic competitiveness and housing cost affordability? Are there any more scalable approaches we could consider that would attain both goals?

A: The methodology of setting water tap fees through utilization of CBT price as an indicator dates back to 2000. Utility Staff keep a pure unbiased view on cost recovery. It has been clear guidance from previous City Council Actions, previous Public Works Director memos and actions, and previous Utility Committee and Citizen Rate Committees.

TAP FEE COMPARSION TABLE				
Municipality	Water	Sewer	Storm	Total
2019 Broomfield	$ 23,577	$ 12,559	N/A	$ 36,136
2020 Broomfield (est)	$ 24,756	$ 12,559	N/A	$ 37,315
2019 Erie	$ 30,380	$ 5,200	$ 1,612	$ 37,192
2019 Lafayette	$ 19,760	$ 5,300	$ 9,570	$ 34,630
2019 Superior	$ 23,340	$ 4,803	$ 2,982	$ 31,125
2020 Superior (est)	$ 24,040	$ 4,947	$ 3,071	$ 32,059
2019 Louisville	$ 30,500	$ 4,600	N/A	$ 35,100
2020 Louisville (proposed)	$ 53,500	$ 5,500	N/A	$ 59,000

ORDINANCE NO. 1339
SERIES 2000

AN ORDINANCE DELEGATING TO THE CITY ADMINISTRATOR THE AUTHORITY TO ESTABLISH CITY WATER TAP FEES ON A QUARTERLY BASIS AND AMENDING CERTAIN SECTIONS OF CHAPTER 13.12 OF THE LOUISVILLE MUNICIPAL CODE IN CONNECTION THEREWITH.

WHEREAS, the City Council finds that the costs of water necessary to supply the City's waterworks, as well as other costs to be paid through the City's water tap fee, have increased dramatically in recent years; and

WHEREAS, the City Council finds that the increases it has adopted to the City's water tap fee have not kept pace with the increases in such costs; and

WHEREAS, the City Council finds that adjustment of the City water tap fee by ordinance is a cumbersome procedure that does not allow timely adjustments to the water tap fee to reflect increases in such costs; and

WHEREAS, the City Council finds that, in order to allow for timely adjustments of the water tap fee to reflect increases in such costs, the tap fee should be set and adjusted by the City Administrator on a quarterly basis, subject to certain guidelines that will enable the City Administrator to carry out the intent of the City Council; and

WHEREAS, the City Council has determined that delegating to the City Administrator the authority and responsibility to set water tap fees in the most efficient means to set and maintain accurate and up-to-date water tap fees; and

WHEREAS, the City Council has determined that such a method of setting the City's water tap fee is necessary to properly and adequately finance the services provided by the City's water activity enterprise.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LOUISVILLE, COLORADO:

Section 1. Subsections C and D of Section 13.12.020 of the Louisville Municipal Code are hereby amended to read as follows (words added are underlined; words deleted are ~~stricken through~~):

C. The amount of the tap fee for residential units shall be determined by the city and shall be based upon the size of the tap, as calculated pursuant to the provisions of the International ~~Uniform~~ Plumbing Code then in effect, and by

reference to the ~~appropriate~~ table of fees established by the city administrator in accordance with ~~as set forth in~~ section 13.12.040; provided that the minimum tap fee paid for each multifamily unit other than a townhouse after payment in full for the first tap issued shall be 60 percent of the existing charge for a three-quarter-inch tap and provided that the minimum tap fee paid for each townhouse in a group of attached "townhouses," as defined in Code section 17.08.560, after payment in full for the first tap issued, shall be 80 percent of the existing charge for a three-quarter-inch tap.

D. The tap fee for nonresidential units shall be determined by the city and shall be based upon the size of the tap, as calculated pursuant to the provisions of the International ~~Uniform~~ Plumbing Code then in effect, and ~~Table B of~~ by reference to the table of fees established by the city administrator in accordance with section 13.12.040.

Section 2. Subsection C of Section 13.12.030 of the Louisville Municipal Code is hereby amended to read as follows (words added are underlined; words deleted are ~~stricken through~~):

C. In the event a consumer desires to provide automatic fire-control protection for the consumer's premises and for emergency service only, which requires a tap larger than three-fourths-inch, the tap fee charged shall be based only on the demand set forth in the International Plumbing Code and by reference to the table of fees established by the city administrator in accordance with ~~Table B of~~ section 13.12.040. The user shall be required to pay the full cost of installation of the service, including all pipe, valves, and valve boxes.

Section 3. The title of Section 13.12.040, and Subsections A and B of Section 13.12.040, of the Louisville Municipal Code are hereby amended to read as follows (words added are underlined; words deleted are ~~stricken through~~):

Sec. 13.12.040. Tap Fee~~--Table B.~~

A. The tap fee shall be computed by reference to Sections 13.12.020 and 13.12.030, ~~the appropriate classification in Table B, below, and~~ subsection D of this section, if applicable, and a table of fees established by the city administrator. On or before July 17, 2000, for the balance of the third calendar quarter of 2000, and by the first day of each calendar quarter thereafter, the city administrator shall by order establish a table of city water tap fees to be paid for the ensuing calendar quarter. The tap fees shall classified according to the size of the tap requested, for taps up to four inches. The tap fees shall be based on and used for growth related capital expansion costs of water supply, water storage, transmission, treatment and distribution facilities, related costs and factors. The tap fees shall reflect the city's

overall costs incurred to provide services for which the tap is requested and for which the tap fee is designed. The city council may be resolution call up a current table of tap fees adopted by the city administrator and require adjustments thereto that are consistent with the provisions of this chapter, which changes shall remain effective for the balance of the calendar quarter. The current table of tap shall be posted at city hall. All applicants for a water tap shall be advised as to the existence of table of tap fees and a copy thereof shall be made available to such applicants.

~~**TABLE B**~~

~~Effective January 25, 2000~~

~~Fee Calculations~~

~~Demand (gpm)~~	~~Tap Size~~	~~Tap Fee~~
~~0-22~~	~~¾"~~	~~$13,400~~
~~23-45~~	~~1"~~	~~19,800~~
~~46-80~~	~~1½"~~	~~39,700~~
~~81-140~~	~~2"~~	~~79,400~~
~~141-280~~	~~3"~~	~~178,600~~
~~281-500~~	~~4"~~	~~357,100~~

For taps larger than 4 inches, the tap fee and other terms and conditions of the issuance of the tap shall be established by written agreement approved by the city council.

B. For landscape areas using drip irrigation systems, tap fees shall be as set forth in the table of fees established by the city administrator in accordance with section 13.12.040.A ~~listed below~~. Drip irrigation tap fees shall be limited to computable irrigation system flow rates of five gallons per minute, or less, and to areas less than 4,000 square feet. Drip irrigation taps are not available for landscaped areas incorporating spray irrigation landscaping, regardless of size. Drip irrigation systems shall be physically restricted in flow capacity to five gallons per minute or less.

~~Effective January 1, 1993,~~

~~*Demand (gpm)*~~	~~*Tap fee*~~
~~0-5~~	~~$1,650.00~~

Section 4. Section 13.12.050 of the Louisville Municipal Code are hereby amended to read as follows (words added are underlined; words deleted are ~~stricken through~~):

Sec. 13.12.040. Tap Fee--Outside city limits.

For any tap applied for where the service requested is out of the city limits, the fee will be two times the fee as established pursuant to ~~calculated in Table B of~~ section 13.12.040.

Section 5. This ordinance shall take effect July 17, 2000, provided the same has been previously published as required by C.R.S. section 31-16-105.

Section 6. If any portion of this ordinance is held to be invalid for any reason, such decision shall not affect the validity of the remaining portions of this ordinance. The City Council hereby declares that it would have passed this ordinance and each part hereof irrespective of the fact that any one part be declared invalid.

Section 7. The repeal or modification of any provision of the Municipal Code of the City of Louisville by this ordinance shall not release, extinguish, alter, modify, or change in whole or in part any penalty, forfeiture, or liability, either civil or criminal, which shall have been incurred under such provision, and each provision shall be treated and held as still remaining in force for the purpose of sustaining any and all proper actions, suits, proceedings, and prosecutions for the enforcement of the penalty, forfeiture, or liability, as well as for the purpose of sustaining any judgment, decree, or order which can or may be rendered, entered, or made in such actions, suits, proceedings, or prosecutions.

Section 8. All other ordinances or portions thereof inconsistent or conflicting with this ordinance or any portion hereof are hereby repealed to the extent of such inconsistency or conflict.

INTRODUCED, READ, PASSED ON FIRST READING, AND ORDERED PUBLISHED this 16th day of May, 2000.

CITY OF LOUISVILLE SEAL COLORADO

Tom Davidson

Tom Davidson, Mayor

Nancy Varra

Nancy Varra, City Clerk

APPROVED AS TO FORM:

Griffiths, Tanoue & Light, P.C.
City Attorney

PASSED AND ADOPTED ON SECOND AND FINAL READING, this 20th day of June, 2000.

CITY OF LOUISVILLE SEAL COLORADO

ATTEST:

Tom Davidson, Mayor

Nancy Varra, City Clerk

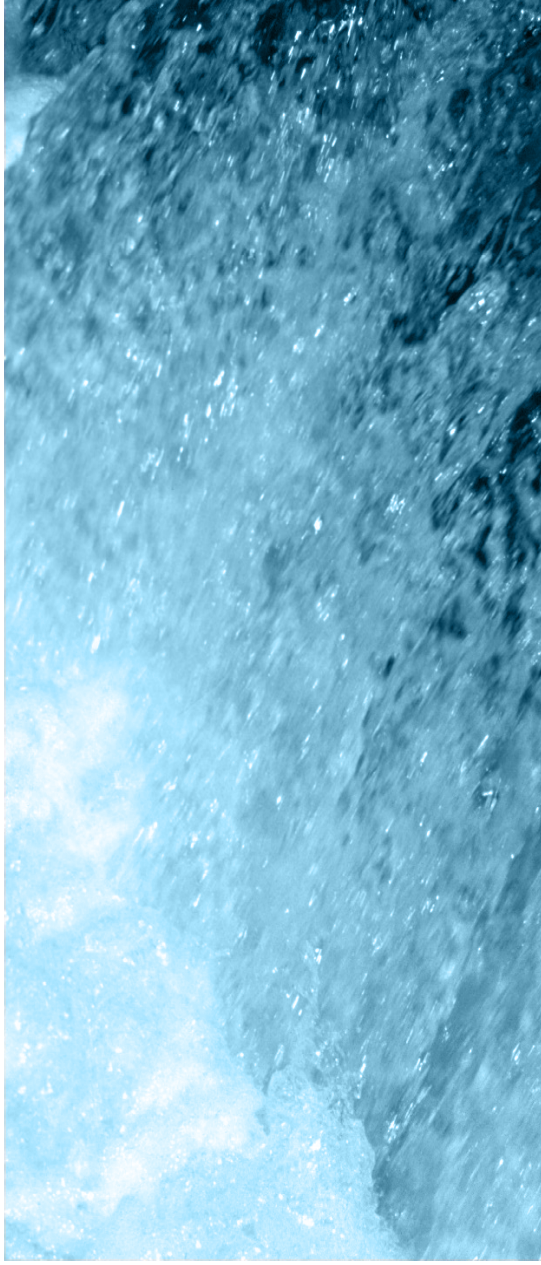
Water Efficiency Plan

Prepared for

City of Louisville

COLORADO • SINCE 1878

January 2015



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WaterDM
DEMAND MANAGEMENT

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Report

Water Efficiency Plan

Prepared for

City of Louisville

January 2015

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1 City of Louisville Water Rate Structure
2 Public Review Supporting Documentation
3 Compliance with State Requirements

Acronyms and Abbreviations

AMI	advanced metering infrastructure
AMR	automated meter reading
AWWA	American Water Works Association
BMP	best management practice
C-BT	Colorado-Big Thompson
cfs	cubic feet per second
CIP	capital improvement plan
CIS	Customer Information System
City	City of Louisville
COMI	commercial-inside
COMO	commercial-outside
CRC	Center for ReSource Conservation
CTC	Colorado Technology Center
CWCB	Colorado Water Conservation Board
°F	degrees Fahrenheit
FRICO	Farmers Reservoir and Irrigation Company
gpcd	gallons per capita per day
HOA	homeowners association
IPPs	Identified Projects and Processes
IRRI	irrigation
IWA	International Water Association
LMC	Louisville Municipal Code
MF	multifamily
MG	million gallons
mgd	million gallons per day
M&I	municipal and industrial
PRSV	pre-rinse spray valve
RESI	residential-inside
RESO	residential-outside
SWSI	Statewide Water Supply Initiative
WTP	water treatment plant
WWTP	wastewater treatment plant

1 Profile Existing Water System

1.1 Overview and Purpose

The City of Louisville (City) is a Colorado municipality covering a service area of 8.50 square miles with an estimated population of 18,771 in 2014 (the population estimated from the 2010 US Census was 18,376). The City, incorporated in 1878, lies in Boulder County roughly 6 miles east of Boulder and 25 miles northwest of Denver. On average the City has 15.5 inches of rain and 275 days of sunshine a year. Mean monthly temperatures range from 29.5 degrees Fahrenheit (°F) in January to 72°F in July. At this time, the City owns, either alone or in conjunction with other governmental entities, approximately 1,700 acres of designated open space.

The residential size of the City is not likely to grow significantly, with an estimated population of 22,145 at full occupation. There is the potential for significant commercial and industrial growth at three main business centers: Centennial Valley, the Colorado Technology Center, and the Phillips 66 campus.

The City has two water treatment facilities with capacity to produce up to 12.1 million gallons per day (mgd) of potable water, potable water storage in the distribution system of 8.5 million gallons, 115 miles of finished water distribution system piping, and 6,784 service taps (as of 2013). The City has a treatment plant to reuse wastewater for irrigation; the treatment capacity of the reuse plant is 2 mgd, although the amount available for reuse varies depending on water rights operations.

1.2 Water Supply and Reliability

The City of Louisville obtains the majority of its water supply from South Boulder Creek through direct flow rights, storage rights, and exchanges. The City is also a participant in Northern Water's Colorado-Big Thompson (C-BT) project and the Windy Gap project. The City also obtains water from Boulder Creek through exchanges and has some storage and direct flow rights on Coal Creek. The City maintains water rights for the municipal water system as well as for agricultural uses. South Boulder Creek rights are transferred ditch rights so there is a lot of supply in the spring. Water supply in the winter is primarily from storage in Harper, Louisville, and Marshall Reservoirs. Summer water supply is augmented with C-BT water to meet peak demand. This augmentation is sometimes required due to algal blooms in the Louisville reservoir that cause water quality issues. A summary of storage water rights is provided in Table 1.

TABLE 1
City of Louisville Raw Water Storage Summary

Storage	Volume (acre-feet)	Notes
Harper Reservoir	715	—
Louisville Reservoir	210	—
Marshall Lake (Louisville Farmers Reservoir and Irrigation Company [FRICO] share, South Boulder and Coal Creek Storage Water, and Foreign Water)	1,020 to 2,540	—
Colorado-Big Thompson Storage	1,447	—
Total raw water storage capacity	3,392 to 4,912	Depending on FRICO share and Marshall

The *2003 Raw Water Master Plan Update* included an analysis of baseline yields of the City's raw water supply system. Determining the water yield is a complex analysis that attempts to account for the details of water rights, including return flow obligations, legal priority of the water right, and conveyance. The master plan estimated the maximum divertible yields from South Boulder Creek range from 2,000 to 4,700 acre-feet each year, and nearly 80 percent of that amount is divertible only during the months of May through July. The Southern Water Supply Project (SWSP) includes C-BT and Windy Gap water. The average available C-BT yield is 1,447[1] acre-feet, with average Windy Gap yield assumed to be zero and a maximum of 900[2] acre-feet. The master plan included many assumed supply and demand scenarios; the *2003 Raw Water Master Plan* estimated that under future conditions the raw water supply system would provide a firm yield of 5,400 acre-feet. Deficits were predicted during drought years but the demand used in the scenarios was very high at 7,120 acre-feet.

The master plan was completed more than 10 years ago. Therefore, it is recommended the City update the plan to incorporate changes since 2003, including improvements to the raw water infrastructure, improved information on water supply from C-BT and Windy Gap, updated demand data, and resiliency to climate variability.

At this time, no major raw water acquisitions are planned by the City. Overall, there is limited raw water storage in the City's system and additional storage would be beneficial. The total raw water storage capacity of 3,392 to 4,912 acre-feet is lower than the City's forecasted annual water consumption (See Section 2.4 Demand Forecast). The storage system would provide approximately 6 months of water at forecasted baseline demands at the lower end of storage volume. The City is planning on continued efficient water use, but additional water rights acquisition will most likely be required.

1.3 Supply-Side Limitations and Future Needs

As mentioned above, the City has water rights along South Boulder Creek, a tributary to the South Platte River. In the most recent Statewide Water Supply Initiative (SWSI) completed in January 2011, the South Platte Basin is one of the basins facing a municipal and industrial (M&I) gap in 2050. The M&I gap is the difference between the projected municipal and industrial water demand and supplies from existing sources and supplies from Identified Projects and Processes (IPPs). The M&I gap for the South Platte Basin is projected to be 36,000 to 170,000 acre-feet per year, depending on the success rate of IPPs (see Table 5-19 of the January 2011 SWSI). The SWSI also noted that from "a regional perspective, the largest gaps occur in the Northern region, consistent with the high levels of current and future demands and urbanization in Boulder, Larimer, and Weld Counties." There is also little to no unappropriated water remaining in the South Platte Basin. Based on the outlook from SWSI efficient water use will need to continue as a component of the City's raw water master planning.

Limitations and future needs for the City's raw water and treated water systems are summarized in Table 2.

TABLE 2
Summary of Supply Side Limitations and Future Needs

Limitation or Future Need	Comments on Limitation or Future Need	How is Limitation or Future Need Being Addressed
Raw water supply	The estimated firm yield from the City's *2003 Raw Water Master Plan* was approximately 5,400 acre-feet. Drought years may result in a deficit.	Efficient water use especially during drought years will be required. Monitor growth of commercial properties that are not yet developed.

[1] 2,067 shares at 0.7 acre-feet/share firm yield.

[2] 9 shares at 100 acre-feet/share.

TABLE 2
Summary of Supply Side Limitations and Future Needs

Limitation or Future Need	Comments on Limitation or Future Need	How is Limitation or Future Need Being Addressed
Raw water storage	The total raw water storage capacity of 1,927 to 3,427 acre-feet is less than the City's current annual water consumption.	Efficient water use to minimize the need for additional raw water storage. Evaluate interconnects and storage projects to increase flexibility of raw water supply system.
Water treatment plant capacity	The City has two water treatment plants with a combined treatment capacity of 13.0 mgd (firm production capacity of approximately 12.1 mgd). There are some limitations on the source water that each plant is able to receive.	Efficient water use to eliminate need for capacity increases at the water treatment plants. Increase flexibility of moving raw water between the two treatment plants.
Wastewater treatment plant (WWTP) capacity to meet future regulations	Current rated WWTP capacity is 3.4 mgd, but future effluent regulations have the potential to impact the plant capacity.	In 2015, the City will start construction of the WWTP upgrades to meet redundancy, ammonia, and nutrient removal regulations. The plant capacity will also be decreased to 2.53 mgd to meet regulations.
Louisville pipeline	The pipeline reliably delivers 5.2 cfs (3.36 mgd) to the Howard Berry WTP and 4.9 cfs to the Louisville Reservoir. May operate at capacity during peak months depending on demand, the amount of water supplied from C-BT, and the amount of divertible water rights.	There are no projects planned to increase capacity of the Louisville pipeline. Blending of raw water sources will be required to meet future demands.
C-BT water pipeline	Pipeline capacity is 4.2 cfs (2.7 mgd). The City has other water supplies, but if more C-BT water was required to meet demand it would be difficult to meet the peak, especially in summer months.	SWSP upsizing is planned to occur within the next 10 years. Blending of raw water sources will be required to meet future demands.
Overall system reliability	Even with multiple water supply options and two treatment plants, the system is still vulnerable to unpredictable events. Interconnects would increase reliability.	The City has potable water interconnects with the City of Lafayette and is currently working on designing an interconnect with the Town of Superior.

Notes:
C-BT = Colorado-Big Thompson
cfs = cubic feet per second
mgd = million gallons per day

2 Water Demand and Historical Demand Management

2.1 Service Area Characteristics

2.1.1 Land Use

Title 17 of the Louisville Municipal Code (LMC) outlines the type of development allowed within the City; the most current plan is summarized in the *Louisville Comprehensive Plan* (May 7, 2013). A map of the City's service area and the 2012 land use map is shown in Figure 1. A summary of land use and built land use is provided in Table 3.

TABLE 3
Land Use Summary

Land Use	Land Percent of Total Land Area	Built Percent of Total Built Area
Agricultural	3.5	0.1
Entertainment	0.2	0.3
Hotel	0.4	1.5
Industrial	5.2	13.5
Large Format Retail	0.5	1.3
Mixed Use Commercial	0.7	1.4
Mobile Home	0.4	0.0
Multi-Tenant Retail	0.6	1.5
Office	3.4	9.1
Open Space/Parks	26.5	0.0
Public Service/Institutional	8.8	1.2
Residential Low Density	26.5	53.9
Residential Medium Density	1.3	3.7
Residential High Density	1.7	6.9
Single Tenant Retail	0.8	1.4
Stand Alone Restaurant	0.3	0.6
Vacant	19.1	3.6

Source: *City of Louisville Comprehensive Plan*, adopted May 7, 2013.

The highest percentages of land use in the City are residential low density and open space/parks, which together make up 53 percent of the total land area in the City. City parks, golf course, and open space total 3,335 acres. The highest percentage of built land use is from residential low density at 53.9 percent, followed by industrial (13.5 percent) and office (9.1 percent). The City estimates that residential land use areas will reach build out in 10 years and the remaining land use areas will take longer to develop.

Vacant or undeveloped land makes up 19.1 percent of the land use area in the City. There are several vacant areas that are eligible for development, although full development of these eligible areas depends on how much the market can actually support. Three large areas that are planned to have future growth for office and industrial uses include the Centennial Valley Business Park, the Colorado Technology Center (CTC), and the Phillips 66 campus. The areas are also designated as special districts by the City's *Comprehensive Plan*. It is important to include the potential impact of these areas on future water demand.

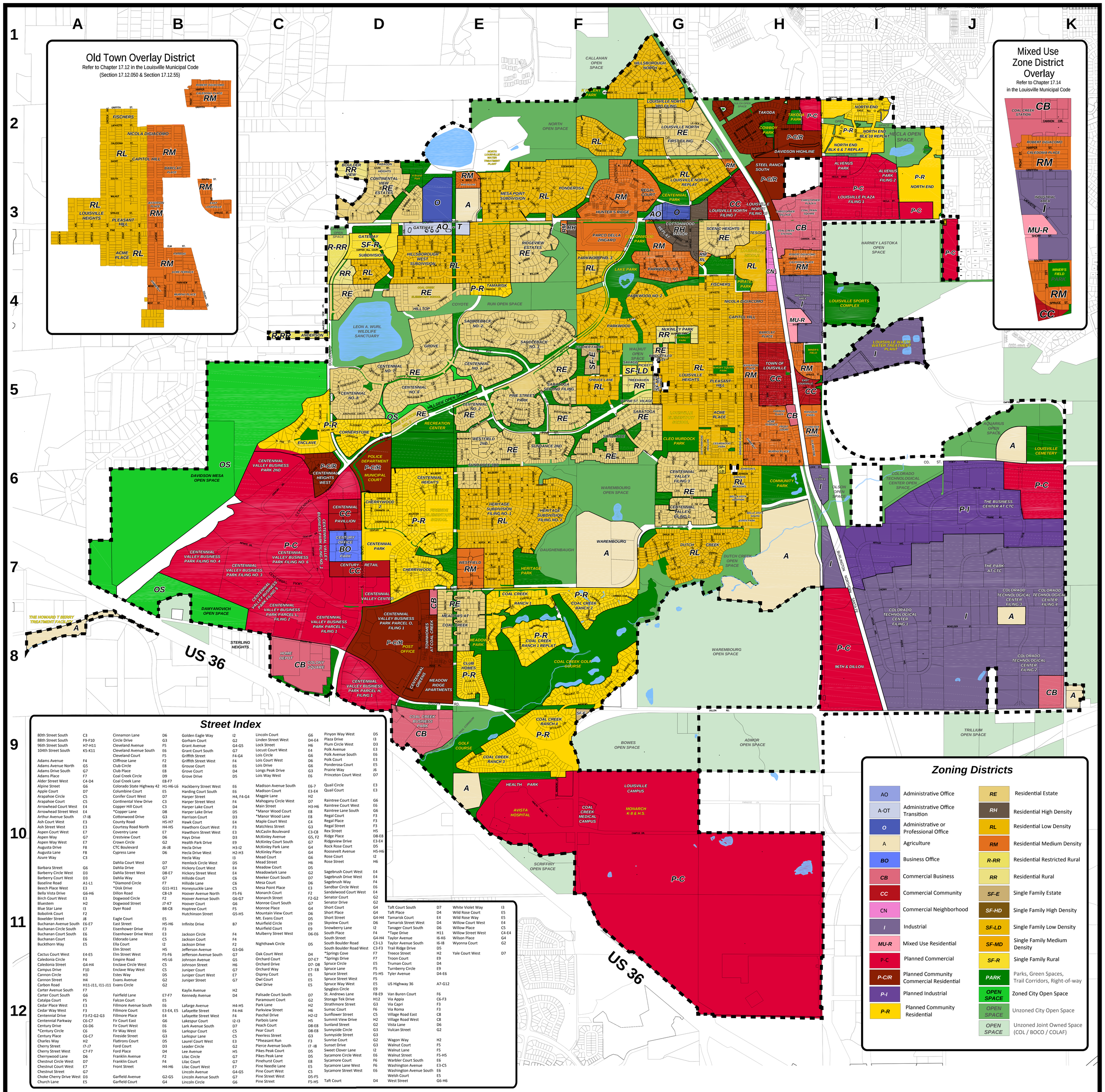


FIGURE 1

2012 ZONING DISTRICT MAP

Planning and Building Safety Department

Robert P. Muckle, Mayor

City of Louisville
COLORADO • SINCE 1878

2.1.2 Customer Categories

Water usage is tracked for several customer categories (see Table 4). All customers have water meters and are billed monthly.

TABLE 4
Customer Categories

Category	Code	Description	Metered (Yes/No)	Revenue (Yes/No)
Metered Consumption				
City	CITY	Indoor and outdoor use at City facilities including parks, medians, recreation centers, pools, and golf course. The golf course can be irrigated with raw, reuse, or potable water.	Yes	No (current)[1] Yes (future)
Residential-Inside	RESI	Single-family home, inside City limits, indoor and outdoor use.	Yes	Yes
Residential-Outside	RESO	Single-family home, outside City limits, indoor and outdoor use	Yes	Yes
Multifamily	MF	Multifamily residence, inside and outside City limits.	Yes	Yes
Commercial-Inside	COMI	Commercial, inside City limits, indoor and outdoor use.	Yes	Yes
Commercial-Outside	COMO	Commercial, outside City limits, indoor and outdoor use.	Yes	Yes
Irrigation	IRRI	Dedicated taps for outdoor water use for commercial and homeowners association (HOA) landscaping. Not all commercial users have dedicated irrigation taps for outdoor use.	Yes	Yes
Bulk Water	—	Water for construction use.	Yes	Yes

[1] The City is phasing in charging itself as a water customer. In 2014, the City is paying 25% of water costs, 50% in 2015, 75% in 2017, and full cost in 2017.

The City customer category is currently not billed and is authorized non-revenue water. However the City is phasing in charging itself as a water customer; in 2014, the City is paying 25% of water costs, 50% in 2015, 75% in 2017, and full cost in 2017. Not all commercial establishments have a separate irrigation tap for outdoor water use; the City code provides guidance on how large an area can be before a separate irrigation tap is required.

Construction water is authorized for use through bulk water usage permits and is tracked separately from the main customer categories in Table 4. Bulk water usage is metered using several bulk water meters in the system. The demand depends on the amount of construction each year. Bulk water usage is accounted for in the demand projections in Section 2.4, Demand Forecast. Other authorized uses that are not currently metered or billed (non-revenue) include distribution system flushing, firefighting, and street washing. A majority of water uses are metered and billed. However, the City does not have accurate estimates for this non-revenue water, but the volume of water for these purposes is usually small compared to the total water demand.

The City also has a reuse water system that currently irrigates City properties. Reuse water is used for irrigating Coal Creek Golf Course, Community Park, Louisville Sports Complex, Miner's Field, and the wastewater treatment plant. Reuse water usage is summarized in Section 2.2.2, Reuse Water.

2.2 Historical Water Usage

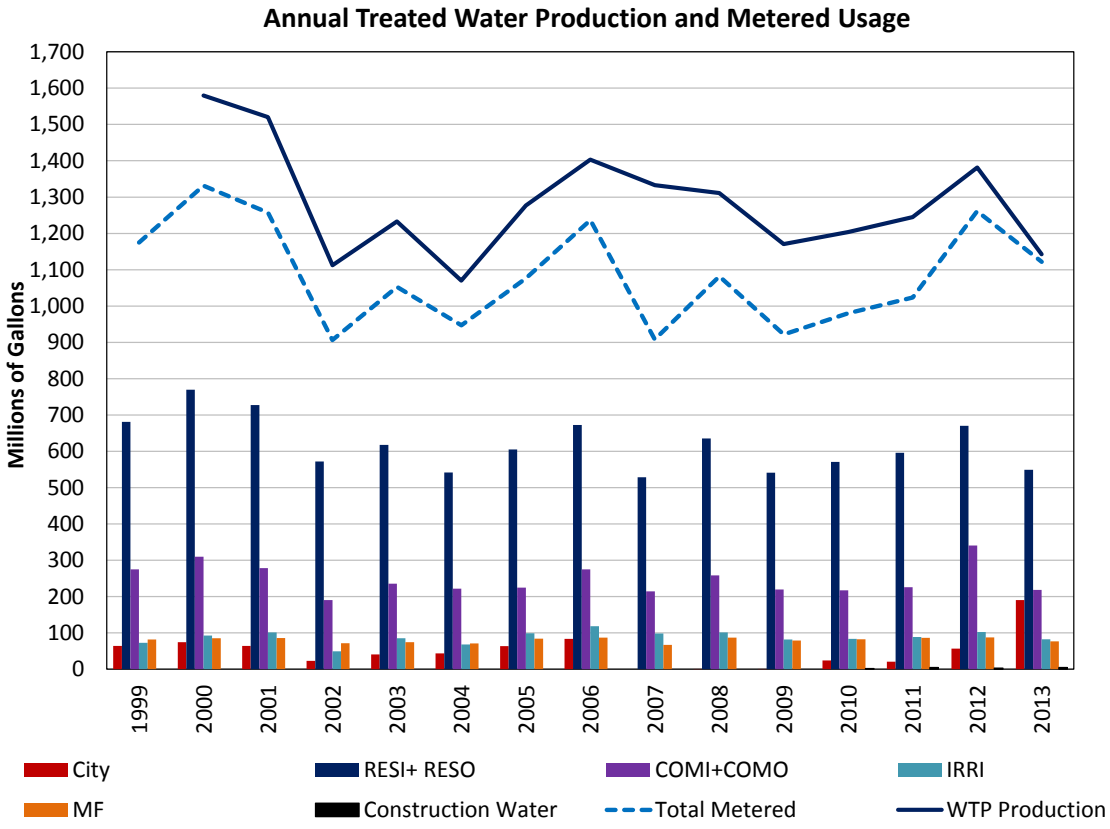
The summary of historical potable water use is summarized into authorized water use and water losses, as discussed in the following subsections.

2.2.1 Authorized Water Use

Authorized uses of water from the City of Louisville include metered water to customers, bulk water permits, and unmetered water for authorized purposes (flushing, firefighting, street washing, etc.). Water used for bulk permits is shown as an authorized use. There are no estimates of unmetered water for authorized purposes, so this water is not accounted for in the authorized use category in this evaluation. In the future, this relatively small number should be quantified so it can be accounted for as authorized unbilled usage. Annual water treatment plant production and authorized water usage for the City's water customers from 1999 to 2013 is summarized in Figure 2.

Demand data prior to 2011 should be interpreted with caution for two main reasons: (1) a portion of the water meters in the system were misclassified in the billing system, and (2) upgrades to the billing system that improved water accounting were complete in 2010.

FIGURE 2
Annual Treated Water Production and Authorized (Metered) Consumption, 1999 to 2013



Water conservation programs and resources have been available from the City for several years. However, in 2002 there was a noticeable decrease in metered water consumption due to a severe drought that year. Since that time, citywide consumption has remained relatively stable, even as the population has increased.

A numerical summary of the last 5 years of authorized water use and water treatment plant production is provided in Table 5. Annual treated water production from 2009 to 2013 ranged from 1,170.81 to 1,381.41 million gallons (MG), or 3,593 to 4,239 acre-feet.

TABLE 5
Summary of Annual Authorized Water Use and Treated Water Production, 2009 to 2013

Year	City[1]	Residential (RESI+RESO)	Multifamily (MF)	Commercial (COMI+COMO)	Irrigation (IRRI)	Authorized[2]	Total Authorized	Treated Water Production
2009	0.43	540.89	79.31	219.59	81.77	—	922.00	1170.81
2010	24.06	570.59	82.41	217.23	83.91	1.74	979.93	1203.65
2011	20.86	596.29	86.46	225.92	89.04	4.82	1023.37	1244.70
2012	56.87	670.06	87.61	340.66	102.60	3.30	1261.11	1381.41
2013	190.17	549.00	77.04	218.42	83.47	4.63	1121.52	1142.53

Notes:
[1] The accounting system for City water usage was not considered reliable until 2013.
[2] Authorized usage represents metered water for bulk water permits.
Units are in millions of gallons.

Analysis of water consumption per customer type shows that residential consumption consistently accounts for almost 50 percent or more of total consumption. Commercial is the second largest consumer, accounting for nearly 25 percent of total production. City, irrigation, and multifamily users make up the remaining 25 percent.

2.2.1.1 Water Losses

The difference in the total treated water production and authorized water use (Figure 3) is considered water loss. Water loss is divided into two categories: (1) real losses (leaks, overflows, unauthorized use, etc.), and (2) apparent losses (accounting and data collection errors). A certain amount of real water loss is inevitable, but utilities can minimize the amount of real water loss with maintenance and leak detection programs. The City of Louisville had apparent losses prior to 2012 when metered water was not being properly accounted for in the billing system. A summary of water loss for the last 5 years is provided in Table 6.

TABLE 6
Water Loss Summary, 2009-2013

Year	Total Authorized (MG)	Treated Water Production (MG)	Water Loss (% of Treated Water Production)
2009	922.00	1170.81	21.3%
2010	979.93	1203.65	18.6%
2011	1023.37	1244.70	18.9%
2012	1261.11	1381.41	8.8%
2013	1122.72	1142.53	1.8%

Note:
MG = million gallons

Prior to 2012, the average annual water loss was 19.8 percent. Water accounting improved in 2012 with the new CIS system and significantly decreased apparent water losses. In 2013, the calculated water loss was very low at 1.8 percent. The City will need to monitor water loss with the new CIS system to establish a baseline level that can be used to measure system improvement or deterioration.

2.2.1.2 Seasonal and Non-seasonal Demands

Indoor water use consists of water used for washing machines, dishwashers, showers, toilet flushing, cooking, and direct consumption. The majority of outdoor water use is assumed to be used for lawn

irrigation. Metered water demands for residential customers includes both indoor and outdoor uses. The irrigation account is water used for irrigation of landscaping at some commercial properties and homeowners associations (HOAs). A summary of season and non-seasonal metered usage is provided in Table 7 from 2013. The portion of water for seasonal and non-seasonal use for each category is used later in the demand forecast (Section 2.4, Demand Forecast).

TABLE 7
2013 Seasonal and Non-seasonal Metered Water Usage

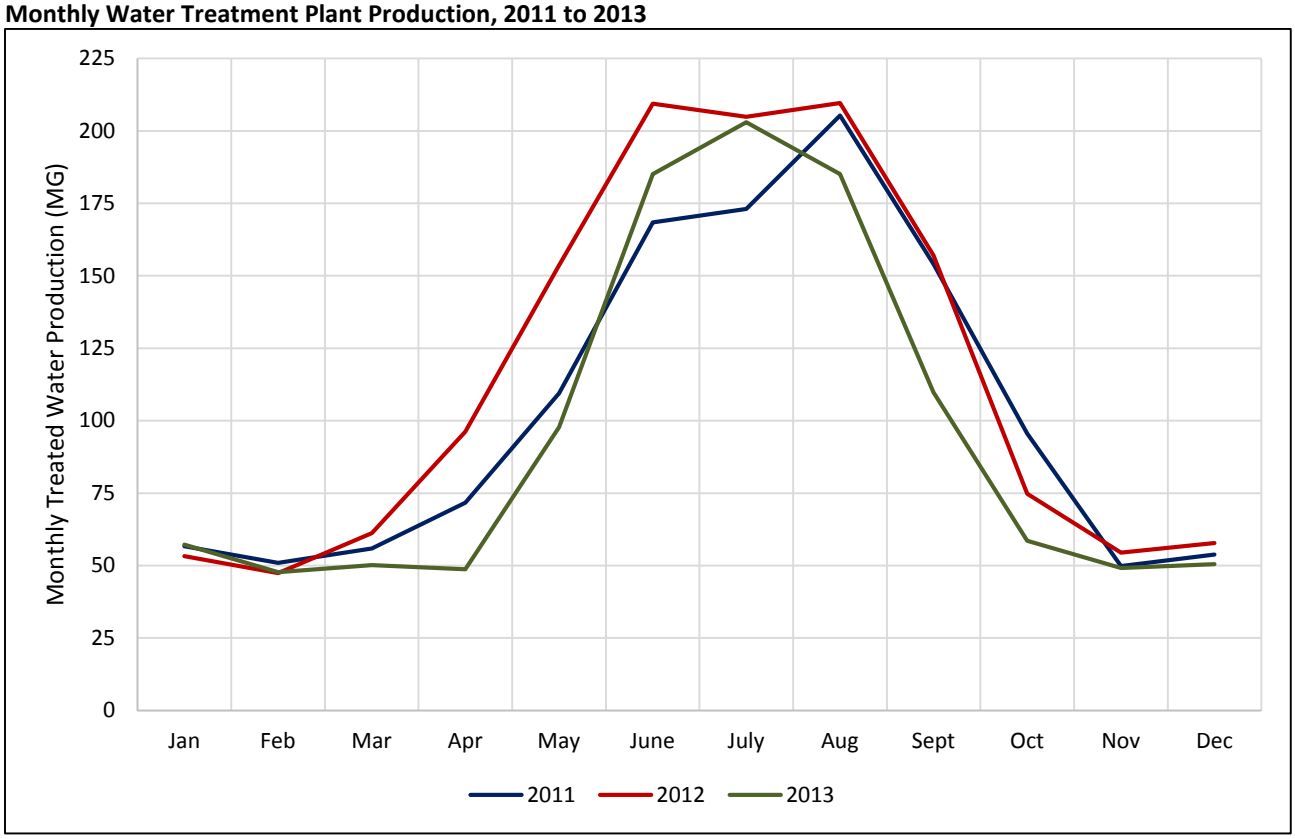
Customer Category	Seasonal (MG)	Non-seasonal (MG)	Seasonal (%)	Non-seasonal (%)
City	135.5	55.6	71%	29%
Commercial (inside City limits)	98.9	119.6	45%	55%
Multifamily	17.0	60.0	22%	78%
Residential (inside City limits)	247.5	299.6	45%	55%
Residential (outside City limits)	1.0	0.95	52%	48%
Irrigation	82.3	0	100%	0%

Note:
MG = million gallons

Monthly water treatment plant (WTP) production also increases from April through October (Figure 3). This is a seasonal pattern which correlates with an increase in consumption due to outdoor water use. Non-seasonal monthly WTP production from November to March is 50 MG per month on average.

Assuming that the non-seasonal production values represent indoor consumption year round, then the increase in WTP production between April and October is for outdoor use, which accounts for approximately 48 percent of total annual water consumption on average.

FIGURE 3
Monthly Water Treatment Plant Production, 2011 to 2013



2.2.1.3 Per Capita Water Usage

Per capita water use is a method of quantifying the volume of water used by a certain population. It can be calculated many ways and used to track efficiency over a large population or more specific customer categories. In this evaluation, the per capita water use is only calculated from 2010 to 2013 because the City's population was adjusted down 6.5 percent in the 2010 U.S. Census; population estimates prior to 2010 were inaccurate, and per capita values for these years would likely be underestimated. Per capita water use from 2010 to 2013 is summarized in Figure 4 and Table 8.

FIGURE 4
Per Capita Water Usage, 2010 to 2012

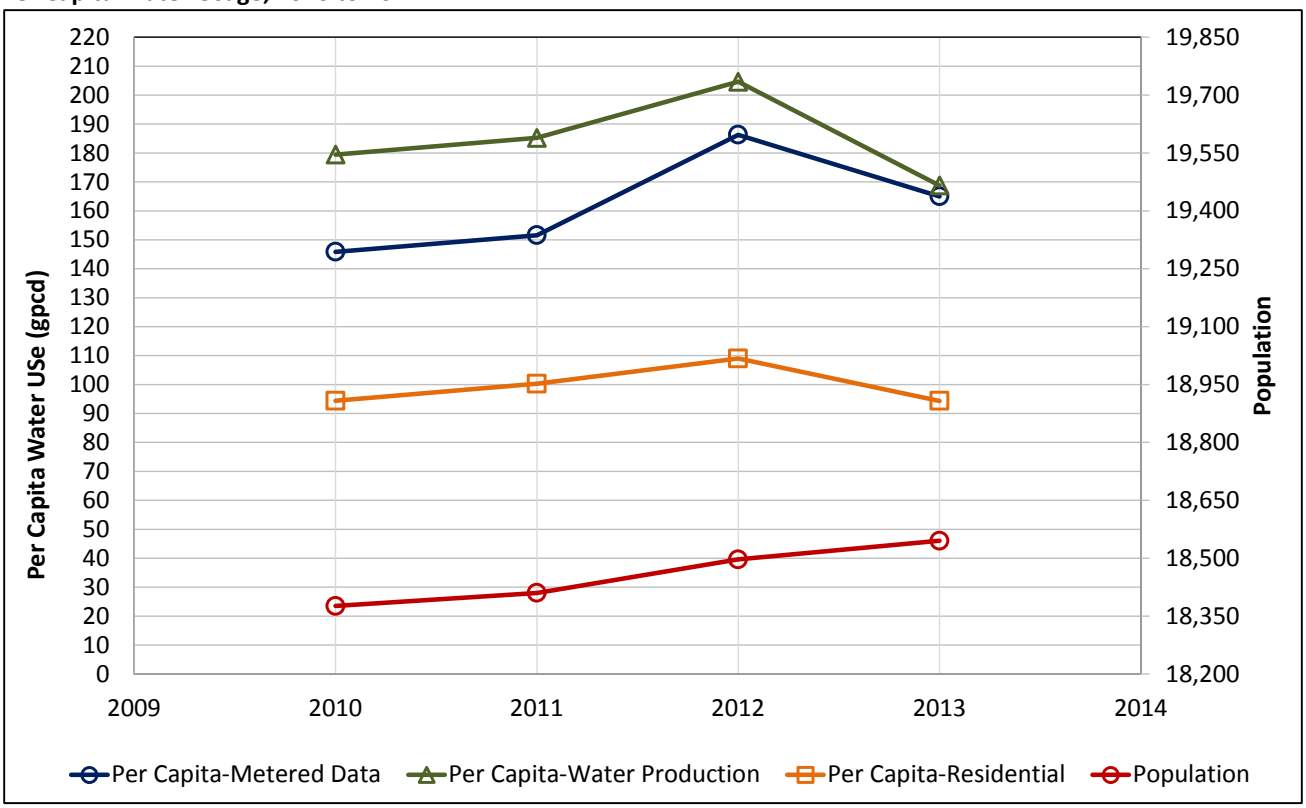


TABLE 8
Per Capita Water Use Summary

Year	Service Area Population[1]	Per Capita – Metered Use (gpcd)	Per Capita – Residential Use (gpcd)[2]	Per Capita – Treated Water Production (gpcd)
2010	18,376	146.7	97.4	179.5
2011	18,410	151.6	101.6	185.2
2012	18,497	186.3	112.2	204.6
2013	18,545	165.0	92.3	168.8

Notes:
[1] Population from Water System Facilities Plan (July 2012). The City's population according to the 2010 U.S. Census was 18,376.
gpcd = gallons per capita per day

Based on metered usage of all the City' customer categories the per capita water usage of the service area population was an average of 162 gallons per capita per day (gpcd) from 2010-2013. An estimate of per capita usage of the residential population was an average of 101 gpcd from 2010 to 2013. This usage number represents the average amount of water required every day for each person in the RESI, RESO, and MF categories. These per capita values do not account for water use that is not metered as part of the billing system (for example, bulk water), real water loss, or apparent water loss. To capture the total amount of water per capita required at the entrance to the system, the water treatment plant production must be used in the calculation. The average per capita water required from the water treatment plant was 185 gpcd from 2010 to 2013.

2.2.2 Estimated Savings from Past Water Conservation

Efficient use of water has been a consistent message from the City's water utility for several years. Over the years, many factors contribute to decreasing per capita water demand, including City water conservation programs, improved metering, continued learned behavior from drought years, and public education. The estimate of savings from water conservation for the City of Louisville was based on the average per capita treated water production from 1999 to 2001 applied to the current 2013 population, and then comparing this result to the actual value from the 2011-to-2013 average. As stated previously, the 2010 U.S. Census adjusted the population to a lower value. Because an overestimate of population will result in underestimating per capita water use, the population was reverse forecasted from 2010 back to 1999 in order to estimate savings already achieved. Per capita values of treated water production were used instead of metered data because customers were not fully metered in 1999.

Based on a gradual increase of savings over time, the total water saved since 1999 is estimated to be 326 MG (1,001 acre-feet). This estimate was calculated as follows: The average per capita treated water production from 1999 to 2001 was estimated at 209 gpcd. When applied to the 2013 population of 18,584, this is an annual treated water production of 1,418 MG. The actual average from 2011 to 2013 was 1,092 MG. The actual treated water produced was approximately 326 MG (1,001 acre-feet) less than the estimated production based on past per capita values.

2.2.3 Reuse Water

The City's wastewater treatment plant (WWTP) has the capability to treat a portion of the water to be reused for irrigation. The reuse plant has a maximum treatment capacity of 2 mgd, but the actual amount of water available for reuse is limited by influent flow to the WWTP and water rights operations. Current average daily flow rates to the WWTP are 1.8 mgd. Reuse water is primarily used for irrigation at Coal Creek Golf Course, Community Park, Sports Complex, Miner's Field, and the WWTP. The average monthly total reuse water produced and the average production per day is summarized in Table 9 based on available historical data beginning in 1994.

TABLE 9
Summary of Reuse Water Production

Month	Average Daily Reuse Water Usage[1] (mgd)	Average Total Reuse Water Usage (MG)
January	0.021	0.67
February	0.0.032	0.98
March	0.055	1.71
April	0.134	4.16
May	0.386	11.96
June	0.589	18.27
July	0.715	22.15
August	0.616	19.10
September	0.421	13.05
October	0.164	5.08
November	0.075	2.33
December	0.020	0.63

Notes:
[1] Usage based on a 10-year average for the Coal Creek Golf Course, a 5-year average for the WWTP and ball fields, and 50 acre-feet of demand for Community Park distributed across the irrigation months.
MG = million gallons
mgd = million gallons per day

Peak demand occurred in July 2013 at 0.715 mgd. Average production from the plant during warmer months from May through September is approximately 0.55 mgd. Total annual production from the plant in 2013 was approximately 100 MG

The City supports maximizing reusable system utilization and the potential exists to increase the supply of reuse water. Several water users have expressed interest in switching to reuse in place of potable water for their irrigation needs. During 2014, the City conducted a study evaluating reuse system expansion. It was found that with the current water rights usage, there is very little spare capacity in the reuse system because the City has a limited amount of reusable water. As a result of that study, Louisville decided to maximize utilization of the system by installing infrastructure that would enable several large users to transition from potable water to reuse supply. This transition is expected to occur within the next five years and is estimated to reduce Louisville's peak demand by 130,000 gpd, and seasonal demand by approximately 12 MG. More reusable water will become available as Windy Gap water starts to get used in the municipal system, which will be done once the Windy Gap Firming Project is completed. Currently, the Windy Gap supply is not utilized because of its unreliability and high cost. Several City parks still use potable water for irrigation, totaling about 66 MG per season. Expanding the reuse system to include additional large water users and City parks could increase the total reuse water used annually to approximately 120 MG. Over a period of 6 months, this would be equivalent to approximately 0.66 mgd.

2.3 Current Demand Management Activities

The City of Louisville is very committed to efficient water use and good environmental stewardship. The activities and programs described in this section were implemented by the City prior to 2014 and water savings have already been achieved from these efforts. A summary of water conservation activities is also provided later in the plan in Table 14, which also has a list of existing activities.

2.3.1 Foundational Activities

2.3.1.1 Water Conservation and Integrated Resources Planning

- The City implements an integrated resources planning approach that fully integrates water conservation into water supply planning processes.
- The City regularly updates their water supply master plan, capital improvement plan, and feasibility studies to ensure a diverse, robust, and resilient water supply.

2.3.1.2 Metering, Water Rates, and Billing Practices

- 100 percent of the City's customers are metered.
- Water use is tracked by various customer categories (residential, multifamily, commercial, irrigation, and city).
- There is monthly volumetric billing for all customers.
- Drive-by advanced metering infrastructure (AMI) with new meters were installed in 2010-2011.
- The City has a goal to replace meters every 10 years.
- Water rates are reviewed annually and adjustments are made to cover utility costs.
- There is an inclining block water rate structure to encourage efficient outdoor water use and other conservation-oriented structures are being considered.
- Commercial water tap fees are charged based on estimated annual demand, which could result in more water-efficient development.
- Separate irrigation meters are required for townhomes and multifamily developments with 5 or more units and are offered for commercial as optional.

2.3.1.3 System Efficiency (Water Loss Control and Pressure Management)

- Leak detection with listening equipment is performed every other year for a portion of the City.
- Water pipeline replacement program is part of the annual operations budget.
- Coal Creek Golf Course is irrigated with raw and reuse water to conserve treated water.
- Louisville Sports Complex and Community Park are irrigated with raw and reuse water to conserve treated water.

2.3.1.4 Monitoring and Evaluation

- Water consumption by large water users are regularly monitored as part of the industrial pretreatment program.
- Billing staff will occasionally flag monthly usage that exhibits an obvious variance from past data or shows a zero reading. The meters are then checked to determine if the reading was due to a broken meter or a leak.
- Water use by customer category is evaluated annually.

2.3.2 Targeted Technical Assistance and Incentives

2.3.2.1 Water Efficient Fixtures-Indoor

- Some City facilities have been upgraded with high efficiency fixtures and appliances, including City Hall (low-flow faucets, low-volume toilets) and the recreation center (low-flow shower heads, ultra-low flush urinals, and a pool cover).

2.3.2.2 Water Efficient Devices-Outdoor

- The vast majority of the City's irrigation systems controls are linked to a master Central Control Irrigation System (CCIS) that can be used to adjust watering times or turn off irrigation when there is a precipitation event.

2.3.2.3 Incentive Programs

- High-efficiency toilet rebate program.
- High-efficiency clothes washer rebate program.
- Drip irrigation system rebate towards cost of equipment.
- Buffalo grass turf rebate.

2.3.2.4 Efficient Water Use/Audits

- Outdoor irrigation efficiency audits offered by Center for ReSource Conservation (CRC) for residential and commercial customers.

2.3.3 Ordinances and Regulations

- Louisville Municipal Code (Title 17) established development Design Standards & Guidelines for commercial, industrial, and mixed use developments that incorporate low-water-use plants and efficient irrigation concepts into the landscape design of each development.
- Water waste ordinance, includes overspray limitations.
- Compliance with Colorado Department of Public Health and Environment's (CDPHE's) Regulation No. 84 limits runoff, ponding, and overspray from areas using reuse water.
- The City's Commercial Development Design Standards and Guidelines include a policy to conserve water by utilizing alternative means for maintaining a suitable landscape environment.
- The City's Open Space Division utilizes soil amendments and low-water plants.

- Louisville Municipal Code established development Design Standards & Guidelines for commercial, industrial, and mixed use developments. Subirrigation of turf areas, minimizing runoff, and use of local and drought-resistant plants are also incorporated in the guidelines.
- New state law phases in sale of only WaterSense[3]-labeled fixtures by 2016.
- City adopted the International Code Council (ICC) *2012 International Building Code* (2012 IBC) that requires new construction and remodels meet these standards.

2.3.4 Public Information and Education

The City communicates about water use and conservation with their customers using the following tools and methods:

- Regular newsletter distributed.
- Water conservation information available on the City's website.
- A Water Committee made up of City Council members; meeting agendas are posted and the public are welcome at any meeting. The purpose of the Committee is to provide information to the City Council about current City utility activities, projects, and water supply.
- Educational opportunities including school tours of water infrastructure facilities.
- Coordinated messaging with other local cities and Boulder County for consumer message and campaign development, particularly in times of drought.
- Instructional workshops for customers on relevant topics such as irrigation efficiency and management.
- Landscape design and maintenance workshops (through the Center for Resource Conservation [CRC]).

2.4 Demand Forecast

2.4.1 Summary

As part of the water efficiency planning process, three distinct water demand forecasts were prepared. First, a baseline demand forecast starting from 2014 and going out to 2032 was prepared. This baseline forecast did not include the impact of water conservation of any kind, even passive water savings, and was developed only to assess the adequacy of future supplies under reasonable worst-case conditions and to demonstrate the impact of anticipated efficiency improvements. Baseline treated water production in 2014 was estimated to be 1,417.7 MG and under the baseline forecast increased by 558.4 MG resulting in treated water production of 1,943.9 MG in 2032.

A second water demand forecast through 2032 includes the impact of passive efficiencies from Colorado legislation, and federal plumbing codes and standards. This forecast estimated that City water production would increase to 1,777.7 MG in 2032, or 166 MG *less* than they would be under the baseline forecast.

A third forecast was prepared that includes the anticipated impact the City's planned water efficiency program measures described in this plan. Under this forecast, water production increases to 1,707.0 MG in 2032. Compared with the original baseline forecast, if the elements of this plan are fully realized, then it is estimated that water demand at 2032 will be reduced by 236.9 MG (0.65 mgd) as result of passive and active water conservation measures in the City.

These forecasts form the core of the Water Efficiency Plan and are the forecasts on which estimated conservation savings are based.

[3] WaterSense is a U.S. Environmental Protection Agency (EPA) partnership program that helps people save water with a product label and tips for saving water around the house. Products carrying the WaterSense label perform well, help save money, and encourage innovation in manufacturing.

2.4.1.1 Climate Variability Impact on Water Supply and Demand

Climate variability has the potential to impact water supply patterns and water demand. Recent climate forecasts indicate the potential for a future warming trend in the region. For example, in 2012 the Water Research Foundation completed a *Joint Front Range Climate Change Vulnerability Study*. All of the scenarios simulated as part of the study showed an increase in annual average temperature ranging from 1 degree to 6 degrees Fahrenheit for 2040. However, the annual percent change in precipitation ranged from -15 percent to +17 percent for 2040. While it is becoming more common to consider the impacts of climate variability on water supply planning the potential impact on water demands are less understood because of the variability of temperature and precipitation forecasts. Because recent water demands were used as the basis for forecasting future water demands, the demand forecasts in this plan already reflect some impact on water demand based on current climate conditions. A sensible approach to water demand forecasting is to regularly update demand projections based on actual current conditions.

The purpose and goal of this document was to prepare a water conservation plan to improve water efficiency under current supply and demand conditions. In order to plan for potential climate variability it is recommended the City complete an analysis of water supply and demand under climate change conditions to determine the adequacy of the City's water supply under a variety of future climate scenarios; such an effort was outside of the scope of work for this water conservation planning effort.

2.4.2 Forecast Development

As part of the preparation of the Water Efficiency Plan, three separate demand forecasts were prepared:

- Baseline forecast (without conservation)
- Passive savings forecast
- Passive and active savings forecast

The baseline forecasting method used historic demand patterns to establish the baseline per capita demand and then increase these demands with population out to 2032 as if the 2014 per capita water-use patterns continue without change to 2032. This is a standard approach to demand forecasting, but it does not take into account the expected impacts of water efficiency.

The second and third forecasts were developed using a more robust approach in which demands were separated out by water-use sector or customer category (for example, residential, commercial, irrigation, etc.), with seasonal and non-seasonal demands (outdoor and indoor) disaggregated for each category. Then a separate demand forecast out to 2032 was prepared for indoor and outdoor demand in each customer category. This allowed the impacts of specific water efficiency measures like high-efficiency toilets and clothes washers to be considered.

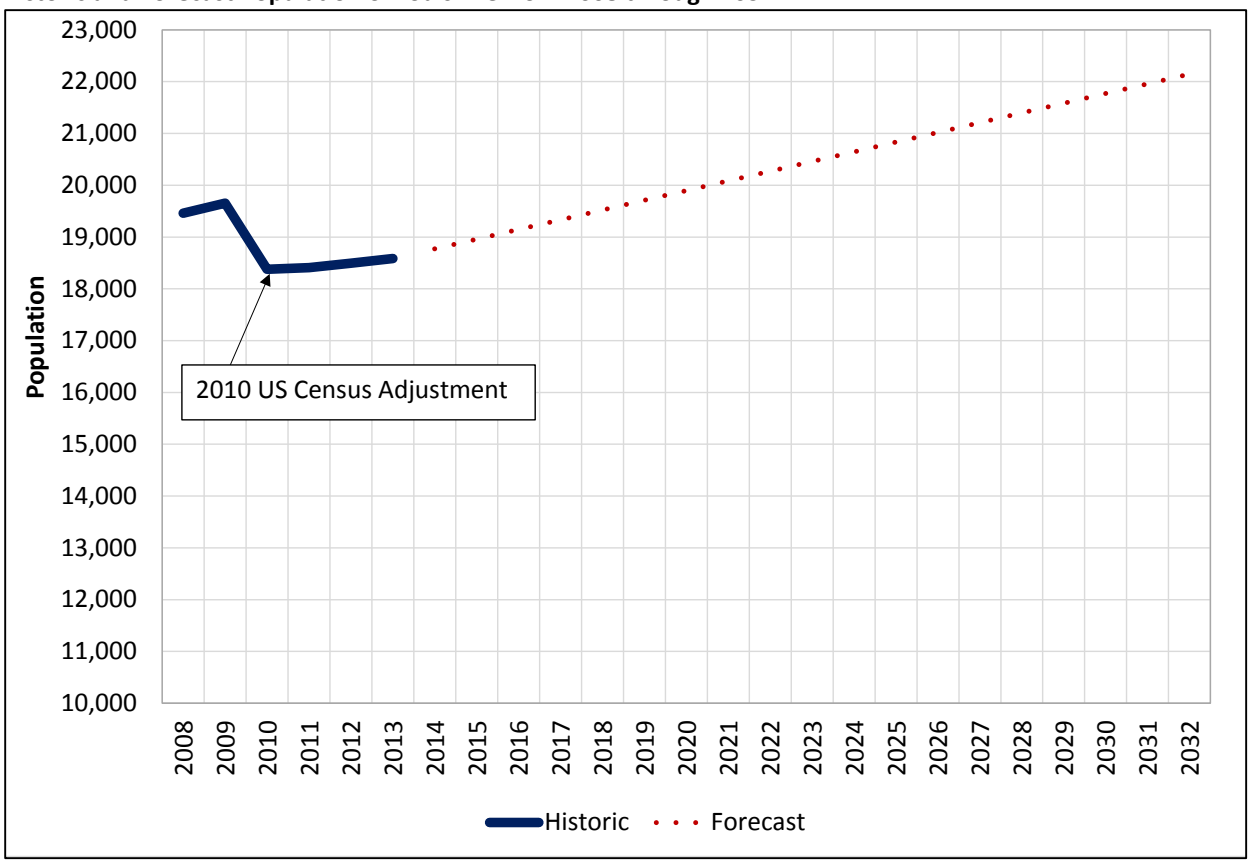
2.4.2.1 Population Planning Projections

The population served with potable water by the City of Louisville in 2013 was approximately 18,584. Staff have indicated that the City plans to achieve a build out population of 22,145 by 2032. This suggests an average annual growth rate of between 0.75 to 1.0 percent per year. Table 10 shows the population forecast for Louisville from 2015 to 2032. The year 2032 was chosen as a demand forecasting horizon. These data are shown graphically in Figure 5.

TABLE 10
Population Growth Projections from 2008 through 2032

Year	Estimated Population	% Change from Previous Year	Data Source
2008	19,461	—	Water Facilities Master Plan (July 2012)
2009	19,656	1.00	Water Facilities Master Plan (July 2012)
2010	18,376	-6.51	2010 U.S. Census
2011	18,410	0.19	Water Facilities Master Plan (July 2012)
2012	18,497	0.47	Water Facilities Master Plan (July 2012)
2013	18,584	0.47	Water Facilities Master Plan (July 2012)
2014	18,771	1.01	Water Facilities Master Plan (July 2012)
2015	18,959	1.00	Water Facilities Master Plan (July 2012)
2016	19,146	0.99	Water Facilities Master Plan (July 2012)
2017	19,334	0.98	Water Facilities Master Plan (July 2012)
2018	19,521	0.97	Water Facilities Master Plan (July 2012)
2019	19,709	0.96	Water Facilities Master Plan (July 2012)
2020	19,896	0.95	Water Facilities Master Plan (July 2012)
2021	20,083	0.94	Water Facilities Master Plan (July 2012)
2022	20,271	0.93	Water Facilities Master Plan (July 2012)
2023	20,458	0.92	Water Facilities Master Plan (July 2012)
2024	20,646	0.92	Water Facilities Master Plan (July 2012)
2025	20,833	0.91	Water Facilities Master Plan (July 2012)
2026	21,020	0.90	Extrapolation
2027	21,208	0.89	Extrapolation
2028	21,395	0.88	Extrapolation
2029	21,583	0.88	Extrapolation
2030	21,770	0.87	Extrapolation
2031	21,958	0.86	Extrapolation
2032	22,145	0.85	Build-out population of 22,145 in 2032 from Joliette Woodson email 11/20/2013

FIGURE 5
Historic and Forecast Population of Louisville from 2008 through 2032



An analysis of recent water use data was performed to establish a starting point for the water demand forecasts. The minimum, maximum, and average water use for each customer category was calculated for each year from 2009 to 2013. These values were compared to the 2013 value. Engineering judgment was used to select the starting point for each customer category, guided by the intent to start the forecast at a value that was representative of recent demand but not too low or too high. A summary of the metered data for the last 5 years is shown in Table 11 (which was also provided Table 5), as well as a summary of the minimum, maximum, average, and baseline starting values.

TABLE 11
Summary of Annual Authorized Water Use and Treated Water Production, 2009 to 2013

Year	Population	City[1]	Residential (RESI+RESO)	Multifamily (MF)	Commercial (COMI+COMO)	Irrigation (IRRI)	Total Metered[2]
2009	—	0.43	540.89	79.31	219.59	81.77	922.00
2010	18,376	24.06	570.59	82.41	217.23	83.91	984.20
2011	18,410	20.86	596.29	86.46	225.92	89.04	1,018.55
2012	18,497	56.87	670.06	87.61	340.66	102.60	1,257.81
2013	18,584	190.17	549.00	77.04	218.42	83.47	1,116.90
5-year min.	—	0.43	540.89	77.04	217.23	81.77	922.00
5-year max.	.—	190.17	670.06	87.61	340.66	102.60	1,257.81

TABLE 11
Summary of Annual Authorized Water Use and Treated Water Production, 2009 to 2013

Year	Population	City[1]	Residential (RESI+RESO)	Multifamily (MF)	Commercial (COMI+COMO)	Irrigation (IRRI)	Total Metered[2]
5-year avg.	—	58.48	585.37	82.57	244.36	89.12	1,059.89
Baseline Starting Point	18,584	190.17	585.37	82.57	244.36	89.12	1,191.69

Notes:

[1] Starting point for City's baseline forecast is 2013 because the accounting system for City water usage was not considered reliable until 2013.

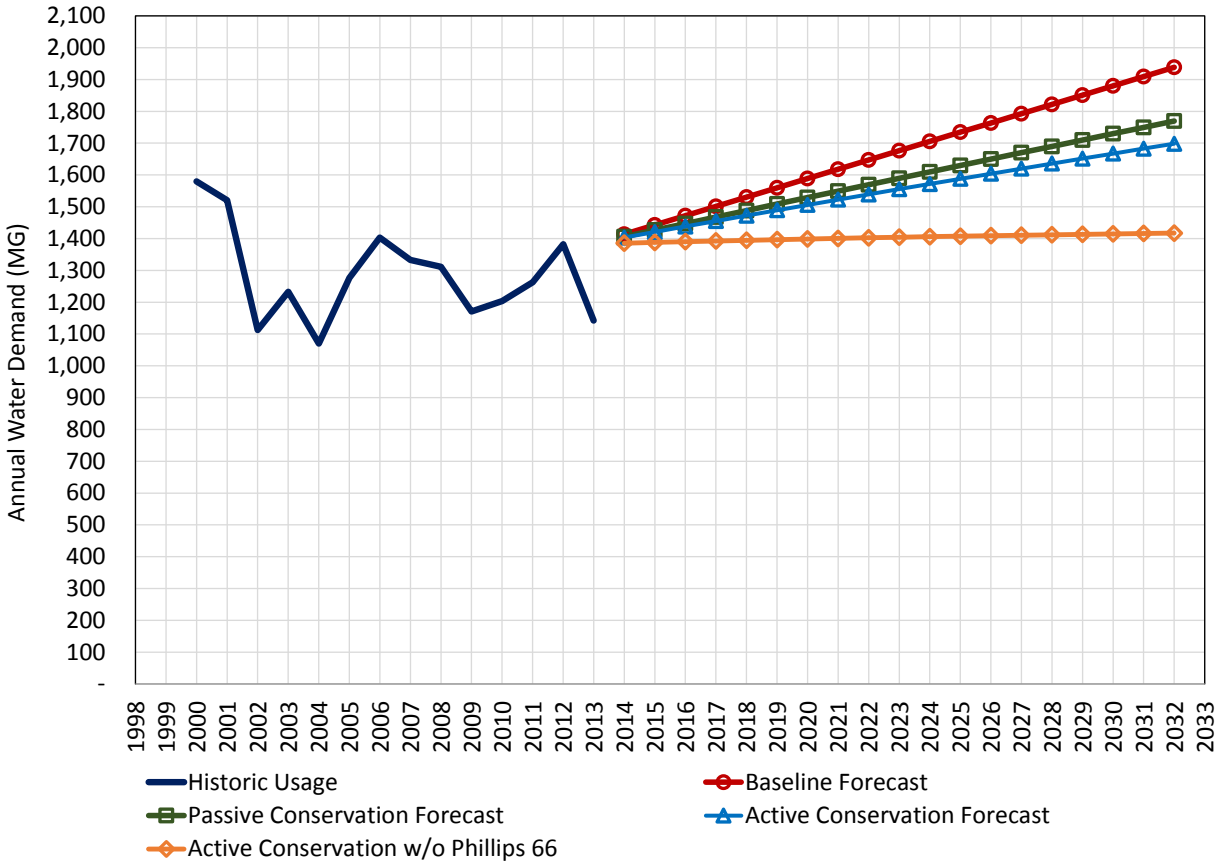
[2] Starting point for total metered water usage is the summation of the starting points of the individual categories.

Units are in millions of gallons.

The total metered water demand for the starting point of forecasting is 1,191.69 MG divided by the 2013 population of 18,584, resulting in a per capita metered usage of 176 gpcd. For the baseline forecast, this per capita value was applied to the forecasted population for each year out to 2032 to calculate the forecasted metered water demand for the baseline forecast.

The three forecasts (baseline, passive, passive and active) form the core of the Water Efficiency Plan and are the forecasts upon which estimated conservation savings are based. Each forecast shows demand starting in 2014 and going through the planning horizon of 2032 (18 years). The results are provided in Figure 6 and further described in more detail in the following sections.

FIGURE 6
Baseline, Passive, and Active Demand Forecasts through 2032



2.4.3 Baseline Forecast

Baseline demands were developed based on a combination of anticipated demographic and land use changes in the City of Louisville. In the baseline forecast all demands (indoor and outdoor) increase proportionally with the population at the current rate of usage. For the residential portion of the water demand, this assumes that new customers joining the system will use water identically to the current customer base. A major assumption for this baseline forecast is for the commercial users where it is assumed that water use at the Phillips 66 property will increase linearly from 0 MG in 2015 to 250 MG in 2032, when the site reaches full occupancy and usage potential.

The fundamental purpose of the baseline forecast is to assess the adequacy of future supplies under reasonable "worst case" conditions (that is, no water efficiency gains) and to demonstrate the anticipated impact of water efficiency in the City from both passive and active conservation programs.

Key assumptions in the baseline forecast are as follows:

- Baseline water use patterns and forecast starting point (Table 11)
- Population forecast (Table 10)
- Water use in all sectors both seasonal and non-seasonal increases proportionally with the population
- Annual bulk water usage of 4.8 MG that does not increase or decrease each year
- Outdoor water use impacts from temperature and precipitation in 2032 are similar to 2014

Baseline treated water production in 2014 was estimated to be 1,413.7 MG and increases by 525 MG, resulting in a total baseline demand of 1,938.4 MG (5,949.72 acre-feet) in 2032.

2.4.4 Passive Conservation Forecast

The passive conservation water demand forecast to 2032 includes the impact of anticipated passive efficiencies from State of Colorado legislation, and federal plumbing codes and standards on a sector-by-sector basis for both indoor and outdoor use. An example of a passive water conservation effort that is accounted for in this forecast would be the passing of Colorado Senate Bill 2014-103, which phases out the sale of low-efficiency lavatory faucets, showerheads, flushing urinals, and tank-type toilets.

Key assumptions in the passive conservation forecast are as follows:

- Baseline water use patterns and forecast starting point (Table 11)
- Population forecast (Table 10)
- Outdoor water use in all use categories increases proportionally with the population
- Outdoor water use impacts from temperature and precipitation in 2032 are similar to 2014
- 1 percent per year decrease in residential indoor (inside and outside City limits) per capita water use (from 47.1 gpcd in 2014 to 39.3 gpcd in 2032), which represents a continuing pattern of the past 15 years
- 1 percent per year decrease in multifamily residential indoor per capita water use, which represents a continuing pattern of the past 15 years
- 0.5 percent per year decrease in per capita commercial indoor (inside City limit) use from ongoing replacement of fixtures, appliances, and equipment and new State of Colorado legislation (Senate Bill 14-103) assuring high-efficiency plumbing in new construction
- 1 percent per year increase in per capita commercial indoor (outside City limit) water use to account for additional growth potential in the sector
- Annual construction water demand of 4.8 MG that does not increase or decrease each year

- Steady increase in water use at the Phillips 66 property from 0 gallons in 2014 to 250 MG at build-out in 2032
- Volume of water loss is held constant at 189 MG, which represents the average water loss from the last 5 years, thus reducing water loss from 15.8 percent in 2014 to 11.9 percent in 2032

The passive forecast estimates that City water demands will increase to 1,769.4 MG (5,430.00 acre-feet) in 2032 which is 169 MG less than the baseline forecast. The passive conservation forecast estimates a 28.3-percent increase in treated water demand over the next 18 years and suggests that more efficient fixtures and appliances could help reduce future demands in the City by 169 MG annually compared with the baseline forecast.

2.4.5 Active Conservation Forecast

The active conservation forecast includes the anticipated impact from the City's planned water efficiency program measures described in this plan (see Section 4, Selection of Water Efficiency Activities).

Key assumptions in the active conservation forecast are as follows:

- Baseline water use patterns and forecast starting point (Table 11)
- Population forecast (Table 10)
- Outdoor water use in all sectors increases proportionally with the population
- Outdoor water use impacts from temperature and precipitation in 2032 are similar to 2014
- 1 percent per year decrease in residential indoor (inside and outside City limits) per capita water use (from 47.1 gpcd in 2014 to 39.3 gpcd in 2032), which represents a continuing pattern of the past 15 years
- 0.5 percent per year decrease in residential outdoor water use (inside and outside City limits) due to the City's water conservation efforts and rate structure
- 1 percent per year decrease in multifamily residential indoor per capita water use, which represents a continuing pattern of the past 15 years
- 0.5 percent per year decrease in multifamily residential outdoor water use due to the City's water conservation efforts and rate structure
- 0.6 percent per year decrease in per capita commercial indoor (inside City limit) use from ongoing replacement of fixtures, appliances, and equipment and new State of Colorado legislation (Senate Bill 14-103) assuring high-efficiency plumbing in new construction
- 0.5 percent per year decrease in commercial outdoor water use (inside City limit) due to the City's water conservation efforts and rate structure
- 1 percent per year increase in commercial water use outside City limit to account for additional growth potential in the sector
- 0.25-percent decrease per year in city/municipal indoor water use from ongoing replacement of fixtures, appliances, and equipment and new Colorado legislation (Senate Bill 14-103)
- Annual construction water demand of 4.8 MG that does not increase or decrease each year
- Steady increase in water use at the Phillips 66 property from 0 gallons in 2014 to 250 MG at build-out in 2032
- Volume of water loss is held constant at 189 MG, which represents the average water loss from the last 5 years, thus reducing water loss from 15.8 percent in 2014 to 11.9 percent in 2032

Treated water demand for the active conservation forecast increases to 1,698.1 MG (5,211.2 acre-feet) in 2032. This is 241 MG less than the original baseline forecast and 71 MG less than the passive conservation forecast. If the elements of this plan are fully realized, then it is estimated that water demand at 2032 will be reduced by 241 MG (0.66 mgd) as result of passive and active water conservation measures.

If the assumption for water use at the Phillips 66 property is not included in the active forecast the active conservation forecast is 1,417.3 MG (4,349.6 acre-feet) in 2032.

2.4.6 Adequacy of Water Supply and Infrastructure

From the summary in Section 1.2, Water Supply Reliability, the *2003 Raw Water Master Plan* estimated that under future conditions the raw water supply system would provide a firm yield of 5,400 acre-feet. The master plan included many assumptions for supply and demand scenarios and should be updated to reflect more recent water supply and demand data. However, the estimate of firm yield illustrates the importance of water conservation for the City. A summary of the treated water demand forecasts and other infrastructure capacities is provided in Table 12.

TABLE 12
Annual Treated Water Demand Forecast Summary and Raw Water Supply

Forecast Scenario	Demand (MG)	Average Daily Demand (mgd)	Demand (acre-feet)	Notes
Baseline	1,938.4	5.3	5,949.7	—
Passive Conservation	1,769.4	4.9	5,430.0	—
Active Conservation	1,698.1	4.7	5,211.2	—
Active Conservation w/o Phillips 66 Demand	1,417.3	3.9	4,349.6	—
Raw Water Supply Firm Yield	—	—	5,400	Estimated from *2003 Raw Water Master Plan*

Notes:
MG = million gallons
mgd = million gallons per day

In this evaluation, the total demand for treated water ranges from 4,350 to 5,950 acre-feet depending on the level of water conservation and development. The estimated raw water supply firm yield is 5,400 acre-feet from the *2003 Raw Water Master Plan*. The firm yield value will be verified as part of the 2014 Raw Water Master Plan Update project to reflect more recent conditions. However, water conservation will be important for the City in the future to decrease the likelihood of having to find additional raw water sources.

The *2012 Water System Facilities Plan* also forecasted treated water demand for the City. The time frame to build-out and total population were similar to this evaluation. Treated water demands forecasted from the *2012 Water System Facilities Plan* range from 4.4 mgd to 5.1 mgd depending on the method of calculation. These endpoints are similar, but an exact comparison may not be possible. The forecast from this evaluation (Table 12) explicitly includes additional demand for the Philips 66 property and accounts for water loss. It is not clear if these were accounted for in the *2012 Water System Facilities Plan* forecast. Based on calculations from the projections, it seems the per capita metered usage from the *2012 Water System Facilities Plan* ranged from 198 to 225 gpcd, which is slightly higher than the baseline forecast value of 176 gpcd.

The firm water treatment plant production capacity is 12.1 mgd. The estimated volume of total treated water demand, when distributed over an entire year, represents the average demand. However, peak demands have to be met by the water treatment facilities and peak-day demands are usually used to size water treatment facilities. The City's *2012 Water System Facilities Plan* evaluated peak-day factors: The

average from 2003 to 2010 was 2.59 and the 75th percentile value was 2.68. To be slightly conservative, the 75th percentile factor was used for this evaluation. A summary of hypothetical peak-day demands for each forecast is summarized in Table 13 and shown graphically in Figure 7. Table 13 includes two peak-day scenarios: one where the peaking factor is applied to the average demand, and a second where the peaking factor is only applied to the metered demand and not to the portion of demand from construction water and estimated water loss.

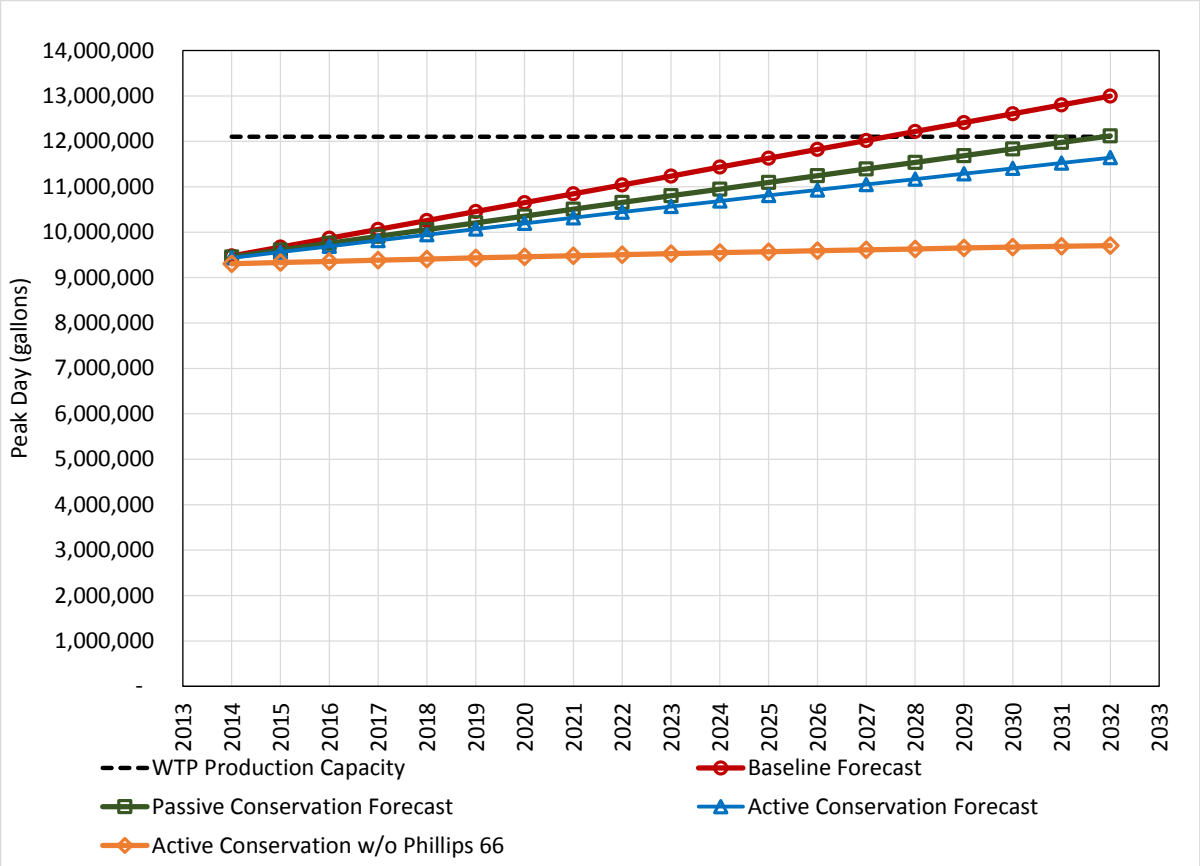
The baseline forecast estimates a peak-day demand of 14.2 mgd which is greater than the treatment plant production capacity. The water treatment plant production capacity of 12.1 mgd is close to meeting the peak-day demand for the active conservation forecast of 12.6 mgd and meets the demand for the active conservation forecast without the Phillips 66 demand. Depending on development, the peak demands at build out will be close to the treatment plant capacity, but could be managed with water efficient measures targeted at decreasing peak demand.

TABLE 13
Estimated Peak-Day Demand and Water Treatment Plant Capacity

Forecast Scenario	Average Daily Demand (mgd)	Peaking Factor (PF)	Estimated Peak-Day Demand (mgd)	Estimated Peak-Day Demand w/ Selective PF[1] (mgd)	Notes
Baseline	5.3	2.68	14.2	13.0	75th percentile peaking actor from 2012 Water System Facilities Plan
Passive Conservation	4.9	2.68	13.1	12.1	75th percentile peaking actor from 2012 Water System Facilities Plan
Active Conservation	4.7	2.68	12.6	11.6	75th percentile peaking actor from 2012 Water System Facilities Plan
Active Conservation w/o Phillips 66 Demand	3.9	2.68	10.5	9.7	75th percentile peaking actor from 2012 Water System Facilities Plan
Water Treatment Plant Production Capacity	—	—	12.1	12.1	WTP treatment capacity is 13.0 mgd which is approximately 12.1 mgd of water produced at the effluent.

Note:
[1] Peaking factor (PF) selectively applied to metered demand only and not to the portion of demand from construction water and estimated water loss.
mgd = million gallons per day

FIGURE 7
Treated Water Demand Peak Forecast and Water Treatment Plant Capacity



3 Integrated Planning and Water Efficiency Benefits and Goals

3.1 Water Efficiency and Water Supply Planning

Integrated resources planning is implemented by the City in its planning process; new water supplies as well as water conservation are considered when planning to meet future demand. Over the years the City has expanded its water supply portfolio beyond South Boulder Creek to include C-BT and Windy Gap water. The City's most recent water master plan, the *2012 Water System Facilities Plan*, incorporated water conservation into the demand forecasting methodology. Efficient water use the by the City and its customers will be important to increasing the reliability of the supply when the City is built out. The summary table (Table 2) from Section 1.2, Water Supply and Reliability is repeated here.

TABLE 2 (REPEAT)
Supply Side Limitations and Future Needs Summary

Limitation or Future Need	Comments on Limitation or Future Need	How is Limitation or Future Need Being Addressed
Raw water supply	The estimated firm yield from the City's *2003 Raw Water Master Plan* was approximately 5,400 acre-feet. Drought years may result in a deficit.	Efficient water use especially during drought years will be required. Monitor growth of commercial properties that are not yet developed.
Raw water storage	The total raw water storage capacity of 1,927 to 3,427 acre-feet is less than the City's current annual water consumption.	Efficient water use to minimize the need for additional raw water storage. Evaluate interconnects and storage projects to increase flexibility of raw water supply system.
Water treatment plant capacity	The City has two water treatment plants with a combined treatment capacity of 13.0 mgd (firm production capacity of approximately 12.1 mgd). There are some limitations on the source water that each plant is able to receive.	Efficient water use to eliminate need for capacity increases at the water treatment plants. Increase flexibility of moving raw water between the two treatment plants.
Wastewater treatment plant (WWTP) capacity to meet future regulations	Current rated WWTP capacity is 3.4 mgd, but future effluent regulations have the potential to impact the plant capacity.	In 2015, the City will start construction of the WWTP upgrades to meet redundancy, ammonia, and nutrient removal regulations. The plant capacity will also be decreased to 2.53 mgd to meet regulations.
Louisville pipeline	The pipeline reliably delivers 5.2 cfs (3.36 mgd) to the Howard Berry WTP and 4.9 cfs to the Louisville Reservoir. May operate at capacity during peak months depending on demand, the amount of water supplied from C-BT, and the amount of divertible water rights.	There are no projects planned to increase capacity of the Louisville pipeline. Blending of raw water sources will be required to meet future demands.
C-BT water pipeline	Pipeline capacity is 4.2 cfs (2.7 mgd). The City has other water supplies, but if more C-BT water was required to meet demand it would be difficult to meet the peak, especially in summer months.	SWSP upsizing is planned to occur within the next 10 years. Blending of raw water sources will be required to meet future demands.

TABLE 2 (REPEAT)
Supply Side Limitations and Future Needs Summary

Limitation or Future Need	Comments on Limitation or Future Need	How is Limitation or Future Need Being Addressed
Overall system reliability	Even with multiple water supply options and two treatment plants, the system is still vulnerable to unpredictable events. Interconnects would increase reliability.	The City has potable water interconnects with the City of Lafayette and is currently working on designing an interconnect with the Town of Superior.

Notes:
C-BT = Colorado-Big Thompson
cfs = cubic feet per second
mgd = million gallons per day

Efficient water use will need to be a consistent practice and message from the City in order to address future water supply needs. Maintaining the integration of efficient water use into raw water resource planning will be critical. Efficient water use to reduce peak-day demands may defer or eliminate the need for a new water treatment facility or a significant upgrade to the existing plants. Efficient water use also results in decreased flow to the wastewater treatment plant; while this helps limit costly expansion to the facility, it also lowers the amount of water available for reuse. The City's operation and maintenance plan and capital improvement plan (CIP) are updated annually and will need to be integrated with results from water supply planning so the appropriate infrastructure is in place to achieve the goals.

3.2 Water Efficiency Goals

The end goals of the water efficiency plan were established with staff from the City's Public Works Department, including the director, engineers, and operators. Goals were established based on the knowledge of the system limitations, areas needing improvement, and underutilized resources. A summary of the City's water efficiency goals is provided in Table 14.

TABLE 14
Summary of Water Efficiency Goals

Goal	Approach	Measurement
Total annual water savings of 10 percent below baseline forecast at build out (600 acre-feet).	Water efficiency activities identified in this plan.	• Annual water treatment plant production • Per capita treated water production.
Account for all Water	Meter water that is currently authorized and unmetered for City use. Conduct AWWA Manual M36 water audit.	• Monthly water use be category with separate category for bulk water • Per capita metered • Per capita residential • Complete AWWA Manual M36 audit
Decreased peak-day demand at build-out to less than 13 mgd.	Water efficiency activities identified in this plan targeted to outdoor water use; increase reuse water distribution.	Daily water treatment plant production.

4 Selection of Water Efficiency Activities

4.1 Summary of Selection Process

The process of selecting water efficiency activities took place during several meetings with the City's Public Works staff. The conservation measures included in this plan were selected using the following process:

- City staff and the consulting team assembled a list of all water demand management measures implemented by the City in recent years.
- Consulting team consolidated and organized the list of activities and selected a number of additional measures for consideration. Only measures that were cost-effective best practices and that could be implemented effectively using existing staff resources were included.
- City staff and the consulting team met and reviewed all existing and potential measures and selected measures to carry through for inclusion in the plan.
- Consulting team prepared an internal Draft Water Efficiency Plan in July 2014.
- City staff reviewed the draft and modified conservation planning measures.
- The consulting team prepared a Draft Final Water Efficiency Plan in August 2014 for public review.
- Public comments collected during a 60-day review period from September 10, 2014 to November 10, 2014.
- A final draft was prepared in November 2014 for review by CWCB. There were no comments and the plan was approved by CWCB on January 6, 2015.

Many of the water efficiency activities that have already been implemented by the City will continue. Because of the established water efficiency goals (Table 13), many of the new water efficiency activities considered targeted efficient outdoor water use to decrease the peak demand.

The City of Louisville has a strong commitment to water conservation, but does not have a full-time water conservation coordinator. A key decision factor when considering water conservation programs for implementation were measures that can be effectively implemented using existing staff resources. The water conservation measures included in this plan have been selected to ensure effective ongoing water demand management in the City in the coming years and continuity with previous water conservation efforts.

The identification and screening of water efficiency activities is summarized in Table 15.

TABLE 15
City of Louisville
Identification and Screening of Water Efficiency Activities

Water Efficiency Activities	Existing Activity	Continue Activity	Implement New Activity	Other Notes
Foundational Activities				
Staff				
Water Conservation Coordinator	No		Yes	City will designate an existing staff member as the water conservation coordinator.
Planning				
Integrated Water Resources Plans	Yes	Yes		
Master Plans/Water Supply Plans	Yes	Yes		Update the 2003 Raw Water Master Plan
Capital Improvement Plans	Yes	Yes		Updated annually.
Feasbility Studies	Yes	Yes		
Metering, Water Rates, Billing				
Automatic Meter Reading Installation and Operations	Yes			Drive by AMR
Meter Replacement	Yes	Yes		
Meter Upgrades	Yes	No		Meters were updated in 2010-2011; do not need to be upgraded again in the time frame of this plan.
Volumetric Billing	Yes	Yes		
Monthly Meter Reading and Billing	Yes	Yes		
Track Water Use by Customer Categories	Yes	Yes	Yes	Add categories for bulk water and authorized use.
Inclining Block Rates	Yes	Yes	Yes	City plans to evaluate the rate structure to see if more efficiency can be encouraged for outdoor irrigation.
Separate Irrigation Meters-Commercial	Yes	Yes	Yes	This is currently optional; not all commercial users have a separate meter. Consider mandatory for large customers.
Separate Irrigation Meters-HOAs	Yes	Yes		
Separate Irrigation Meters-Multifamily with 5+ Units	Yes	Yes		
Water Budgets	No		No	A Water Rate Study was performed in 2013; feedback from the public did not support water budgets at this time.
Informational Water Budgets	No		Yes	
Tap Fees with Water Use Efficiency Incentives	Yes	Yes		
System Efficiency				
Leak Detection Repair Program	Yes	Yes		Performed every other year.
Water Line Replacement Program	Yes	Yes		Ongoing annual maintenance program.
System Wide Water Audit	No		Yes	Perform water audit in accordance with AWWA M36 method
Phreatophyte Eradication	Yes	Yes		
Reuse Water System	Yes	Yes		Increase distribution of reuse water.
Monitoring and Evaluation				
Monitor Water Use of Large Customers	Yes	Yes		Large water users are monitored as part of the Industrial Pretreatment Program.
Monitor Irregular Water Use	Yes	Yes		Billing software alerts if there is a deviation in water use.
Annual Water Use Tracking by Customer Category	Yes	Yes		
Update Conservation Plan	No		Yes	Every 5 to 7 years to meet CWCB requirements.
Report Water Use to CWCB	No		Yes	Annually
Targeted Technical Assistance				
Water Efficient Fixtures-Indoor				
Low Flow Faucets	Yes	Yes		Installed at City Hall, expand to other facilities in the future.
Low Volume Toilets	Yes	Yes		Installed at City Hall, expand to other facilities in the future.
Low Flow Shower Heads	Yes	No		Installed at Recreation Center. No need to continue except for replacement.
Ultra-Low Flush Urinals	Yes	Yes		Installed at City Hall, expand to other facilities in the future.
High Efficiency Pre-Rinse Spray Nozzles	No		Yes	
Water Efficient Devices-Outdoor				
Weather-Based Irrigation Controller - City Facilities	Yes	Yes		

TABLE 15

City of Louisville

Identification and Screening of Water Efficiency Activities

Incentives				
Weather-Based Irrigation Controller	No		Yes	
Soil Sensors	No	No		Technology still being developed.
HE Clothes Washer Rebate	Yes	No		Potential to phase this out based on new State requirements for water efficient fixtures.
Low Volume Toilet Rebate	Yes	No		Potential to phase this out based on new State requirements for water efficient fixtures.
Drip Irrigation System Rebate	Yes	No		Outdated rebate offer with limited participation.
Dishwasher Rebate	No		No	Industry standards are adequate, natural replacement will occur.
Garden in a Box	No		Yes	Offered through Center for ReSource Conservation (CRC)
Buffalo Grass Turf Rebate	Yes		Yes	
Efficient Water Use (Audits)				
Outdoor Water Audits-Residential	Yes	Yes		Offered through Center for ReSource Conservation (CRC)
Outdoor Water Audits-Commercial	Yes	Yes		Offered through Center for ReSource Conservation (CRC)
Indoor Water Audits-Commercial	No		Yes	Offered through Center for ReSource Conservation (CRC)
Ordinances and Regulations				
Water Waste Ordinance/Limit Overspray	Yes		Yes	
Soil Amendments	No	No		Significant time commitment to inspect and verify amendments.
Time of Day Watering Restrictions	No		Yes	These are currently voluntary unless the City is in a Stage 2 Drought or greater. Implement these hours at all times.
Low Water Plants in Medians of Right of Ways	Yes	Yes		
Landscape Training and Certification	No		No	Significant time commitment. Rely on State or regional effort.
Green Building Requirements	Yes	Yes		
Regulation 84 for Reuse Water	Yes	Yes		
Commerical Water Use-Car Wash Regulations	No		Yes	Reach out to local car washes.
Coordinated Message with Local Cities	Yes	Yes		Coordinated effort with local cities to establish Best Management Practices (BMPs)
Education and Outreach				
Newsletter	Yes	Yes		
City Water Conservation Website	Yes	Yes		
K-12 Teacher and Classroom Education Programs	Yes	Yes		Tours of water facilities
Customer Surveys	Yes	Yes		
Water Committee	Yes	Yes		Comprised of City Council members, meetings open to public.
Targeted Water Commitees	Yes	Yes		When required, create a public member committee to provide input.
Landscape Design and Maintenance Workshops	Yes	Yes		

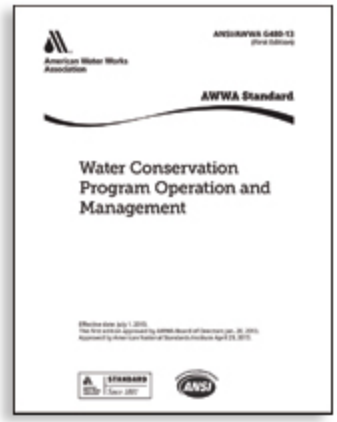
4.2 Demand Management Activities

4.2.1 Foundational Activities

4.2.1.1 Water Conservation Staff

The City does not have a dedicated staff member for water conservation, but they will identify a conservation coordinator as one point of contact for customers with questions about water conservation. City staff members including Dmitry Tepo, Kurt Kowar, and Joliette Woodson will assist with plan implementation.

4.2.1.2 Water Conservation and Integrated Resources Planning



"*Integrated resources planning (IRP) is a comprehensive planning effort that incorporates water conservation programs as another option for meeting future needs*" (*CWCB 2010 Best Practices Guidebook*). The City of Louisville implements a rigorous, integrated resources planning approach that fully integrates water conservation into water supply planning processes as exemplified by previous master plans and the development and approval of this plan. The *2014 Louisville Water Efficiency Plan* is a CWCB-approved water conservation plan prepared by CH2M HILL and WaterDM that meets or exceeds all Colorado planning requirements (Attachment 3).

The City of Louisville practices integrated water resources planning through its other water resource planning efforts as well. The City regularly updates their water supply master plan, capital improvement plan, and feasibility studies including the anticipated impacts of water conservation to ensure a diverse, robust, and resilient water supply. It is recommended the City update the *2003 Raw Water Master Plan* with more recent information on water supply and demand.

4.2.1.3 Metering, Water Rates, and Billing Practices

The City of Louisville's metering, water rates, and billing practices all adhere to established best practices for water conservation as described in the following paragraphs.

Metering and Testing. In the City, 100 percent of customers with taps are metered and all customers are billed volumetrically based on their actual consumption. The City is equipped with a drive-by automated meter reading (AMR) system. New meters were installed across the service area in 2010-2011. Water meters in Louisville are tested and replaced based on AWWA recommendations and protocols.

Billing Practices and Water Rates. Customers are billed monthly using an inclining block rate structure described in the Rate Structure – Landscape Efficiency paragraph below. Water rates are adjusted regularly to ensure sufficient revenue is collected to operate the water utility. The rates were most recently updated on May 1, 2014. These rates are included in Attachment 2. A revised conservation oriented rate structure which could include customer-specific water budgets is currently under consideration. The City will also bill volumetrically for sewer service, starting in 2015.

Customer Categorization. The City has classified all customers in the water system based on the type or category of building/account: residential, multifamily, commercial, irrigation, and city. Water use is regularly tracked by customer category. To improve water accounting it is recommended the City begin to track bulk water and authorized uses as categories.

Rate Structure – Landscape Efficiency. The most significant contributor to overall landscape efficiency in Louisville is the City's increasing block rate water billing structure (Attachment 1) that results in significantly higher bills for customers who use more water. Most frequently this type of inclining block rate structure impacts customers that irrigate their landscape excessively, because it is designed to send a price signal to customers with abnormally high water use during any monthly billing period. The City's increasing block rate structure provides financial incentive for customers adopt water wise landscaping practices. The City plans to maintain the efficiency components of the water rate structure and plans to evaluate strengthening the water rate structure, while encouraging healthy landscapes.

Separate Irrigation Meters (Submetering). Louisville requires separate irrigation services for certain townhome and multifamily developments. Currently separate irrigation meters are required for HOAs and multifamily residences with more than five units, and are optional for commercial buildings. This is an important best practice that provides better accounting of irrigation demands and offers the opportunity for utilizing landscape water budgets based on the irrigated area. The City will be considering implementing mandatory irrigation taps for large commercial customers as part of this plan.

Tap Fees. The City's tap fee structure for new development includes efficiency incentives for builders/ developers. This is an important best practice that ensures new customers join the City's water system at a high level of water efficiency, eliminating the need for future retrofits. Under the existing tap fee structure, a lower tap fee can be secured by a builder/developer if proven water efficiency is incorporated into development plans.

Landscape Water Budgets. The City recently completed a rate study (*2013 Rate Evaluation*) where water budgets were considered as an alternative. A number of implementation concepts were considered including informational water budgets and a water budget-based rate structure. Currently, a new water rate structure has not been adopted and the Water Committee and the City Council will revisit changing this structure in late 2014. At a minimum, the City plans to implement informational water budget information that would be available on customer water bills for comparison to actual usage.

4.2.1.4 System Efficiency (Water Loss Control and Pressure Management)

The City of Louisville strives to maintain a high level of water system efficiency within its distribution system and seeks to reduce water loss whenever and wherever possible. The City works to control apparent losses with accurate metering and regular meter testing, as well as assuring that all customers are metered and billed for the water they use.

Leak Detection. The City implements a regular leak detection and repair program for the water system. A private leak detection contractor is hired every other year to bring listening equipment to the City and to search for water main leaks in designated areas of the City. If a leak is detected, the City has a repair crew ready to dig up the pipe and repair the leak.

Water Line Replacement. The City has implemented an ongoing program as part of regular annual maintenance to replace old water lines throughout the City. In this program, the City designates a specific section (or sections) of water lines for replacement each year. Through this process, the entire distribution network is

replaced and upgraded over time. The current focus of this program is the old downtown area, an area with the oldest pipes.

System Wide Water Audit. The City has identified some gaps in the collection of water use data, such as bulk water and authorized unmetered use. The City is planning to perform an annual implementation of the International Water Association (IWA)/AWWA water loss audit method described in AWWA Manual M36. This best practice is a method of auditing and water loss tracking for utilities where real and apparent losses are evaluated and quantified. Cost and benefit considerations are used to help decision makers select the most appropriate next steps for water loss control. Implementing an annual system water audit would be an important step forward for the City.

Reuse Water System. The City has a reuse water treatment plant. Maximizing the use of reuse water for irrigation will offset the demand on treated water. The City plans to increase use of reuse water; the golf course that was destroyed during the flood is being rebuilt with a reuse water distribution system for irrigation.

4.2.1.5 Monitoring and Evaluation

The City of Louisville implements the following monitoring and evaluation efforts to ensure water efficiency goals are met.

High-Demand Customers. The City monitors demands among the largest users in the system as part of the Industrial Pretreatment Program and investigates usage that deviates from previous patterns.

Irregular Water Use. The City's billing staff occasionally detect changes in total water use from month to month. The City is able to identify these locations and follow up to determine the cause of the increase or decrease. These fluctuations are usually due to an undetected water leak or a meter malfunction.

Annual Water Use. Total annual water use is evaluated annually for each customer category. Information from this data helps track the progress of efficient water use.

Evaluation. The City plans on updating the Water Efficiency Plan every 5 to 7 years to meet the CWCB requirements. They will also report water demand data annually to the CWCB under the rules established in House Bill 1051.

4.2.2 Targeted Technical Assistance and Incentives

4.2.2.1 Incentives

Rebate Programs. The City of Louisville currently offers four rebates to customers with an annual budget of approximately $5,000 each year (see Table 16).

TABLE 16
City of Louisville 2014 Water Efficiency Rebate Offerings

Category	Rebate Amount	Rebate Maximum	Approved Product
Turf Type Buffalo Grass	$0.25 per square foot	$75.00	Type "609" Legacy
Drip Irrigation Systems	50% of purchase price	$50.00	Any major manufacturer. Drip piping/connectors only; installation or "sprinkler" costs are not covered.
High-Efficiency Clothes Washers (1 rebate per customer every 5-year period)	$75.00	$75.00	Models meeting CEE Standards (see list)
Toilets (1 rebate per customer every 5-year period)	$25.00 each (limit 3 per household)	$75.00	Any 1.5- or 1.6-gallon water saver toilet

The City is phasing out the toilet and clothes washer rebates in the coming years because of Colorado's new state law mandating a transition to water efficient fixtures in the marketplace. Colorado's new state law, SB14-103, requires that as of September 1, 2016, all tank-type toilets, urinals, faucets, and showerheads sold in Colorado will meet the same flow requirements as WaterSense-labeled plumbing fixtures. This law is expected to advance indoor water efficiency in both the residential and nonresidential settings. New construction in Colorado after 2016 should come equipped with high-efficiency fixtures. Retrofits completed after 2016 will include high-efficiency toilets, showers, urinals, and faucets. Louisville understands that this new law significantly reduces the need for water providers to incent customers to purchase high-efficiency fixtures and is planning to phase out their rebate incentive program as a result. The City is also planning to phase out the drip irrigation system rebate because these parts are now readily available from local home improvement stores and there is very limited participation.

In support of shifting the focus of incentives to outdoor watering efficiency the City is planning to maintain the buffalo grass rebate and increase the amount to $1.00 per square foot up to a maximum of $150. The City will also consider adding a rebate for weather-based irrigation controllers up to $100 each. It is important that controllers are WaterSense® labeled to be eligible for the rebate. Soil sensors are also an option but these are more complicated and technology is still improving.

Garden in a Box. The City would like to add the Garden in a Box offered by CRC to the incentive program for residential customers. The program will help educate the public on water efficient landscaping and make it easy for them to implement in their own yard.

4.2.2.2 Water Efficient Fixtures-Indoor

Water Efficient Fixtures – Indoor. In recent years the City has upgraded municipal buildings including City Hall with high efficiency fixtures and appliances. Low-flow faucets, low-volume toilets, and ultra-low-volume urinals are installed at City Hall. Low-flow shower heads were installed at the Recreation Center. This process will continue wherever practical.

High-Efficiency Pre-Rinse Spray Nozzles. To supplement indoor commercial water audits the City is also considering providing high-efficiency pre-rinse spray valves (PRSVs) to local restaurants and cafeterias. PRSVs (see photo to the right) are a proven effective method for reducing water and energy demands in the food service industry.

4.2.2.3 Water Efficient Devices-Outdoor

Central Irrigation System Control. All the City's irrigation systems can be controlled from a central irrigation control system. Watering can be adjusted based on rainfall. The City will evaluate if the central irrigation control system can be further improved through the inclusion of weather-based technology including rain sensors, soil sensors, and ET-based control.

Rain Sensors. The City's irrigation system is not yet linked to rain or soil moisture sensors. The City is considering this technology so the system will automatically adjust to real time rainfall conditions. The potential for reducing water use through implementation of these technologies will be explored.

4.2.2.4 Efficient Water Use – Audits

Indoor Commercial Water Audits. The City already contracts with CRC to conduct landscape irrigation audits. CRC now offers non-residential indoor audits as well and the City is considering adding this service starting in 2016.

Irrigation Efficiency Audits. Improving the efficiency of landscape irrigation and particularly the efficiency of automatic irrigation systems is and will continue to be an important focus of the City's conservation program. The City contracts annually with the CRC to offer free irrigation efficiency audits to interested residential and commercial customers. CRC provides Louisville with an inexpensive and effective way to

offer effective water conservation programs targeted at the areas of greatest need. CRC audits typically include:

- Evaluation of irrigation system performance
- Adjustment of heads to correct for over-spray
- Discussion of appropriate irrigation scheduling with the customer
- Inspection of rain sensors (if installed)

4.2.3 Ordinances and Regulations

Water Waste Ordinance. The City has an approved water waste ordinance that is enacted during times of drought. As part of this ordinance, the City can mandate time-of-day watering restrictions when necessary and has the authority to issue fines and penalties for overspray, wasteful irrigation practices, and time of day violations.

Watering Ordinance. Except in times of drought the City does not have mandatory watering times in place for customers. The City could implement mandatory watering hours during a time of drought as outlined in the *2013 Drought Management Plan*.

Green Building Code. Effective March 31, 2014, the City of Louisville adopted the 2012 International Building Code (2102 IBC).

Landscape Regulations. Louisville's commercial landscape regulations help ensure that new landscapes in the City are water efficient. The CDPHE's Regulation No. 84 prohibits excess runoff from areas irrigating with reuse water.

Regulation No. 84 – Reclaimed Water Control Regulation. The City's reuse water system complies with the Regulation No. 84 that includes requirements for irrigation efficiency to minimize overspray, ponding, and runoff of reuse water.

Soil Amendment Requirements. The City's Open Space Division utilizes soil amendments and low-water plants, but there are no plans to expand the soil requirement to others because the required inspection to verify the requirements is too labor-intensive for the City's current staff.

Commercial Car Wash Regulations. The City is considering reaching out to local car washes to work with them to implement regulations to increase water efficiency. Some of the measures could include recycling of water for new facilities or retrofitting devices for existing facilities to increase water efficiency.

4.2.4 Information and Education

The City encourages the adoption of water wise landscaping practices and efficient irrigation through customer education and information offerings including bill stuffers, brochures, and the City's web site.

Available Information. The City's web site had information on water conservation, water rates, and the City's incentive programs.

Communication. The City distributes a newsletter via mail to inform customers of relevant information for efficient water use and notify customers of upcoming workshops.

Education. The City gives tours of the water facilities for educational purposes. The City also offers instructional workshops for customers on relevant topics such as irrigation efficiency and management.

Water Committee. The City has a Water Committee that is made up of City Council members. They meet two to three times a year to discuss water related issues the City is facing. These meetings are open to the public. Targeted water committees are formed when needed to address specific topics. These committees can be a combination of Council members and the public.

5 Implementation and Monitoring Plan

5.1 Implementation Plan

Many of the programs that the City currently has to encourage efficient water use will continue. A summary of the activities planned for implementation is provided in Table 17. A list of estimated annual costs is provided in Table 18 for planning purposes.

The City plans to implement the following 11 new activities in the next several years:

- Identify a single person as the water conservation coordinator for the City
- Provide customers with theoretical informational water budgets on the monthly bill for comparison to actual use or implement a conservation-oriented water rate structure
- Perform a system-wide water audit in conformance with AWWA Manual M36
- Update this Water Efficiency Plan every 5 to 7 years
- Report water use to CWCB to meet State requirements
- Distribute high-efficiency spray nozzles to local restaurants
- Evaluate the installation of weather-based irrigation controllers for the City's irrigation systems
- Add weather-based irrigation controller rebate for customers
- Add Garden in a Box (offered by CRC) to the incentives for local residential customers
- Add indoor water audits for commercial customers (offered by CRC)
- Evaluate adding mandatory time-of-day (or day-of-week) watering restrictions even when not in a drought
- Reach out to local car washes to establish regulations for efficient water use

In addition to the new activities that the City will consider, the City plans to modify the following three activities:

- Track water use by customer category and add categories for bulk water and authorized uses
- Evaluate if a more aggressive inclining block rate structure would encourage further efficient outdoor water use
- Have a mandatory requirement for separate irrigation taps for large commercial customers

The City will consider removing the following four activities from the program:

- Meters were updated in 2010-2011; they do not need to be upgraded again in the time frame of this plan
- Low-flow shower heads were already installed at the recreation center; therefore, no new heads are needed except for replacement
- High-efficiency clothes washer rebate (potential to phase this out based on new State requirements for water-efficient fixtures and industry standards)
- Low-volume toilet rebates (potential to phase this out based on new State requirements for water-efficient fixtures and industry standards)
- Drip irrigation system rebates

TABLE 17
City of Louisville
Water Efficiency Activity Implementation Summary

Water Efficiency Activities	Existing Activity	Continue/Start/ Modify Activity	Implementation Time Frame	Other Notes
Foundational Activities				
Staff				
Water Conservation Coordinator	No	Yes	Immediately	City will designate an existing staff member as the water conservation coordinator.
Planning				
Integrated Water Resources Plans	Yes	Yes	Continue Ongoing	
Master Plans/Water Supply Plans	Yes	Yes	Continue Ongoing	Update the 2003 Raw Water Master Plan
Capital Improvement Plans	Yes	Yes	Continue Ongoing	
Feasbility Studies	Yes	Yes	Continue Ongoing	
Metering, Water Rates, Billing				
Automatic Meter Reading Installation and Operations	Yes	Yes	Continue Ongoing	
Meter Replacement	Yes	Yes	Continue Ongoing	
Volumetric Billing	Yes	Yes	Continue Ongoing	
Monthly Meter Reading and Billing	Yes	Yes	Continue Ongoing	
Track Water Use by Customer Categories	Yes	Modify	w/in 1 year	Add categories for bulk water and authorized use.
Inclining Block Rates	Yes	Modify	2 to 3 years	Evaluate the rate structure to see if more efficiency can be encouraged for outdoor irrigation.
Separate Irrigation Meters-Commercial	Yes	Modify	2 to 3 years	This is currently optional for commerical. Consider mandatory for large customers.
Separate Irrigation Meters-HOAs	Yes	Yes	Continue Ongoing	
Separate Irrigation Meters-Multifamily with 5+ Units	Yes	Yes	Continue Ongoing	
Informational Water Budgets	No	Yes	3 to 5 years	
Tap Fees with Water Use Efficiency Incentives	Yes	Yes	Continue Ongoing	
System Efficiency				
Leak Detection Repair Program	Yes	Yes	Continue Ongoing	
Water Line Replacement Program	Yes	Yes	Continue Ongoing	
System Wide Water Audit	No	Yes	1 to 2 years	Perform water audit in accordance with AWWA M36 method
Phreatophyte Eradication	Yes	Yes	Continue Ongoing	
Reuse Water System	Yes	Yes	Continue Ongoing	Increase distribution of reuse water.
Monitoring and Evaluation				
Track Water Use of Large Customers	Yes	Yes	Continue Ongoing	Large water users are tracked as part of the Industrial Pretreatment Program.
Track Irregular Water Use	Yes	Yes	Continue Ongoing	Billing software alerts if there is a deviation in water use.
Annual Water Use Tarcking by Customer Category	Yes	Yes	Continue Ongoing	
Update Conservation Plan	No	Yes	5 to 7 years	Every 5 to 7 years to meet CWCB requirements.
Report Water Use to CWCB	No	Yes	Continue Ongoing	Annually
Targeted Technical Assistance				
Water Efficient Fixtures-Indoor				
Low Flow Faucets	Yes	Yes	Continue Ongoing	Installed at City Hall, expand to other facilities in the future.
Low Volume Toilets	Yes	Yes	Continue Ongoing	Installed at City Hall, expand to other facilities in the future.
Ultra-Low Flush Urinals	Yes	Yes	Continue Ongoing	Installed at City Hall, expand to other facilities in the future.
High Efficiency Pre-Rinse Spray Nozzles	No	Yes	2 to 3 years	
Water Efficient Devices-Outdoor				
Weather-Based Irrigation Controller - City Facilities	Yes	Yes	2 to 3 years	

TABLE 17

City of Louisville

Water Efficiency Activity Implementation Summary

Incentives				
Weather-Based Irrigation Controller	No	Yes	2 to 3 years	Includes soil sensor, rain sensor, WaterSense certified
Garden in a Box	No	Yes	1 to 2 years	Offered through Center for Resource Conservation (CRC)
Buffalo Grass Turf Rebate	Yes	Yes	Continue Ongoing	
Efficient Water Use (Audits)				
Outdoor Water Audits-Residential	Yes	Yes	Continue Ongoing	Offered through Center for Resource Conservation (CRC)
Outdoor Water Audits-Commercial	Yes	Yes	Continue Ongoing	Offered through Center for Resource Conservation (CRC)
Indoor Water Audits-Commercial	No	Yes	1 to 2 years	Offered through Center for Resource Conservation (CRC)
Ordinances and Regulations				
Water Waste Ordinance/Limit Overspray	Yes	Yes	Continue Ongoing	
Time of Day Watering Restrictions	No	Yes	1 to 2 years	
Low Water Plants in Medians of Right of Ways	Yes	Yes	Continue Ongoing	
Green Building Requirements	Yes	Yes	Continue Ongoing	
Regulation 84 for Reuse Water	Yes	Yes	Continue Ongoing	
Commerical Water Use-Car Wash Regulations	No	Yes	3 to 5 years	
Coordinated Message with Local Cities	Yes	Yes	Continue Ongoing	Coordinated effort with local cities to establish Best Management Practices (BMPs)
Education and Outreach				
Newsletter	Yes	Yes	Continue Ongoing	
City Water Conservation Website	Yes	Yes	Continue Ongoing	
K-12 Teacher and Classroom Education Programs	Yes	Yes	Continue Ongoing	Tours of water facilities
Customer Surveys	Yes	Yes	Continue Ongoing	
Water Committee	Yes	Yes	Continue Ongoing	Comprised of City Council members, meetings open to public.
Targeted Water Commitees	Yes	Yes	Continue Ongoing	When required, create a public member committee to provide input.
Landscape Design and Maintenance Workshops	Yes	Yes	Continue Ongoing	

The estimated annual costs for several water efficiency activities are provided in Table 18. Costs have been estimated for activities that have tangible costs such as rebates and water audits. Costs have not been estimated for activities that involve staff time such as establishing ordinances and providing educational outreach; it is assumed these activities will be completed by the designated conservation coordinated as time allows each year. The costs in Table 18 are in addition to the regular operation and maintenance costs that the City already budgets for to maintain pipelines, replace meters, and detect and repair leaks in the distribution system.

TABLE 18
Suggested Annual Budget for Water Efficiency Activities

Water Efficiency Activity	Quantity	Unit Cost	Annual Budget	Notes
System Wide Water Audit	1	$10,000	$10,000	Perform every 1 to 2 years.
High-Efficiency Pre-Rinse Spray nozzles	20	$100	$2,000	-
Weather-Based Irrigation Controller – City Facilities	1	$500	$500	Only include in budget until large City facilities are equipped.
Weather-Based Irrigation Controller Rebate	20	$100	$2,000	$100 rebate; adjust budget each year based on demand from customers
Garden In A Box	20	$50	$1,000	$50 rebate; Typical cost for a box from CRC is $100
Buffalo Grass Turf Rebate	10	$150	$1,500	$1/sf up to $150 maximum
Outdoor Water Audits-Residential	1	$3,000	$3,000	Lump sum to CRC.
Outdoor Water Audits-Commercial	1	$3,000	$3,000	Lump sum to CRC.
Indoor Water Audits-Commercial	1	$5,000	$5,000	Lump sum to CRC.
Total Estimated Annual Budget for Rebates, Incentives and Audits	**-**	**-**	**$28,000**	
Other Annual Costs to Consider:				
Water Conservation Coordinator	200 hrs	$80/hr	$16,000	A new staff member is not required so this is not a new cost. The information is provided to give an expectation of effort required.
Other Periodic Costs to Consider:				
Update Water Conservation Plan	1	$30,000 to $40,000	$30,000 to $40,000	Every 5 to 7 years.

5.2 Monitoring Plan

Monitoring and verification of program effectiveness will be conducted through a combination of tracking efforts to measure the value of the activities being implemented by the City. Of course, some of the proposed water conservation activities such as general customer education and increased water rates will not be measured directly. However, for some of the activities, such as the commercial audits and rebates, tracking individual customer water use will be performed to monitor water efficiency and track customer water use.

The monitoring and verification efforts that the City proposes to initiate include the following:

- Daily, monthly, and annual water treatment plant production
- Monthly water use by each customer category
- Residential, metered, and treated water production per capita values

6 Adoption, Public Review, and Approval

6.1 Public Review Process

A draft of the Water Efficiency Plan was made available to the public for a 60-day public review period from September 10, 2104 to November 10, 2014. Comments were received from the public and updates were made to the plan. A summary of public comments and proof of posting date is provided in Attachment 2. If changes were made to the plan in response to a comment it is noted in the summary. The City thanks the public for their interest and meaningful comments on the plan.

6.2 Efficiency Plan Approval and Adoption

The plan has been approved by City Staff. It was submitted to CWCB for review in November 2014; there were no additional comments and the plan was approved by CWCB in January 2015. The plan will be brought to City Council for formal approval and adoption.

6.3 Plan Review and Update

The City will summarize the findings of the monitoring and verification efforts and provide a briefing to the Water Committee once a year. The City will use these data as the basis for formally updating the Water Efficiency Plan once every 7 years, as required by the CWCB. The plan will be updated by the end of 2021.

6.4 Compliance with State Planning Requirements

A summary of the plan's compliance with State planning requirements is provided in Attachment 3.

ATTACHMENT 1

City of Louisville Water Rate Structure

City of Louisville Water Rates (Effective May 1, 2014)

Residential Accounts (up to 1" meter size)	
Gallons	**Rate**
Zero - 5,000	$12.32 (minimum monthly charge)
5,001 - 20,000	$12.32 for the first 5,000 gallons, plus $3.55 for each additional 1,000 gallons (or fraction thereof)
20,001 - 30,000	$65.57 for the first 20,000 gallons, plus $8.84 for each additional 1,000 gallons (or fraction thereof)
30,001 - 40,000	$153.97 for the first 30,000 gallons, plus $9.55 for each additional 1,000 gallons (or fraction thereof)
40,001 - 50,000	$249.47 for the first 40,000 gallons, plus $10.20 for each additional 1,000 gallons (or fraction thereof)
50,001 and over	$351.47 for the first 50,000 gallons, plus $10.88 for each additional 1,000 gallons (or fraction thereof)

Commercial and Irrigation Accounts (up to 3/4" meter size)	
Gallons	**Rate**
Zero - 20,000	$12.32 (minimum monthly charge), plus $3.55 for each 1,000 gallons (or fraction thereof)
20,001 - 30,000	$83.32 for the first 20,000 gallons, plus $8.84 for each additional 1,000 gallons (or fraction thereof)
30,001 - 40,000	$171.72 for the first 30,000 gallons, plus $9.55 for each additional 1,000 gallons (or fraction thereof)
40,001 - 50,000	$267.22 for the first 40,000 gallons, plus $10.20 for each additional 1,000 gallons (or fraction thereof)
50,001 and over	$369.22 for the first 50,000 gallons, plus $10.88 for each additional 1,000 gallons (or fraction thereof)

Commercial, Irrigation, and 2 Unit Multifamily Accounts (1" meter size)	
Gallons	**Rate**
Zero - 40,000	$24.63 (minimum monthly charge), plus $3.55 for each 1,000 gallons (or fraction thereof)
40,001 - 60,000	$166.63 for the first 40,000 gallons, plus $8.84 for each additional 1,000 gallons (or fraction thereof)
60,001 - 80,000	$343.43 for the first 60,000 gallons, plus $9.55 for each additional 1,000 gallons (or fraction thereof)
80,001 - 100,000	$534.43 for the first 80,000 gallons, plus $10.20 for each additional 1,000 gallons (or fraction thereof)
100,001 and over	$738.43 for the first 100,000 gallons, plus $10.88 for each additional 1,000 gallons (or fraction thereof)

Commercial, Irrigation, and 3-6 Unit Multifamily Accounts (1.5" meter size)	
Gallons	**Rate**
Zero - 80,000	$36.96 (minimum monthly charge), plus $3.55 for each 1,000 gallons (or fraction thereof)
80,001 - 120,000	$320.96 for the first 80,000 gallons, plus $8.84 for each additional 1,000 gallons (or fraction thereof)
120,001 - 160,000	$674.56 for the first 120,000 gallons, plus $9.55 for each additional 1,000 gallons (or fraction thereof)
160,001 - 200,000	$1,056.56 for the first 160,000 gallons, plus $10.20 for each additional 1,000 gallons (or fraction thereof)
200,001 and over	$1,464.56 for the first 200,000 gallons, plus $10.88 for each additional 1,000 gallons (or fraction thereof)

Commercial, Irrigation, and 7-11 Unit Multifamily Accounts (2” meter size)	
Gallons	**Rate**
Zero - 160,000	$49.20 (minimum monthly charge), plus $3.55 for each 1,000 gallons (or fraction thereof)
160,001 - 240,000	$617.20 for the first 160,000 gallons, plus $8.84 for each additional 1,000 gallons (or fraction thereof)
240,001 - 320,000	$1,324.40 for the first 240,000 gallons, plus $9.55 for each additional 1,000 gallons (or fraction thereof)
320,001 - 400,000	$2,088.40 for the first 320,000 gallons, plus $10.20 for each additional 1,000 gallons (or fraction thereof)
400,001 and over	$2,904.40 for the first 400,000 gallons, plus $10.88 for each additional 1,000 gallons (or fraction thereof)

Commercial, Irrigation, and 12-26 Unit Multifamily Accounts (3” meter size)	
Gallons	**Rate**
Zero - 320,000	$98.56 (minimum monthly charge), plus $3.55 for each 1,000 gallons (or fraction thereof)
320,001 - 480,000	$1,234.56 for the first 320,000 gallons, plus $8.84 for each additional 1,000 gallons (or fraction thereof)
480,001 - 640,000	$2,648.96 for the first 480,000 gallons, plus $9.55 for each additional 1,000 gallons (or fraction thereof)
640,001 - 800,000	$4,176.96 for the first 640,000 gallons, plus $10.20 for each additional 1,000 gallons (or fraction thereof)
800,001 and over	$5,808.96 for the first 800,000 gallons, plus $10.88 for each additional 1,000 gallons (or fraction thereof)

Commercial, Irrigation, and 27-47 Unit Multifamily Accounts (4” meter size)	
Gallons	**Rate**
Zero - 640,000	$197.10 (minimum monthly charge), plus $3.55 for each 1,000 gallons (or fraction thereof)
640,001 - 960,000	$2,469.10 for the first 640,000 gallons, plus $8.84 for each additional 1,000 gallons (or fraction thereof)
960,001 – 1,280,000	$5,297.90 for the first 960,000 gallons, plus $9.55 for each additional 1,000 gallons (or fraction thereof)
1,280,001 – 1,600,000	$8,353.90 for the first 1,280,000 gallons, plus $10.20 for each additional 1,000 gallons (or fraction thereof)
1,600,001 and over	$11,617.90 for the first 1,600,000 gallons, plus $10.88 for each additional 1,000 gallons (or fraction thereof)

Commercial, Irrigation, and 48+ Unit Multifamily Accounts (6” meter size)	
Gallons	**Rate**
Zero – 1,280,000	$394.24 (minimum monthly charge), plus $3.55 for each 1,000 gallons (or fraction thereof)
1,280,001 - 1,920,000	$4,938.24 for the first 1,280,000 gallons, plus $8.84 for each additional 1,000 gallons (or fraction thereof)
1,920,001 – 2,560,000	$10,595.84 for the first 1,920,000 gallons, plus $9.55 for each additional 1,000 gallons (or fraction thereof)
2,560,001 – 3,200,000	$16,707.84 for the first 2,560,000 gallons, plus $10.20 for each additional 1,000 gallons (or fraction thereof)
3,200,001 and over	$23,235.84 for the first 3,200,000 gallons, plus $10.88 for each additional 1,000 gallons (or fraction thereof)

ATTACHMENT 2

Public Review Supporting Documentation

Following is a summary of all comments received by the City of Louisville during the Public Review period from September 10, 2014 to November 10, 2014. If changes were made to the plan it has been noted in the response.

Comment 1: Can reuse water be extended to commercial irrigation?

Response: The quality of reuse water Louisville produces does allow commercial users and HOAs, but at this point, Louisville doesn't have the water rights to accommodate additional reuse customers. Most water rights the City owns are single use, and once they are used in the municipal system and treated by the wastewater treatment plant, they must be returned to the waterways where they originated. Only a small portion of the City's rights allow being reused multiple times. During the golf course reconstruction, there were several supply taps added that will be brought online in the near future, but the City is water rights limited after that point.

Comment 2: I'd like to see more education/outreach on xeriscaping. The City may want to reach out to local nurseries and landscapers to promote plants that require less water. The report says that the City has education on landscaping methods, but I haven't see any info on that and it's not obvious where to find such information (not easily found on the website).

Response: The City partners with the Center for ReSource Conservation to conduct sprinkler system audits and a Water-Wise Landscape Seminar. As part of this project, we will review the website to make sure information is easy to find. The City is also planning to participate in CRC's garden in a box program.

Comment 3: Because the City bills for water, the City may want to experiment with methods of providing social pressure to reduce water consumption on the water bills. Water bills provide an easy comparison between this year and last year, but not with how the household compares with other households. I would like to see some grading of a household's water use with comparable households. For example, the water bill could grade a resident A to F for how well the resident conserves water. Or, perhaps something softer like Gold, Silver, Bronze. Or provide percentile information. I think this would give residents a better understanding of how much they consume water. If the City wanted to be systematic about this, the City could do this grading for half the residents and not do anything for the other half, and then see if this information affected consumption. The City could get a CU prof to coordinate this project and then the CU prof can publish a paper and the City could get free publicity from that study.

Response: The City conducted a utility rate study last year, which determined adequacy of rates (how much people pay) and rate structures (how charges are incurred). This work was done with a citizen task force, which made the ultimate recommendations. The task force recommended a water budget structure, which is widely viewed as the most conservation oriented of the structures typically used by water providers. The Council initially did not believe this rate structure was justified, but agreed to further consider it for the future. This conversation will be continuing over the next year to determine which structure will be implemented. As part of this discussion, the Council already expressed interest in providing an educational component on utility bills. If the City adopts the water budget structure, staff will have to gather information such as landscaped area and indoor water consumption, which will make the type of comparison you are asking about possible. If this structure is not implemented, staff will have to evaluate what kind of educational information can be provided.

Comment 4: The section on climate change's impact on water use is disappointing. No one expects the water plan to have a completely accurate prediction of the future, so the "crystal ball" comment is completely unnecessary and a little patronizing. One possible expectation from climate change is wilder swings in rainfall -- sometimes more flooding, sometimes longer droughts. We should be able to understand how prepared the City is for a more extreme event, which could be based on so many standard deviations from the historical average. The current "plan" on how to deal with climate change is not helpful -- "regularly update and refine demand projections based on actual current conditions." Isn't this something that should be done in the absence of climate change? How is this plan for climate change different? What does it even mean?

Response: For a municipality of Louisville's size, regularly updating forecast projections and working with other municipalities to share knowledge and observations would be our ongoing preparations. With Louisville's staff and resources, we would not be able to stay on the cutting edge of the climate change research. However, when we are working with a world-class consultant, such as CH2M Hill, we should get a summary of most current data. I will ask CH2 to provide more detail in that section. You are correct, the City is always evaluating its capacity to respond to droughts. Louisville currently owns more water rights than what is required for serve its population, but if the demands outstrip supply, the City already has tools to manage that by declaring the various drought stages and purchasing supplemental water supplies. Additional information was added to the plan in Section 2.4.1.1.

Comment 5: Section 4.2.2.3: What does the City have to consider with rain sensor/weather-based irrigation technology before making a decision? Section 5.1 shows some contradiction with weather-based irrigation. The City is going to add a rebate for this technology for customers, but the City still has to evaluate the controllers for the City's systems. If it's cost effective for customers and worth the City to pay customers to install these controllers, shouldn't these be cost effective for the City?

Response: That could use some clarification. Having spoken to the Parks and Open Space Departments in the past, I believe they would like to install rain sensors, but it is a question of priority when it comes to spending their budget. Until recently, City Departments did not pay utility bills, so there was no financial incentive for them to conserve water, although I believe they are mindful of their water consumption. I expect that a stronger emphasis on water efficiency will emerge with phasing in water charges. Additional information was added to the plan in Section 4.2.2.3.

Comment 6: While I support a single person as the water conservation coordinator for the City, I'm concerned that the report says a new staff member is not required (Table 18). Is this work going to displace other work normally done by staff? Or were these duties done by several people in the past so the idea would be that we could just reallocate resources? If so, how many employees were doing the water conservation coordinator duties in the past year?

Response: This plan was compiled with the requirement that all conservation programs be handled by existing staff. CH2's recommendation is that one staff member be the point of contact for conservation issues. Currently, conservation issues are handled by two staff members who would have to shift workloads to accommodate that recommendation. If staff determines that cannot be done, other options would be evaluated, such as hiring more staff or cutting conservation programs.

Comment 7: Table 1 does not appear to include CBT storage which comes with CBT water. The Marshall Lake storage volume appears to ignore the foreign water storage right. If these two components of storage are included in table 1 the available storage would be noticeably greater.

Response: The following information was added to Table 1: Colorado-Big Thompson: 1,447 acre-feet. Staff verified that all storage accounts have been included in the Marshall storage number. The storage total was updated.

Comment 8: Page 1-2, the maximum divertible yields are noticeable less than my recollection of the potential from the City's basin water rights, if all rights are diverted at the maximum volumes allowed.

Response: The annual yield from South Boulder Creek is 3,000-5,100 acre-feet/year.

Comment 9: In Table 2 there is mention of the WWTP, water supply limits and system reliability. It is not clear why this material is in a water conservation plan.

Response: The WWTP flow is related to the capacity of the reuse system, and the State requires information on existing infrastructure.

Comment 10: Tables 15 and 17 are very good summaries. They will make monitoring and updating the conservation plan straightforward.

Response: Thank you

Following is proof the plan was posted for Public Review on September 10, 2014 and instructions were provided for how to submit comments.

Figure 1 – Notice of Draft Water Efficiency Plan for Public Comment

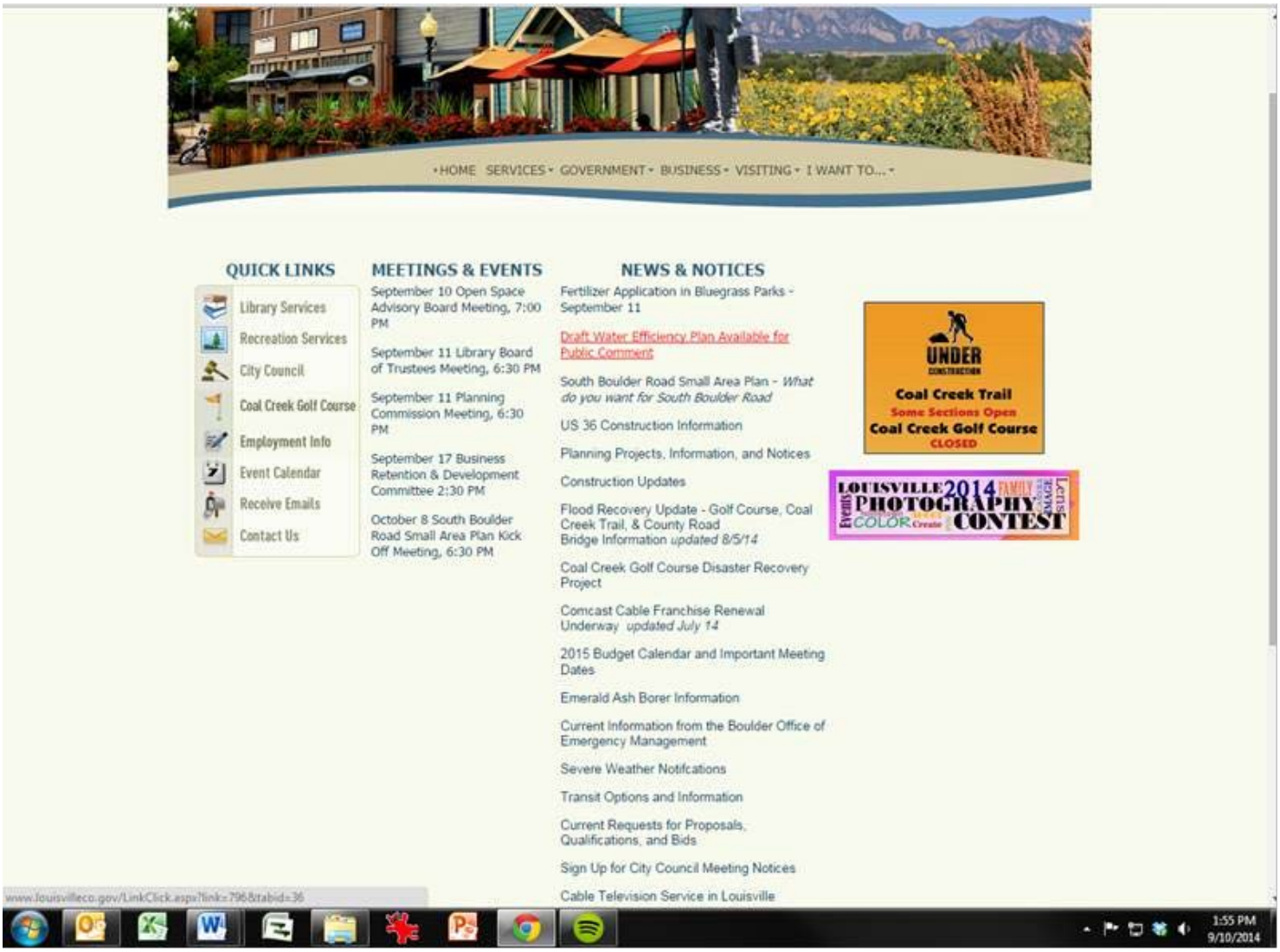
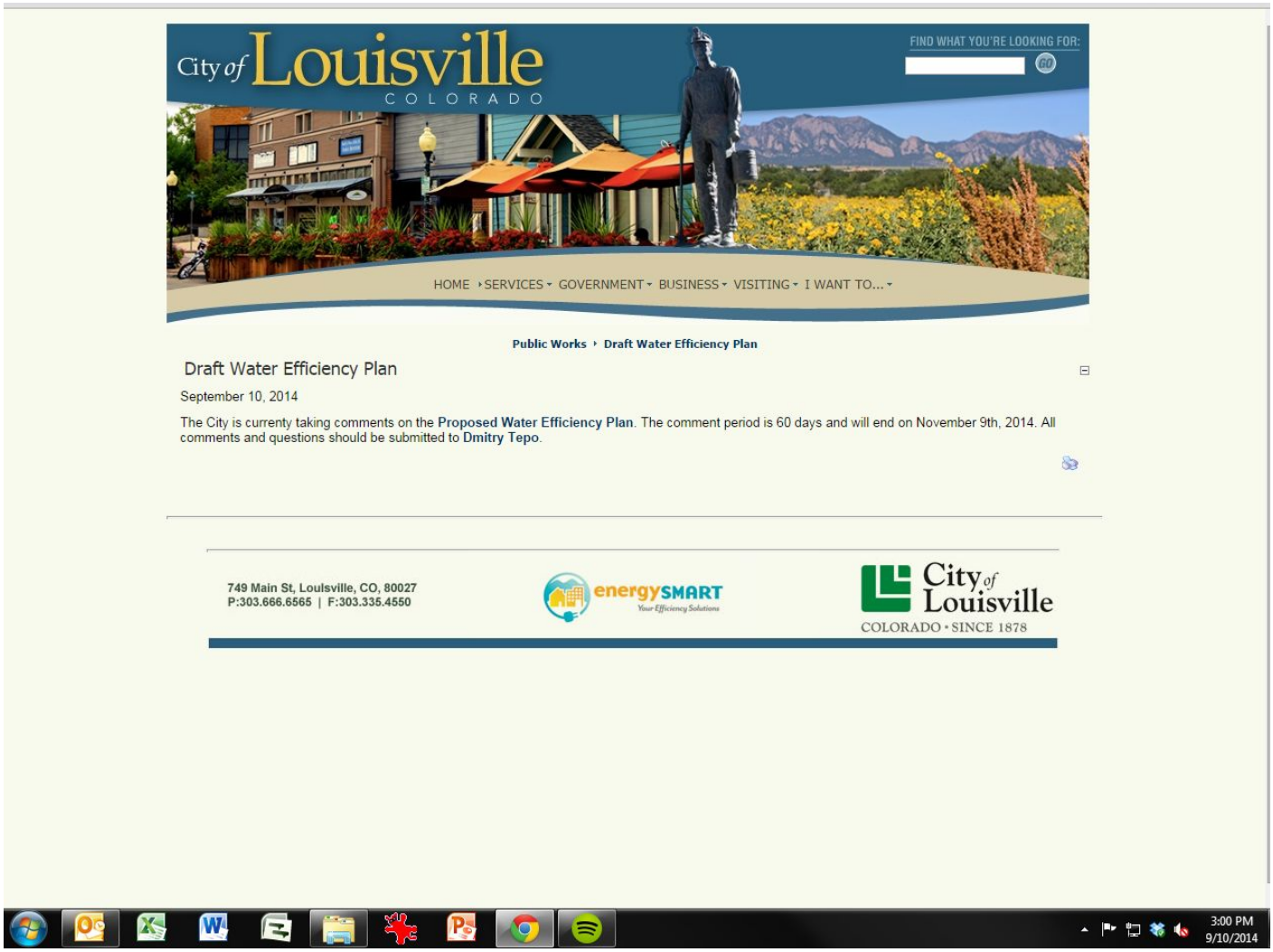


Figure 2 – Link to Plan and Email Address



ATTACHMENT 3

Compliance with State Requirements

Compliance with State Planning Requirements

Colorado Revised Statute § 37-60-126 requires a covered entity to develop, adopt, make publicly available, and implement a water conservation plan that will encourage its domestic, commercial, industrial, and public facility customers to use water more efficiently. Key elements that must be fully evaluated in development of the plan are listed as follows:

1. Water-saving measures and programs including: (I) water-efficient fixtures and appliances; (II) water-wise landscapes; (III) water-efficient industrial and commercial water-using processes; (IV) water reuse systems; (V) distribution system leak identification and repair; (VI) information and education; (VII) conservation oriented rate structure; (VIII) technical assistance; (IX) regulatory measures designed to encourage water conservation; (X) incentives to implement water conservation techniques including rebates.
2. Role of conservation in the entity's supply planning.
3. Plan implementation, monitoring, review, and revision.
4. Future review of plan within 5-7 years.
5. Estimated savings from previous conservation efforts as well as estimates from implementation of current plan and new plan.
6. A 60-day minimum public comment period (or other time period based on local ordinance).

The following section of the plan details the City of Louisville's compliance with this statute.

City of Louisville Compliance

The City of Louisville developed this conservation plan in order to comply with C.R.S. § 37-60-126. Each element of compliance is documented below.

1. Consideration of specific conservation measures

(I) ***Fixture and appliances*** – The City actively promotes the installation of water efficient fixtures and appliances through their regular conservation education efforts. City facilities have been upgraded with high-efficiency fixtures and appliances, including City Hall (low-flow faucets, low-volume toilets) and the recreation center (low-flow shower heads, ultra-low flush urinals, and a pool cover). The City currently offers a high-efficiency toilet rebate and clothes washer rebate, but both will be phased out in the coming years because of changes to the state and federal regulations that mandate water efficient products at the retail level. A new Colorado law passed in 2014 will phase in mandatory sale of WaterSense labeled toilets and showerheads. The City is planning to implement a high-efficiency pre-rinse spray valve installation program in the coming years.

(II) ***Water wise landscape*** – The City actively promotes water wise landscaping practices through their regular conservation education efforts and conservation-oriented rate structure. Outdoor irrigation efficiency audits are offered by the Center for Resource Conservation (CRC) for residential customers. The City has design standards and guidelines for commercial customers that incorporate low-water-use plants and efficient irrigation. The City encourages the installation of water wise landscapes through buffalo grass rebates and a new rebate program for weather-based irrigation controllers. The City irrigates a significant number of properties using reuse water and will continue to seek new opportunities for reuse water irrigation.

(III) ***Commercial, Industrial and Institutional (CII) measures*** – The City actively promotes CII water conservation through their regular conservation education efforts and conservation-oriented rate structure. The City plans to implement a commercial audit program through the Center for ReSource

Conservation, targeted at high demand customers. As part of this effort the City will install high efficiency pre-rinse spray valves (where appropriate) in commercial kitchens.

(IV) ***Water reuse systems*** – The City's wastewater treatment plant (WWTP) has the capability to treat a portion of the water to be reused for irrigation. Reuse water is primarily used for irrigation at Coal Creek Golf Course, Community Park, Sports Complex, Miner's Field, and the WWTP. The City is actively working to expand use of reuse water.

(V) ***Water loss and system leakage reduction*** – The City of Louisville strives to maintain a high level of water system efficiency within its distribution system and seeks to reduce water loss whenever and wherever possible. The City works to control apparent losses with accurate metering and regular meter testing, as well as assuring that all customers are metered and billed for the water they use. The City implements a regular leak detection and repair program for the water system. A private leak detection contractor is hired every other year to bring listening equipment to the City and to search for water main leaks in designated areas of the City. If a leak is detected, the City has a repair crew ready to dig up the pipe and repair the leak. The City plans to implement an annual M36 Water Loss Control audit beginning in 2015.

(VI) ***Information and public education*** – A key component of the City's water conservation efforts is public education and information. The City regularly provides information to customers about ways to conserve water and avoid water waste through flyers and bill stuffers and the utility web site. The City also maintains conservation materials and information that are available upon request. The City communicates about water use and conservation with their customers using the following tools and methods:

- Regular newsletter distributed.
- Water conservation information available on the City's website.
- A water committee made up of City Council members; meeting agendas are posted and the public are welcome at any meeting. The purpose of the committee is to provide information to the City Council about current City water activities.
- Educational opportunities including school tours of water infrastructure facilities.
- Instructional workshops for customers on relevant topics such as irrigation efficiency and management.
- Landscape design and maintenance workshops (through the Center for Resource Conservation [CRC]).

(VII) ***Water rate structure*** – The City currently bills its customers on a monthly basis using a conservation-oriented increasing block rate structure (described in Attachment 1). This conservation oriented rate structure was updated in 2014.

(VIII) ***Technical assistance*** – The City obtained a grant from CWCB for this plan and contracted with CH2M HILL Engineers, Inc. and WaterDM to develop the plan.

(IX) ***Regulatory measures*** – The City relies on the following regulatory measures to improve water use efficiency:

- Louisville Municipal Code (Title 17) established development Design Standards & Guidelines for commercial, industrial, and mixed use developments that incorporate low-water-use plants and efficient irrigation concepts into the landscape design of each development.

- Water waste ordinance, includes overspray limitations.
- Voluntary time-of-day watering restrictions.
- Compliance with Colorado Department of Public Health and Environment's (CDPHE's) Regulation No. 84 limits runoff, ponding and overspray from areas using reuse water.
- Soil amendment practices for City's Open Space.
- Louisville Municipal Code established development Design Standards & Guidelines for commercial.

(X) ***Incentives*** – The City has offered rebates for many water efficiency products in the past. Under this plan the City will offer rebates for buffalo grass, Garden-in-a-box, weather-based irrigation controllers, and high-efficiency pre-rinse spray valves.

2. Role of conservation in raw water supply planning

This water conservation plan represents the City of Louisville's most comprehensive effort to integrate water conservation into water supply planning. Through this plan, the City has established that their raw water supply is sufficient to meet future growth.

3. Plan implementation, monitoring, review, and revision

The City monitors water use on a regular basis and will continue to do so. The City produces monthly and annual demand reports for each customer sector and the system as a whole and keeps close track of demand. The City will review and update this water conservation plan every five to seven years. During this review, progress towards achieving the stated conservation goals will be evaluated.

4. Future review of plan within seven years

The City will review and update this water conservation plan every seven years or as needed.

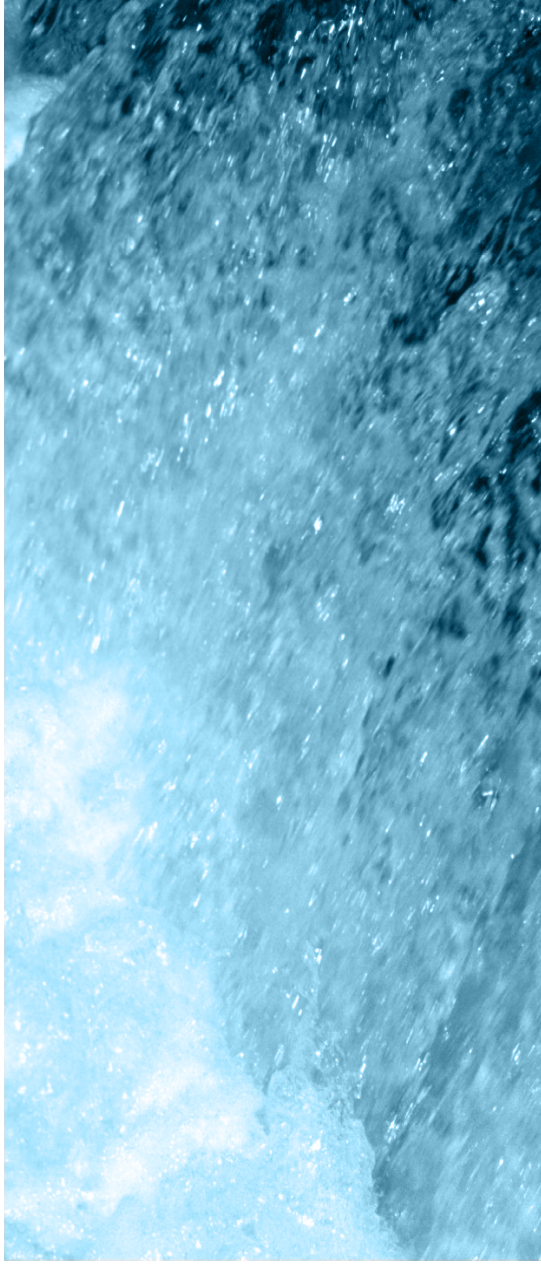
5. Estimated savings from previous conservation efforts and current plan

Past savings: Based on a gradual increase of savings over time the total water saved since 1999 from demand management is estimated to be 326 MG (1,001 acre-feet).

Future savings: If the elements of this plan are fully realized, then it is estimated that water demand at 2032 will be reduced by 241 MG (0.66 mgd) as result of passive and active water conservation measures.

6. Public comment period

As per state statute, the City of Louisville conducted a 60-day public comment period of this water conservation plan. The public comment period began on September 10, 2014 and was concluded on November 10, 2014. Citizens and interested parties were invited to comment via legal advertisement and web site posting. The plan was posted on the City's web site and hard copies were made available at public offices. Upon completion of the public comment period, the conservation plan will be submitted to CWCB for review. After CWCB review and approval the plan will be finalized and adopted by City Council.



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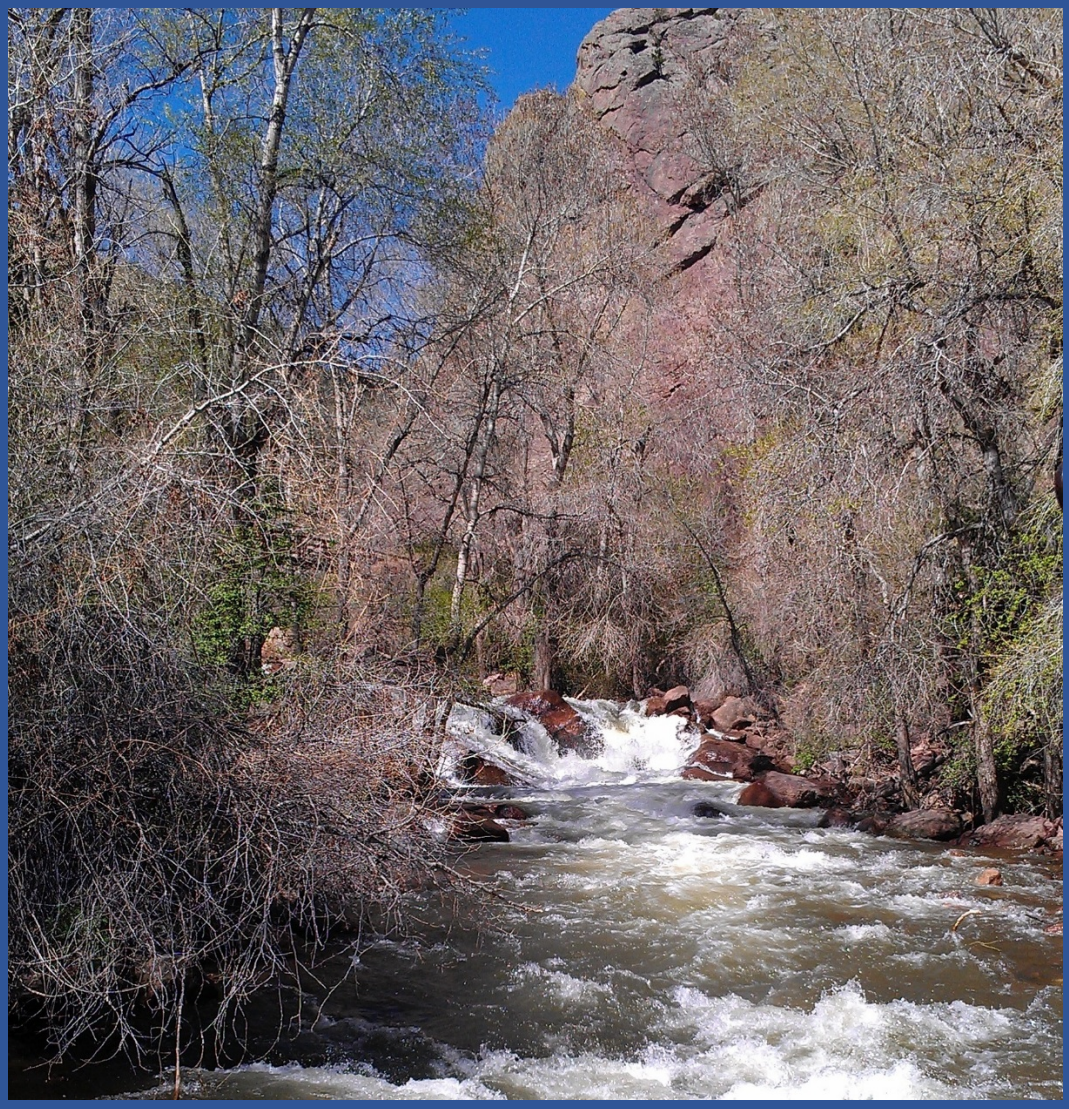

Municipal Water Management Plan

City of Louisville, Colorado

October 2016

RESOURCE BASED INTERNATIONAL

City of Louisville
COLORADO • SINCE 1878

Municipal Water Management Plan

For the City of Louisville, Colorado

Prepared by

RESOURCE BASED INTERNATIONAL

In Collaboration with
Spronk Water Engineers, Inc

October 2016

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INTRODUCTION

This Water Management Plan ("Plan") is recognized as part of the City of Louisville's ("City") continuing long range water resource planning process. The Plan's purpose is to keep the planning process updated using current water related data. Aspects and updates related to the City's databases, operation and management goals and general water-related policies adopted in this report are consistent with other recently available City documents, most notably the Comprehensive Plan. Additionally, this Plan is also recognized as a continuation of previous "Raw Water Master Plans" prepared for the City in 1992, 1998, and 2003. This previous planning and foresight has resulted in the development of varied water resources sufficient to supply the City's current water needs through drought periods.

The purpose of this report, however, varies in context from previous studies with regard to the following topics: water supply operations, historical trends, drought management planning, climate change implications, and future water acquisitions. The basis of this difference is found in the report's structure to provide practical alternatives for each of these components, rather than solely identifying technical results. This report also includes the additional consideration that such alternatives will need to be reviewed and modified on a regular basis, especially as further hydrological information becomes available.

This report is categorized into the five sections mentioned above. The overall methodology used in developing the report was to initially establish a comprehensive scientific database using the study period of 2003-2015, and adding to the previous City Raw Water Master Plan database (1950 - 2002). Data from the previous Raw Water Management Plan was updated through 2015. Subsequently, the updated database provided the necessary information to perform the other analyses described within this report. The other categories were identified and selected because of their importance in providing the City's staff the necessary information to proceed with its water resource project planning, budget development, city-wide water operations enhancements, and proposed water right acquisitions.

This report also provides practical City-wide alternatives to improve overall efficiency and maximize Louisville's annual water supplies. These comments are based on Resource Based International's ("RBI") past five years of administering the City's water rights and, recognizing operational constraints. This practical approach precluded the need to do City-wide operational modeling. This report does address areas of management that may require further modeling efforts, but these future efforts need to be strategic in purpose and address only a few operational scenarios rather than reexamine the entire City-wide operations.

A new addition to the City's water resource planning is the evaluation of potential climate change impacts on the City's water rights and raw water operations. Climate change impacts were evaluated using the results of previous regional climate studies to project potential effects on Louisville's water operations and infrastructure. The purpose of the climate change evaluation was to: (1) focus on possible changes related to the City's water supplies and demands; (2) determine climate change effects on the City's current drought management strategies; and (3) adjust the City's long term water supply planning to adapt to climate change effects.

The report concludes with a summary of the study's findings and a list of alternatives for continuing to optimize the City's water resources. RBI recommends updating or supplementing this report as needed based on further information.

LOUISVILLE'S WATER SUPPLY SYSTEM OPERATIONS

The City of Louisville's water supply system is supplied with diversions from South Boulder Creek through two diversion structures: the Louisville Pipeline and the Community Ditch. South Boulder Creek diversions can be conveyed directly to the City's water treatment plants - Sid Copeland Water Treatment Plant ("SCWTP") and the Howard Berry Water Treatment Plant ("HBWTP") – or stored for later use in the City's storage facilities. The City's water system is supplemented with deliveries of water from the Colorado Big Thompson Project via a pipeline to the SCWTP. Future deliveries from the Windy Gap Firming Project will also supplement the City's water supply. A map of the City's water supply is attached as Figure 1.

The following discussion provides a background description of the City's raw water supply systems/ operations and identifies the existing constraints within the system.

<u>Water Supplies</u>

South Boulder Creek Water Rights

<u>Diversions</u>

Louisville has forty-four combined direct flow and storage water rights, from thirteen ditch companies that are administered on a daily basis on South Boulder Creek. The majority of Louisville's water rights are direct flow rights that are available only during the irrigation season (April through October) and can be used for direct use at the treatment plants, or stored in Harper, Louisville, or Marshall Reservoirs. Louisville also has storage water rights, which are available only in the non-irrigation season (November – March), that are typically diverted at the Louisville Pipeline and stored in Louisville or Harper Reservoirs until the following spring. To the extent possible, Louisville historically stored this water prior to delivery to the treatments plants to obtain the highest possible level of water quality.

South Boulder Creek

Water rights are administered on hydrological and legal considerations by the State of Colorado and are allocated pursuant to the Prior Appropriation Doctrine: first in time, first in use. Water rights are characterized as having "senior" to "junior" status; in times of water shortage, senior rights are allowed to divert their full entitlement water before any junior rights are allowed to divert. The City operates its water rights on a daily basis depending on: (1) water availability in South Boulder Creek; (2) legal and administrative constraints associated with each right; (3) delivery rate limits related to pipelines and treatment capacities; and (4) daily City water demands. The City's most senior rights are available in all years, whereas the junior rights typically are available in only average to above average runoff years (Table 1). Operations and diversions are also determined by the City's daily municipal water demands and the delivery system capacities of the treatment plants.

Table 1
Summary of Louisville's Direct Flow Water Rights

	NAME	CASE	PRIORITY			START DATE		END DATE	
			MON	DAY	YR	MO	DAY	MON	DAY
Senior Rights	HOWARD DIVERSION	(W-8500-77)	4	1	1850	4	1	10	31
	HOWARD CU	(W-8500-77)	4	1	1860	4	1	10	31
	HOWARD CU 2	99CW230	4	1	1860	4	1	10	31
	HOWARD .65	(21299)	4	1	1860	4	2	10	30
	HOWARD	(10904 & 12698)	4	1	1860	4	1	10	31
	McGINN DITCH	87-CW-327	5	1	1860	4	1	10	31
	EAST BOULDER	(82CW305)	4	1	1862	4	1	10	31
	COTTONWOOD #2	(W-9193-78)	4	15	1863	5	1	8	31
	COTTONWOOD No. 2	99CW230	4	15	1863	5	1	8	31
Mixed Rights	DRY CREEK DAVIDSON	(12698)	5	1	1863	4	1	10	31
	DRY CREEK #2	(21299)	5	1	1864	4	2	10	30
	DRY CREEK NO. 2	(W-8500-77)	5	1	1864	4	15	10	1
	DRY CREEK No. 2 CU	99CW230	5	1	1864	4	15	10	1
	ENTERPRISE	(21299)	2	1	1865	4	2	10	30
	ENTERPRISE	(82-CW-305)	2	1	1865	4	15	9	15
	LEYNER COTTONWOOD S	87-CW-327	4	1	1865	4	15	9	15
	McGINN DITCH	87-CW-327	6	1	1865	4	25	8	31
	MARSHALLVILLE DITCH	87-CW-327	6	1	1865	4	25	8	31
	LEYNER COTTONWOOD M	87-CW-327	4	1	1866	4	15	9	15
	LEYNER COTTONWOOD J	87-CW-327	10	1	1870	4	11	9	24
Junior Rights	DAVIDSON DITCH	(83-CW-319)	4	15	1872	4	25	8	31
	S BOULDER & COAL CREEK	(21299)	6	1	1872	4	2	10	30
	S.B.C.C. (DIRECT)		6	1	1872	5	1	8	31
	GOODHUE DITCH	(83-CW-319)	5	1	1873	4	25	8	31
	MARSHALLVILLE DITCH	87-CW-327	6	30	1878	5	15	7	12
	COMMUNITY DIRECT		6	6	1885	5	1	7	25
	LOUIS. PIPELINE	(83CW318)	6	18	1983	11	1	10	31
	GOLF COURSE DIRECT	88-CW-172	9	20	1988	11	1	10	31

South Boulder Creek water rights are generally categorized into three groups: Marshall Lake shares; South Boulder and Coal Creek Ditch shares; and all other South Boulder Creek water rights

- *Marshall Lake Shares* – Marshall Lake is owned and operated by Farmers Reservoir and Irrigation Company ("FRICO"). FRICO diverts water from South Boulder Creek under a number of winter storage rights for the benefit of their shareholders. At the end of the winter storage season, FRICO allocates the water in storage at Marshall Lake to its shareholders. The City receives a pro-rata portion of the allocation which becomes available for use in the City's water system. The primary Marshall Lake storage rights are senior to all other winter storage rights on the South Boulder Creek and the South Platte.

  The Marshall Lake summer direct flow rights are generally available to divert during May 15 - July 15. Marshall Lake direct flow rights yield water to the City in average to above average streamflow years. As a result, these direct rights do not contribute to dry-year supplies ("firm yield") unless they were stored the previous year.

- *South Boulder and Coal Creek Ditch Shares ("SBCC")* - The SBCC ditch originally had its own headgate on South Boulder Creek. In 1940, after a flood, the ditch company legally changed the

point of diversion location downstream to the Community Ditch. Accordingly, the South Boulder and Coal Creek Ditch currently delivers water diverted, pursuant to its decrees, to company's shareholders via the Community Ditch and through Marshall Lake. Louisville is the majority owner of SBCC shares which consist of direct flow and storage rights.

- *Other South Boulder Creek Water* ("Other SBC") - All other water diverted from South Boulder Creek that is not associated with the Marshall Lake or SBCC shares is referred to Other South Boulder Creek Water. When this water is diverted through FRICO facilities, Community Ditch and Marshall Lake, it is referred to as Foreign Water. Other SBC water is comprised of both direct flow and storage water rights. The direct flow rights were originally irrigation rights but have subsequently been acquired and transferred through water court by the City for municipal use. This category of water rights constitutes 36 of the 44 South Boulder Creek water rights owned by Louisville. These supplies include a range of senior to junior water rights, with the majority of the rights available during May-June each year. All of these rights are decreed for diversion at the Community Ditch, the Louisville Pipeline, or both.

Return Flow Obligations

Many of the transferred water rights (from agricultural to municipal use) purchased by the City have two components: consumptive use credits and return flow obligations. The consumptive use credit is that portion of the water right that was historically consumed by the crop; the return flow obligation is that portion that represents surface and groundwater runoff resulting from historical irrigation practices. The City is entitled to use its entire share of consumptive use credits but must replace the return flow component back to stream system.

Return flow obligations usually represent about 20-25% of the water diverted from South Boulder Creek with some variability based on individual water rights. Some water rights have a higher percentage than others while many of the older water right transfer cases decreed by the City did not have any return flow component. Further, return flow obligations are separated into surface return flows and groundwater return flows. Surface return flows are returned to South Boulder Creek at the time the specific water right is diverted; groundwater return flows are lagged to simulate the historical groundwater travel time to reach the creek. Lagged groundwater return flow obligations are returned as specified in the various water right decrees.

City Reuse Potential

Only Marshall Lake shares and SBCC rights can be utilized by the City for reuse under current conditions; these rights have specified reuse terms in their decrees allowing the City to 'recycle' the water and send it to the City's reuse water system. This water is defined as reusable water and these "credits" are available to the City for other uses, including replacing return flow obligations discharged from the wastewater treatment plant. All other South Boulder Creek water rights with potential return flow credits require future water court action for reuse approval. Windy Gap Firming water, outlined below, will also be reusable within the City's system once available.

A prior analysis was performed by RBI to determine the of amount reuse water that was available during a study period of 2004-2014. The results indicated that Louisville annually averages approximately

1,100 acre-feet ("AF") of reusable water. Historically, replacing the required daily return flow requirements was the first priority for which this reusable water was used.

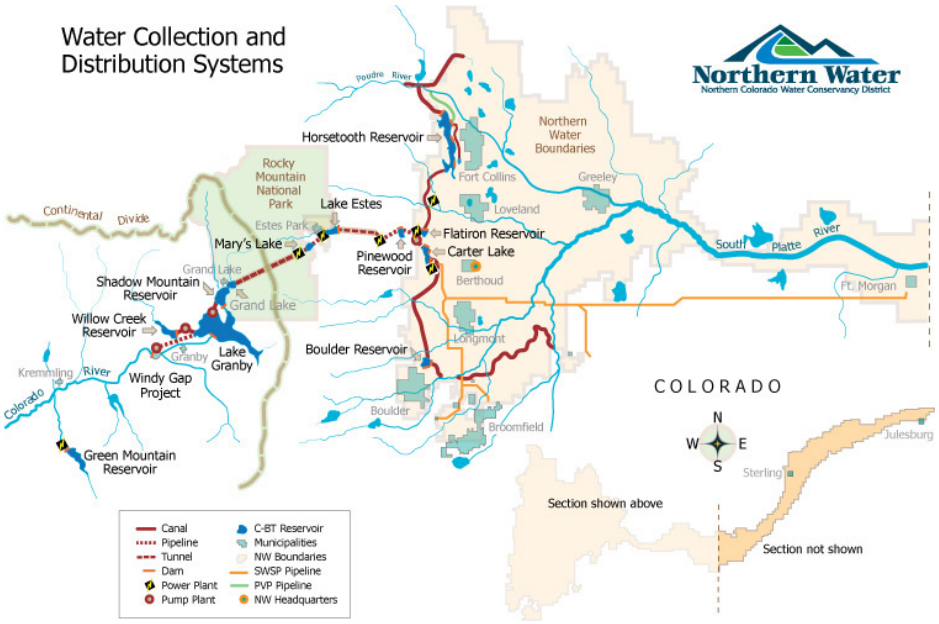
Coal Creek Golf Course

The second use of reusable credits is supplemental irrigation supplies at the Coal Creek Golf Course ("golf course") and City parks. Historically, when excess reusable water was available, the golf course and parks received deliveries from July-October.

Study results indicate that while there is sufficient reusable water supplies in average and above average years for use in the City, reusable supplies are available in amounts only sufficient to meet return flow obligations after the first year of a drought. During the second year of a drought, the City's return flow obligations dominate the use of the reusable water. As the City seeks to refill Marshall Reservoir as expediently as possible, increased diversions magnify the return flow obligations that are typically spread over the entire diversion season. As a result of these increased return flow obligations incurred while filling Marshall Reservoir, no reuse water is available to supply water for any other uses. Further, because reuse supplies and return flow obligations are essentially the same during droughts, reuse water does not contribute to the City's firm yield supplies.

Colorado – Big Thompson Units (C-BT)

A significant supplemental supply source for the City are C-BT units that are derived from the Northern Colorado Water Conservancy District ("NCWCD") storage and delivery system. The C-BT system collects water from the Colorado River headwaters, on the West Slope, and diverts it through a series of tunnels to the Eastern Slope. C-BT water (and future Windy Gap water) is then delivered to the City via the Southern Water Supply Project ("SWSP") pipeline. C-BT units have been considered a primary option for meeting future demands and drought protection (C-BT's source of supply is located on the west slope). Purchase and use of C-BT units are not subject to the usually required water court transaction associated with South Boulder Creek rights. C-BT units are legally available for municipal use at the time of purchase, thereby making these units a viable water source for the future. Louisville owns 2,067 C-BT units which yield an average of 0.70 AF/unit of water annually. C-BT units are comprised of "one-time" use water only, and therefore, cannot be reused within the City's system.



C-BT System

Windy Gap Firming Project (Windy Gap Firming)

The Windy Gap Firming Project is an ongoing project of the Northern Water Municipal Subdistrict to divert and store west slope water supplies in the yet-to-be-built eastern slope storage - Chimney Hollow Reservoir.

Windy Gap Reservoir – Northern Water

Windy Gap Firming Project supplies have also been considered a viable water source for the same reasons as C-BT units. However, for planning purposes, Windy Gap Firming water has been considered drought protection rather than an average year water supply, based on costs and operations. Windy Gap Firming water rights are subject to transaction constraints similar to C-BT units. Further, Windy Gap Firming's west slope rights are junior and can be diverted to east slope reservoirs only during times of water and storage availability on the west slope. As a result, and until such time Chimney Hollow Reservoir is constructed, the junior priority of the Windy Gap Firming water rights does not provide a significant benefit to the City (Louisville has not utilized Windy Gap water supplies).

Upon completion of the reservoir, the Windy Gap Firming Project will divert water from the West Slope in times of sufficient supply, store the water in the newly completed reservoir, and then release this water to the City in times of water shortage (dry years and droughts). Through Louisville's ownership of

9 units of Windy Gap water supplies, the City is entitled to 2,700 AF in Chimney Hollow Reservoir and the guaranteed firm water yield is anticipated to average 600 AF per year. Windy Gap Firming water is reusable, however acquisition costs are substantially higher than C-BT units.

Louisville Water Facilities

Water operations at the City of Louisville involve the following components: raw water diversions and deliveries to storage facilities, distributions to the treatment plants, reuse from the wastewater treatment plant, and deliveries to the golf course and parks to the extent water is available. This section describes each phase of the operations system.

Ditches and Pipelines

Louisville has three main conveyance structures from which the City obtains its raw water supplies: Community Ditch, Louisville Pipeline, and the Southern Water Supply Project pipeline. An ancillary structure is the Louisville Lateral, the predecessor to the Louisville Pipeline.

Community Ditch

Community Ditch

The Community Ditch, the City's primary diversion structure on South Boulder Creek, is located near Eldorado Springs. The ditch diverts both storage (winter) and direct flow (summer) water rights and has a maximum capacity of approximately at 250 cubic feet per second (cfs). The Community Ditch can be used to divert the City's Marshall Lake share water (direct flow and storage), the City's SBCC share water, and the City's Other SBC water.

The Community Ditch is owned and operated by FRICO and Louisville is allowed to use the ditch pursuant to several FRICO/Louisville agreements, the latest signed in 1992. The City's diversions are coordinated on a daily basis with FRICO and water commissioner to divert the City's water entitlements.

Louisville Pipeline

The Louisville Pipeline also diverts from South Boulder Creek near Eldorado Springs and can deliver water to the SCWTP, Harper Reservoir, Louisville Reservoir, HBWTP, or Marshall Reservoir. It is owned solely by the City. The design capacity of the pipeline is 7.7 cfs, but recent diversions have been closer to 5.0 cfs. The Louisville Pipeline can be used to divert the City's Marshall Lake share water (direct flow and storage), the City's SBCC share water, and the City's Other SBC water.

Typically, the pipeline operates year round delivering direct flow water rights in the summer and Louisville Reservoir storage rights in the winter. Pursuant to the reservoir's storage decree, Louisville is allowed to store up to 210 AF annually during dry years winter periods. Most of Louisville's senior water rights are entitled to divert at the Louisville pipeline and/or the Community Ditch. Therefore, especially during drought periods, the pipeline offers the City a primary diversion point that increases yield to the city at a rate up to 10 AF per day.

Louisville Pipeline Diversion Structure

Additionally, Louisville has an agreement with the Town of Eldorado Springs that allows the Town to use a small portion of the pipeline capacity for its water rights' operations. This agreement does not impair Louisville's ability to fully utilize the capacity of the pipeline, but it does provide Eldorado Springs the required infrastructure to operate its water system in compliance with its water court decree.

<u>SWSP Pipeline</u>

The SWSP delivers C-BT/Windy Gap supplemental water directly to the SCWTP or to Louisville Reservoir. The pipeline's capacity is 4.2 cfs. In the summer months, the SWSP cannot fully meet the SCWTP demands, and therefore a combination of SWSP deliveries and diversions from the Louisville Pipeline, Harper Reservoir, or Marshall Lake releases are required.

Louisville Storage Facilities

The City has access to four reservoirs to store its raw water supplies: Marshall Lake, Harper Reservoir, Louisville Reservoir, and McKay Reservoir. Marshall Lake and McKay Reservoir are owned and operated by FRICO. Harper and Louisville Reservoirs are owned by the City. The following is a brief description of the operation for each storage facility and its role within the City-wide water storage system.

Marshall Lake

Marshall Lake

Marshall Lake is the primary storage facility for the City with a storage capacity of 9,655 AF; Louisville's pro-rata portion is approximately one-third of the total capacity. Use and operation of the reservoir is primarily shared between other FRICO shareholders (irrigation use) and the City (municipal use). In addition to Marshall Lake share water, the City can store Other SBC Water (Foreign Water) in the reservoir.

Louisville's use of Marshall Lake is subject to the terms of the 1992 FRICO/Louisville Agreement.

There are two basic operational scenarios related to City operations:

Scenario 1: Marshall Lake fills to full capacity in April-May

Scenario 2: Marshall Reservoir does not fill to capacity during the year

If the Marshall Lake fills to capacity, Other SBC Water/Foreign Water stored in the reservoir during the prior water year is booked over (a.k.a. spilled) to make storage space available for Marshall Lake share water. Once the irrigation releases from the reservoir begin, usually in late-July, storage space becomes available in Marshall Lake. At that time, Louisville is then entitled to store its Other SBC/Foreign Water supplies in the "excess" storage space created by these irrigation releases from FRICO storage.

In those years that the reservoir does not fill during the preceding winter storage season, Louisville's prior water year Other SBC/Foreign Water does not spill and the City is typically able to store this water year's Other SBC/Foreign Water in Marshall Lake's excess space beginning in April. Factors that determine whether Marshall Lake fills each year is a function of the previous year's carry-over in the reservoir, winter snowpack, and springtime runoff flows in South Boulder Creek. Releases from Marshall Lake supply the HBWTP; Marshall Reservoir can also deliver water to the SCWTP and the golf course, but only through the Louisville Lateral and Cherry Street Pipeline.

Harper Reservoir

Harper Reservoir is a secondary storage site for Louisville and has a capacity of approximately 750 AF. Harper Reservoir is supplied by the Louisville Pipeline or Louisville Lateral. Water delivered from Harper Reservoir can be stored in Louisville Reservoir or used directly at the SCWTP.

Harper Reservoir

Louisville Reservoir

Louisville Reservoir is operated as a "forebay" to the North Plant. Its purpose is to supply water directly to the SCWTP, which is located adjacent to the reservoir. The reservoir has a capacity of 210 AF and is rarely lowered below 190 AF. Water deliveries to the reservoir are made through the Louisville Lateral, the Louisville Pipeline, or the SWSP Pipeline.

McKay Reservoir

McKay Reservoir is located in the Big Dry Creek basin outside of the City's water delivery system and, therefore, does not directly contribute to City's raw water supply. Instead, McKay Reservoir can be used to fulfill certain legal requirements associated with the City's Marshall Lake Division's direct and storage rights. As a result, McKay Reservoir serves a solely administrative function for the City. However, recent court cases involving Marshall shares from the Big Dry Creek basin have required return flow obligations to be released to the Big Dry basin to maintain the historical flow patterns. City water stored in McKay Reservoir can potentially be released to fulfill these obligations. Further, it is anticipated that future Marshall Lake shares acquired by the City or any other municipality will have similar return flow obligations to Big Dry Creek. As a result, the future use of McKay Reservoir is expected to integrate more fully into the City-wide operations and have an increasing level of use to meet Louisville's Big Dry Creek return flow obligations.

McKay Reservoir

System Constraints

In Louisville's collection and distribution system, not all available water supplies can be utilized at their maximum levels due to constraints involving pipeline capacity, storage capacity, timing of available

supplies, and timing of City's daily municipal demand. As a result, water supplies have historically been diverted at lower rates than the City's maximum legal entitlement because of these constraints.

Many of the constraints listed below occur in only extreme conditions: drought or high flows. However, many other constraints are chronic issues that occur irrelevant of the annual streamflow or supply source. While these constraints are limiting factors affecting the City's water supply system and subsequent delivery to the treatment plants or reservoirs, modifications to specific system operations can be made to address these constraints and minimize their effects.

Three issues are directly or indirectly related to the potential use of the Louisville pipeline: pipeline capacity, timely head gate operations, and a lack of available City storage during April 15 - July 15.

Constraint No. 1 – Louisville Pipeline

The Louisville pipeline has a design capacity of 7.7 cfs, when utilizing the booster pump station. Typically operations are in the range of 2.0 – 5.0 cfs to ensure pipe pressures do not stress the system. Throughout the study period, South Boulder Creek records indicate that streamflows in excess of the pipeline flow capacity were available at various times to divert at the pipeline. Consequently, the records consistently demonstrate that water which could have been diverted to the City's treatment plants and reservoirs, was instead bypassed at the intake on South Boulder Creek. For example, in 2014-2015, 82 AF of water was not diverted at the pipeline at times that demand and/or storage was available but pipeline capacity was limited.

Lack of timely head gate operations also limits the use of the pipeline. Daily water rights administration can dramatically change during the summer months due to rainstorms. Subsequent storm water runoff becomes available at the pipeline for short periods of time (1-3 days) as the storm surge moves downstream. However, time constraints related to shifting manpower duties, required travel distance to the pipeline headgate, and daily (even hourly) communication requirements between staff members cause much of this available storm water to bypass the pipeline intake before the adjustments can be completed. Historically, on average, 155-180 AF per year has not been diverted due to operational constraints. However, it is anticipated that recent (2016) repairs and projected improvements at the pipeline intake will address the majority of these operational issues.

Constraint No. 2 – System-Wide Storage Capacity

Storage space is a limiting constraint to optimize water yields from Louisville's water rights portfolio. At times during the study period, Louisville had more water yield than available space to store it. For example, on years that Marshall Lake fills to capacity (63% of the time), an average of 680 AF of foreign water stored in Marshall Lake the previous year by Louisville is "spilled" from the reservoir to make space for water diverted under FRICO's Marshall Lake Division storage rights. (This water is not physically spilled from the reservoir but rather "booked" from the Louisville account over to the FRICO account in Marshall Reservoir.) When Marshall Reservoir spills occur, up to approximately 67% of this water is lost from Louisville's system and cannot be recaptured by the City. The remaining 33% amount is redistributed to the City through its ownership of its Marshall Division shares.

Some water rights were not diverted during many years of the study period due to lack of existing daily demand levels and/or storage space. This was anticipated in Louisville's earlier Raw Water Management

Plans with the understanding that many of the rights would be primarily used for the following purposes:

- Drought protection, and thus not diverted during average years;
- Refill of the City's storage facilities following a drought;
- Meeting the City's future demands up to build-out levels.

Storage limitations also have a significant impact on South Boulder Creek diversions. At certain times during the year (April-July) in which Louisville is entitled to divert, the system-wide storage capacity often has no excess capacity to store potential diversions. As a result, the only option is to bypass the flow at the Community Ditch headgate and/or the Louisville Pipeline intake. On average, system-wide storage constraints decrease diversions at the pipeline by 300 AF per year.

Constraint No. 3 – SWSP Pipeline Capacity

C-BT water deliveries to the City from the SWSP are currently limited to a 4.2 cfs flow rate because of pipeline capacity limitations (Louisville has the ability to increase the pipeline capacity to 7.2 cfs , effectively improving the City's firm yield during droughts). While the 4.2 cfs flow rate is adequate for wintertime deliveries, the SCWTP summertime demands exceed this flow rate. Therefore, historically during the summer months, C-BT units have been considered supplemental supplies for use at the SCWTP. The reasons for this were two-fold: (1) South Boulder Creek supplies are less expensive to deliver to the treatment plants (gravity flow); and (2) flow restrictions associated with the SWSP. These restrictions preclude higher C-BT delivery rates during summer peak demands and prolonged drought periods, resulting in larger releases from Marshall, Harper, or Louisville Reservoir. These releases from the City's storage facilities may cause implementation of Louisville's Drought Plan, despite adequate stored C-BT's supplies within the NCWCD system.

Southern Water Supply Pipeline – Northern Water

Due to high operational costs (pumping costs and annual assessments) it is more economical for the City to use its C-BT annual allocations prior to any use of Windy Gap Firming diversions. Because the City has sufficient C-BT water supply in average runoff years, Windy Gap Firming water would be used during only drought periods. However, until the Windy Gap Firming Project is completed with east slope storage, the water supply is not considered a viable water supply source in dry year periods.

Additionally, the lack of capacity in the SWSP also limits the City's ability to deliver Windy Gap Firming water. Firm yield analysis results show that for Louisville to reach the maximum firm yield levels with its current water supplies, C-BT and Windy Gap Firming supplies need to be diverted simultaneously to the SCWTP.

Constraint No. 4 – Louisville Lateral

Use of the Louisville Lateral was limited during the study period due to conveyance and maintenance issues related to the structure. Only two short-term releases were made from Marshall Lake to the lateral in 2007 and 2008. Therefore, it's generally recognized that during the study period there was no demand for the lateral's use - given that the SCWTP demands were met through the Louisville Pipeline.

Expected future use of the Lateral is related to the SCWTP water deliveries at times when demands exceed the Louisville Pipeline capacity. At such times preserving C-BT water sources is possible and desirable, the lateral could be operated simultaneously with the pipeline to maximize South Boulder Creek water deliveries to: (1) Louisville Reservoir for later diversion into the SCWTP; or (2) Harper Reservoir for subsequent delivery to Louisville Reservoir.

Constraint No. 5 - South Boulder Creek's Instream Flow

The Colorado Water Conservation Board ("CWCB") filed an instream flow water right below the reach of South Boulder Creek from which Louisville diverts at the Community Ditch and the Louisville Pipeline. The purpose of the instream flow right is to protect the fishery and riparian habitat from low streamflow conditions. The filing was made in December, 1980 for 15 cfs minimum flow rate in the summer and 2 cfs in the winter. For a variety of legal reasons specific to in stream flow rights, the CWCB water right is administered as a "senior" right to approximately 82% of Louisville's South Boulder Creek water rights. Therefore, at times the instream flow water right is the calling right on South Boulder, Louisville must curtail a majority of its diversions.

South Boulder Creek - Howard Ditch Headgate

DATA COLLECTION AND HISTORICAL TRENDS

Previous water planning reports conducted for the City utilized sophisticated computer modeling techniques to assess current and future water operations. RBI used the results of these modeling efforts, extended the previous master plan database, and then combined them with the practical experience of operating Louisville's water rights system to provide: (1) a description of the ongoing

management practices; and (2) changes to the current system and evaluate future operation alternatives.

Period of Record

The study period for this report's database was 2004-2015. The database included available information related to the City's water demands and supplies during these specific years. Once developed, the 2004-2015 database was integrated with the 2003 Raw Water Master Plan's database to create a continuum of data through 2015. The City's "water supply" was calculated using the historical daily, monthly, and annual amounts of water diverted and stored. Conversely, treatment plant records, golf course irrigation use, and other reuse needs comprised the City's overall "water demand" amounts.

The period of record also reflects conservation measures implemented by the City, recent system-wide improvements, and all additional water right acquisitions since 2003.

Diversion Records

Diversion records were obtained from the City's historical monthly and annual accounting reports submitted during the study periods to the following agencies: (1) the State Engineer's office; (2) FRICO; and 3) South Boulder – Coal Creek Ditch Company. Data for years 2000-2003 were derived from the Louisville's 2003 Raw Water Master Plan. Additionally, the City's internal accounting software records were used to supplement missing data. If there was discrepancy between the various databases, the lowest and most conservative recorded values were used in the analysis. Total diversions from the City's various water supply sources are listed in the table below for each month of the study period.

Table 2
City Louisville Historical Water Diversions
(acre-feet)

Water Year	Marshall Storage	Marshall Directs	Other SBC Water	C-BT	Windy Gap	Total
2000	1746	1022	2973	---	0	5741
2001	1940	6938	4514	521	0	13913
2002	645	0	2222	722	0	3589
2003	1179	1309	1422	256	0	4166
2004	1129	1660	1790	0	0	4579
2005	1613	1205	1998	30	0	4846
2006	968	2106	2008	66	0	5148
2007	1613	1317	1640	21	0	4591
2008	968	2190	2153	0	0	5311
2009	1779	280	1725	28	0	3812
2010	1779	1379	1050	80	0	4288
2011	1456	1658	1289	160	0	4563
2012	1203	0	2229	991	0	4423
2013	1492	742	1778	967	0	4979
2014	1497	1809	3880	637	0	7823
2015	1520	3501	1858	1031	0	7910
Ave	1408	1695	2158	367	0	5605

Note: Other SBC Water is referred to as Foreign Water when diverted in FRICO's facilities

The results indicate that diversions during the 2000-2015 study period are consistent with the trends reported in the earlier master plan reports (1992, 1998, and 2003), including the typical annual variations reflected in South Boulder Creek diversions and C-BT allocations. No significant changes from previous reports (and study periods) were identified during this study period.

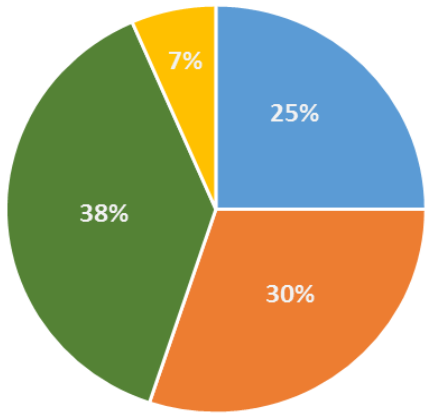
For future consideration, it is not anticipated that hydrological conditions will change significantly in the short term, but long term, climate change impacts may alter historical flow conditions – most notably in the timing of the runoff season.

Nevertheless, this historical trend analysis provided the baseline data to investigate the City's current water supplies (yields) and the foundation to assess existing and future city-wide operations.

Average Distribution of Supplies

The average annual allocation of supplies from each of the City's water sources during the 2000-2014 study period is illustrated in Figure 2.

Figure 2
Allocation of Raw Water Supplies



Precentages based on 2000-2015 average historical water diversions

Marshall Storage Marshall Directs Other SBC Water C-BT

Historical Demands

Total treatment plant production at the HBWTP and SCWTP was summarized to develop a baseline monthly and annual demand for raw water during the study period. Production numbers varied widely and the historical data reflected conservation measures implemented by the City in times of supply shortages. Annual demands are shown in Table 2.

Table 3
City of Louisville Raw Water Demands
(acre-feet)

Month	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Total
2000	247	205	197	188	220	326	602	749	792	738	554	308	5126
2001	192	202	210	178	206	247	443	716	776	721	575	354	4820
2002	215	197	196	187	213	369	453	387	448	393	318	225	3601
2003	153	169	172	154	153	168	347	478	701	627	408	345	3875
2004	162	163	175	163	188	186	390	446	479	457	412	220	3441
2005	163	170	175	149	171	195	353	496	731	582	522	241	3948
2006	191	174	174	166	175	303	574	702	643	618	442	257	4419
2007	157	174	176	157	182	200	376	623	743	632	509	296	4225
2008	173	166	170	164	174	210	410	591	797	665	443	252	4215
2009	179	175	179	161	193	192	383	388	550	585	512	216	3713
2010	167	175	170	170	158	185	301	497	577	591	535	308	3834
2011	171	184	180	164	179	226	345	546	550	655	493	304	3997
2012	158	173	169	155	196	309	493	672	649	672	491	233	4370
2013	177	181	181	151	162	158	311	590	649	592	344	189	3685
2014	159	163	168	150	171	203	353	544	617	530	377	234	3669
2015	155	169	166	143	163	207	234	375	481	606	563	409	3671
Ave	176	177	179	163	181	230	398	550	636	604	469	274	4038

Note: The Coal Creek Golf Course average annual total demand is an additional 210 AF.

DROUGHT MANAGEMENT PLANNING

Design Drought Determination

Previous raw water master plans included an analysis of historical flow records on South Boulder Creek to identify past droughts with respect to duration, severity, and frequency of re-occurrence. The purpose of the analysis was to determine the type of drought ("design drought") for which Louisville should use for planning and management strategies. From the design-drought analysis, the City's water supplies and demands are compared to identify any water shortages. The amount of Louisville's water supply during all years including a drought is commonly referred to as "firm yield" which is generally derived from the City's more senior water rights. In previous water planning reports, the 24-month period from March-1963 to February-1965 was selected as the "design-drought" for the City's future water supply planning.

These previous design drought analyses were reexamined for accuracy and to assess the feasibility of replacing the previous 1963-1965 design-drought with a more predictive period. The 2003 Raw Water Master Plan's hydrological records were updated through 2015 and then used to determine the need for a new design-drought. The result of this re-examination was that the criteria for using the 1963-1965 drought period continues to be applicable and provide the most representative design period for City-wide drought planning.

To project drought impacts to the City, the 1960's drought represents the unique set of circumstances and factors that most significantly affect the City's raw water supply. The 2002 drought is the most significant drought year during the study period, but the one year duration allowed City-wide storage to substantially refill in 2003. Further, while the drought of 1952-1957 was more severe in terms of low streamflow records on South Boulder Creek, using the 1960's drought-design period produces more significant drawdown in storage, and consequently, has a higher level of impact on developing and implementing drought management actions.

Therefore, in the case of Louisville, categorizing drought events only by its associated reoccurrence level (example: 1-in-50 years) has been determined to be inappropriate. A more important parameter with selection the proper design drought is the duration of the drought and its impacts on storage levels. The duration is an important because: (1) extended droughts generally do not occur frequently enough to justify the expense to protect against them in the future; (2) extended droughts are generally less severe in any given year but occur for longer periods, and (3) short-term (18 months or less) droughts do not fully impact City-wide storage for long periods and therefore have much less significant impacts on water operations. For Louisville, the 2-year duration of the 1960's design-drought was selected because of its critical impacts on City storage levels.

The key factor in assessing drought actions for Louisville is associated with the drawdown of City-wide storage levels during the first two years of the drought. The City currently has a two-year storage buffer available for the design-drought periods. During the first year of the design drought, water storage levels are drawn below average end-of-water year (November 15th) recorded levels. During the second year, the City is reliant on its carry-over from the previous year and the firm yield amount of water supplied in the second year. If the storage drawdown rate is significantly higher than previous (typical) years during the first year of the drought, then the City must rely on its firm yield water supplies and,

simultaneously, implement management strategies to address drought conditions and reduce City-wide water demands throughout the second year.

For these reasons, the design drought for this analysis was selected as the 2-year, 1963-1965 hydrological period on South Boulder Creek. The results from this analysis indicate that the City has a firm yield approximately 6,500 AF annually. Firm yield sources include senior South Boulder Creek water rights, City-wide winter storage, Colorado-Big Thompson and Windy Gap Firming water supplies.

Implementing Drought Management Restrictions

A critical component to properly manage the City's water resources during drought periods is to identify the appropriate time to implement the Drought Plan. Implementing the drought plan too early results in supplies exceeding demands, negating the need for outdoor water restrictions. Contrarily, implementing restrictions too slowly results in drawing City-wide storage levels significantly below average, causing the City to reduce its carry-over supplies for subsequent use if drought conditions continue.

Drought management restrictions not only lower total City-wide water demands, they also lower the amount of revenue the City's water billing will generate during the period in which the restrictions are enforced. Therefore, imposing outdoor water restrictions too early in the spring has the potential to lower the City's annual water revenue. In contrast, imposing water restrictions too late in the spring may cause the City to have to purchase or lease water at an inflated cost to supplement supplies during droughts.

Sprinkler

The time of year in which drought management restriction are determined will depend on a variety of hydrological factors: winter snowpack within the South Boulder Creek, projected C-BT's west slope deliveries, Marshall Lake carry-over storage supplies, and the City's March-April water usage. At times snowpack levels are significantly below-average within the South Boulder Creek drainage (e.g. 2002), it is reasonable to anticipate water restrictions during April-October. However, at times when snowpack levels are only marginally below average, timing the drought management actions becomes more difficult. Historically, during times of low spring snowpack within the basin, the City relied more heavily and earlier on C-BT supplies prior to implementing outdoor watering restrictions. By doing so, the City prevented the need to impose drought restrictions too early in the summer irrigation season, but risked the need to implement the same restrictions later in the summer (July-August) or the following spring.

Outdoor watering restrictions need to be consistently implemented only at times they are determined to be season-long actions (as a minimum). Public perception is important to obtain compliance with watering restrictions, and inconsistency and/or "false alarms" associated with the timing of watering restrictions erodes public confidence and compliance with the City's drought rules and management. Generally, a high level of consistency can be achieved by assessing the City's water supplies by May 1 (or earlier) of each year. For example, during the first year of the design-drought period used in this study, watering restrictions would be unlikely. However, by May 1 of the second drought year, indicators

(snowpack/runoff predictions, Marshall Lake carry-over storage, recorded City demands, and projected C-BT deliveries) are anticipated to indicate the need and level of watering restrictions to match estimated water supplies.

CLIMATE CHANGE

Climate Change Modeling Review

RBI has reviewed climate change modeling results that apply to the South Boulder Creek, Boulder Creek, and the South Platte River to assess potential long term impacts on the regional hydrology, water rights administration, and city water operations. Because of the wide variations and uncertainty in the modeling results, only general conclusions are offered below. As Louisville proceeds with future water resource management planning and as additional modeling results become refined, it is recommended that the City review these findings and make appropriated modifications as necessary.

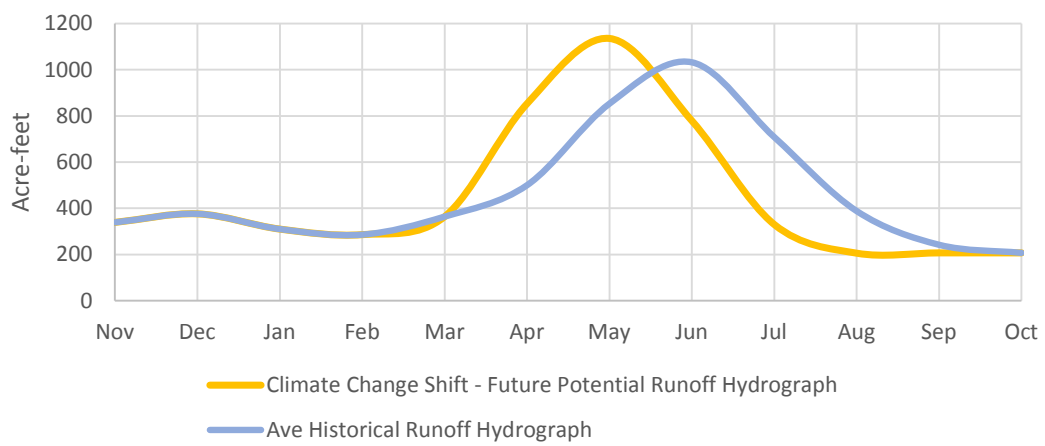
Predicted Result – No. 1: Hydrology

The consensus of the models reviewed (Colorado Water Conservation Board, Boulder Climate Change Study (2009)), Joint Front Range Climate Change Vulnerability Study (2012), Colorado State University Technical Report 12-203(a) indicates the following:

- The runoff period on South Boulder Creek will gradually shift 20-45 days earlier from May 20 – June 22 to April 20 – May 22

Figure 3

Potential Runoff Timing Shift



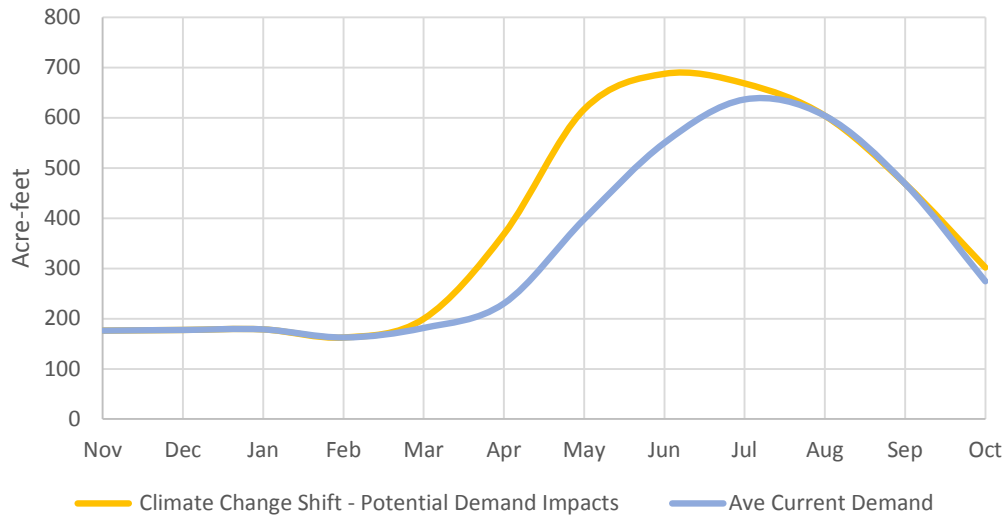
Other climate change assumptions also to be considered with runoff shift effects:

- Winter precipitation will increase 10-20%; summer precipitation will decrease 5-15%
- Annual runoff and stream flow volumes will be increased up to 10%
- Late summer stream flows will decrease 8-10 %
- Extreme climate conditions (droughts and floods) will increase in frequency and duration.

Predicted Result – No. 2: Water Demands

- City demands will shift from April – September to March – October

Figure 4
Potential City Demand Shift



Other climate change assumptions also to be considered with potential City demand shift effects:

- Annual irrigation demand volumes are projected to increase 5-15% without City imposed limitations
- Daily temperature increases will also increase daily evaporative reservoir losses at Marshall, Harper, McKay and Louisville Reservoirs, decreasing the potential annual yield released from each.

Predicted Result – No. 3: Operational Changes

- Marshall Reservoir will fill to capacity less frequently
- Junior water rights (foreign water) will be diverted more frequently in March and April
- Total peak runoff diversions will decrease
- Post-peak junior diversions will increase
- Senior rights will be used in June-October period rather than July- September
- Decreed monthly and annual volumetric limits will be reached more frequently for all of Louisville water rights, but most notably for the City's senior water rights
- Higher evaporative losses from the City's reservoirs.

Predicted Result - No. 4: Colorado River Compact

- More frequent and longer droughts are anticipated to reduce flows within the Colorado River basin

- River flows are reduced over time, and the associated storage levels within the basin are reduced in prolonged drought
- The likelihood of a Colorado River Compact call being placed on the Colorado River increases from "unlikely" to "possible" and some models show "probable".
- A compact call will reduce or eliminate delivers from C-BT and Windy Gap water supplies
- Specific impacts to the Louisville's water supplies based on a Colorado River call would require specific system wide modeling for the City's delivery system.

Watershed Protection

- Increased wildfire danger - increase frequency and duration
- Increased runoff due to extreme thunderstorm events
- Increased flash-flooding - local tributary capacities exceeded (Dowdy Hollow).

ALTERNATIVES

The City has adopted many of the recommendations provided in the 2003 Raw Water Management Plan. Consequently, an updated evaluation of the raw water supply system now includes these previous recommendations, and as result, the current baseline has been established against which to compare other future alternatives.

Current Water Supply and Demand

Louisville's average annual demand currently is 4,250 af/year. The City's firm yield is also currently estimated at 5,000 af/year. This is based on data for water treatment plant deliveries (demand) and the historical South Boulder Creek diversions and SWSP deliveries to SCWTP (supply). Therefore, based on the current level of demand, the City has sufficient supplies to meet average demands without imposing watering restrictions.

However, it is anticipated that future demands will increase; at time of this report the City's build-out demand is somewhat uncertain. RBI was provided three likely demand levels at the time the City's build-out occurs:

- 6,100 AF per year – (estimate provided by Louisville's Water Efficiency Plan)
- 6,500 AF per year – (estimate provided by the draft Drought Management Plan)
- 7,120 AF per year – (previous Water Master Plan estimated build-out demand from 2003).

For each of these build-out demand levels, the difference between build-out demand and current water supply systems was analyzed to determine:

- The amount of water supply shortfall based on the future firm yield estimates
- The adequacy of current drought management practices to address these shortfalls
- List alternative actions the City may consider reducing overall City demand during drought periods

- List alternative actions the City may consider increasing its water rights portfolio and drought water supplies.

The results of this particular analysis are provided below. Costs for the alternatives are estimated, although the water markets' volatility in northern Colorado is a consideration for any future water acquisition.

No Additional Action

Most City-wide planning documents include a "No Action" alternative addressing the current situation and impacts in the future. For this report, the recommendations listed in the 2003 Raw Water Management Report adopted or to be adopted by the City are included in the No Additional Action alternative (e.g. load shifting, obtain Windy Gap Firming supplies, and increase in SWSP capacity).

The No Additional Action alternative is used to quantify the impact of using only the current City's supply system to meet future projected demands. No Additional Action, however, does not imply that the City will not decide to improve/repair/construct its water supply infrastructure, discontinue its water leasing to other local users, or make other management decisions that will improve the efficiency of the raw water supply system.

The No Additional Action does accurately reflect Louisville's current water and storage supplies and the City's sole reliance on the existing firm yield water supply during future droughts. Consequently, as build-out demands approach and potential shortfalls occur, City management may need to invoke drought management strategies earlier and more frequently if not combined with other alternatives.

The components of the No Additional Action alternative are listed below:

Firm Yield	(AF/yr)
Current:	5,000
Current with No Additional Action Alternative	6,500
Demand	
Current (average)	4,250
Build-out Scenario No. 1	6,100
Build-out Scenario No. 2	6,500
Build-out Scenario No. 3	7,120

The analysis shows that the City has sufficient water supplies to meet its near-term demands. To meet demands at the three build-out levels, the City must implement load-shifting from the HBWTP to SCWTP, enlarge the SWSP pipeline to SCWTP (to 7.2 cfs), and utilize water conservation measures to ensure that demands do not exceed firm yield supplies. These measures increase the yield to 6,500 AF per year, which meets the two lesser demand scenarios. Build-out #2 scenario was selected as the "Baseline Demand" to assess the City's need to acquire additional water supplies and/or storage. If future build-out demands are less than the "Baseline Demand", the City may avoid engaging in future water and/or storage acquisitions. Conversely, to meet the build-out #3 (7,120 AF) scenario, a water acquisition plan becomes necessary. Additionally, in the build-out #3 scenario, load-shifting, water conservation, and watering restrictions (10-15% reduction) may be implemented to lower City-wide

demands to firm yield water supply levels. Below is a summary of potential alternative projects that could be utilized to improve the City's water resources.

Additional Storage

The acquisition of additional storage can be achieved two ways: (1) Marshall Lake Division shares; and 2) build or acquire additional storage space. Marshall Lake Division water includes direct and storage water rights based on the City's pro rata ownership in the division. Therefore, storage in Marshall Lake is included with every purchased share. In past City water reports, acquired or constructed storage space was considered prohibitively expensive. However, while costs remain relatively expensive, alternatives exist that warrant further consideration:

Enlargement of Gross Reservoir: Add one-foot of elevation to the dam height and create an 800-1,000 AF "excess" pool. The estimated cost is $4-8 million. Cooperation with Denver Water, City of Boulder, and City of Lafayette would be an integral part of obtaining approval for such additional storage space in Gross Reservoir. Modifications to the reservoir inlet are also anticipated. Given the current status of Denver Water's project to enlarge Gross Reservoir, this option has a low feasibility valuation.

Enlargement of Marshall Lake: Previous reviews conducted by the City indicated that increasing Marshall Lake may be problematic because of the resulting increased footprint of the reservoir area. Increasing the dam height may cause alluvial groundwater to build-up behind the dam to levels that would have detrimental effects to the adjacent landowners (landfill) and Highway 93. While further investigation is needed, these preliminary findings reduce the viability of this storage alternative.

Marshall Lake Forebay: Construct a 600 - 1,000 AF forebay storage facility adjacent to Marshall Lake for the purpose of diverting "spill water" and in-priority junior water rights from Marshall Lake to the forebay. The initial proposed site is south of the HBWTP, property presently owned by Boulder Open Space. The estimated cost is $12-$15 million.

Storage Partnerships with Surrounding Communities: Collaboratively investigate storage opportunities with entities such as District 6 water users and the Cities of Lafayette, Superior, Firestone and Erie. Periodic meetings with participants from each entity would be conducted to identify water needs (volumes, amounts, timing) and build the framework for a storage project within the South Boulder Creek/Boulder Creek/South Platte River drainages.

Dredge Marshall Lake: RBI is not aware of any updated storage-capacity curves for Marshall Lake. Without an updated curves, water elevation levels may no longer accurately represent storage volumes in the reservoir. Therefore, preferably in collaboration with FRICO, updated Marshall Lake storage capacity curves need to be developed to assess the current storage volume. Once the curves are developed, the City and FRICO can assess the amount of dredging that is needed to maximize the benefits versus the costs. It is anticipated that only a small portion of the overall storage is affected and this recovery would need to be combined with other options. A planning level cost for dredging is estimated at $2 million.

Excess credit leasing/trade: Develop a leasing program or partnership program (water trade) to utilize excess reuse credits in non-drought years. The available reuse water would be used at times the City's water excess credit supplies exceeds its demands. The excess water could be leased to generate revenue or traded with other entities for use of CB-T units, additional South Boulder Creek water rights,

or additional Marshall Lake shares. Terms and conditions of future leases will be contingent upon future water market demands.

C-BT/Windy Gap Conveyance to HBWTP

Load-shifting has proven to be a valuable management tool to maximize Louisville's water supplies, most notably C-BT and Windy Gap sources. However, load-shifting is only from the HBWTP to SCWTP to fully utilize C-BT and Windy Gap supplies especially during winter operations. Under the current water delivery system, no C-BT/Windy Firming Gap water can be diverted to the HBWTP.

Historically, Marshall Lake has been the primary source of water for the HBWTP. Using storage at Marshall Lake to meet the plant's demands rather than C-BT/Windy Gap Firming supplies has proven a cost-effective strategy (no pumping costs) and reserves C-BT/Windy Gap Firming water for later use at the SCWTP to carry the City through the design-drought.

However, recent events have illustrated the potential need for a C-BT/Windy Gap Firming conveyance to the HBWTP. Events such as the 2013 flood effectively eliminated the use of Marshall Lake due to high turbidity levels. Additionally, in 2015, repairs to the Community Ditch required closing the head gate during the middle of the summer, thereby eliminating any additional diversions into Marshall Lake. Further, diversion from the Louisville Pipeline to the HBWTP were curtailed by repairs in 2015, again impacting water yields at Marshall Lake. Also, ongoing water quality issues have hindered the use of Louisville Reservoir in late summer, thereby increasing the treatment demands at the HBWTP. Under all of these conditions, preserving Marshall Lake water shifted to a higher priority as a result of limited storage supplies.

As a result of these events, a potential option has developed for a conveyance facility to deliver water from SWSP to the HBWTP to address times when storage becomes limiting in Marshall Reservoir. A full feasibility analysis is required to assess the design and cost of the pipeline, but estimates range from $8-20 million.

Enlargement of Louisville Pipeline

The upper operation range of the pipeline is between 5.0 and 5.5 cfs. Expanding the capacity of the line to 10 cfs increases the average South Boulder Creek yield by 400 AF; during drought years, firm yield would increase approximately 200 AF.

This updated analysis confirms the results of the 2003 Raw Water Master Plan. Given the cost of C-BT units and the uncertainty of water right transfers, optimizing infrastructure to increase water yield is an economically viable alternative. The enlarged pipeline would be designed to divert water that currently bypasses the headgate. If additional capacity existed, higher flow rates could be diverted in accordance to the City's water right entitlements.

However, the marginal benefits associated with enlarging the Louisville Pipeline are lessened by the lack of storage and seasonal demand in average years. While higher rates of diversion are possible with an enlarged pipeline capacity, storage of such water occurs only if space is available in Marshall Lake or Harper Lake. If these two reservoirs are at full capacity, maximum pipeline diversions would be limited

(equal) to daily treatment plant demands. However, it is anticipated that City future demands will increase resulting in higher diversion occurring at the pipeline.

Nevertheless, additional pipeline capacity would allow the City to reserve its Marshall Lake and C-BT allocations, thereby increasing Louisville's average and the firm yield water supplies. Further, no water court action to enlarge the pipeline is required if the location of the head gate on South Boulder Creek does not substantially change (which is not anticipated). The estimated cost is $10-15 million, which converts to $25,000 - $37,500 per AF of increased yield.

Another advantage of enlarging the pipeline involves operational maintenance issues. The pipeline was constructed in the 1950's making it part of the City's aging infrastructure that will see an increase in repairs and maintenance. Rather than replace and repair the existing pipeline - with no increased capacity benefits - the City could adopt a replacement program that enlarges the pipeline to allow for future increased flows. This option gives the City the ability to maintain and repair the pipeline and simultaneously gradually increase its capacity. It is expected that if no replacement of the pipeline is undertaken by the City, the Louisville Pipeline will incur significant expenses for extensive repairs and unplanned water supply interruptions. A condition assessment of the pipeline is planned for 2017 whereby an estimated life expectancy and will be used to develop a long range maintenance plan.

Water Acquisition

The planning criteria for future water acquisitions is four-fold: (1) identify the City's projected water demands; (2) identify the City's firm yield supply amount; (3) identify shortfalls between current supplies and future demands; and (4) purchase the "type" of water that best serves the long term interest of the City.

Water Rights Considered for Purchase

Colorado's water markets have various types of rights available for purchase, including agricultural ditch rights, C-BT units, and Marshall Division shares. (Groundwater, based on earlier studies, is not considered a viable alternative water source for Louisville. Deep groundwater supplies are limited and considered not sustainable based on current ground water supply and pumping costs). Selecting the "best-fit" for Louisville requires an analysis that determines which of these purchase options meets the City's long term needs at the most cost effective manner. This section describes three alternatives.

Agricultural Ditch Rights

Louisville currently has 31 agricultural ditch water rights involving 14 irrigation ditches that have been transferred through water court for use within the City's municipal system. These water rights consist of a combination of senior and junior water rights, with 80% of the City's water diverted during the months of May - July. Former agricultural rights comprise the "foreign" water classification and can be legally stored in City reservoirs or directly diverted to the treatment plants. Each of these water rights has specific terms and conditions that define the timing and amount of water the City is entitled.

Ditch Flume

Agricultural irrigation rights within the South Boulder Creek basin generally do not have associated storage rights, but rather are solely direct flow rights that can be diverted only during the summer's irrigation season. Therefore, the value of these rights is limited at times the City's current storage facilities reach full capacity. Under these circumstances, direct flow agricultural rights can only be diverted to the treatment plants, with flow rates limited by daily city demands rather than the larger legal entitlement. As a result, foreign water is less valuable to the City when compared with the other sources.

Current purchase costs for agricultural water rights within the South Boulder Creek basin average $25,000 - 30,000/AF. However, transactions costs (engineering and legal) to transfer these rights from agricultural to municipal use in Colorado's water court averages $150,000 (2016). Comparable costs vary depending on the amount of water transferred in each water court application. Therefore, the economies of scale for the purchase and transaction of these rights would indicate that it would be beneficial to acquire a large amount of water prior to undertaking any water court action by the City.

C-BT Units

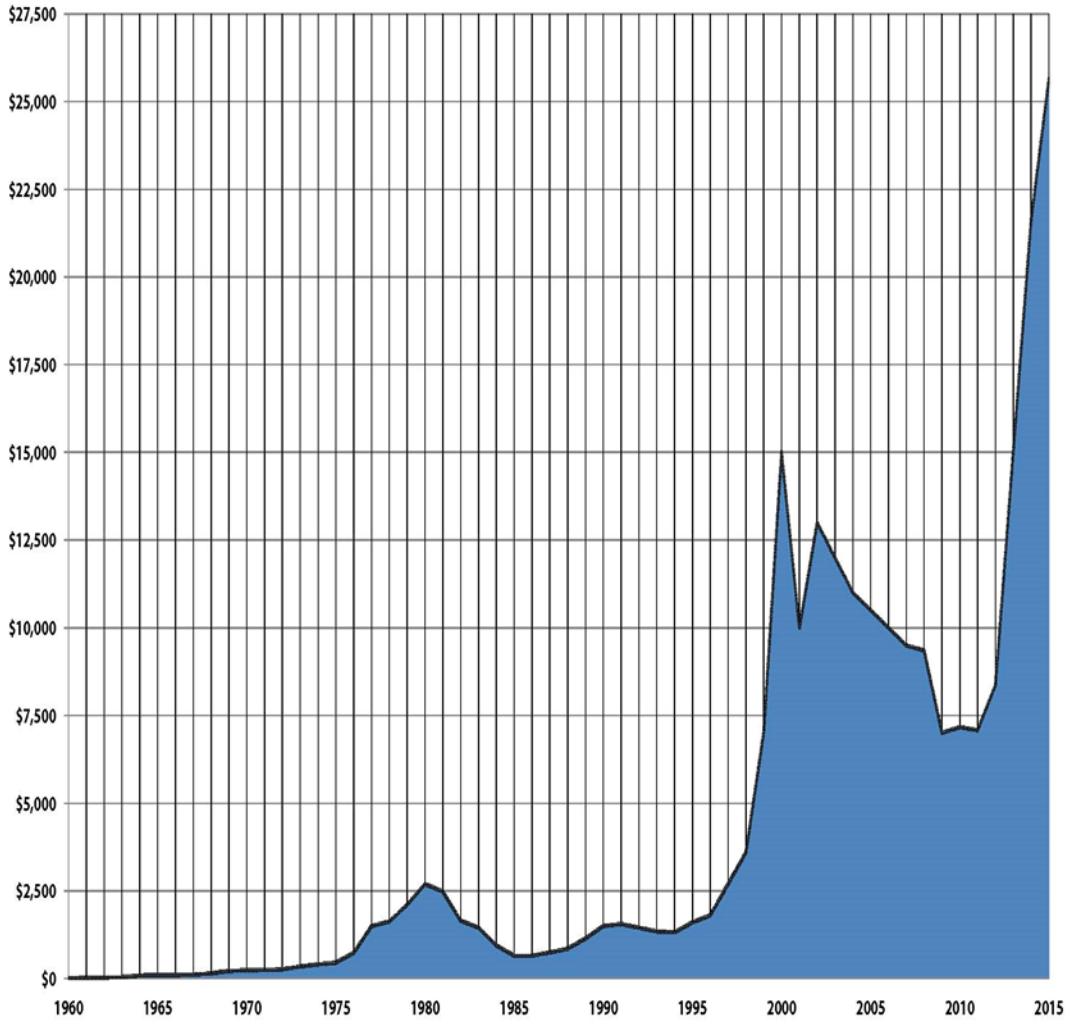
The Colorado-Big Thompson Project diverts water from the headwaters of the Colorado River and delivers this water to various east slope reservoirs. Units of C-BT water can be bought and sold on the open market. Built originally during the 1930's to serve northern Colorado agricultural communities, C-BT units have been gradually acquired by municipal and energy interests and now make up the majority of usage.

Once collected on the west slope and diverted to NCWCD's east slope storage sites, C-BT units are not subject to Colorado's legal water allocation system and therefore offer more flexibility related a unit's time of use. However, C-BT units are subject to a Colorado River Compact river call, if one was to occur in the future. On average, a single C-BT unit equals 0.7 AF of water which was used in assessing future C-BT amounts and needs. C-BT units can be used year-round because of the storage component associated with each unit. As a result, the demand for C-BT water has been increasing over the last ten years, especially due to the recent increased demand from municipal interests.

The price of C-BT water has increased dramatically since 2010. Currently, the price of C-BT water is at record levels ($23,000-$27,000 per unit). Delivery costs to the City are currently $35/unit, not including the $17/AF pumping costs. Slowing energy development may lower prices in the near-term, but municipal demand has remained constant. Historical transactions indicate that C-BT costs do not fluctuate during drought and flood periods. However, historical economic variations in housing development in northern Colorado have proven to significantly impact the C-BT market.

Figure 5

Historical Representative Market Prices Per C-BT Acre-Foot Unit [1]



[1] District allottees of C-BT Project water may transfer and sell their respective acre-foot units to other parties within Northern Water boundaries. These transactions are subject to rules and regulations of the Board. The above table represents data gathered by voluntary action and serves as an indicator of how the price of C-BT Project water has fluctuated on the open market through the years. Actual transaction prices may vary.

64 Northern Water

Windy Gap Units

Louisville owns 9 units of the Windy Gap Firming Project. Future shares of Windy Gap Firming will be associated with any acquisition of C-BT units. However, Windy Gap units may be purchased without associated C-BT units. Because of the project's junior water rights, Windy Gap Firming water cannot be diverted during low runoff years. Conversely, during wet periods, storage space in the project's west slope reservoir, Granby Lake, is not available for Windy Gap water because it has a lower "storage priority" (as determined by NCWCD) than C-BT Project water.

Chimney Hollow Reservoir will increase the Windy Gap Firming project's annual firm yield to approximately 30,000 AF. This equates to approximately 600 AF entitled to Louisville Windy Gap water, with storage, would be considered drought protection for the City. It is also the most expensive water acquisition alternative at $1.4 million per unit and an annual debt service charge of approximately $25,000/year. Delivery charges for Windy Gap Firming water to the City is currently $130/AF, plus pumping costs ($17/AF).

The expected commencement date of the Windy Gap Firming Project - and the construction of Chimney Hollow Reservoir - is anticipated to be mid-2018.

At the time of this report, there is potential to acquire addition Windy Gap units as several project participants have reassessed their respective positions and looking to reduce their unit total.

Marshall Division Shares

Louisville owns 381.64 shares in FRICO's Marshall Lake Division; the total number of Marshall Division shares is 1,278.979 shares. The Marshall Division water rights consist of the Marshall Lake Division direct flow priorities and the Marshall Lake and McKay Reservoir storage rights.

The storage capability in Marshall Lake differentiates Marshall Lake Division rights from other agricultural water rights within the South Boulder Creek drainage basin. As a result, the Marshall Division shares provide a higher value to the City because of the Marshall Division right's storage component. Recent sales of Marshall Division shares have averaged $23,000 - $30,000 per share, with each share averaging 4 AF/year.

South Boulder and Coal Creek Ditch Shares

Louisville owns shares of South Boulder and Coal Creek shares. Similar to Marshall Division shares, these shares also consist of a storage and direct flow water rights. No recent sales of South Boulder and Coal Creek Ditch shares have occurred. However, it is anticipated that such rights have a value comparable (if not slightly cheaper) than Marshall Division shares. Only about 12% of the company's shares are still untransferred. Prior City engineering reports indicated that Louisville's ownership in the remaining shares could assist in protecting the City's current interest in the ditch company in addition to providing additional water supply to the City.

Gross Reservoir

During the past few years, Louisville has participated in negotiations with Denver Water (owner of Gross Reservoir) and the cities of Boulder and Lafayette to assess the feasibility of acquiring storage in Gross Reservoir. Denver Water is undergoing a re-permitting process for the reservoir and has identified 5,000 AF of additional storage space ("Environmental Pool") in Gross Reservoir. The purpose of Environmental Pool is to store water for later release to benefit the riparian habitat along South Boulder Creek and supplement streamflows when the Colorado Water Conservation Board's instream flow is the calling right on the creek (late summer). An early version of the proposal from the participants included storing Boulder, Lafayette's and Louisville's water in the newly available storage space each given a specific amount of storage space based on each city's ability to use its own water rights for environmental purposes.

The other parties have decreed water rights for storage in Gross Reservoir; Louisville has no such right. This lack of decreed storage space in Gross Reservoir has severely limited Louisville's participation. Without a water source to store in the reservoir, Louisville does not have the ability to meet the Environmental Pool requirements. Further, Boulder and Lafayette have the ability to release water from Gross Reservoir, shepherd the water through the instream flow reach of South Boulder Creek, and recapture the water for use in the municipal system. Louisville, however, has no ability to recapture the water from below the instream flow reach of South Boulder Creek. Louisville's water rights are diverted above the instream flow reach. Therefore, Louisville's ability to provide environmental enhancement and recapture Gross Reservoir releases for later City use has proven to be problematic.

The remaining parties continue to negotiate final terms (volume amounts and capital storage costs). Previously, Louisville has made proposals to the other parties to cost-share expenses associated with Gross Reservoir storage (since 2007), but without a legal water storage supply and identified, tangible environmental benefits, Louisville cannot meet the re-permitting requirements.

Amount of Water to Purchase

The amount of water required to adequately supply the City during the design-drought duration is contingent on: (1) risk assessment; (2) estimated costs; and (3) other adopted alternatives. Currently the City has an average demand of approximately 4,250 AF/year. Current firm yield supplies are estimated at 5,000 AF/year. Therefore, in the near-term planning period, Louisville's supply is sufficient to meet historical average demands. With load-shifting and water conservation management, the City's firm yield can be increased to 6,500 AF/year.

Based on review of historical records and City staff discussions, the 6,500 AF build-out scenario was used as the baseline annual demand for this report. At this level, the current firm yield supplies are adequate to meet the City's raw water demands with the implementation of the No Additional Action Alternative. However, due to inherent inefficiencies in the City's raw water transmission and distribution system, it is recommended that the City consider increasing its raw water supplies and/or storage to add 200 AF of C-BT units, Windy Gap units, or Marshall Division shares.

If the build-out demand is higher than 6,500 AF then additional water supplies and/or additional storage capacity will be needed. If the City water demand reaches the 7,120 AF/year level, there is a potential shortfall of 620 AF/yr at this build-out demand level.

To cover potential future water supply deficits which would result from demands exceeding 6,500 AF/year, the City will need additional water supply (from sources listed above) and/or storage acquisition. However, the following issues should also be considered with such purchases:

- C-BT purchases are limited to 400 units without increasing our contribution to Windy Gap
- Windy Gap Firming -- is considered best suited for drought protection rather than used to increase average annual supply because of high cost of acquisition and operation
- South Boulder Creek water rights include the uncertainty related to water court proceedings, in stream flows, and other administrative constraints
- In general, without additional storage, relatively more senior rights are required to address the shortfall. However, senior water rights comprise a smaller segment of the water market and, as a result, are relatively more expensive than other less senior (but more abundant) water rights.
- Marshall Lake shares include a storage component, increasing their value for City use

- Raw water supply needs are subject to change due to any of the following reasons: (1) future changes in water operations, (2) development of future cooperative agreements, (3) increase in city-wide storage capacity, (4) revised lower demand projections.

OTHER CONSIDERATIONS

General Cooperative Partnerships

Louisville has existing water/storage supply-related agreements with several entities including:

- Annual water supply leases - Asphalt Specialties, Three Leaf Farms
    - 2016 Lease Amount is 20 AF/yr
- Use of Louisville Pipeline for augmentation bypasses - Eldorado Springs
    - Approximately 10 AF during 2015 water year
- Use of Louisville Pipeline as an alternate point of diversion - City of Lafayette
    - Legal right, not contractual right

The Asphalt Specialties, Three Leaf Farm, and Eldorado Springs agreements are currently under review to assess the following:

- Policy strategies for renewing lease contracts (Asphalt and Three Leaf Farm);
    - Honor existing leases
    - Add new leases only on an annual basis - to the extent water is available.
- Louisville Pipeline Use -
    - Review and revise existing terms and conditions regarding the Facility Use Agreement with Eldorado Springs.

Future partnerships are anticipated regarding potential South Boulder basin local storage, basin-wide water right administration and management, and the possibility (and feasibility) of developing South Boulder Creek cooperative opportunities. Initial discussions with local entities are needed to develop the structure and process associated with these partnerships- with a primary focus on current basin-wide issues and future planning. Potential participants in these partnerships include water users in District 6 and, to the extent necessary, the users located on the lower St. Vrain and South Platte Rivers.

McKay Reservoir Conveyance

McKay Reservoir has the potential to supply replacement water for the City's return flow obligations, including Marshall Division shares, which could alleviate the need for such replacements to be made from Marshall Lake or the City's wastewater treatment plant. However, without an approved conveyance, such replacements from McKay Reservoir are not physically possible.

Negotiations with other water users to allow for water deliveries have been undertaken and are anticipated to continue. Discussions need to focus on Louisville's (and others) requirement to make return flow replacements. Recent rulings from similar water court proceedings indicate that future

similar requirements will be imposed on water right transfers associated with Marshall Lake Division shares. Current and projected terms of water supplies will create a higher demand for McKay Reservoir releases to supply municipal replacement obligations in time, place a location of the historical depletions (including Louisville's). This effectively eliminates the ability to deliver such return flows replacements from the City's wastewater treatment plant. Therefore, full compliance with Louisville's water court decrees will require a new conveyance structure. Final costs will depend on cost sharing arrangement with other parties involved and the type of engineering solutions selected to allow McKay Reservoir releases.

State of Colorado Water Plan

A recently published statewide water plan, developed by the Colorado Water Conservation Board, has indicated more cooperative operations are needed to address the projected shortfall of municipal water supplies in the state. Specifically, the plan identifies the need for increased flexibility to provide municipal water supplies during droughts. This flexibility can be achieved through cooperative agreements between water users within the basin, e.g. interruptible water supplies and water banking.

The state-wide plan recommends basin-wide cooperative planning among local water users. However, currently there is no formal planning forum for South Boulder Creek water right holders. Therefore, to implement the state plan, a District 6 water forum needs to be established with representation from the various District 6 water users. The purpose of the forum would be to discuss: (1) current water supplies/storage; (2) near-term basin-wide operations; (3) future water right operations; (4) watershed protection strategies, and (5) improved communication among the participants.

State of Colorado, Division of Water Resources, Water Rights Accounting Audit

Louisville began the audit process with the Colorado Division of Water Resources in 2014 to standardize the City's accounting forms, reporting procedures, and accounting process. This audit phase currently continues revisions to the accounting forms and procedures, with review and comment from the Division 1 Engineer, and the State Engineer's Office. It is anticipated that the audit process will be completed by December, 2017.

SUMMARY

The purpose of this report was to provide Louisville with an analysis related to its current and future water supply and use. Results indicate that the City has a firm yield of 6,500 AF/yr, with a current annual demand of 4,250 AF/yr. Three projected water demand levels were used to evaluate whether current water supplies are sufficient to meet the City's future growth. Results indicated that current raw water supplies were adequate to meet all but the highest demand level: 7,120 AF/yr.

To accurately appraise these results, several assumptions need to be identified when considering the outcomes described above:

- The modeling analysis assumed current storage capacities are an accurate representation of existing conditions.

- The Louisville Pipeline's recent diversion rate is around 5.0 cfs. This was based on typical historical use of the pipeline rather than the original design flow rate of 7.7 cfs.
- To the extent water and storage/demand was available, it was assumed in the original modeling analysis that Louisville diverted water to its fullest legal entitlement. However, in practice, full efficiency in water diversions and deliveries is unrealistic. Historical diversion/delivery records clearly indicate that there were several occasions whereby water was available but not diverted. Therefore, appropriate modifications were made to reflect practical constraints limiting the City's ability to divert at the highest rates, most notably regarding the two pipelines.
- To achieve the firm yield of 6,500 AF/yr with current water supplies it is anticipated that the City will need to increase its current level of water resource management, specifically daily administration and operations. This includes providing the capability to divert, deliver, and store all available water. As a result, higher daily management is required to achieve this level of water operations.
- Three future City-wide water demand levels were chosen for this analysis based on previous reports and estimates. Further refinement of these three City's future build-out demand estimates is warranted to specifically target the amount of any water supply shortfall.

This report identifies a variety of water resource management alternatives designed to meet all future City water demands. However, the intent was not to present these individual alternatives mutually exclusive of each other. To the contrary, it is anticipated that a combination of alternatives will be adopted to achieve the desired goals. It is also anticipated changes and modifications will be necessary to update the information contained in this report. As the City develops into its build-out scenario in 2065, review of this document is warranted on 2-5 year basis, rather than the previous 10-year review.

Table 4
Summary of Capital Improvement Alternatives

Alternative	Increased Yield (AF)	Cost/AF	Difficulty (1-5)*	Total Cost
Enlarge SWSP Pipeline Capacity	800	$10K - $18K	3	$1-3 Million
Marshall Lake Forebay	600 - 1000	$20K - $25K	5	$12-25 Million
Dredge Marshall Lake	400 *	$10K	3	$4 Million
Water Purchase	250 *	$22K - $28K	5	$4-7 Million
Gross Reservoir Storage	250 *	$10K - $20K	5+	$2.5-5 Million

* 1-5 = easy to difficult transaction level
** Estimated yield unknown - only estimates provided

RECOMMENDATIONS

After considering the information gathered, the Louisville Staff has the following specific recommendations:

- Maintain the Design Drought period of 1963-1965
- Proceed with the SWSP Transmission Capacity Project
- Continue participation in the Windy Gap Firming Project
- Develop and implement load shift operational procedures
- Maintain and expand the Water Conservation Program
- Finalize McKay Reservoir negotiation
- Perform bathometric survey of Marshall Lake
- Utilize a build-out demand projection of 6,700 acre-feet for short term acquisition strategy
- Update the current Drought Management Plan
- Update the current City's water demand projections at Louisville's build-out use (Year 2065)
- Acquire up to 200 acre-feet of additional water supplies by purchasing C-BT units, and/or FRICO's Marshall Division shares, and/or South Boulder and Coal Creek Ditch shares.

From: Jeff Lipton
To: Heather Balser
Cc: City Council
Subject: Proposed Water Tap Fee Increases
Date: Sunday, November 3, 2019 12:03:10 PM

Hi Heather,

I have a number of questions I would like to have answered related to the proposed water tap fee increases included in tomorrow's packet. I was hoping that after the Finance Committee's discussion on this matter, that there would be additional analysis included in the Council Packet related to this topic. I was a bit disappointed that the Council packet didn't provide much more than what was presented at the Finance Committee meeting.

I would start by saying that I am not questioning our policy goal that new growth should pay its own way. But, raising tap fees immediately as is being proposed does bring up issues related to our long-term economic sustainability and cost of housing. All of our policy goals need to be balanced and recognize that they are inter-related at some level.

Specifically, I would like to see additional information or answers to the following:

1- According to our current practices, at what point in the development review process does an applicant actually make a request and is assessed for water taps? Is it when they apply for a building permit or is it earlier in the review process? Do we have more time to analyze and consider the water tap fee proposal?

2- Can staff provide Council with an analysis of the City's current inventory of water and how much additional development that any current surpluses could support recognizing our needs for resiliency against climate change and cyclical draught conditions. I don't recall City Council seeing analysis of that kind in recent years. What is our capacity today and what will we need in the future?

3- What are the City's processes for providing credits to parcels being proposed for new or re-development which had already acquired water taps in the past? Is the cost of new taps at higher fees off-set partially by the capacity and taps already purchased for those properties mitigating the impacts to these developments?

4- Inasmuch as the City increased the requirements for sprinkling residential and commercial properties in recent years and thus causing the property owners to increase their associated tap sizes to accommodate the rare use of inside sprinkling systems, was that change reflected in our current modeling for replacement water? Obviously, the use of that water capacity would be highly infrequent and wouldn't be a continuing burden on the City's on-going water needs.

5- Can the staff provide a chart showing Louisville's current tap fees compared to the surrounding communities (Boulder, Lafayette, Superior, Broomfield, etc.) also indicating the new tap fees being proposed?

6- Can staff provide us a full list of CBT acquisitions over the past five years including the amounts purchased and the costs per unit? Also, could staff provide Council with the City's water consultant's forecast for future prices of CBT water?

7- What other policy and pricing alternatives did the City staff consider as part of a migration strategy for tap fee increases that would both meet our community goal of having growth pay its own way while maintaining the City's economic competitiveness and housing cost affordability? Are there any more scalable approaches we could consider that would attain both goals?

Thanks in advance for your help with these questions. I recognize your desire to move this forward quickly. But, there are important considerations related to all of these issues that the City Council and public didn't have before the information was contained in the packet or the analysis used in making your recommendations.

Best,

Jeff Lipton
Louisville City Council
Ward II

From:	Susan Loo
To:	Kurt Kowar; Heather Balser
Cc:	Cory Peterson; City Council; Megan Davis; Rob Zuccaro
Subject:	Proposed 2020 Tap Fees
Date:	Sunday, November 3, 2019 2:12:04 AM

Staff is proposing a 75% increase in tap fees for 2020, effective on February 15.

Basically, the traditional domestic 1.25 inch line has increased from $122,000 to $214,000. That is a substantial increase if someone wants to build a house. For a commercial property with a potential 2 inch line, the cost rises from $217,000 to $380,500.

While the price of CBT water is definitely trending up in the graph provided, the market value appears to go down sometimes. Does our model account for decreases as well as increases?

Do we ever adjust tap fees mid-year to account for market changes?

Staff indicates various communities are also raising tap fees. What are their proposed rates and how do they compare to ours?

Our policy that growth pays its own way and costs should not be foisted on existing residents remains the guiding principle. However, if these new tap fees put us at a disadvantage, some staff suggestions on how we stay competitive would be useful.

I would appreciate more detail on the pros and cons of developers providing water rights in lieu of tap fees.

Links to minutes/discussions by members of the Utility and Finance Committees on this topic might also be enlightening.

I am considering pulling this item from Consent.

Thanks for any further explanation you can provide.

CANTILEVERS

COLORADO TECH CENTER

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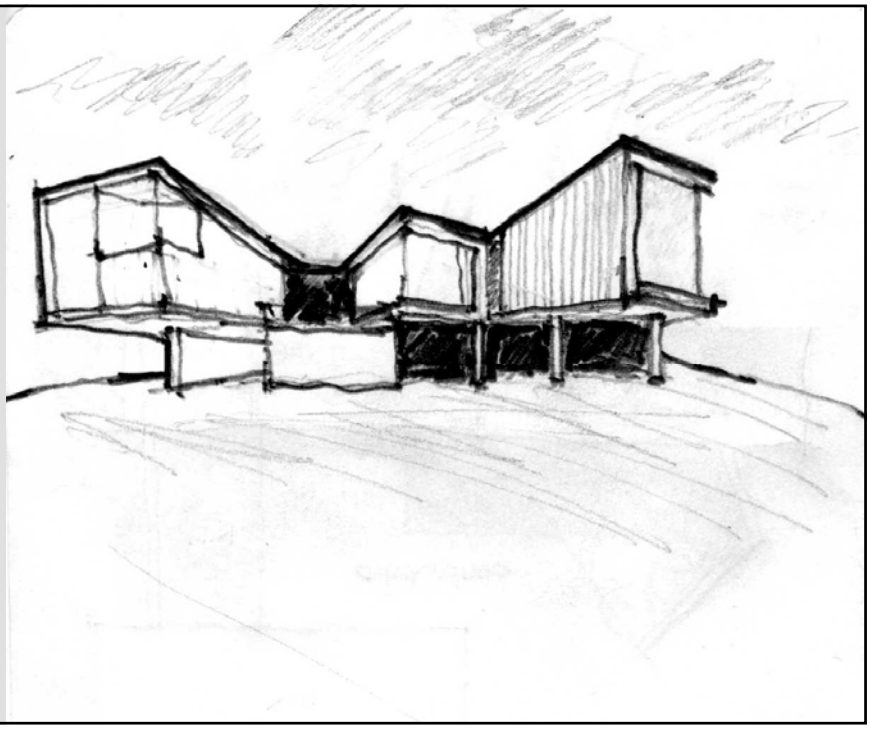

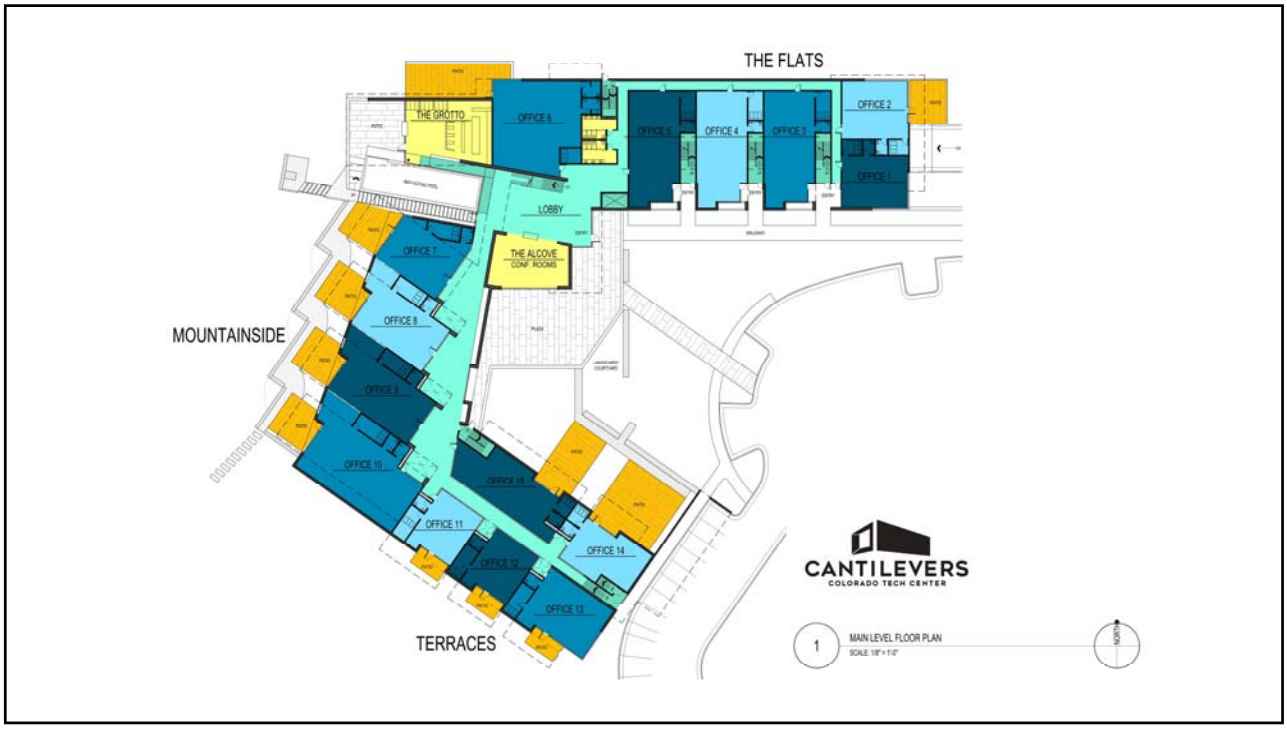
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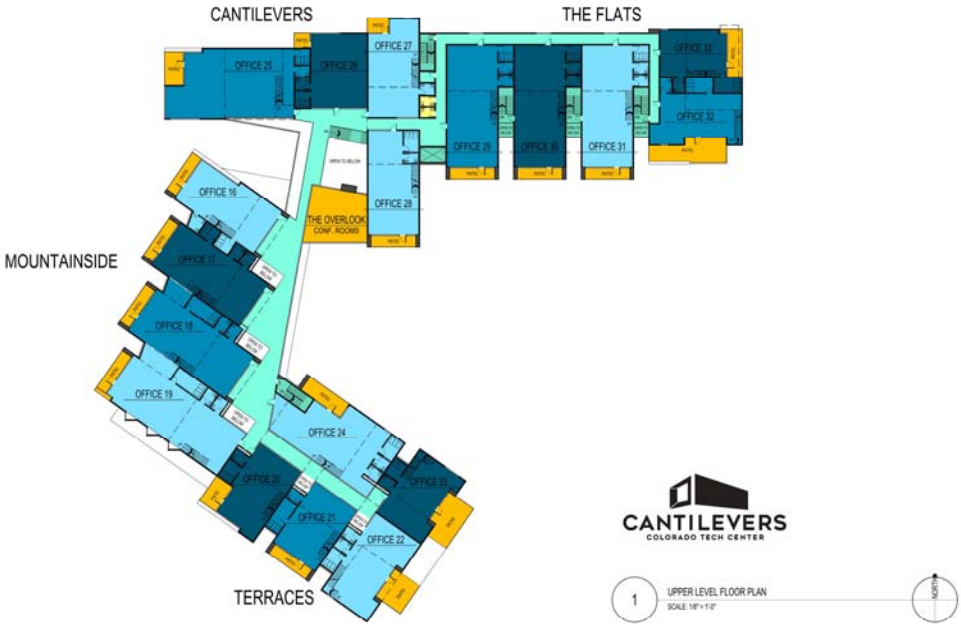
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THE OVERLOOK CONF. ROOMS
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COLORADO TECH CENTER
1
UPPER LEVEL FLOOR PLAN
SCALE: 1/8" = 1'-0"
NORTH

CANTILEVERS
COLORADO TECH CENTER
1
MEZZANINE LEVEL FLOOR PLAN
SCALE: 1/8" = 1'-0"
NORTH

AMENITIES.

ARCHITECTURE.

- Progressive architectural design that leverages both beauty with functionality.
- 33 individual office condominiums that are all unique
- Condos can be grouped in a large variety of ways to create larger spaces.
- Cross-Laminated Timber construction that provides both structural support and beautiful design.
- Mezzanines for all second-floor units
- All units have either outdoor patios or balconies.
- Private entries for northeast units
- Secure underground private parking garage with 37 spaces and 27 covered surface parking.

PUBLIC SPACES.

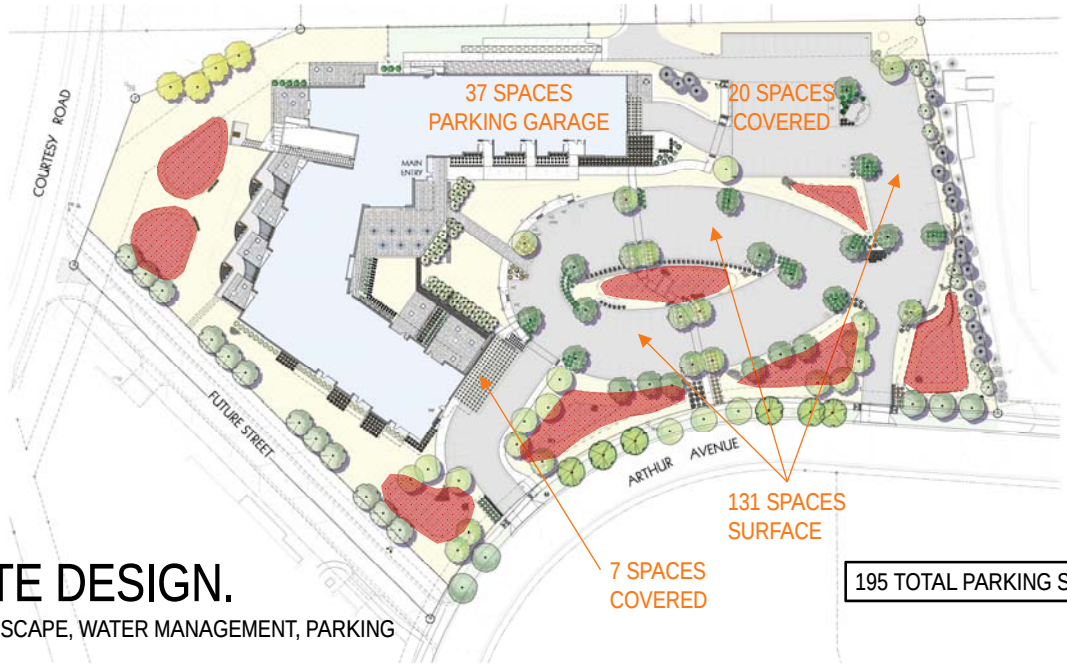
- The Grotto, The Overlook, The Alcove reservable lounge and meeting spaces.
- The Plaza outdoor hardscaped courtyard.
- Reflecting pool with infinity edge waterfall and rock garden.
- Secure indoor bike parking.
- Lobby with contemporary furnishings and fireplace.
- Common outdoor patios & landscaped areas.
- Space for a third-party operated coffee cart.
- Walking path on property.
- Public dog run area.

TECHNOLOGY.

- Smart Technology security and concierge service.
- Highly energy-efficient building envelope.
- High-efficiency heating, cooling and ventilation.
- 20,000 SF of rooftop area dedicated to solar electric installations.
- Electric vehicle (EV) charging stations.
- Infrastructure to support heavy technology users.
- High-speed Internet service via Comcast Business fiber optic.
- High-end vending machine services

SURROUNDING AREA.

- Stunning views of the Front Range and open space around Louisville and Lafayette.
- Proximity to Louisville's Historic Downtown.
- Easy access to coffee houses, bakeries, restaurants, and breweries.
- Plenty of places to support your physical well-being through indoor climbing, fitness, CrossFit, yoga, golf, and more.
- Vast network of Boulder County bike paths and trails for the active lifestyle.
- Closely situated to the mountains for hiking, skiing, camping, mountain biking and other outdoor activities.
- Well located near Boulder, Denver, Hwy 36 and Hwy 287.
- New access road off 96th Street planned along the southwest border of the property.



SITE DESIGN.

LANDSCAPE, WATER MANAGEMENT, PARKING

195 TOTAL PARKING SPACES

DEDICATION.

30' R.O.W. FOR ACCESS ROAD

PARKING.

Sec. 17.20.010. - Parking requirements.

Where square feet are specified, the area measured shall be the floor area primary to the functioning of the particular use of property and shall exclude stairwells; elevator shafts; hallways; ornamental balconies; space occupied by heating, air conditioning or other utility equipment; space devoted exclusively to storage; and space devoted to off-street parking or loading.

The number of employees of a new or expanding business shall be estimated in a manner approved by the planning commission, and the number of employees of an established business shall be determined from an examination of employment information presented by applicants.

REQUIRED PARKING.

Total building area counted toward parking	60,652 SF
Required parking ratio	4 : 1000
Required parking	243 parking spaces

PROVIDED PARKING.

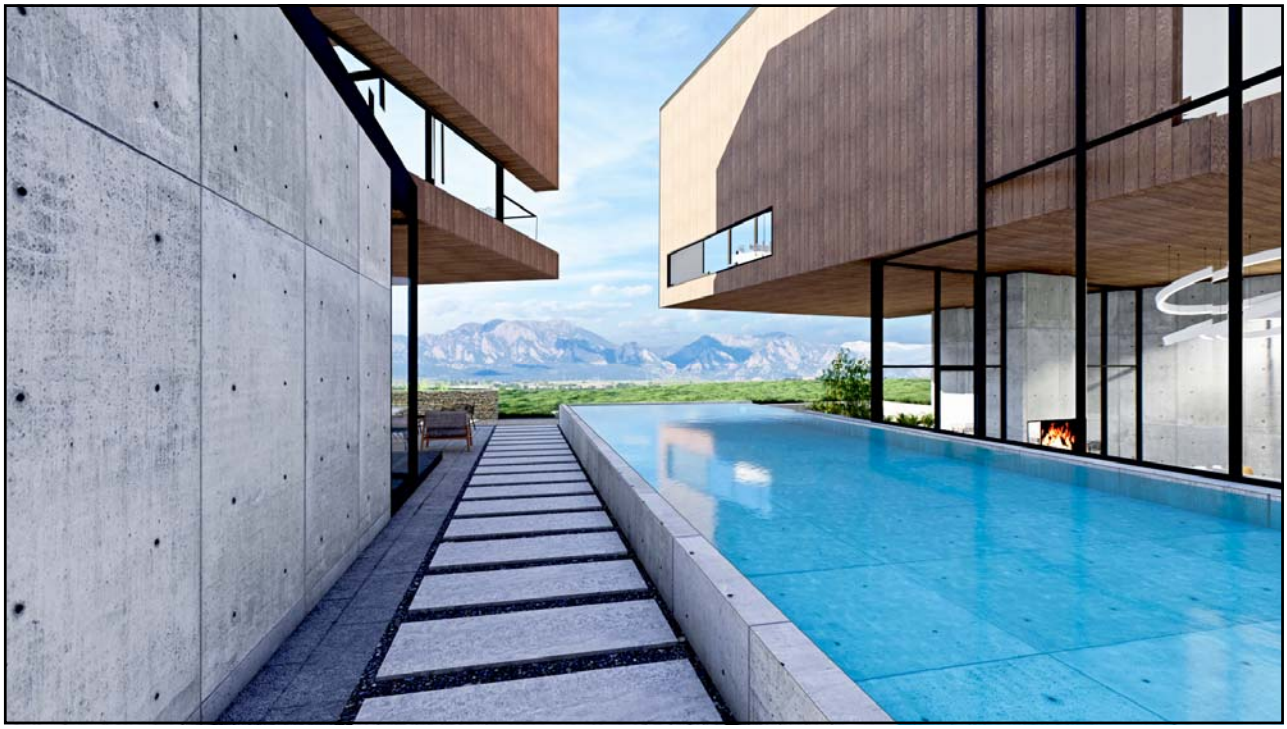
Total building area counted toward parking	60,652 SF
Suggested parking ratio	3.2 : 1000
Parking Provided	195 parking spaces
Projected Occupancy (5/condo avg)	165 occupants
Estimate breakdown of transportation to building	
Traveling by single occupant vehicle	145
Carpooling (assume 2/vehicle)	10 (reduction of 5 spaces)
Bicycle	15

OFFICE AREAS					
MAIN LEVEL			SECOND LEVEL		
NAME	AREA (SF)	PATIO (SF)	NAME	AREA (SF)	BALCONY (SF)
CONDO 1	1,140	0	CONDO 16	1,982	144
CONDO 2	1,249	476	CONDO 17	2,339	144
CONDO 3	1,805	0	CONDO 18	2,841	144
CONDO 4	1,805	0	CONDO 19	3,247	144
CONDO 5	1,813	0	CONDO 20	1,716	168
CONDO 6	2,435	910	CONDO 21	1,699	144
CONDO 7	1,397	487	CONDO 22	2,126	288
CONDO 8	1,654	471	CONDO 23	1,620	370
CONDO 9	1,880	472	CONDO 24	2,600	221
CONDO 10	2,592	470	CONDO 25	3,500	180
CONDO 11	1,101	182	CONDO 26	1,349	66
CONDO 12	1,100	182	CONDO 27	1,835	92
CONDO 13	1,512	182	CONDO 28	2,020	144
CONDO 14	1,189	1,312	CONDO 29	2,640	144
CONDO 15	1,601	780	CONDO 30	2,630	144
			CONDO 31	2,630	144
			CONDO 32	1,862	456
			CONDO 33	1,429	212
SUB-TOTAL	24,273	5,924	SUB-TOTAL	40,065	3,349
TOTAL PRIVATE AREA			64,338		
TOTAL PRIVATE PATIO/BALCONY			9,273		
TOTAL PRIVATE AREA + PATIO/BALCONY			73,611		
COMMON AREAS					
COMMON INDOOR AREAS			COMMON OUTDOOR AREAS		
COMMON		11,237	PLAZZA		3,728
GROTTO		1,604	GROTTO		795
LOBBY / ENTRANCE		2,028			
CONFERENCE ROOMS		2,010			
SUB-TOTAL		16,879	SUB-TOTAL		4,523

PARKING CALCULATIONS.

	EXCLUSIONS WITHIN CONDOS	CONDO AREA	COMMON AREA	TOTAL
MAIN LEVEL	-3,093	24,273	2,718	23,898
SECOND LEVEL	-4,207	40,065	896	36,754
TOTAL PARKING AREA				60,652
PER CODE				243 PARKING SPACES

EXCLUSIONS:
Restrooms, Mechanical Rooms, Hallways, Vertical Circulation, Wall Construction



CANTILEVERS
COLORADO TECH CENTER

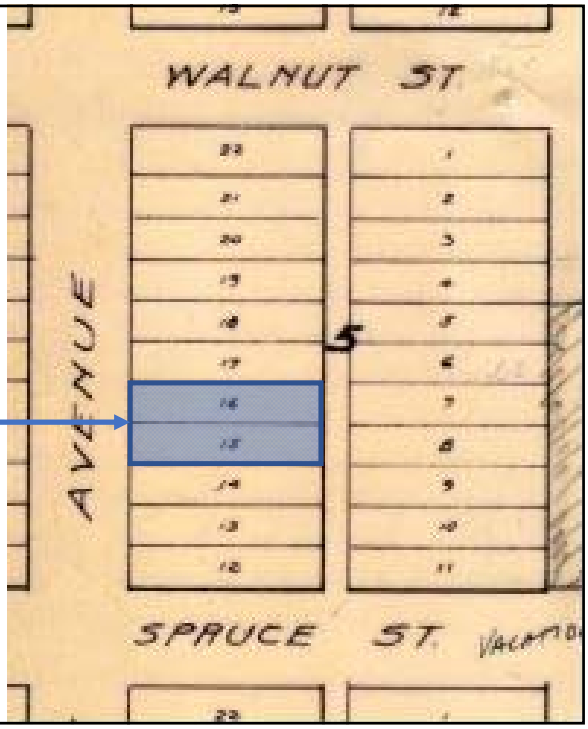
DAJDESIGN
ARCHITECTURE+INTERIORS

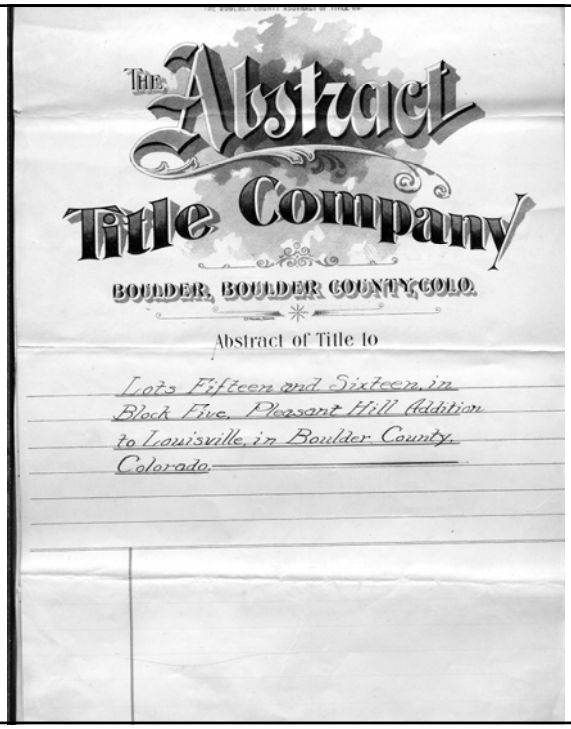
816 LINCOLN AVE

LANDMARK, GRANT, ALTERATION

LOTS 15 & 16

Records date back to 1875
to the original deed.



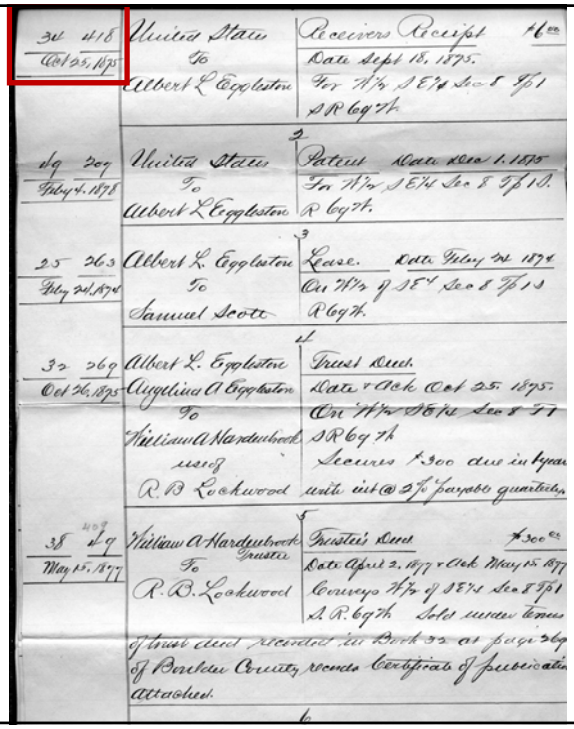


THE Abstract Title Company

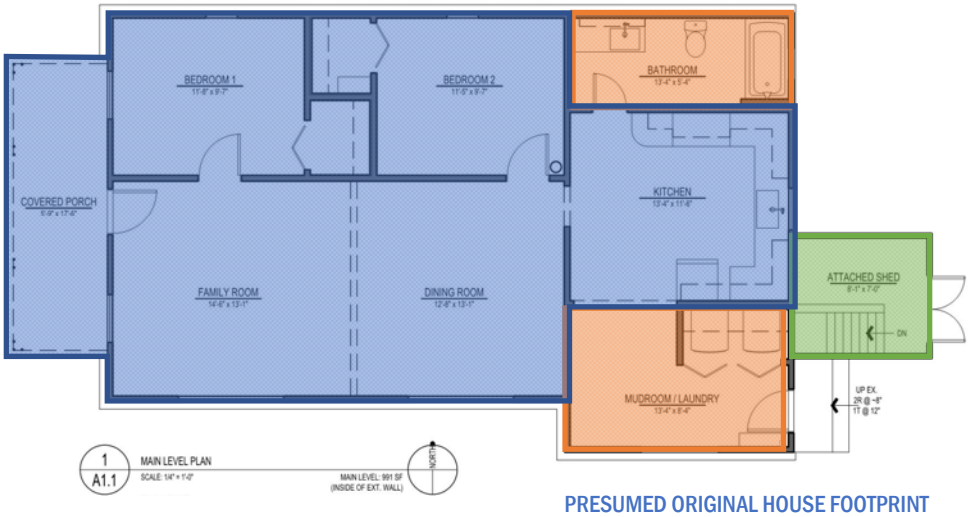
BOULDER, BOULDER COUNTY, COLO.

Abstract of Title to

Lots Fifteen and Sixteen in Block Five, Pleasant Hill Addition to Louisville, in Boulder County, Colorado.



30 418 Oct 25, 1875	United States To Albert L Eggleston	Receivers Receipt Date Sept 18, 1875. For W½ SE¼ Sec 8 Tp 1 S R 69 W.	160
19 209 Feby 4, 1878	United States To Albert L Eggleston	2 Patent Date Nov 1, 1875 For W½ SE¼ Sec 8 Tp 1 S. R 69 W.	
25 263 Feby 24, 1874	Albert L. Eggleston To Samuel Scott	3 Lease. Date Feby 24 1874 On W½ of SE¼ Sec 8 Tp 1 S R 69 W.	
32 269 Oct 26, 1875	Albert L. Eggleston Angeline A Eggleston To William A Hardenbrook using R. B Lockwood	4 Trust Deed. Date & Ack Oct 25 1875. On W½ SE¼ Sec 8 T 1 S R 69 W Secures $300 due in year with int @ 3% payable quarterly	
38 409 May 15, 1877	William A Hardenbrook Trustee To R. B. Lockwood	5 Trustee's Deed Date April 2, 1877 & Ack May 15 1877 Conveys W½ of SE¼ Sec 8 Tp 1 S R. 69 W. Sales under terms of trust deed recorded in Book 32 at page 269 of Boulder County Records Certificate of publication attached.	$300 00



PRESUMED ORIGINAL HOUSE FOOTPRINT

PRE-1948 ADDITIONS TO HOUSE

COVERED CELLAR ADDITION TO HOUSE, LATER DATE

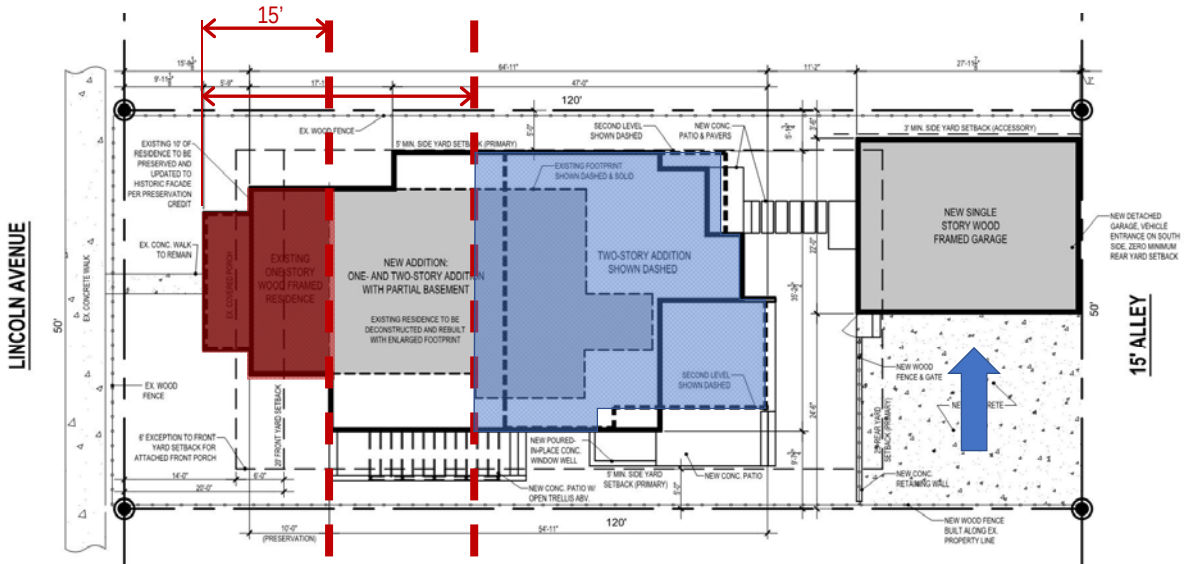
- ARCHITECTURAL INTEGRITY MAINTAINED
- FRONT PORCH SIMILAR
- DORMERS
- WINDOW LOCATIONS

- EXISTING REAR OF HOUSE SAME AS 1948 PHOTO
- REAR PORCH ENCLOSED WITH DOOR ON SIDE.
- BATHROOM ADDED TO NORTH SIDE.
- CELLAR DOORS COVERED.

1
A3
EAST ELEVATION
SCALE: 1/4" = 1'-0"

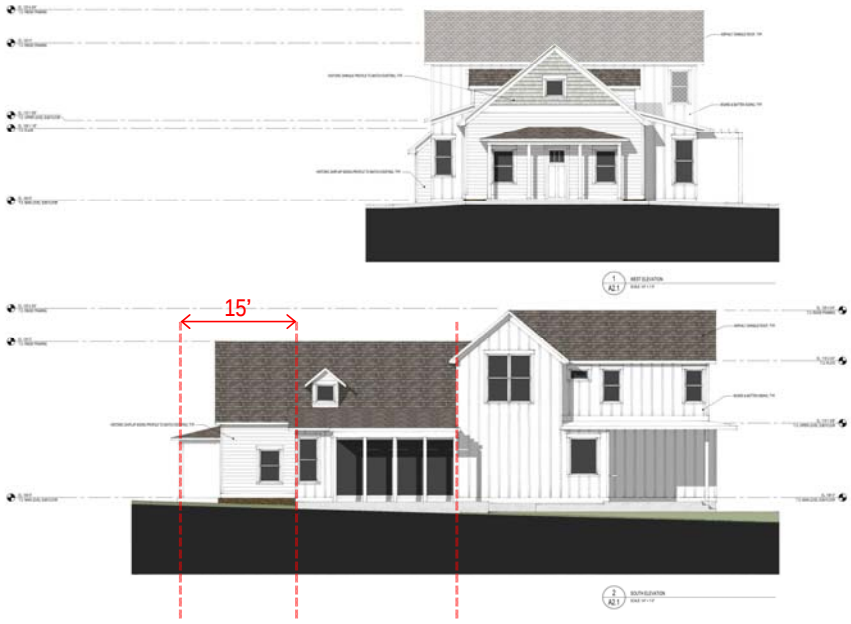
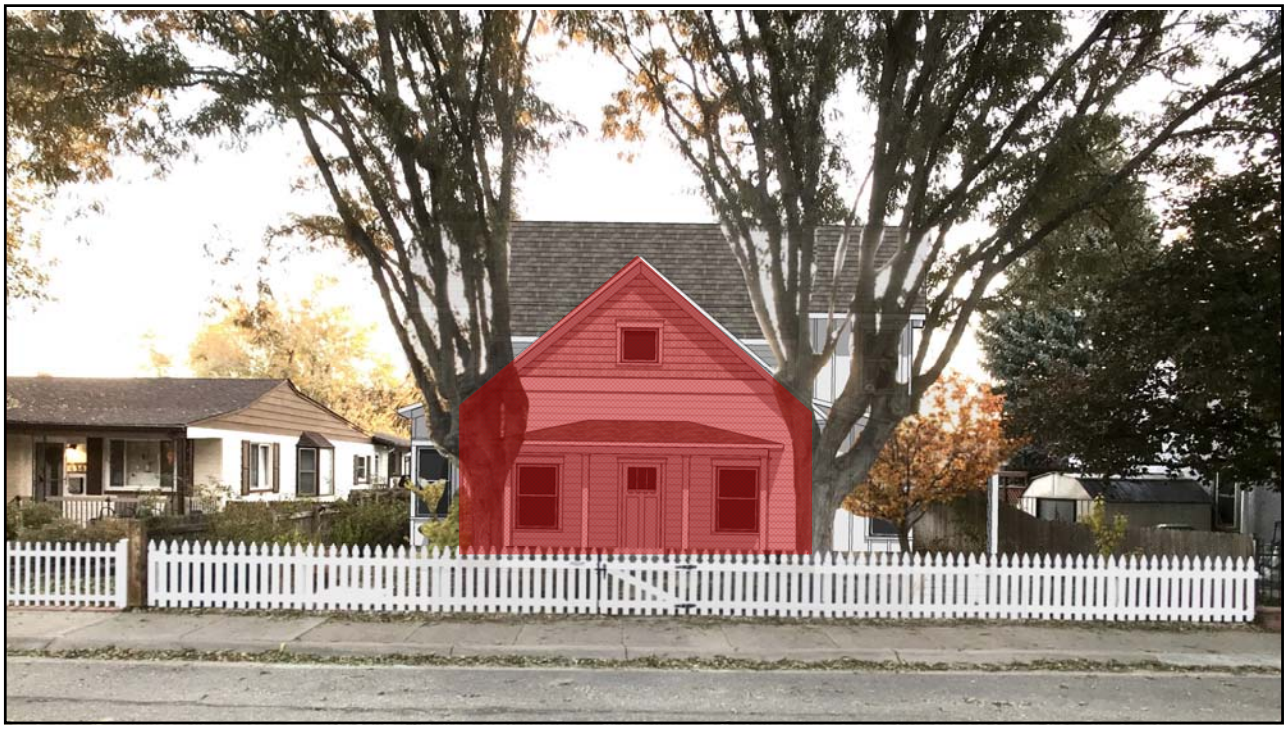
1
A4
SOUTH ELEVATION
SCALE: 1/4" = 1'-0"

1 / A2 NORTH ELEVATION
SCALE: 1/4" = 1'-0"



1 / A1.0 SITE PLAN
SCALE: 1" = 10'-0"

ZONING ANALYSIS:	PROPOSED	ALLOWED
LOT COVERAGE PERCENTAGE	2084	35.0%
LOT COVERAGE SQUARE FEET	2,084.0 SF	2,250 SF


15'

22'